Winterbourne Wind Farm

Environmental Impact Statement

27 October 2022

Project No.: 0526676

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Winterbourne Wind Farm

Environmental Impact Statement

Catherine Timbrell
Planner

Dianne Munro
Principal Planner

Murray Curtis
Associate Director

Mark Davey
Partner

Environmental Resources Management Australia Pty Ltd
Level 15, 309 Kent Street
Sydney NSW 2000

CERTIFICATION

Project Details	
Project Name	Winterbourne Wind Farm
Application Number	SSD-10471
Address of the land in respect of which the development application is made	Land comprises 315 freehold landholdings, see Section 3.2.1.
Applicant details	
Applicant Name	WinterbourneWind Pty Ltd
Applicant Address	Level 4, 312 Street Kilda Rd, Melbourne VIC 3004 Australia
Details of person by whom this EIS was prepared	
Name	Dr M. Davey
Address	L15, 309 Kent Street, Sydney NSW 2000 Australia
Professional qualifications	PhD, MSC, BAppSci
Declaration of environmental assessment practitioner	
Name	Dr M Davey
Registration Number	N/A
Organisation registered with	N/A
Declaration	The undersigned declares that this EIS: ■ Has been prepared in accordance with Schedule 2 of the *Environmental Planning and Assessment Regulation 2021*; ■ Contains all available information relevant to the environmental assessment of the development, activity or infrastructure to which the EIS relates; ■ Does not contain information that is false or misleading; ■ Addresses the Planning Secretary's environmental assessment requirements (SEARs) for the project; ■ Identifies and addresses the relevant statutory requirements for the project, including any relevant matters for consideration in environmental planning instruments; ■ Has been prepared having regard to the Department's State Significant Development Guidelines - Preparing an Environmental Impact Statement; ■ Contains a simple and easy to understand summary of the project as a whole, having regard to the economic, environmental and social impacts of the project and the principles of ecologically sustainable development; ■ Contains a consolidated description of the project in a single chapter of the EIS; ■ Contains an accurate summary of the findings of any community engagement; and ■ Contains an accurate summary of the detailed technical assessment of the impacts of the project as a whole.
Signature	
Date	27 October 2022

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APPENDICES

Acronyms and Abbreviations

Abbreviation	Description
AAAA	Aerial Agriculture Association of Australia
ABS	Australian Bureau of Statistics
ACHAR	Aboriginal Cultural Heritage Assessment Report
ACHMP	Aboriginal Cultural Heritage Management Plan
ACMA	Australian Communications and Media Authority
AEMO	Australian Energy Market Operator
AEP	Annual Exceedance Probability
AGL	Above Ground Level
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
AIA	Aviation Impact Assessment
ALA	Aircraft Landing Area
ALARP	as low as reasonably practicable
AMSL	Above Mean Sea Level
ANZECC	Australian and New Zealand Environment Conservation Council
Approved Methods	*Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (NSW EPA, 2005)
APZ	Asset Protection Zone
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
ARR	Australian Rainfall and Runoff
AS	Australian Standard
ASA	Air Services Australia
Assessment Area	Includes all land within a 500 m buffer of the Development Site, as appropriate for linear development under the BAM, for which landscape features such as native vegetation cover, bioregions, waterways and other features are described.
Aurecon	Aurecon Australasia Pty Ltd
AusWEA	Australian Wind Energy Association
BAM	Biodiversity Assessment Method
BAL	Basic Left Turn
BAR	Basic Right Turn
BCD	Biodiversity Conservation Division of DPE
BC Act	*Biodiversity Conservation Act 2016* (NSW)
BDAR	Biodiversity Development Assessment Report
BESS	Battery Energy Storage System
BFEMOP	Bush Fire Emergency Management and Operational Plan
BFMC	Bushfire Management Committee
BGS	Below Ground Surface

Abbreviation	Description
BMP	Biodiversity Management Plan
BMS	Battery Management System
BMT	BMT Commercial Australia Pty Ltd
BoM	Bureau of Meteorology
BOS	Biodiversity Offset Strategy
BSAL	Biophysical Strategic Agricultural Land
BUS	Bird Utilisation Survey
CAR	Civil Aviation Regulation
CASA	Civil Aviation Safety Authority
CCC	Community Consultative Committee
CERRA	Central Eastern Rainforest Reserves of Australia
CIA	Cumulative Impact Assessment
CIA Guidelines	*Cumulative Impact Assessment (CIA) Guidelines for State Significant Projects* (DPIE, 2021d)
CEMP	Construction Environmental Management Plan
CLM Act	*Contaminated Land Management Act 1997* (NSW)
Commissioner	Australian Energy Infrastructure Commissioner
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAWE	Commonwealth Department of Agriculture, Water and the Environment
dB	Decibel
dB(A)	A-weighted Decibels
DCP	Development Control Plan
DECC	Department of Environment and Climate Change
DECCW	Department of Environment, Climate Change and Water (now DPE)
Development Footprint	The area of land that is directly impacted by the Project, including all temporary and permanent impact areas, and all areas where vegetation may be removed during project construction and operations, as utilised in the BDAR.
Development Site	The BDAR includes the Development Footprint, plus a 100 m buffer around all areas of the Development Footprint. This is also referred to as the *Study Area*. The Development Site is the area in which Stage 1 of the BAM has been applied to assess the biodiversity values of the land where direct and indirect impacts may occur.
DNG	Derived Native Grassland
DNV	DNV Energy Systems
DP	Deposited Plan
DPE	NSW Department of Planning and Environment
DPIE	NSW Department of Planning, Industry and Environment (now DPE)
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
EL	Exploration Licence
ELF	Extremely Low Frequency

Abbreviation	Description
EMF	Electromagnetic Field
EMI	Electromagnetic Interference
EMP	Environmental Management Plan
EMR	Electromagnetic Radiation
EMS	Environmental Management Strategy
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
EPBC Regulations	*Environment Protection and Biodiversity Conservation Regulations 2000* (Cth)
EPI	Environmental Planning Instrument
EPL	Environmental Protection Licence
ERM	Environmental Resources Management Australia Pty Ltd
ESD	Ecologically Sustainable Development
ESCP	Erosion and Sediment Control Plan
FM	Frequency Modulation
FM Act	*Fisheries Management Act 1994* (NSW)
FRNSW	Fire and Rescue NSW
FTE	Full Time Equivalent
G	Gauss
GHG	Greenhouse Gas
GPS	Global Positioning System
ha	Hectares
HBT	Hollow-bearing tree
HHA	Historic Heritage Assessment
HHMP	Historic Heritage Management Plan
HIPAP	Hazardous Industry Planning Advisory Paper
HIPAP 4	*Hazardous Industry Planning Advisory Paper No. 4 – Risk Criteria for Land Use Safety Planning*
HIPAP 6	*Hazardous Industry Planning Advisory Paper No. 6 – Guidelines for Hazard Analysis*
HVAC	Heating, Ventilation, and Air Conditioning
HRV	Heavy Rigid Trucks
Hz	Hertz
IBRA	Interim Biogeographic Regionalism for Australia
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IEC	International Electrotechnical Commission
IFR	Instrument Flight Rules
INP	*NSW Environmental Noise Management – Industrial Noise Policy*
IPA	Inner Protection Area

Abbreviation	Description
ISO	International Standards Organisation
ISP	Internet Service Providers
km	Kilometre
kPa	Kilopascal
kV	Kilovolt
LCU	Landscape Character Units
LEP	Local Environmental Plan
LG Act	*Local Government Act 1993* (NSW)
LGA	Local Government Area
LSALT	Lowest Safe Altitude
LRET	Large-scale Renewable Energy Target
LSC	Land and Soil Capability
LSPS	Local Strategic Planning Statement
LVIA	Landscape Visual Impact Assessment
m	Metres
m/s	Metres per second
mG	Milligauss
Minister	NSW Minister for Planning and Public Spaces
MNES	Matters of National Environmental Significance
MOC	Minimum Obstacle Clearance
MRV	Medium Rigid Trucks
Mt	Million tonnes
mT	Millitesla
Mt-CO_2e pa	Million tonnes CO_2 equivalent per annum
MVA	Mega Volt Ampere
MW	Megawatt
MWh	Megawatt hour
NEM	National Electricity Market
NEPM	National Environment Protection (Ambient Air Quality) Measure
NGH	NGH Pty Ltd
NHMRC	National Health Medical Research Council
NMP	Noise Management Plan
NM	Nautical mile
Noise Bulletin	*Wind Energy: Noise Assessment Bulletin* (2016)
NP&W Act	*National Parks and Wildlife Act 1974* (NSW)
NPI	*Noise Policy for Industry* (2017)

Abbreviation	Description
NPWS	National Parks and Wildlife Service
NSW	New South Wales
NT Act	*Native Title Act 1993* (NSW)
NT LSS	Northern Tablelands Local Land Services
NVIA	Noise and Vibration Impact Assessment
NW Act	*Noxious Weeds Act 1993* (NSW)
O&M	Operation and Maintenance
OEH	NSW Office of Environment and Heritage (now BCD)
OH&S	Occupational Health and Safety
OLS	Obstacle Limitation Surface
OSOM	Oversize and Overmass
OzArk	OzArk Environment & Heritage
PANS-OPS	Procedures for Air Navigation Services – Operations Surfaces
PBP 2019	Planning for Bushfire Protection 2019
PCT	Plant Community Type
PHA	Preliminary Hazard Analysis
Planning Systems SEPP	*State Environmental Planning Policy (Planning Systems) 2021*
POEO Act	*Protection of the Environment Operation Act 1997* (NSW)
RAP	Registered Aboriginal Party
RAV	Restricted Access Vehicles
RBL	Rating Background Level
RE Act	*Renewable Energy (Electricity) Act 2000* (Cth)
RECs	Renewable Energy Certificates
Resilience and Hazards SEPP	*State Environmental Planning Policy (Resilience and Hazards) 2021*
RET	Renewable Energy Target
REZ	Renewable Energy Zone
RFS	NSW Rural Fire Service
RJA	Rex J Andrews Pty Ltd
rms	root mean square
RRL	Register of Radiocommunications Licences
SAII	Serious and Irreversible Impact
SCADA	Supervisory Control and Data Acquisition
SDG	Sustainable Development Goals
SEARs	Secretary's Environmental Assessment Requirements
SEIFA	Socio-Economic Index for Areas
SEPP	State Environmental Planning Policy

Abbreviation	Description
Sherpa	Sherpa Consulting Pty Ltd
SIA	Social Impact Assessment
SIA Guidelines	*Social Impact Assessment Guideline: For State Significant Projects*
SSD	State Significant Development
SWMP	Soil and Water Management Plan
T	Tesla
TEC	Threatened Ecological Communities
TfNSW	Transport for NSW
The Blue Book	*Managing Urban Stormwater: Soils and Construction- Volume 1* (Landcom, 2004)
The Proponent and Applicant	WinterbourneWind Pty Ltd
TIA	Traffic Impact Assessment
TMP	Traffic Management Plan
Transport and Infrastructure SEPP	*State Environmental Planning Policy (Transport and Infrastructure) 2021*
UCL	Urban Centres and Localities
Uralla LEP	Uralla Local Environmental Plan 2012
V	Volts
VIZ	Visual Influence Zone
Visual Bulletin	*Wind Energy: Visual Bulletin 2016*
VFR	Visual Flight Rules
VP	Voluntary Planning Agreement
vpd	Vehicles Per Day
V/C	Volume Capacity Ratio
V/m	Volts per metre
Walcha LEP	*Walcha Local Environmental Plan 2012*
WARR Act	*Waste Avoidance and Resource Recovery Act 2001* (NSW)
WHO	World Health Organisation
WM Act	*Water Management Act 2000* (NSW)
WMP	Waste Management Plan
WPI	Wind Power Invest
WQO	Water Quality Objective
WTG	Wind Turbine Generator
ZVI	Zone of Visual Influence

SUMMARY

S.1 Introduction

This Environmental Impact Statement (EIS) has been prepared for WinterbourneWind Pty Ltd (Proponent or Applicant) to assess environmental matters relating to the proposed development of the Winterbourne Wind Farm.

The Winterbourne Wind Farm is proposed to be located 6.5 kilometres (km) northeast of Walcha in the New England Tablelands region of New South Wales (NSW) (Project). The Project is located within Walcha Council Local Government Area (LGA) and the Uralla Shire Council LGA.

The wind farm site comprises 315 freehold landholdings, one Crown land parcel, and Crown land paper roads, covering approximately 22,285 hectares (ha) (Project Area). The Project Area includes the main wind farm area and a transmission line area which extends northwest from the wind farm for approximately 23 km. The transmission line area comprises a 60 m easement corridor extending from the wind farm and crossing the Salisbury Plains. Upgrades to the public road network are located outside the Project Area. The Development Footprint of the Project covers 581.41 ha.

The Project is declared State Significant Development (SSD) under Part 2.2, clause 2.6 and Schedule 1 of the *State Environmental Planning Policy (Planning Systems) 2021* (Planning Systems SEPP) and therefore requires development consent under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Environmental Resources Management Australia Pty Ltd (ERM) has prepared this EIS on behalf of the Proponent to SUPPORT a SSD Application for the Project. The EIS has been prepared in accordance with:

- Part 8 Division 4 and Division 5 of the *Environmental Planning and Assessment Regulations 2021* (2021 EP&A Regulations);
- The Department of Planning and Environment (DPE) *Wind Energy Guidelines for State significant wind energy development* (December 2016) (DPE, 2016a);
- Planning Secretary's Environmental Assessment Requirements (SEARs) issued for the Project (SSD-10471); and
- The Commonwealth Department of Agriculture, Water and Environment (DAWE) Assessment Requirements.

This EIS also supports the application for approval under Part 9 of *Environment Protection and Biodiversity Act 1999* (Cth) (EPBC Act) Referral (EPBC Ref: 2020/8734) for which the Project was determined to be a controlled action on 31 August 2020. This EIS also addresses the Commonwealth Department of Agriculture, Water and the Environment (DAWE) Assessment Requirements.

WinterbourneWind Pty Ltd is a subsidiary of Vestas Wind System A/S, one of the largest wind energy companies in the world. Vestas designs, manufactures, installs, develops and services wind energy and hybrid energy projects around the world. Vestas has installed more than 157 GW of wind turbines installed in 88 countries. In 2022, Vestas was ranked the most sustainable company in the world in the 18th annual Global 100 ranking published by Corporate Knights.

S.2 Project Description

The Project would involve the construction, operation and decommissioning of a wind farm with up to 119 wind turbine generators (WTG), together with associated and ancillary infrastructure. The Project would have an approximate renewable energy generating capacity of 700 megawatts (MW) and would be connected directly into the electricity grid constituting the National Electricity Market (NEM).

The project has been revised and refined over time in response to design and constructability requirements, and in consideration of environmental constraints and the outcomes of community consultation.

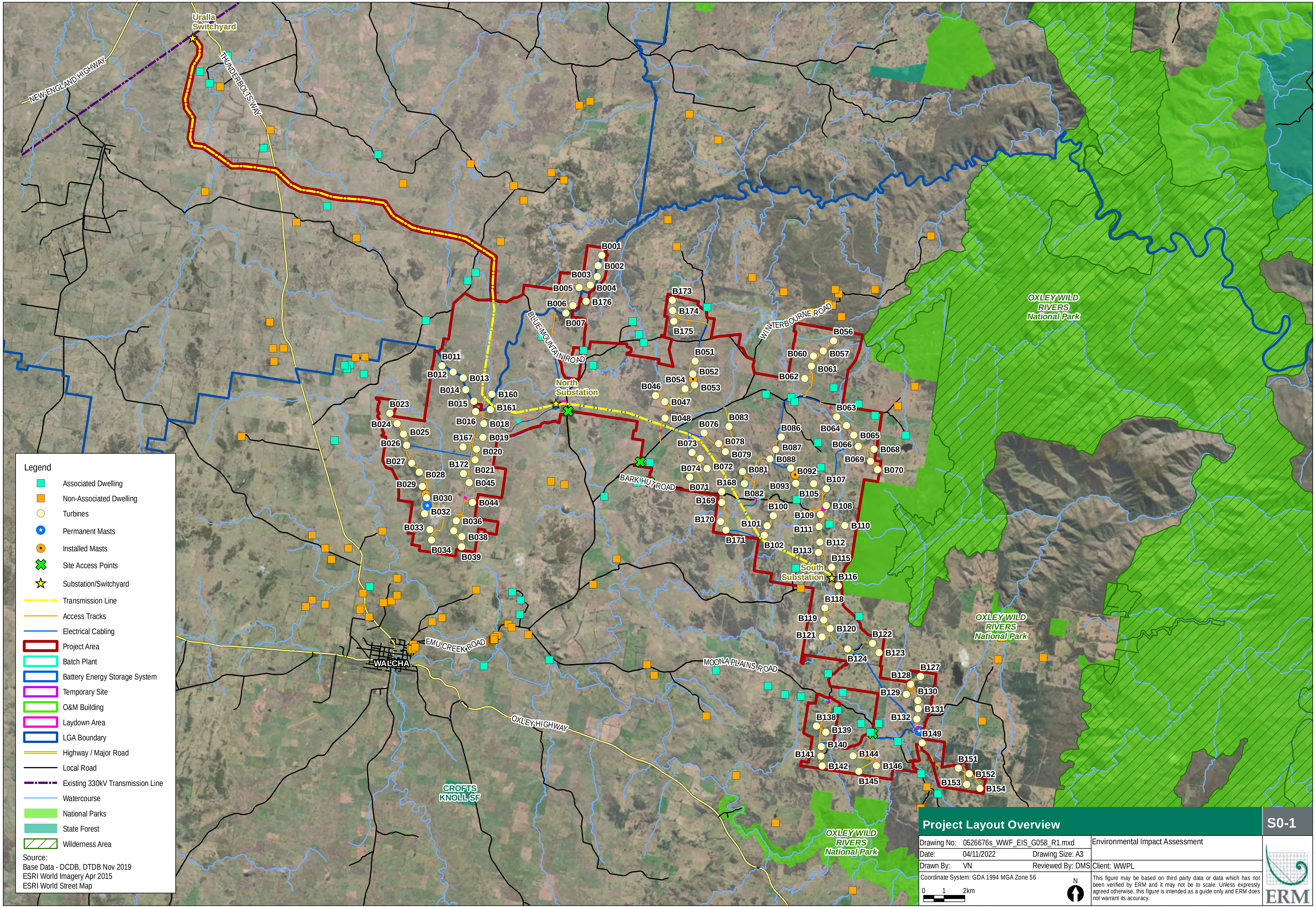
The key components of the Project are:

- Up to 119 WTGs, with a combined generating capacity of around 700 MW;
- Each WTG comprises:
  - Three blades mounted on a rotor hub on a tubular steel tower, with the combined height of blade and tower limited to a maximum tip height of 230 m AGL (to the blade tip);
  - A gearbox and generator assembly housed in a nacelle;
- Two 33/330 kV electrical substations, including transformers, insulators, switchyard and other ancillary equipment;
- A lithium ion battery energy storage system (BESS) with a rated capacity of up to 100 MW / 200 MWh;
- Underground and/or overhead 33 kV electrical reticulation and fibre optic cabling connecting the WTGs to the onsite substation (designed to follow site access tracks where practicable);
- A 330 kV single or double circuit, three phase, twin conductor bundle overhead transmission line, connecting the on-site substations to a new switchyard approximately 7 km south of Uralla, approximately 23 km from the wind farm boundary;
- A switchyard to connect the transmission line to the existing 330 kV TransGrid Tamworth to Armidale overhead transmission line network, enabling the project to connect to the national grid;
- An internal private access road network (combined total length of approximately 113 km);
- An operations and maintenance facility;
- Commissioning and decommissioning of four temporary meteorological monitoring masts (met mast) for power testing and installation of up to two permanent met masts; and
- Upgrades of local roads and crossings to facilitate the delivery of wind turbine components and associated infrastructure.

The following temporary elements will be required during construction of the Project:

- Temporary site buildings and facilities, including site offices, car parking, and amenities;
- Mobile concrete batching plants to supply concrete for WTG foundations and substation construction works;
- Earthworks to facilitate construction of access roads, WTG foundations;
- Potentially rock crushing facilities for the generation of aggregate suitable for concrete batching, and/or for access roads and hardstand construction;
- Additional hardstand areas for the temporary storage of construction materials, plant and equipment;
- External water supply for use in concrete batching and construction activities;
- Transport, storage and handling of fuels, oils and other hazardous materials used during construction and operation of the wind farm; and
- Beneficial reuse of materials won from the development footprint during construction.

The Project overview is provided in **Figure S-1**.



Uralla Switchyard
NEW ENGLAND HIGHWAY
THUNDERBOLTS WAY
BLUE MOUNTAIN ROAD
North Substation
WINTERBOURNE ROAD
BARK HUT ROAD
South Substation
EMU CREEK ROAD
WALCHA
MOONA PLAINS ROAD
OXLEY HIGHWAY
CROFTS KNOLL SF
OXLEY WILD RIVERS National Park
Legend
Associated Dwelling
Non-Associated Dwelling
Turbines
Permanent Masts
Installed Masts
Site Access Points
Substation/Switchyard
Transmission Line
Access Tracks
Electrical Cabling
Project Area
Batch Plant
Battery Energy Storage System
Temporary Site
O&M Building
Laydown Area
LGA Boundary
Highway / Major Road
Local Road
Existing 330kV Transmission Line
Watercourse
National Parks
State Forest
Wilderness Area
Source:
Base Data - DCDB, DTDB Nov 2019
ESRI World Imagery Apr 2015
ESRI World Street Map
Project Layout Overview
S0-1
Drawing No: 0526676s_WWF_EIS_G058_R1.mxd
Date: 04/11/2022
Drawing Size: A3
Drawn By: VN
Reviewed By: DMS
Environmental Impact Assessment
Client: WWPL
Coordinate System: GDA 1994 MGA Zone 56
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This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM

S.3 Project Justification

Australia and the world are in the process of transitioning from traditional fossil fuel energy generation. Wind energy is a clean and inexhaustible resource that generates zero pollution or carbon emissions during operation (U.S. Energy Information Administration, 2021). Wind energy is now cheaper than new generation from coal and natural gas, and together with solar and other renewable energy projects, wind energy is helping to drive down the cost of wholesale electricity (CSIRO, 2021).

Compared to traditional energy sources such as coal and gas, wind farms:

- Require no invasive mining, extraction or burning of fossil fuels;
- Emit no greenhouse gas during operations;
- Emit no fine particle pollution, sulphur dioxide, or oxides of nitrogen; and
- Typically offset all emissions generated across the turbine lifecycle in the first year of plant operation (Vestas, 2021).

Increased adoption of renewable energy generation sources will assist Australia to transition from traditional fossil fuel energy production. The Project is expected to generate 2,100,000 megawatt hours (MWh) per year of clean, renewable energy — enough to power more than 375,000 NSW homes on average.

The Federal Governments Renewable Energy Target (RET) is designed to reduce emissions of greenhouse gases in the electricity sector and encourage the additional generation of electricity from sustainable and renewable sources. The Federal Government has also committed to achieving net zero greenhouse gas emissions by 2050.

Similarly, the NSW Government has set emissions reductions targets, which aim for a 50% reduction in emissions relevant to 2005 levels, and net zero by 2050. The NSW Government has also released several policies and strategies to facilitate the low carbon energy transition.

The *NSW Electricity Strategy* (DPIE, 2019a) and *Electricity Infrastructure Roadmap* (DPIE, 2020d) establish the framework to deliver the state's first five Renewable Energy Zones (REZs) in strategic areas across the state, including in the New England region. The REZs will play a significant role in delivering renewable energy generation to help replace existing fossil fuel power stations as they come to their end of operational life.

The New England region has been identified as one of five REZs to be created in NSW, with the aim to combine wind, solar, hydroelectric and energy storage, together with high-voltage transmission lines, to generate and deliver clean, renewable energy. The New England REZ encompasses some of Australia's best natural energy resources. The location of the New England REZ was selected based on detailed geospatial mapping, which identified areas of high renewable energy resource potential (e.g. wind speeds, solar irradiance), proximity to existing transmission infrastructure, and interactions with existing land uses. The Project Area is shown on **Figure S-1** is strategically located within and aligns with the strategic objectives of the New England REZ.

The Project will deliver renewable, low-cost energy to the national grid and contribute to the NSW Government's net-zero emissions target by 2050. The Project will further provide a significant amount of the new generation capacity required as coal-fired power stations are retired over the next decade, including the 1,680 MW Liddell Power Station (scheduled to close in 2023) and the 2,880 MW Eraring Power Station (scheduled to close in 2025).

The Project will primarily be developed on agricultural land which has been previously disturbed and/or historically cleared. Wind farms are very much compatible with existing farming operations as the turbines occupy only a small amount of land, and landowners are able to continue normal grazing or cropping activities.

The Project layout has been designed to maximise the use of existing disturbed areas and to avoid or minimise impact to identified biodiversity and Aboriginal cultural heritage values. Progressive design iterations for the turbines, ancillary infrastructure, and the transmission line corridor have progressed with key drivers being measures to minimise and avoid environmental and social impacts in line with the avoid-minimise-mitigate-offset design hierarchy.

The Project will create a range of social and economic benefits which will inject substantial capital investment in Walcha and the broader New England region. The Project is anticipated to generate up to 400 full time equivalent (FTE) construction jobs, in turn creating approximately $150 million in direct wages and profits, and more than $160 million in indirect wages and profits, per year of construction. The construction workforce will generate more economic activity at local businesses.

During operations, the Project will generate up to 39 FTE jobs and $25 million per year in direct and indirect economic benefit for the local region. The Proponent will operate and maintain the WTGs and other infrastructure to ensure safe and efficient works that optimise energy generation. The Proponent’s service team will include around 16 skilled and support staff permanently based in Walcha or surrounding towns.

There will be opportunities for local contractors and businesses to supply services during Project construction and operation. The Project will offer training and development to upskill the regional workforce to support the growing renewable energy industry. The Project will further provide a diversified income stream for rural landholders and neighbours through payments to host landholders and the Neighbour Benefit Fund. The income provided to landowners hosting wind farm infrastructure can help make farms more resilient to the impacts of droughts, fires and commodity price fluctuations.

A Community Benefit Fund is proposed to be established by the proponent and will be managed by Walcha Council under a Voluntary Local Planning Agreement (VPA). The Community Benefit Fund will support local community initiatives and programs, non-profits and charities, and services and infrastructure in the Walcha and Uralla communities.

The employment and economic opportunities created by the Project have been supported by the community during engagement and consultation activities.

The Proponent will plan and manage construction to minimise disturbance through:

- Regular and ongoing communication with the community;
- Working during standard construction hours as much as possible;
- Communicating with affected stakeholders where it may be necessary to work outside standard hours, or where work is expected to be disruptive;
- A rigorous safety culture; and
- Environmental monitoring.

Through the implementation of best practice management, the potential environmental impacts associated with the Project can be appropriately managed, which will also address the community concerns and associated social impacts identified during the stakeholder engagement process.

Given the net benefit and commitment from the Proponent to appropriately manage the potential environmental impacts associated with the Project, it is considered the Project would result in a net benefit to the Walcha locality, New England region and broader NSW community.

S.4 Community and Stakeholder Engagement

Extensive consultation was undertaken to inform the design such that environmental and social impacts were minimised and benefits to stakeholders were maximised. The Proponent is committed to effective and genuine engagement with key stakeholders and the local community to seek feedback and to help inform the Project. This engagement will continue through subsequent phases of the Project. The range of stakeholder that have been, and will continue to be engaged is extensive, including various local and NSW Government agencies, the local community, special interest groups and neighbouring landowners.

Engagement with stakeholders commenced in 2020 during the preparation of the Scoping Report, and following the feasibility stages of the Project. Early consultation provided an opportunity to understand key stakeholder attitudes and feedback relating to environmental and social aspects required to be addressed as part of the EIS.

As part of the preparation of the Scoping Report, a Stakeholder Engagement Strategy was prepared to guide ongoing consultation and engagement during throughout the development of the EIS, and through subsequent phases of development of the project. Engagement activities were led by ERM.

The Stakeholder Engagement Strategy listed the objectives of the engagement, and outlined an approach to achieving these. Engagement activities and stakeholder and community responses were recorded in a stakeholder database. Several tools were used to engage with and seek feedback from stakeholders including, face-to-face meetings, presentations, site visits, a newsletter, community drop in sessions, public forums, a Project website, surveys, emails, phone and video calls, direct enquiries and media.

Overall, feedback from stakeholders relating to the Project has generally been positive. Comments relating to renewable energy, decreased reliance on coal/gas, assisting NSW and the Commonwealth meet emission reduction targets were common. Issues that were raised were typically specific to the geographic location, an individual stakeholders' views, or views of special interest groups. Issues raised by stakeholders included concerns regarding visual and landscape, biodiversity, social and economic, noise and vibration, traffic and transport, waste, decommissioning, and cumulative impacts. The Proponent has taken into account the issues raised and incorporated these into the technical assessments and Project design, as relevant.

The proponent has also proposed community enhancement and benefits scheme, to be implemented through the Community Benefit Fund that will be administered by Walcha Council through a VPA. In addition to the VPA, the proponent will also incorporate several road upgrades required to facilitate construction and operation of the Project.

S.5 Environmental and Social Assessment

This EIS includes a detailed assessment of the potential environmental, social and economic outcomes of the Project and identifies the management and mitigation measures that will be implemented. A summary of the key findings for each aspect is provide below. **Figure S0-2** provides a visual representation of the key constraints relative to the Project elements.

Biodiversity

A Biodiversity Development Assessment Report (BDAR) (**Appendix G**) was prepared to identify the potential impacts of the project on biodiversity. The assessment included vegetation and habitat mapping and flora and fauna surveys.

Field-verified vegetation mapping identified the presence of three threatened ecological communities (TECs) within the development footprint:

- New England Peppermint (*Eucalyptus nova-anglica*) Woodland on Basalts and Sediments in the New England Tableland Bioregion;
- White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions; and
- Ribbon Gum—Mountain Gum—Snow Gum Grassy Forest/Woodland of the New England Tableland Bioregion.

Two threatened flora species were identified within the development footprint:

- Narrow-leaved Black Peppermint (*Eucalyptus nicholii*); and
- Bluegrass (*Dichanthium setosum*).

Five threatened fauna species considered species credit species were confirmed during the field investigations:

- Koala (*Phascolarctos cinereus*);

- Greater Glider (*Petauroides volans*);
- Squirrel Glider (*Petaurus norfolcensis*);
- Glossy Black-cockatoo (*Calyptorhynchus lathami*); and
- Barking Owl (*Ninox connivens*).

Bird and bat utilisation surveys (BUS) were undertaken and to determine the potential collision risk of the target species recorded flying at the rotor swept area and identified four threatened bird species utilising the Project Area, including:

- Varied Sitella (*Daphoenositta chrysoptera*);
- Speckled Warbler (*Pyrrholaemus sagittatus*);
- Diamond Firetail (*Stagonopleura guttata*); and
- Glossy Black-Cockatoo (*Calyptorhynchus lathami*).

The BUS concluded that impacts to these species were unlikely as none of these species behave in a manner that puts them at risk of collision with operating WTGs. The risk associated with WTG collision and indirect effects for the Project, for most assessed bird and bat species, was rated as negligible.

Within the biodiversity assessment study area, all vegetation (4,262.5 ha) was mapped. The majority (3,055 ha or 72%) was classified as native, the remaining (1,208 ha or 28%) was classified as non-native vegetation dominated by exotic pasture grasses and weeds, which was later classed as Category 1 – Exempt Land under the *Local Land Service Act 2013*. A total of 429.9 ha of this native vegetation is within the development footprint and, conservatively, has been assumed to be cleared. This area represents 14% of the total native vegetation mapped within the biodiversity assessment study area.

Impact to biodiversity values as a result of the Project have been avoided and minimised as much as practicable through design refinements. The BDAR also demonstrated potential impacts were avoided, or minimised including:

- Avoidance of 316.7 ha of native vegetation, reducing potential impacts on native vegetation by 42%;
- Avoidance of 91.1 ha of habitat of serious and irreversible impact (SAII) species, reducing potential impacts on SAII by 68%;
- Avoidance of TEC, reducing potential impacts on TEC by 115 ha; and
- Avoidance of 15 of the 52 identified locations of the threatened flora species *E. nicholii*.

Mitigation measures will be adopted to during construction and operation of the Project to minimise residual biodiversity impacts. These include provisions for biodiversity offsets, monitoring and adaptive management measures.

Noise

The Noise and Vibration Impact Assessment (NVIA) (**Appendix H**) considered WTG and ancillary electrical infrastructure operation, construction, temporary batching and traffic associated with the Project, therefore addressing the environmental noise considerations of the SEARs.

Background noise monitoring was undertaken at seven residential locations to provide an indication of the existing acoustic environment of the inhabited areas surrounding the Project.

Predictions of the noise from various construction activities were made based on typical sound power levels and on weather conditions that are most conducive for the propagation of noise. To provide an indication of the noise level at dwellings, the predictions were based on the distance between turbine locations and dwellings and having line of sight to the construction activity, without the influence of barriers or topography.

The assessment identified that noise from the WTGs and ancillary infrastructure will achieve all relevant noise and vibration criteria at all dwellings, on the basis that the turbines will be operated in accordance with an operating strategy and construction activities will be managed in accordance with the relevant recommendations.

Construction and traffic will also achieve the general intent of the NSW policies where activity is managed in accordance with the recommendations within the EIS. The assessment confirms that the Project complies with the noise and vibration impact assessment requirements.

Landscape and Visual

The Landscape and Visual Impact Assessment (LVIA) (Appendix I) assessed the visual impact of all components of the Project and also considered the cumulative visual impact of surrounding projects (both proposed and operational).

The Project Area and its surrounds are characterised by undulating hills, dramatic gorges and steep elevations ranging from 200 m to 1,294 m above sea level.

A total of 20 non-Associated dwellings were identified within 3,100 m of a proposed turbine, of which:

- Seven were rated as nil / negligible visual impact rating;
- Five were rated as having a low visual impact rating;
- Five were assessed as having a moderate visual impact rating; and
- Three were assessed as having a high visual impact rating.

A total of 23 non-associated dwellings were identified within 3,100 - 4,550 m of a WTG, of which two were assessed as having a high visual impact rating.

On evaluation, with the proposed mitigation measures implemented, the Project can be developed in compliance with the performance objectives as per the Visual Assessment Bulletin.

Fifty-six (56) public viewpoints were assessed which were taken from varying distances and locations surrounding the Project. Each viewpoint was assigned a Visual Influence Zone (VIZ) based on a number of factors which is explained in Appendix A of the LVIA. A total of 24 viewpoints were rated as having a moderate VIZ (VIZ2) while a total of 32 viewpoints were rated as having a low VIZ (VIZ3).

Photography has been collected from a number of neighbouring properties and public viewpoints to produce photomontages. Photomontages provide a visual representation of the wind farm at these viewpoints and are contained in Appendix D of the LVIA.

Mitigation methods incorporated into the design process in conjunction with landscape and visual screening will help to reduce visual impacts. Through the application of mitigation methods, it will be possible to significantly reduce the visual impact to an acceptable level at sensitive viewpoints such as rural residential properties.

When implemented with appropriate environmental management, the Project can be developed in accordance with the visual performance objectives of the Visual Assessment Bulletin and can be undertaken with low impact on the surrounding environment.

Traffic and transport

The Traffic Impact Assessment (TIA) (**Appendix J**) notes that wind farm construction involves a large number of heavy vehicle movements to transport WTG tower sections, blades and other equipment. Construction will also require transport of raw materials. Construction workers and project staff will also travel to and from the Project Area. These movements will be planned and involve support vehicles and traffic control where required.

To minimise impact to the local community, the Project will use major roads to access the construction site whenever possible. Importantly, the proposed transport route for the Project will not require any heavy vehicle movements through the centre of Walcha.

Vehicles travelling to Walcha via the west (Tamworth) will use New England Highway and Oxley Highway, while vehicles travelling to Walcha via the north (Uralla and Armidale) will use Thunderbolts Way.

From Walcha, all vehicles will access the Project Area via Jamieson Street, Ohio Road, and Emu Creek Road to reach the main site compound at the intersection of Winterbourne Road and Blue Mountain Road. Vehicles will then continue on Blue Mountain Road to access the western portion of the Project site, Winterbourne Road to access the northern portion, or they can backtrack and travel along Moona Plains Road to the southern portion.

The peak traffic generating potential for the Project is during construction. The Project will generate up to 288 heavy and 270 light vehicle movements per day during peak construction times. The TIA found that the road network can accommodate Project traffic generated during construction and will continue to operate with a good level of service, including when considering the cumulative impact of surrounding major projects.

During operation, the Project is expected to generate a minimal level of traffic associated with maintenance and operation services. This could be up to 16 vehicle movements per day which would result in a negligible change to the traffic environment.

Traffic generation during decommissioning would be similar to traffic generation during the average construction period.

All local roads currently have sufficient carriageway widths to allow two opposing vehicles to pass, with the exception of the eastern portion of Bark Hut Road and the full length of Rowleys Creek Road.

Public road upgrades will be required to cater for the delivery of blades, nacelles and towers. The upgrades are required to ensure sufficient space for oversized vehicles passage, including intersection widening, trimming and removal of vegetation, removable signs and infrastructure, and the relocation of overhead wires.

The Proponent will work with road authorities and local councils to prepare a Traffic Management Plan (TMP) before construction, describing how the Project will manage traffic and transport to ensure efficient and safe movements.

Hazard and Risk – Aviation Safety

The Aviation Impact Assessment (AIA) (Appendix K) concluded that the Project will not:

- Impact on the operation of Tamworth and Armidale Airports;
- Penetrate any Obstacle Limitation Surface (OLS) surfaces;
- Penetrate Procedures for Air Navigation Services - Aircraft Operations Procedures for Air Navigation Services – Operations Surfaces (PANS-OPS) surfaces;
- Have an impact on the grid lowest safe altitude (LSALT);
- Have an impact on prescribed airspace;
- Have an impact on nearby designated air route (W128); or
- Require obstacle lighting to maintain an acceptable level of safety to aircraft.

The AIA also stated that the Project is wholly contained within Class G airspace, and is outside the clearance zones associated with aviation navigation aids and communication facilities.

Aircraft will be required to navigate around the Project in low cloud conditions where flight is required at 500 ft AGL.

The Proponent will engage with local aerial agricultural and aerial firefighting operators to develop procedures for aircraft operations in the vicinity of the Project, which may include, for example, stopping the rotation of the WTG rotor blades prior to the commencement of the subject aircraft operations within the Project Area. WTGs are generally not a safety concern to aerial agricultural operators. Met masts remain the primary safety concern to aerial agricultural operators, who have expressed a general desire for these towers to be more visible.

The AIA recommended redesigning air route W128 to accommodate the WTGs at 230 m AGL.

Hazard and Risk – Bushfire

The Bushfire Assessment Report (**Appendix L**) notes that the Walcha Council and the Uralla Shire Council Bushfire Prone Land mapping identifies much of the Project Area as bushfire prone land.

Construction activities are a potential source of ignition, with the greatest risk occurring during the bushfire season from October to March. Both construction and decommissioning activities will be managed in accordance with mitigation measures to ensure bushfire risk is kept to a minimum.

Project operations will have a greatly reduced risk of ignition sources for the following reasons:

- Key project elements at risk of fire ignition will be located on hardstand material with established Asset Protection Zones (APZ) around the perimeter;
- WTG towers are made from non-combustible material and do not present a significant fire risk;
- Fire suppression measures will be implemented for the BESS;
- Remote control and automatic shutdown procedures will be installed;
- Hazardous and flammable materials would be appropriately stored in bunded locations;
- Risk of fire starting due to lightning strike within the Project Area may be reduced due to the presence of WTGs; and
- Proposed access roads will be prepared during the first stage of construction using hardstand material.

The mitigation measures will be applied for the life of the Project and are compliant with the relevant criteria contained in the Planning for Bushfire Protection Guideline (NSW RFS, 2019).

Hazards and Risks – Blade Throw

The blade throw risk assessment (**Section 6.5.3**) identified that the risk of injury or property damage associated with blade throw associated with the WTGs is considered very low at all non-associated dwellings and roads in the vicinity of the Project Area.

As a conservative approach, the assessment was based on a theoretical distance radius of 500 m for a blade throw event. Available research suggests that blade throw over this distance has a very low risk of occurrence.

There are no dwellings within this theoretical distance radius. While there are a small number of points along public roads within this theoretical distance radius for a blade throw event, there is general agreement throughout the literature that the likelihood of damage to human life or property from a blade throw incident is extremely small and well within risk levels typically deemed acceptable by society.

International Electrotechnical Commission (IEC) Standards will be used for the design and construction of the Project which will reinforce the confidence that blade throw will represent a very low risk for the Project.

Hazards and Risks – Preliminary Hazards Analysis

A Preliminary Hazard Analysis (PHA) (**Appendix M**) was completed for the BESS facility component of the Project, in accordance with the Department of Planning, Industry and Environment's Hazardous Industry Planning Advisory Paper No. 4 – Risk Criteria for Land Use Safety Planning (DPIE HIPAP No. 6) and Assessment Guideline — Multi Level Risk Assessment.

The PHA was based on the operating phase of the BESS and examined the preliminary hazard risk of 15 likely hazardous and their potential for any offsite impacts outside of the Project Area. A qualitative approach (i.e. Level 1 analysis) was determined appropriate, based on the Hazard Identification findings and the Assessment Guideline — Multi-level Risk Assessment.

A breakdown of the identified 15 hazardous events according to their risk ratings is as follows:

- One high risk event: relating to unauthorised personnel access to the proposed BESS area, resulting in vandalism/asset damage to the infrastructure. A severity rating of ‘Very High’ was assigned to account for the trespasser potentially injuring themselves in the act. No significant offsite impact would be expected. The likelihood was rated as ‘Remote’; and
- 14 low risk events: most events relate to fire and/or explosion events, with no significant offsite impact expected. The highest likelihood for these events were rated as ‘Remote’.

The PHA concluded that there are no events with the potential for significant offsite impact associated with the operation of the BESS and the BESS meets the HIPAP No.4 qualitative risk criteria. Further, the BESS is suitably located within the Project Area and minimises the risk to neighbouring land uses and onsite substations.

Hazards and Risks – Telecommunications

The Telecommunications Assessment (**Appendix N**) identified that the Project has potential to interfere with several point-to-point links crossing the Project Area, and point-to-area style communications hosted by radio-communication towers located within 2 km of the WTG locations. This includes, but is not limited to, links operated by the NSW Governments Telecommunications Authority (Telco Authority), NSW RFS, and Walcha Council.

Consultation with the operators of the links is ongoing to confirm the required clearances and potential for impact. While this includes further consultation with NSW RFS, advice received by the Proponent from NSW RFS suggests that it is not anticipated that the Project will cause material interference to NSW RFS links.

A range of mitigation options will be undertaken in the event that the WTGs interfere with point-to-area style services such as mobile phone signals, radio broadcasting, and terrestrial television broadcasting.

It is unlikely that the Project will cause impacts to satellite television and internet signals that may be received at dwellings near the Project Area.

While the Project may cause interference to other radio-communication services in the surrounding area, such as point-to-multipoint links and meteorological radar, further information from the operators of those services is required through ongoing consultation to determine the likely impacts.

During detailed design, consultation with the operators will occur. If there is a potential for interference from the WTGs, the following mitigation hierarchy will be followed in consultation with the operators:

- Institute a ‘technological fix’ which may include (but not be limited to) existing equipment upgrades, rerouting the link or replacing the link with alternative technology; and
- If this is unsuccessful, relocate relevant WTGs.

Hazards and Risks – Health and Electric and Magnetic Fields

An assessment of the Project’s impact on health and electric and magnetic fields (EMFs) (**Section 6.5.6**) was prepared. The broadly accepted guideline in both Australia and overseas is to implement a prudent avoidance approach which has been adopted in the Project design through the provision of setbacks and easements. The Project has been designed in accordance with relevant standards and guidelines to minimise the overall risk of EMFs.

Due to the low exposure likely to be generated from the Project and the findings of the scientific community, no adverse impacts are expected due to EMFs from the Project.

Aboriginal Cultural Heritage

An Aboriginal Cultural Heritage Assessment Report (ACHAR) has been prepared as part of this EIS (**Appendix O**).

With assistance from Registered Aboriginal Parties (RAPs), the Proponent commissioned cultural heritage surveys in three stages since 2020 to identify items and locations of cultural significance within the Project Area.

The field investigations identified 16 artefact sites, including 12 artefact scatters or isolated artefacts, two culturally modified trees, a quarry site, and an engraving site. No evidence of human burials or skeletal material were recorded. All identified sites have been afforded high cultural value, and two were identified as having high scientific value.

Of the 16 sites, five are outside of any Project impact and will not be impacted. For the remaining sites, the Proponent will ensure that archaeological management strategies are applied to manage and mitigate the impact of the Project. The sites will be either protected (e.g. fenced off), avoided where possible by modification to the Project design, or if impacts are likely, managed appropriately in consultation with the RAPs prior to Project construction.

The Proponent will develop an Aboriginal Cultural Heritage Management Plan (ACHMP) in consultation with the RAPs and relevant regulators. The ACHMP will include an unanticipated finds protocol, unanticipated skeletal remains protocol and long-term management of any artefacts.

Historic Heritage

An Historic Heritage Assessment Report (**Appendix O**) has been prepared as part of this EIS. Three items have been recorded in the Survey Area, although all were assessed as being without heritage value. This includes a site consisting of cattle yards and a loading ramp with stone and brick used as foundation courses (HS01), a memorial marker (HS02), and wooden fencing which is a potential location marker of a grave (HS03).

One item listed on the Muswellbrook Local Environmental Plan 2009 (LEP) is located near potential ground disturbing works associated with the transport corridor. Although not at risk of harm, management measures will be implemented to ensure that the item is not inadvertently harmed.

A Historic Heritage Management Plan (HHMP) will be developed for the Project. If items of historic heritage significance are uncovered during construction of the Project, then the unanticipated finds protocols in the HHMP will be enacted.

Soil and Water

A Soils and Water Assessment has been prepared as part of this EIS (**Appendix P**). Two locations within the Project Area are mapped as Biophysical Strategic Agricultural Land (~327.7 ha) and coincide with larger patches of soil and land capability Class 3 land. Of the 327.7 ha within the Project Area, the Development Footprint comprises approximately 22.5 ha.

The Project Area predominantly consists of Kurosols soil type with patches of Ferrosols, Vertosols and Kandosols.

While some parts of the Project Area comprise groundwater aquifers, a review of groundwater wells within the Project Area identifies that the groundwater aquifer occurs at depths greater than would be intercepted by earthworks associated with the Project construction.

Project design and staged construction will be applied to minimise land disturbance and therefore reduce the erosion hazard. A Soil and Water Management Plan (SWMP) will be prepared prior to the commencement of construction works and it will be accompanied by Progressive Erosion and Sediment Control Plans (ESCP) to mitigate potential soil and water impacts arising from the Project. All necessary mitigation measures will be implemented to manage potential impacts to the adjacent Oxley Wild Rivers National Park.

Rapid Flood Assessment

A Rapid Flood Assessment (**Appendix Q**) has been prepared as part of this EIS. Except for transmission lines, internal access tracks and medium voltage reticulation, the majority of the Project components are situated away from watercourses and high flood risk areas. The WTGs are generally located on catchment ridge lines or high ground some distance away from the major watercourses.

Local overland flow paths may be present at some sites such as the Uralla Switchyard, North Substation, Crane Pad, the Operations and Maintenance Facility, Vestas Laydown, Joint Box and Batch Plant which should be suitably managed or avoided. There is no apparent flood risk from the closest watercourses.

Prior to the commencement of construction activities, a Stormwater Management Plan will be developed to manage additional surface runoff from Project components (e.g. hardstands and access roads).

Air Quality

An air quality impact assessment has been prepared as part of this EIS.

Air quality impacts associated with the Project are temporary and low during the construction phase of the Project. The Project will not generate significant air quality impacts and appropriate measures will be implemented to minimise the potential for offsite dust impacts resulting from construction.

During the operation phase, the Project will generate electricity without directly emitting air pollutants that are known to affect the climate and human health. The Project will contribute to the improvement of air quality through the displacement of emissions that would otherwise be generated through the burning of fossil fuels used to generate electricity from traditional coal fired power stations.

The Project will abate the production of up to 1.8 Mt CO2e per annum which is a substantial contribution towards the reduction of anthropogenic generated greenhouse gases emitted to the atmosphere, and a significant contribution towards the NSW state policy goal of reducing greenhouse gas emissions by 50% (relative to 2005 levels) by 2030.

Waste management

A waste management assessment has been prepared as part of this EIS. The Project will produce various waste streams during the construction, operations, and decommissioning stages. All wastes produced by the Project will be classified, handled, and managed in accordance with the Waste Classification Guidelines – Part 1: Classifying Waste (NSW EPA, 2014a).

A Waste Management Plan (WMP) will be prepared prior to construction. The WMP will detail appropriate measures to be incorporated to avoid potential contamination to land and water, and impacts to human health and wildlife. The Project will separate waste streams to maximise recycling and emphasise reuse of any excess spoil and vegetative matter in accordance with resource recovery orders and exemptions. A key objective of the WMP will be to ensure that any use of local waste management facilities does not disadvantage local businesses and, more generally, the local community, by exhausting any available capacity at these facilities.

A preliminary Decommissioning and Rehabilitation Assessment has been prepared for the Project and will be updated in accordance with relevant project approval requirements.

Social Impact Assessment

A Social Impact Assessment (SIA) (**Appendix R**) has been prepared as part of this EIS. A wide variety of consultation activities have been utilised to inform the social and economic impacts of the Project. Regular and ongoing stakeholder engagement activities provided Project feedback and sentiment from Project neighbours, the wider community, and the Community Consultative Committee (CCC).

Targeted stakeholder interviews for the SIA were conducted during November 2021 to supplement the regular and ongoing stakeholder engagement activities, capturing a diverse range of views from host landowners, Project neighbours, local businesses and chambers of commerce, and community groups.

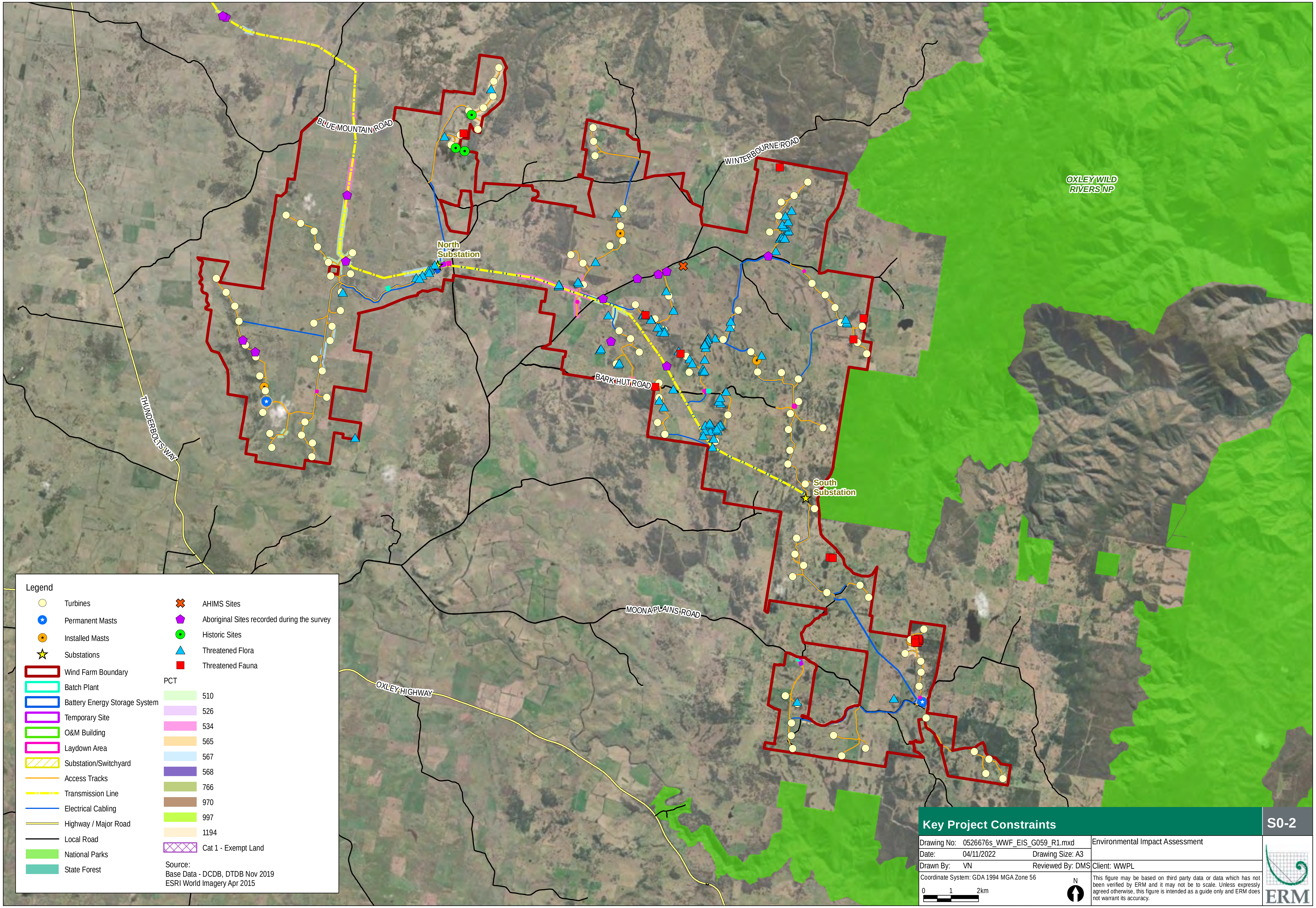
The key drivers of social change that may affect communities within proximity to the Project were found to include:

- Procurement opportunities for local businesses and employment opportunities for the local workforce;
- Disruptions due to construction related activities (noise, dust, transportation of materials and workers, etc.);
- Accommodation arrangements for construction workforce;
- Amenity (noise, visual) and other land use and landscape changes due to altered landscapes;
- Diversified income stream for rural landholders through payments to host landholders; and
- Further community enhancement funding through the Community Benefit Fund to be managed by Walcha Council under a Voluntary Local Planning Agreement.

Among the range of mitigation and management measures proposed, the Proponent commits to developing and implementing a Procurement Policy to maximise local employment and regional business opportunities. Further, a Workforce Accommodation Strategy will be prepared with the goal of managing impacts to local short and long-term accommodation arrangements in surrounding towns.

Cumulative Impacts

The cumulative impact assessment assessed the potential impacts of the project with respect to relevant future developments. These consisted primarily of renewable energy developments within the New England REZ. The cumulative impact assessment identified key aspects for inclusion and aspects that could be justifiably discounted from the assessment. Aspects considered included - Agricultural production and land use; Biodiversity; Visual; Noise; Traffic and Transport; Aviation, and; Socio-economic. The cumulative impact assessment determined that the Project would not contribute to any material cumulative impacts in relation to other relevant future developments.



BLUE MOUNTAIN ROAD
WINTERBOURNE ROAD
OXLEY WILD RIVERS NP
North Substation
South Substation
THUNDERBOLTS WAY
BARK HUT ROAD
MOONA PLAINS ROAD
OXLEY HIGHWAY
Legend
Turbines
Permanent Masts
Installed Masts
Substations
Wind Farm Boundary
Batch Plant
Battery Energy Storage System
Temporary Site
O&M Building
Laydown Area
Substation/Switchyard
Access Tracks
Transmission Line
Electrical Cabling
Highway / Major Road
Local Road
National Parks
State Forest
AHIMS Sites
Aboriginal Sites recorded during the survey
Historic Sites
Threatened Flora
Threatened Fauna
PCT
510
526
534
565
567
568
766
970
997
1194
Cat 1 - Exempt Land
Source:
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ESRI World Imagery Apr 2015
Key Project Constraints
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Reviewed By: DMS
Environmental Impact Assessment
Client: WWPL
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S.6 Management Measures

The anticipated environmental impacts of the Project have been assessed, and various mitigations measures developed to manage adverse ecological, social and economic impacts where possible. The Project would be constructed and operated in accordance with all conditions imposed by any development consent and environment protection licence granted for the Project and will incorporate the mitigation measures provided in **Appendix E** of this EIS.

S.7 Conclusion

The Project involves the operation of up to 119 WTG, together with associated and ancillary infrastructure, which will have an approximate energy generating capacity of 700 MW. The Project will contribute significantly to reducing carbon emissions and human induced climate change as part of the necessary and ongoing clean energy transition.

The Project has been carefully designed and sited to minimise environmental impacts in consultation with the local community and relevant landholders. While there will be some inevitable impacts associated with the Project, including biodiversity, visual and noise impacts as outlined above, these impacts will be significantly outweighed by the strong public and environmental benefits which the Project will deliver.

The Project will:

- Assist the Federal and NSW Governments to fulfil their targets and policies to increase renewable energy supply and reduce carbon emissions;
- The Project is expected to generate 2,100,000 megawatt hours (MWh) per year of clean, renewable energy — enough to power more than 375,000 NSW homes on average;
- Assist in meeting energy demand as part of the market transition from traditional energy sources; and
- Deliver economic benefits to regional and local communities.

The Project represents a positive addition to the local and wider NSW economy and the NEM. Through the implementation of proposed mitigation and management measures, it is considered that this Project is consistent with the objects of the EP&A Act and is in the public interest.

1. INTRODUCTION

This section provides an overview, Applicant's details, objectives, background, design strategies, related developments, and restrictions as each relates to the Project.

1.1 Project Overview

WinterbourneWind Pty Ltd (Proponent) is seeking approval to construct, operate and decommission the Winterbourne Wind Farm, located 6.5 kilometres (km) northeast of Walcha in the New England Tablelands region of New South Wales (NSW) (Project). **Figure 1-1** provides a the regional context of the Project and **Figure 1-2** the Project locality plan.

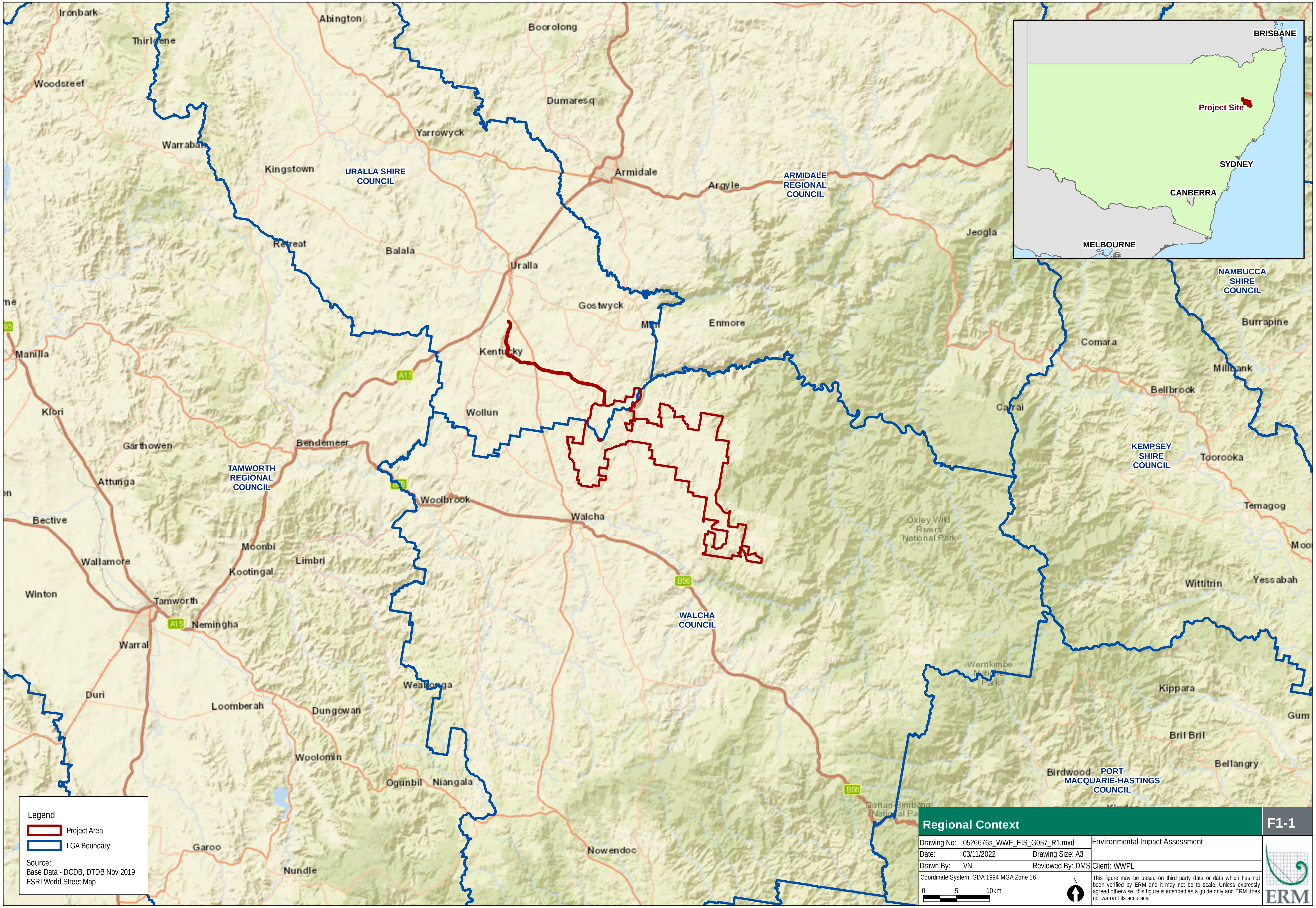
The Project would supply approximately 700 Megawatts (MW) of installed renewable energy capacity directly into the electricity grid constituting the National Electricity Market (NEM) through an overhead 330 kV transmission line, which would connect to a new switching station approximately 7 km south of Uralla.

The Project involves the construction, operation and where relevant (decommissioning) of:

- Up to 119 Wind Turbines Generators (WTG) with maximum height of 230 metres (m) (to blade tip); and
- Ancillary infrastructure including (but not limited to) internal access tracks, road upgrades, internal electrical reticulation network (both overhead and underground), two onsite substations, a Battery Energy Storage System (BESS), meteorological masts, and operation and maintenance (O&M) buildings, landscaping, utilities and erosion and sediment controls.

An indicative Project layout overview is provided in **Figure 1-3**. This indicative layout is subject to detailed design.

No developments, either existing or approved, relate to the Project. No known restrictions or covenants apply to the Project Area. No aspects of the project are currently subject to separate approvals.



Regional Context F1-1

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Environmental Impact Assessment
Client: WWPL

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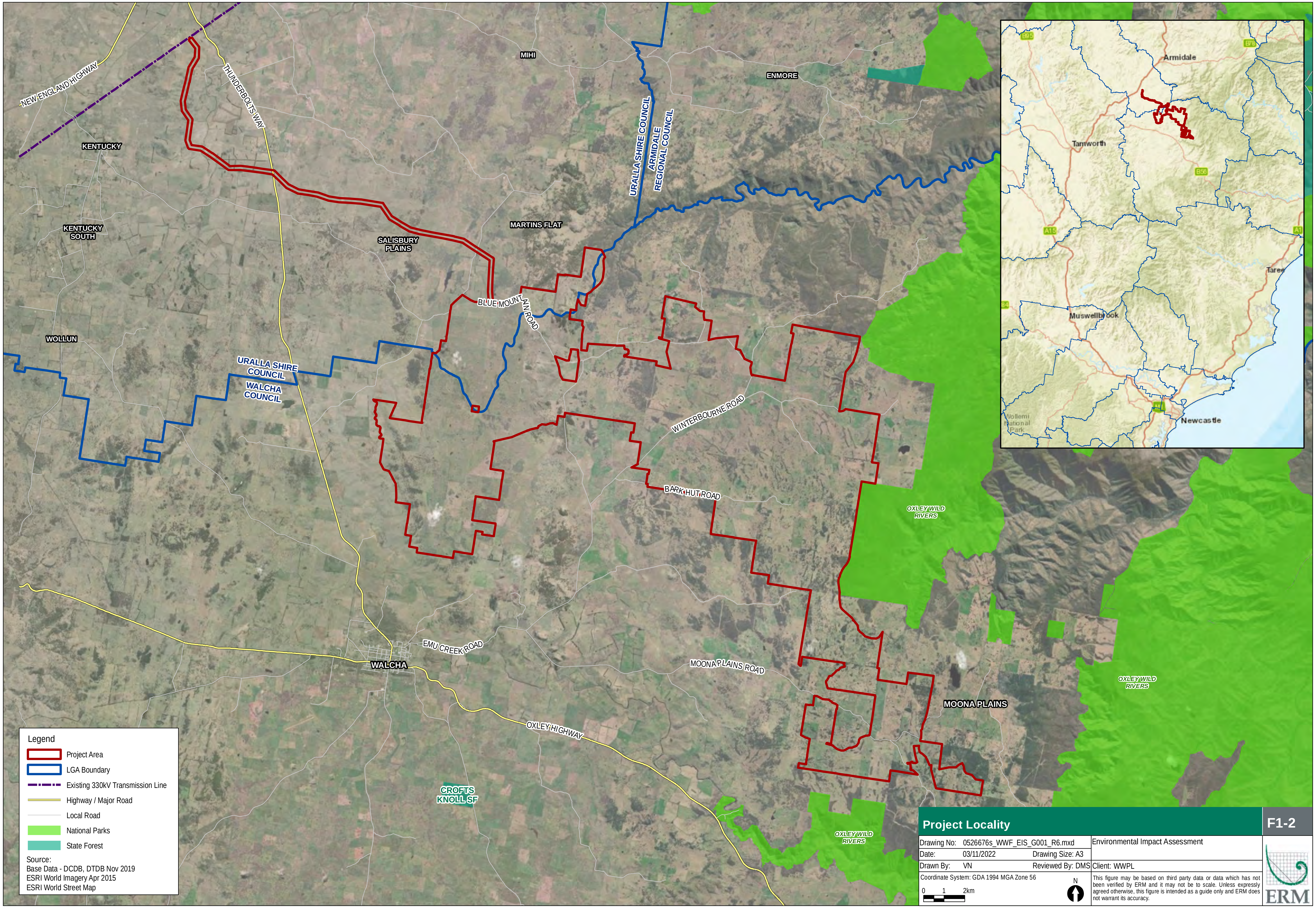

NEW ENGLAND HIGHWAY
THUNDERBOLTS WAY
MIHI
ENMORE
KENTUCKY
URALLA SHIRE COUNCIL
ARMIDALE REGIONAL COUNCIL
KENTUCKY SOUTH
SALISBURY PLAINS
MARTINS FLAT
BLUE MOUNTAIN ROAD
WOLLUN
URALLA SHIRE COUNCIL
WALCHA COUNCIL
WINTERBOURNE ROAD
BARK HUT ROAD
OXLEY WILD RIVERS
EMU CREEK ROAD
WALCHA
MOONA PLAINS ROAD
OXLEY WILD RIVERS
MOONA PLAINS
OXLEY HIGHWAY
CROFTS KNOLL SF
OXLEY WILD RIVERS
Armidale
Tamworth
Taree
Muswellbrook
Newcastle
Wollemi National Park
Legend
Project Area
LGA Boundary
Existing 330kV Transmission Line
Highway / Major Road
Local Road
National Parks
State Forest
Source:
Base Data - DCDB, DTDB Nov 2019
ESRI World Imagery Apr 2015
ESRI World Street Map
Project Locality
F1-2
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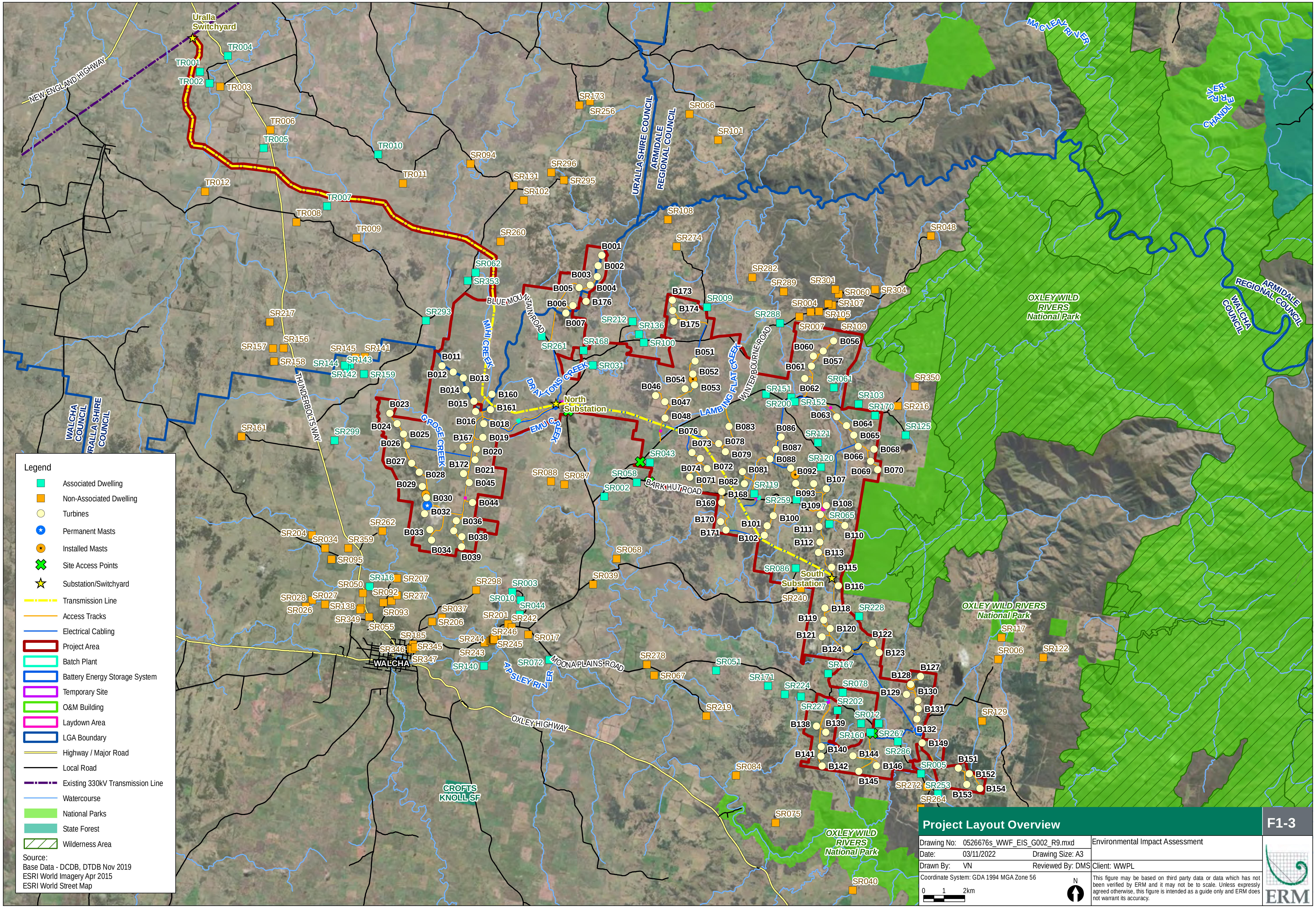
Project Layout Overview
F1-3
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Reviewed By: DMS
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Client: WWPL
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ERM
Legend
Associated Dwelling
Non-Associated Dwelling
Turbines
Permanent Masts
Installed Masts
Site Access Points
Substation/Switchyard
Transmission Line
Access Tracks
Electrical Cabling
Project Area
Batch Plant
Battery Energy Storage System
Temporary Site
O&M Building
Laydown Area
LGA Boundary
Highway / Major Road
Local Road
Existing 330kV Transmission Line
Watercourse
National Parks
State Forest
Wilderness Area
Source:
Base Data - DCDB, DTDB Nov 2019
ESRI World Imagery Apr 2015
ESRI World Street Map
Uralla Switchyard
NEW ENGLAND HIGHWAY
North Substation
South Substation
WALCHA
OXLEY HIGHWAY
THUNDERBOLTS WAY
BLUE MOUNTAIN ROAD
BARK HUT ROAD
WINTERBOURNE ROAD
MOONA PLAINS ROAD
URALLA SHIRE COUNCIL
ARMIDALE REGIONAL COUNCIL
WALCHA COUNCIL
OXLEY WILD RIVERS National Park
CROFTS KNOLL SF
MACLEAY RIVER
CHANDLER RIVER
APSLEY RIVER
EMU CREEK
DRAYTONS CREEK
LAMBING FLAT CREEK
GROSE CREEK
MAHI CREEK

1.2 Project Objectives

The Project has the following social, economic and environmental objectives:

- Support the transition being undertaken in the energy sector away from a centralised system of large fossil fuel generation, towards a decentralised system of widely dispersed, renewable energy production;
- Provide necessary alternative electricity production given the forecasted retirement of coal-fired power stations, including the 1,680 MW Liddell Power Station (scheduled to close in 2023) and the 2,880 MW Eraring Power Station (scheduled to close in 2025);
- Contribute to meeting increasing energy demand in NSW and the eastern coast of Australia;
- Provide dispatchable energy through the proposed grid-scale BESS;
- Contribute to greenhouse gas (GHG) emissions reductions in the order of 1.8 million tonnes CO_2 equivalent per annum (Mt-CO_2e pa), supporting Australia's recent commitments of net zero by 2050;
- Contribute materially to NSW and Federal Government's renewable energy targets;
- Deliver economic benefits to regional and local communities, including:
  - More than $150 million in direct wages and profits, and more than $160 million in indirect wages and profits in each year of construction;
  - More than $25 million per year in direct and indirect economic benefit for the local region during operations;
  - Material employment of up to 400 Full Time Equivalent (FTE) jobs through the construction period, and up to 39 FTE jobs during Operations (across professional, scientific and technical industry sector), including approximately 16 site-based jobs for the life of the Project;
  - Providing a diversified income stream for rural landholders through payments to associated landholders (also described as "involved" in some technical studies) and relevant others through the 'Neighbour Benefit Fund';
  - Further community enhancement funding through the 'Community Benefit Fund' to be managed by Walcha Council under a Voluntary Planning Agreement (VPA). The Proponent will provide $1,00,000 prior at financial close of the project to Project construction, and $750,000 annually from the start of commercial operations through to Project decommissioning (based on a delivered Project up to 600 MW capacity). In addition, for every MW over 600 MW, WinterbourneWind will contribute an extra $1,000 per MW annually to the Community Benefit Fund;
- Minimise adverse environmental impacts;
- Recycle and reuse materials where practical and economically feasible;
- Ensure quality, safety and environmental standards are maintained; and
- Liaise and work proactively with the community and all potentially affected stakeholders in the identification, mitigation and/or monitoring of any potential environmental effects.

1.3 Locality Description and Context

The Project is located within the New England Tablelands region approximately 425 km (by road) from Sydney and 75 km northeast of Tamworth. The Project Area is located over two Local Government Areas (LGAs), being the Walcha LGA and the Uralla LGA as shown on Figure 1-2. The locality nearest to any WTG is Walcha, the centre of which is approximately 6.5 km from the nearest proposed WTG.

Table 1-1 outlines the nearby townships and localities and provides an approximate distance and direction from the nearest part of the Project Area.

Table 1-1 Proximity to Nearby Localities

Township/Locality	Approximate Distance
Walcha	6.5 km south west
Uralla	25 km north west
Woolbrook	25 km west
Armidale	35 km north
Tamworth	75 km south west

The Project Area is located on top of the Great Dividing Range and extends from near Walcha to the eastern escarpment of the New England Tablelands. From here, the terrain falls towards the Oxley Wild Rivers National Park, located to the east but not within the Project Area. The Oxley Wild Rivers National Park is approximately 165,000 hectares (ha) in size, with approximately 98,906 ha forming part of the Gondwana Rainforests of Australia, a UNESCO World Heritage Area.

The main employing industry (41.1%) within the locality is primary production comprised mainly of agriculture and forestry. The locality is also suited to a range of grazing activities where wool and prime lamb production, together with cattle breeding and fattening, are the major agricultural activities. Walcha district is a significant primary production area for the state. The locality is further known as a producer of high-quality native hardwoods and softwoods.

Walcha LGA has a population of 3,092 people that includes approximately 1,451 persons in the town of Walcha, according to the Australia Bureau of Statistics (ABS) 2016 Census. The LGA covers an area of 626,100 ha giving the Walcha LGA a low population density of 0.005 persons per ha.

Uralla LGA has a population of 6,048 and covers an area of 323,000 ha (Uralla Shire Council, 2021).

1.4 Project Area

The Project Area comprises 315 freehold landholdings, one Crown land parcel, and Crown land paper roads covering approximately 22,285 hectares (ha). The Project Area includes the main wind farm area and an overhead 330 kV transmission line area which extends northwest from the wind farm for approximately 23 km to a new switching station, located approximately 7 km south of Uralla. The transmission line route comprises a 60 m easement corridor extending from the wind farm and crossing the Salisbury Plains. The Development Footprint covers 581.41 ha.

The Project Area is currently used for agricultural purposes such as livestock grazing and cropping and is characterised by large areas of grassland and pastures with isolated remnant patches of forest and woodland vegetation.

The Project Area is bounded by Thunderbolts Way to the west, the Oxley Highway to the south, the Oxley Wild Rivers National Park to the east, and the Salisbury Plains to the north. Thunderbolts Way is a regional road, which extends south from Gwydir Highway, travelling through Uralla and Walcha and terminates at Scone Road in Barrington. Oxley Highway is a State Road, which runs in a general east-west alignment linking Port Macquarie and the Pacific Highway to the New England Highway near Bendemeer. The road network is discussed in **Section 6.4.3**.

1.5 The Proponent

The Proponent is WinterbourneWind Pty Ltd (ABN: 59 113 000 150). In June 2019, Wind Power Invest (WPI), a wholly owned subsidiary of global wind energy giant Vestas Wind Systems A/S (Vestas), acquired a 95% stake in WinterbourneWind Pty Ltd from MirusWind Pty Ltd, which began developing concepts for the Project in 2004.

In December 2021, Copenhagen Infrastructure IV, a fund managed by Copenhagen Infrastructure Partners, entered into an agreement with Vestas to acquire Vestas' shareholding in the Project. The agreement will enable funding to be available to construct the Project once all key development activities for the wind farm have been completed.

The Proponent will continue to progress development and will supply, construct, operate and maintain the Project. Vestas designs, manufactures, installs, and services WTGs across the globe. Since 1979, over 151 GW of Vestas WTGs have been installed in 86 countries, making Vestas one of the wind industry's largest companies. Since 2001, Vestas has been involved in the sale, development, construction and maintenance of wind farms in Australia and New Zealand and currently employs over 500 staff in this region.

The postal address for the Proponent is:

WinterbourneWind Pty Ltd

Level 4, 312 Street Kilda Rd

Melbourne VIC 3004

ABN: 59 113 000 150

The Proponent is not involved, nor has been involved in any proceedings under any Commonwealth, State or Territory law relating to protection of environment or the conservation and sustainable use of natural resources.

WinterbourneWind Pty Ltd is a subsidiary of Vestas Wind System A/S, one of the largest wind energy companies in the world. Vestas designs, manufactures, installs, develops and services wind energy and hybrid energy projects around the world. Vestas has installed more than 157 GW of wind turbines installed in 88 countries. In 2022, Vestas was ranked the most sustainable company in the world in the 18th annual Global 100 ranking published by Corporate Knights.

Vestas is accredited to the Environmental Management System Standard ISO 14001:2015 for the sales, development, manufacture, installation, commissioning, training, service and maintenance of Sustainable Energy Solutions.

Vestas operates a certified integrated management system to manage risk and drive continuous improvement of business performance. Vestas satisfies applicable legal and voluntary requirements and ensure transparency in our quality, occupational health and safety, and environmental performance. The Vestas environmental policy commits the company to:

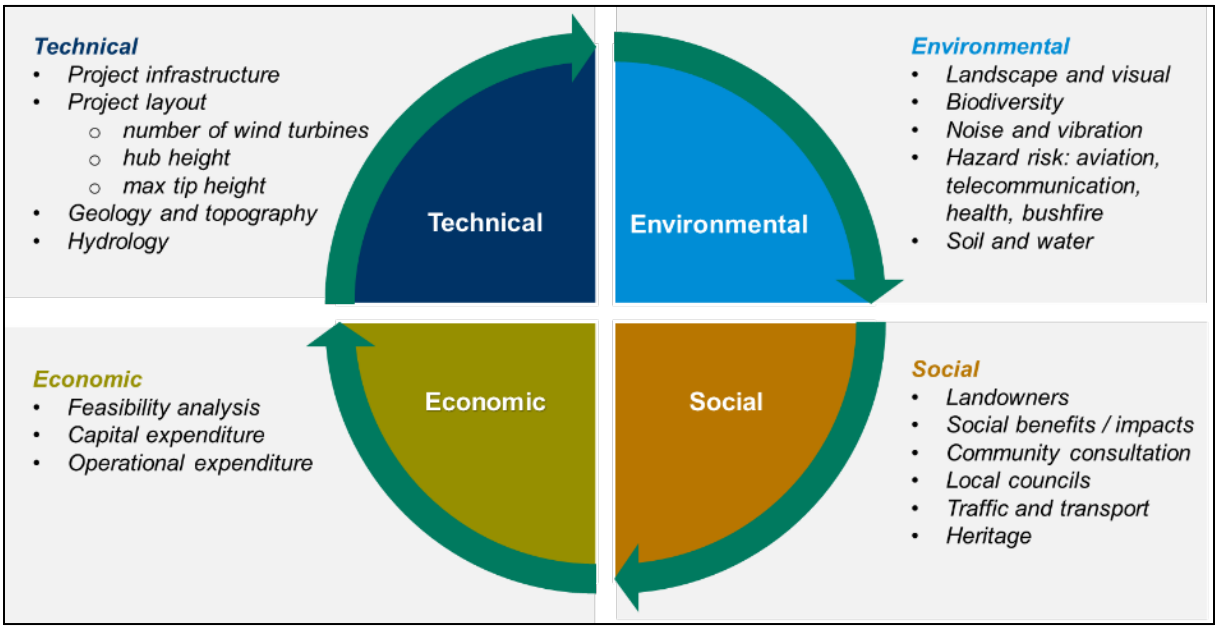
- Prevent pollution and protect the environment in all aspects of the business
- Demonstrate environmental vigilance by taking a life cycle approach in the development, planning and execution of operations, products and services
- Engage customers, employees, contractors, suppliers and other stakeholders through dialogue and training to meet or exceed environmental standards and ensure environmental protection as a pre-requisite to doing business.

More information is available at www.Vestas.com.

1.6 Design Approach

A multivariable and iterative design approach has been utilised for the Project, taking into consideration a range of technical, environmental, social, and economic opportunities and constraints, as shown in **Figure 1-4**.

Figure 1-4 Multivariable and Iterative Design Approach



Design iterations for the WTGs, ancillary infrastructure and the transmission line corridor have progressed with key drivers being measures to minimise and avoid environmental and social impacts in line with the following Avoid-Minimise-Mitigate-Offset design hierarchy:

- Avoid – in the first instance, all efforts were made to avoid potential environmental and social impacts;
- Minimise – where potential impacts could not be avoided, design principles aimed to minimise environmental and social impacts, as far as feasibly possible;
- Mitigate – mitigation strategies will be implemented to manage the extent and severity of remaining environmental and social impacts; and
- Offset – environmental and social offsets shall be used only as applicable, following all efforts to first avoid, minimise and mitigate environmental impacts.

A multidisciplinary design workshop was undertaken involving the Project Ecologist, Project Landscape Architect, Proponent engineers and ERM Project Team. In this workshop, the outcomes of environmental investigations were used to confirm optimal WTG layout and ancillary infrastructure locations to avoid and/or mitigate environmental and social impacts without negatively impacting feasibility from engineering and planning perspectives.

Design evolution and impact minimisation is outlined in **Section 2.2.2**.

1.7 State Significant Development Application

The Project is State Significant Development. A Scoping Report (ERM, 2020) describing the Project was submitted to the NSW Department of Planning and Environment (DPE) in September 2020. Secretary's Environmental Assessment Requirements (SEARs) were issued on 17 September 2020, and the Commonwealth Department of Agriculture, Water and the Environment (DAWE) Assessment Requirements. An Addendum Scoping Report (ERM, 2021) was submitted in March 2021 to include additional WTGs and properties that expanded the Project Area. The SEARs were not amended and form the basis of the assessment criteria for the Project.

This EIS accompanies the development application in accordance with the requirements of Section 4.12 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), and has been prepared in accordance with Part 8, Division 5 of the *Environmental Planning and Assessment Regulation 2021* (EP&A Regulation), the SEARs issued for the Project (SSD-10471 dated 17 September 2020), and DAWE Assessment Requirements (EPBC Ref: 2020/8734).

This EIS has been prepared having regard to the *State Significant Development Guidelines – Preparing an Environmental Impact Statement — Appendix B to the State Significant Development Guidelines* (DPIE, 2021a) (EIS Guidelines).

Appendix A contains the requirements of the EPBC Act, and the relevant NSW agencies and regulators' input to the SEARs. **Appendix A** also identifies where responses to each of these are addressed in the EIS.

1.8 Structure and Content

The EIS has been prepared to describe the Project, address the SEARs and the Commonwealth DAWE Assessment Requirements, assess the potential environmental impacts, and identify required mitigation measures.

For the purposes of the impact assessment, including biodiversity, heritage and visual impacts, these assessments considered a broader area to inform the identification of impacts and constraints to the Project. This information was used to refine the final development layout and the 'development footprint' as described in **Section 3.5**.

Table 1-2 outlines the structure of the EIS.

Table 1-2 Structure of the EIS

EIS Section	Description	EIS Reference
Introduction	Provides an overview of the Project and introduces the Proponent.	Section 1
Strategic Context	Identifies the key strategic issues that are relevant to the assessment of the Project.	Section 2
Project Description	Provides a detailed description of the Project including the key components for both the construction and operational phases.	Section 3
Statutory Context	Identifies the relevant statutory requirements for the Project.	Section 3.12
Stakeholder Engagement	Summarises the consultation activities undertaken with key stakeholders (including landowners, local community, government agencies and authorities).	Section 5
Assessment and Mitigation of Impacts	Describes the existing environment, methodology, assesses potential and actual environmental risks and impacts of the Project, and mitigation and management measures proposed to minimise these risks and impacts.	Section 6.1 to Section 6.14
Cumulative Impacts	Describes the potential cumulative impacts of the Project in combination with existing and other publicly proposed developments in the region.	Section 6.14
Project Justification and Conclusion	Presents the conclusions of the EIS.	Section 7

The Appendices provide the detailed technical assessments discussed in the EIS and supporting documentation. The environmental assessment team consisted of ERM's in-house technical experts and sub-consultants. **Table 1-3** provides a list of the supporting documentation and relevant authors.

Table 1-3 List of Supporting Documentation

Appendix		Author
A	Secretary's Environmental Assessment Requirements	ERM
B	Detailed Maps and Plans	ERM
C	Statutory Compliance	ERM
D	Stakeholder Engagement	ERM
E	Mitigation and Management	ERM
F	Capital Investment Value (CIV) Estimate	Muller Partnership
G	Biodiversity Development Assessment Report	NGH
H	Noise and Vibration Impact Assessment	Sonus
I	Landscape and Visual Impact Assessment	Moir Landscape Architecture
J	Traffic Impact Assessment (Including Transport Route Study)	Amber Organisation (Rex J Andrews)
K	Aviation Impact Assessment	Aviation Projects
L	Bushfire Assessment Report	NGH
M	Preliminary Hazard Analysis	Sherpa Consulting
N	EMI Assessment	DNV-GL
O	Aboriginal Cultural Heritage & Historic Heritage Assessment Report	OzArk
P	Soils and Water Assessment	ERM
Q	Rapid Flood Assessment	BMT
R	Social Impact Assessment	ERM
S	Decommissioning and Rehabilitation Assessment	Aurecon
T	World Heritage Assessment	Duncan Marshall

2. STRATEGIC CONTEXT

This section identifies the key strategic issues that are relevant to the assessment of the Project. It includes the site setting and surrounding land use, how the Project aligns with International, Federal Government, and State Government policies and strategic goals, alternatives to the Project and modifications made to the proposed design during development of the Project, and Benefit Sharing Schemes.

2.1 Alignment with Policy and Strategic Goals

Increased adoption of renewable energy generation will assist Australia to transition from traditional fossil fuel energy production, which is linked to anthropogenic climate change, atmospheric pollution, water pollution, land pollution and human health impacts. Critically, reducing carbon emissions through replacement of traditional energy sources with renewable energy will assist to minimise the effects of climate change, benefitting current and future generations in line with the principles of Ecologically Sustainable Development (ESD).

In addition to achieving the objectives outlined in **Section 1.2**, the Project will assist to achieve objectives of the following International, Federal Government, and State Government policies strategic goals:

- United Nations Sustainable Development Goals;
- The Federal Government's Renewable Energy Target;
- Climate Change Bill 2022;
- NSW Net Zero Plan Stage 1: 2020 – 2030;
- NSW Electricity Strategy;
- NSW Transmission Infrastructure Strategy;
- NSW Electricity Infrastructure Roadmap;
- NSW New England Renewable Energy Zone;
- Contributing to the NEM;
- New England North West Regional Plan;
- Walcha and Uralla Local Strategic Plans; and
- Community Strategic Plans for Walcha and Uralla.

2.1.1 United Nations Sustainable Development Goals

The *United Nations 2030 Agenda for Sustainable Development* includes global Sustainable Development Goals (SDG) to build a more sustainable and resilient future. The 17 SDG and 169 individual targets cover measures towards improvements to economic, social and environmental sustainability. All Member States of the United Nations agreed to work towards achieving the SDGs by 2030. Of relevance to the Project are:

- Goal 7: 'Ensure access to affordable, reliable, sustainable and modern energy for all', Target 7.2 states '*By 2030, increase substantially the share of renewable energy in the global energy mix*'; and
- Goal 11 Sustainable Cities and Communities, Target 11.6 states '*By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management'.*

The Project will provide a source of renewable energy, increasing the proportion of renewable energy generation in Australia. Further, it will assist to reduce reliance on fossil fuels for energy generation, resulting in reduction of GHG emissions and improved air quality.

2.1.2 Federal Government’s Renewable Energy Target

The Renewable Energy Target (RET) is a Federal Government scheme which has been in operation since 2001. It is designed to reduce emissions of GHG in the electricity sector and encourage the additional generation of electricity from sustainable and renewable sources. The RET operates as two schemes – small- and large-scale - of which the Large-scale Renewable Energy Target (LRET) is relevant for this Project. The LRET encourages investment in large-scale renewable energy projects like wind farms, and incentivises the development of renewable energy power stations through a market for the creation and sale of certificates called Large-scale Generation Certificates (LGCs).

Renewable energy power stations accredited in the LRET are able to create LGCs for electricity generated. LGCs can then be sold to entities with liabilities under the LRET (mainly electricity retailers) to meet their compliance obligations. One LGC can be created for each MWh of eligible renewable electricity produced by an accredited renewable power station.

Liable entities are required to buy LGCs from the market and surrender these certificates to the Clean Energy Regulator on an annual basis. LGCs can also be sold to companies and individuals looking to voluntarily offset their energy use and emissions.

The RET target for energy from large-sale renewable projects is 33,000 GW hours. Investment in renewable energy systems remains strong and target has not acted as a cap on new investment (Clean Energy Regulator, 2020) as the competitiveness of renewable energy no longer relies on the generation of LGCs.

This is relevant for the Project as, once constructed, it will contribute toward the RET target and will be an eligible large-scale generator under the RET. The Project will supply approximately 2,100,000 MWh per year of clean, renewable energy — enough to power more than 375,000 NSW homes on average. The Project will deliver renewable, low-cost energy to the national grid, offsetting the generation that will be lost with the closure of coal-fired power stations and contributing to the NSW Government’s net-zero emissions target by 2050.

2.1.3 Climate Change Bill 2022

The Federal Government *Climate Change Bill 2022* will, when it comes into effect, outline Australia's greenhouse gas emissions reduction targets of a 43% reduction from 2005 levels by 2030 and net zero by 2050. The Project will assist in achieving this target by providing an estimated reduction in greenhouse gas emissions of approximately 1.8 Mt $CO_2{}^{-e}$ per annum.

If approved, the Project could be constructed and operational before 2030, which is the year that many nations have pledged significant greenhouse gas emissions reductions relative to 2005 levels.

2.1.4 NSW Government’s Commitments

2.1.4.1 Net Zero Plan Stage 1: 2020-2030

The NSW Government Net Zero Plan Stage 1: 2020–2030 (DPIE, 2020a) sets the foundation for action on climate change and how the NSW Government will deliver on its objective to achieve net zero emissions by 2050, as outlined in the NSW Climate Change Policy Framework (OEH, 2016). The Plan is the NSW Government’s overarching strategy to reduce emissions and mitigate the impacts of climate change.

In September 2021, the NSW Government announced ambitious new emission reductions targets to reduce emissions by 50% below 2005 levels by 2030 (Net Zero Plan Stage 1: 2020 – 2030 Implementation Update - September 2021).

This Project will help give effect to the Net Zero Plan, including the NSW Government's updated 2030 target by providing an estimated reduction in greenhouse gas emissions of approximately 1.8 Mt CO_2^{-e} pa.

2.1.4.2 NSW Electricity Strategy

The *NSW Electricity Strategy* (DPIE, 2019a) is the NSW Government's plan to achieve reliability, affordability and sustainability for the NSW electricity system, and will support an estimated $8 billion of private investment in NSW's electricity system over the next decade.

An aim of the NSW Government's Electricity Strategy is to improve the efficiency and competitiveness of the NSW electricity market by reducing risk, cost, and government-caused delays, and to encourage investment in new price-reducing generation and energy saving technologies. The Strategy identifies the NSW Government's commitment to energy security, including additional capacity increases via interconnector projects and the rolling out of Renewable Energy Zones (REZs). The Strategy aligns closely with the NSW Government's *Net Zero Plan Stage 1: 2020 – 2030*.

The Project is consistent with the Strategy as it provides renewable energy generation and storage capacity that, together with other renewable generation projects, is expected to result in lower cost of energy in the NEM.

2.1.4.3 NSW Transmission Infrastructure Strategy

The *NSW Transmission Infrastructure Strategy* (DPE, 2018) is the NSW Government's plan to unlock private sector investment in priority energy infrastructure projects, which can deliver least-cost energy to customers. The Strategy forms part of the government's broader plan to make energy more affordable, secure investment in new power generation and network infrastructure and ensure new technologies deliver benefits for consumers.

The Strategy seeks to help meet future energy needs by facilitating new transmission that could support up to 17,700 MW of new electricity generation. Other benefits include improved energy reliability, security, timely project delivery, increased affordability and access to cheaper electricity.

The Project will include a 330 kV transmission line to connect the Project to a new electrical switchyard, located approximately 7 km south of Uralla and adjacent to TransGrid's 330 kV Tamworth to Armidale transmission line (Line 85).

2.1.4.4 NSW Electricity Infrastructure Roadmap

The *NSW Electricity Infrastructure Roadmap* (Roadmap), released in November 2020 is the NSW Government's plan to transform the NSW electricity sector into one that is clean, cheap and reliable. The Roadmap builds on the *NSW Electricity Strategy* (DPIE, 2019a) and the *NSW Transmission Infrastructure Strategy* (DPE, 2018). It sets NSW on a plan to replace its ageing coal-fired power stations with a coordinated portfolio of generation, storage and network investment.

The Roadmap emphasises the need to transition to renewable energies, noting four of the State's five coal fired power stations are expected to close within the next 15 years. Liddell Power Station is scheduled to close in early 2023. Origin Energy announced in February 2022 that it intends to close the Eraring Power Station in August 2025, seven years ahead of its previously planned retirement. Vales Point B power station is expected to close in 2029, Bayswater power station in 2033, and Mt Piper, the youngest of NSW's coal-fired power stations, in 2040. These power stations currently provide around three quarters of NSW's electricity supply and two thirds of the firm capacity needed during heat waves (DPIE, 2020d).

Enabled by the *Electricity Infrastructure Investment Act 2020* (NSW), the Roadmap sets out a coordinated framework to support $32 billion in private investment in at least 12 GW of renewable energy generation infrastructure and at least 2 GW of long-duration storage infrastructure by 2030 (DPIE, 2020d).

The Roadmap seeks to reduce GHG emissions from NSW electricity generation by 90 million tonnes by 2030, helping deliver on NSW’s emissions targets (DPIE, 2020d).

The Project will provide a significant amount of renewable energy annually to help offset the retirement of coal-fired power stations in NSW, and will contribute significantly towards reduction of GHG emissions.

2.1.4.5 New England Renewable Energy Zone

The *NSW Electricity Strategy* (DPIE, 2019a) and Electricity Infrastructure Roadmap (DPIE, 2020d) establish the framework to deliver the state’s first five REZs in strategic areas across the state, including in the New England region. The REZs will play a significant role in delivering renewable energy generation and storage to help replace existing fossil fuel power stations as they come to their end of operational life.

The New England region has been identified as one of five REZs to be created in NSW, with others being declared/proposed in the Central-West Orana, Illawarra, south west and Hunter-Central Coast regions of NSW. REZs combine wind, solar, hydroelectric and energy storage, together with high-voltage transmission lines, to generate and deliver clean, renewable energy. By connecting multiple generators and storage in the same area, REZs capitalise on economies of scale to deliver cheap, reliable and clean electricity for homes and businesses in NSW.

The New England REZ encompasses some of Australia’s best natural energy resources. The location of the New England REZ was selected based on detailed geospatial mapping, which identified areas of high renewable energy resource potential (e.g. wind speeds, solar irradiance), proximity to existing transmission infrastructure, and interactions with existing land uses. The New England REZ was declared by the Minister for Energy and Environment in December 2021. The declaration begins the process of formalising the REZ under the Electricity Infrastructure Investment Act 2020, establishes EnergyCo as the Infrastructure Planner for the REZ, and sets the intended network capacity. The declaration of the New England REZ also supports the implementation of the Australian Energy Market Operator’s Integrated System Plan.

The objectives of REZs are to:

- Deliver affordable energy into the future;
- Diversify the NSW energy mix;
- Expand electrical transmission capabilities; and
- Open up new parts of the NEM for energy generation in locations that can benefit from diverse weather patterns.

The Project is strategically located within the New England REZ, and aligns with the strategic objectives of the New England REZ as identified above. The Project will deliver affordable clean energy, contribute to the diversification of the NSW energy sector, and facilitate the expansion of electrical transmissions capabilities and opening up new parts of the NEM for energy generation. The Project has been optimised to make the most of the wind resources, allowing clean, reliable energy that can be matched with transmission and demand. The intent of the REZs is to set up renewable resource rich areas with the right infrastructure and transmission capacity to facilitate the delivery of clean energy where it is needed. While the Project is not connecting to any proposed new REZ infrastructure, it will augment both the generation and transmission of clean energy within the REZ.

2.1.4.6 Contributing to the National Electricity Market

The AEMO *2021 Electricity Statement of Opportunities* provides updated forecasts for demand and supply of electicity (AEMO, 2021).

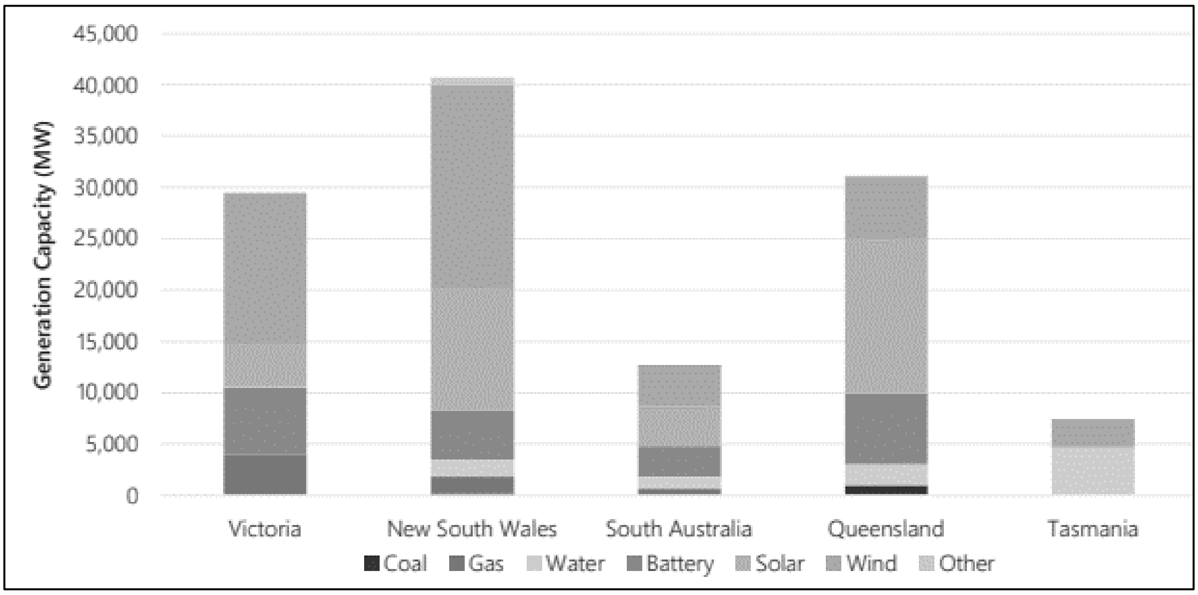
Traditionally, coal-fired generation and some gas peaking power plants have met NSW's electricity needs. In 2020, coal-fired generation supplied 74% of the total electricity generated in Australia, with renewables supplying 24% of generation (Department of Industry, Science, Energy and Resources, 2021). However, it is expected that over 16 gigawatts (GW) of thermal generation (61% of the current coal fleet in the NEM) will retire in the next two decades and between 26 GW to 50 GW of new large-scale wind and solar capacity is forecast to come online (Australian Energy Regulator, 2021).

The *AEMO 2022 Integrated System Plan* (June 2022) (ISP 2022) has attributed the optimal development pathway for the NEM as a nine-fold increase in utility-scale variable renewable energy (VRE). ISP 2022 continues that much of this resource will be built in REZs, which have 'the potential to foster a more holistic approach to regional employment, economic opportunity and community participation' (AEMO, 2022).

The *AEMO's 2021 Electricity Statement of Opportunities* report notes the substantial pipeline of future projects in various stages of development. These projects total 121 GW and are spread across all regions, including NSW. **Figure 2-1** illustrates proposed projects by type of generation and NEM region, beyond those already committed.

The Project will help to meet the projected nine-fold increase in utility-scale variable renewable energy required to meet the optimal development pathway for the NEM. The Project will also include a new 330 kV transmission line, connecting the wind farm to an existing substation, and a BESS to provide energy demand management. The Project will therefore augment the security and reliability of the electricity system in the NEM, through consistent energy generation, energy storage, and transmission to the existing TransGrid's 330 kV Tamworth to Armidale transmission line (Line 85).

Figure 2-1 Proposed Projects Beyond those Already Committed



Source: AEMO (2021)

2.1.5 New England North West Regional Plan

The *New England North West Regional Plan 2036* applies to the Project Area. The plan sets regional planning priorities and provides guidance and direction for regional and local planning decisions for each local government area. A Government direction has been issued to councils so that new planning proposals or updated local planning controls are consistent with the directions and actions outlined in the plan.

Relevant to the project is 'Goal 1: A strong and dynamic regional economy', '*Direction 5: Grow New England North West as the renewable energy hub of NSW*', which states:

- New opportunities for employment will be offered in emerging renewable energy and green technology industries, and positions the new renewable energy generation and 'green' industries as eco-friendly alternatives and solutions to environmental issues and challenges, noting that the region can be a leader in renewable energy;
- That existing proposals for large wind and solar farms will generate employment and investment from construction, operations and connection to the State's electricity grid; and
- Incorporating small-scale cogeneration measures into the design of new developments and providing employment lands for research and development opportunities will further support the sector's growth.

Relevant actions of the plan include:

- 5.1: Diversify the energy sector by identifying renewable energy resource precincts and infrastructure corridors with access to the electricity network; and
- 5.2: Facilitate appropriate smaller-scale renewable energy projects using biowaste, solar, wind, hydro, geothermal or other innovative storage technologies.

2.1.6 Walcha Local Strategic Planning Statement 2036

The *Walcha Local Strategic Planning Statement 2036* (LSPS) identifies clear planning priorities to address planning and development for the Walcha LGA (Walcha Council, 2019). The LSPS sets short, medium and long-term actions to deliver community priorities and vision as referenced in the *New England North West Regional Plan 2036* and *Community Strategic Plan Walcha – 2027*. Priorities within the Walcha LSPS relevant to the Project are summarised in **Table 2-1**.

Table 2-1 Walcha LSPS Planning Priorities Relevant to Project

Walcha LSPS Planning Priority	LSPS Commitment	Project Response
#2 Foster resilience and diversification in the agricultural industry to respond to the ageing farming workforce and climate change	Foster resilience and diversification	The Project is consistent with Planning Priority #2 as it increases diversification of land use in addition to providing a diversified income stream for rural landholders and neighbours through payments to host landholders and the Neighbour Benefit Fund.
#5 Raise the area's profile and awareness of employment, business development and lifestyle opportunities, particularly for younger people and provide services for the ageing population	Stimulate economic opportunities	The Project is consistent with Planning Priority #5 as it delivers jobs and economic benefits to regional and local communities throughout the construction and operation of the Project. The Project is anticipated to create up to 400 FTE jobs through the 24 to 30-month construction period, and 16 FTE local jobs during the operation.
#8. Identify and promote wind, solar and other renewable energy production opportunities; manage and support the transition to renewable energy'	Explore options for renewable energy generation to encourage a diversified economy	The Project is consistent with Planning Priority #8 as it contributes to the creation of a new renewable energy generation industry within the Walcha LGA.

2.1.7 Community Strategic Plan Walcha – 2027

The *Community Strategic Plan Walcha – 2027* (Walcha CSP 2027) is the blueprint for the future of Walcha LGA (Walcha Council, 2017). Walcha CSP 2027 was developed by the community of Walcha and represents the vision, aspirations, goals, priorities and challenges for the Walcha community. Goals of the Walcha CSP 2027 relevant to the Project are summarised in **Table 2-2**.

Table 2-2 Walcha CSP 2027 Goals Relevant to Project

Walcha CSP Goal	Project Response
Goal 4.1 Education and training opportunities will be provided that deliver the skills and knowledge needed to advance the community.	The Project is consistent with Goal 4.1 as it is anticipated to create up to 400 full FTE jobs during construction. While many of these jobs will involve specialised skills (e.g. crane operators), the Proponent has estimated that over 100 jobs could be available to the local workforce during the construction peak. Many of these jobs can be learned in a short period of time, and standard training (such as occupational health and safety training) will be provided by the Proponent. Over the long-term, approximately 16 service and maintenance jobs will be created during plant operation to be based in the Walcha area. Additional roles include supervisors, admin support and warehouse manager. The Proponent will advertise roles in local papers and online platforms. The Proponent will provide all wind-farm specific training required to service WTGs and project infrastructure.
Goal 5.5 Young people will be retained and supported to live in Walcha.	The Project is consistent with Goal 5.5 as jobs will be created throughout construction and operation of the Project, as outlined above. Operational jobs will be based in the Walcha area to ensure that operational issues can be resolved in a timely manner.
Goal 6.4 Walcha will increase the use and production of renewable energy.	Project is consistent with Goal 6.4 as it contributes to the creation of a new renewable energy generation industry within the Walcha LGA.

2.1.8 Uralla Local Strategic Planning Statement 2040

The *Uralla Local Strategic Planning Statement* (LSPS) identifies clear planning priorities to guide economic, social and environmental land use needs for the Uralla Shire LGA (Uralla Shire Council, 2021). The LSPS sets short, medium and long-term actions to deliver community priorities and vision as referenced in the New England North West Regional Plan 2036 and Community Strategic Plan Walcha – 2027. Priorities of the Uralla LSPS relevant to the Project are summarised in **Table 2-3**.

Table 2-3 Uralla LSPS Planning Priorities Relevant to the Project

Uralla LSPS Planning Priority	LSPS Commitment	Project Response
#5.1.1 Identify potential solar and wind energy clusters to support the production of renewable energy in appropriate locations in proximity to TransGrid infrastructure.	Support and Manage Rural Landscapes	The Project is consistent with Planning Priority #5.1.1 as it contributes to the creation of a new renewable energy generation industry within the Uralla LGA.
#7.2.1 Energy efficiency and reduction of greenhouse gases from electricity usage are improved through adjustments to building siting, orientation, design, construction and use of technologies	Adapt to a changing climate	The Project is consistent with Planning Priority #7.2.1 providing an estimated reduction in greenhouse gas emissions of approximately 1.8 Mt CO2-e pa.
#7.2.3 Support the development of small to large scale renewable energy projects in appropriate locations.	Adapt to a changing climate	The Project is consistent with Planning Priority #7.2.3 as it contributes to the creation of a new renewable energy generation industry within the Uralla LGA.

2.1.9 Community Strategic Plan Uralla 2027

The *Community Strategic Plan Uralla – 2022 to 2031* (Uralla CSP) is the blueprint for the future of Uralla LGA (Uralla Shire Council, 2022). Uralla CSP was developed by the community of Uralla and represents the vision, aspirations, goals, priorities and challenges for the Uralla community. Goals of the Uralla CSP relevant to the Project are summarised in **Table 2-4**.

Table 2-4 Uralla CSP 2027 Goals Relevant to the Project

Uralla CSP Goal	Project Response
Goal 2.2 Growing and diversified employment, through growth in existing and new businesses.	The Project is consistent with Goal 2.2 as it is anticipated to create up to 400 full FTE jobs during construction. While many of these jobs will involve specialised skills (e.g. crane operators), the Proponent has estimated that over 100 jobs could be available to the local workforce during the construction peak. Many of these jobs can be learned in a short period of time, and standard training (such as occupational health and safety training) will be provided by the Proponent. Over the long-term, approximately 16 service and maintenance jobs will be created during plant operation to be based in the Walcha area. Additional roles include supervisors, admin support and warehouse manager. The Proponent will advertise roles in local papers and online platforms. The Proponent will provide all wind-farm specific training required to service WTGs and project infrastructure.

2.2 Project Alternatives

2.2.1 'Do Nothing'

The 'do nothing' option needs consideration as it represents the status quo, avoids development impacts but does not realise the Projects benefits. Doing nothing would avoid potential impacts associated with the development and operation of the Project. These include potential construction and operational noise, traffic, dust, visual, biodiversity, and Aboriginal heritage impacts. The land would remain as grazing agricultural land. **Section 6** provides further discussion of these impacts and the accompanying mitigation and management measures. These sections conclude that with appropriate mitigation and management measures, the Project will not have a substantial negative impact on environmental aspects.

Not proceeding with the Project would forgo the benefits outlined in **Section 1.2** and **Section 2.1**, particularly those relating to federal, state and regional policies, and strategies to decarbonise the NEM as outlined in **Section 2.1** and **Section 7**. Should the Project not proceed, the estimated 1.8 Mt CO_2-e pa reduction in greenhouse gas emissions would not be realised.

Given the benefits of the Project as discussed in **Section 2.2** and **Section 7** and the manageability of potential impacts, 'do nothing' was not the preferred option for strategic, economic, social, and environmental reasons.

2.2.2 Design Evolution and Impact Minimisation

Since the conception of this Project, the design has evolved through consideration of technical, environmental, social, and commercial constraints. A significant aspect of this design refinement was engaged with landowners, neighbours to the Project, the broader community, local government, State and Federal Agencies, and business and stakeholder groups. This engagement, along with technical studies undertaken, has helped to shape the indicative Project layout presented in this EIS.

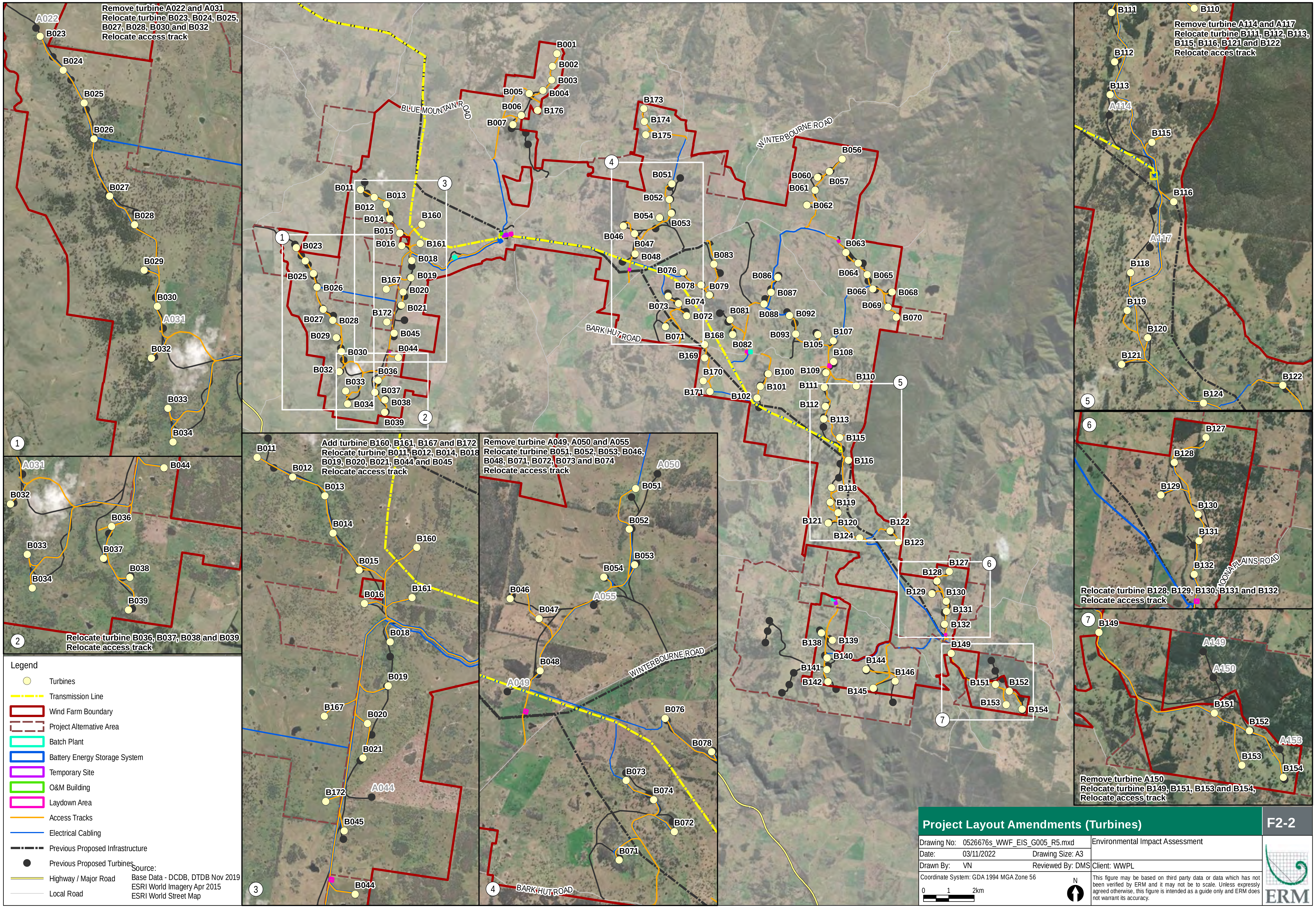
The Proponent has completed environmental assessment of the Project Area in accordance with the SEARs, and has modified the project layout based on the outcomes of these assessments, consideration of technical, environmental, and constructability issues, and community feedback (refer **Section 5**). This section describes Project alternatives that were considered and modifications made to previous designs.

The Project originally consisted of up to 130 WTGs (refer Scoping Report Addendum (ERM, 2021)) and has since been refined to up to 119 WTGs to avoid highly sensitive ecological areas and reduce visual impacts from the Oxley Highway and Apsley Falls. While this alleviated some of the potential impacts, additional design refinements were required to further reduce visual and construction impacts. These included a reduction in the proposed maximum blade tip height from 250 m to 230 m.

Figure 2-2, **Figure 2-3** and **Figure 2-4** illustrate the evolution of the Project layout since the scoping phase. **Table 2-5** outlines the evolution of Project, and the rationale for these is summarised in **Table 2-6**. It is expected that some further adjustment may be necessary in response to feedback received during public exhibition of the EIS.

Table 2-5 Project Amendments since Scoping Phase

Project Component	Scoping Report	Project
Project Area	24,000 ha	22,285 ha
No. of WTGs	■ 126 WTGs – Scoping Report ■ 130 WTGs – Scoping Report Addendum	■ Up to 119 WTGs
WTG dimensions (maximums)	■ Hub Height of 155 m to 160 m ■ Tip Height of 250 m	■ Hub Height of 149 m ■ Tip Height of 230 m
Indicative WTG model	■ Vestas V-162 5.6 MW model was presented as a current turbine option ■ Vestas V-180 6.4 MW model was presented as a future turbine option	■ V162 6.2 MW is the indicative WTG model based on current technology
Electrical Reticulation Network	1 x 330 kV main substation and 2 x 132 kV collector substations	2 x 33/330 kV substations
	~ 164 km of internal electrical reticulation network, underground and overhead 33 kV and 132 kV	~ 324 km of internal electrical reticulation network, underground and overhead 33 kV
	~ 60 km of 330 kV overhead transmission lines	~ 50 km of 330 kV overhead transmission lines
	100 MW / 200 MWh lithium ion battery (indicative)	No change



Remove turbine A022 and A031
Relocate turbine B023, B024, B025, B027, B028, B030 and B032
Relocate access track
Relocate turbine B036, B037, B038 and B039
Relocate access track
Add turbine B160, B161, B167 and B172
Relocate turbine B011, B012, B014, B018, B019, B020, B021, B044 and B045
Relocate access track
Remove turbine A049, A050 and A055
Relocate turbine B051, B052, B053, B046, B048, B071, B072, B073 and B074
Relocate access track
Remove turbine A114 and A117
Relocate turbine B111, B112, B113, B115, B116, B121 and B122
Relocate acces track
Relocate turbine B128, B129, B130, B131 and B132
Relocate access track
Remove turbine A150
Relocate turbine B149, B151, B153 and B154,
Relocate access track
BLUE MOUNTAIN ROAD
WINTERBOURNE ROAD
BARK HUT ROAD
TOONA PLAINS ROAD
Legend
Turbines
Transmission Line
Wind Farm Boundary
Project Alternative Area
Batch Plant
Battery Energy Storage System
Temporary Site
O&M Building
Laydown Area
Access Tracks
Electrical Cabling
Previous Proposed Infrastructure
Previous Proposed Turbines
Highway / Major Road
Local Road
Source:
Base Data - DCDB, DTDB Nov 2019
ESRI World Imagery Apr 2015
ESRI World Street Map
Project Layout Amendments (Turbines)
F2-2
Drawing No: 0526676s_WWF_EIS_G005_R5.mxd
Date: 03/11/2022
Drawing Size: A3
Drawn By: VN
Reviewed By: DMS
Environmental Impact Assessment
Client: WWPL
Coordinate System: GDA 1994 MGA Zone 56
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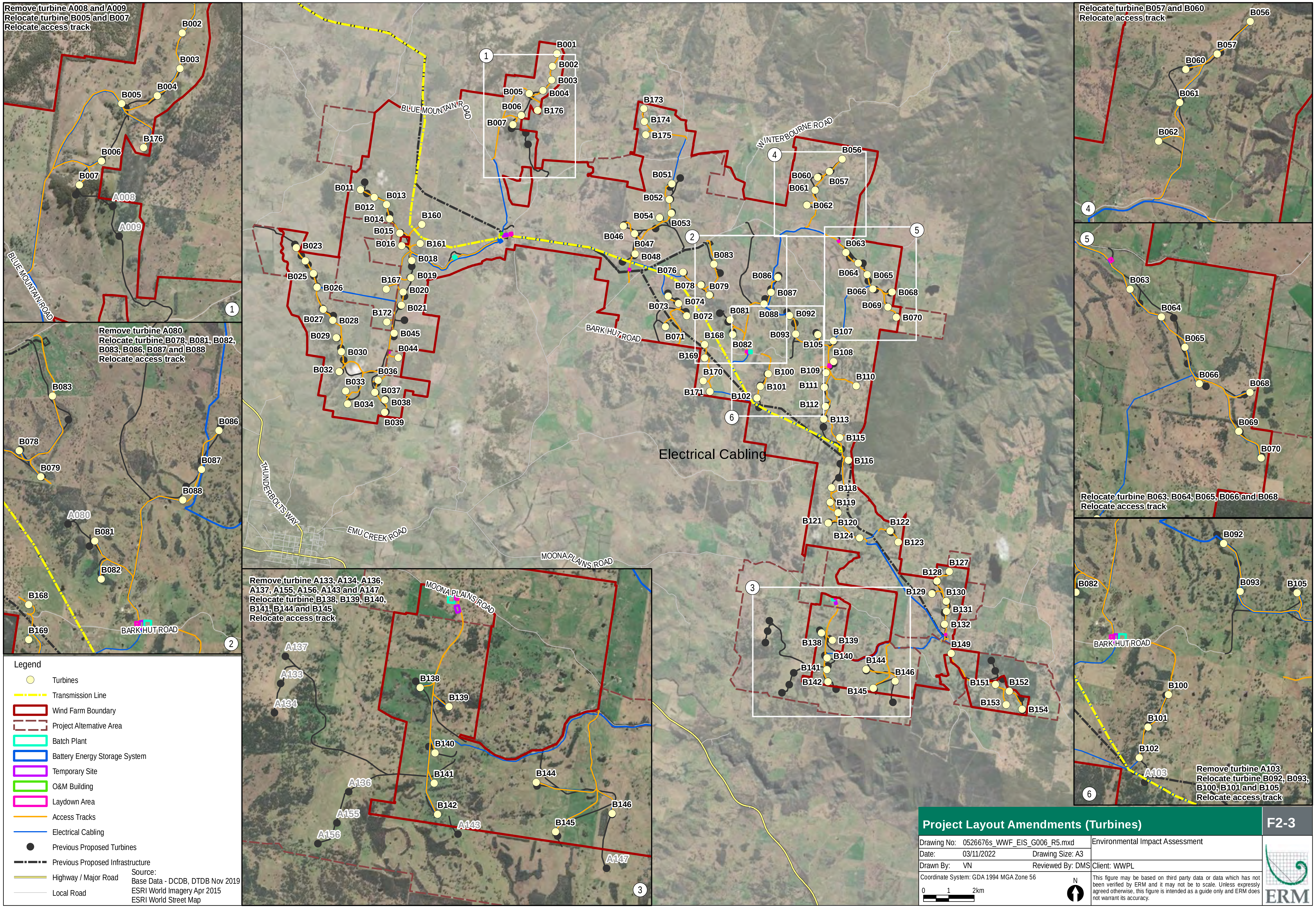

Project Layout Amendments (Turbines)

F2-3

Drawing No: 0526676s_WWF_EIS_G006_R5.mxd
Date: 03/11/2022 Drawing Size: A3
Drawn By: VN Reviewed By: DMS
Coordinate System: GDA 1994 MGA Zone 56

Environmental Impact Assessment

Client: WWPL

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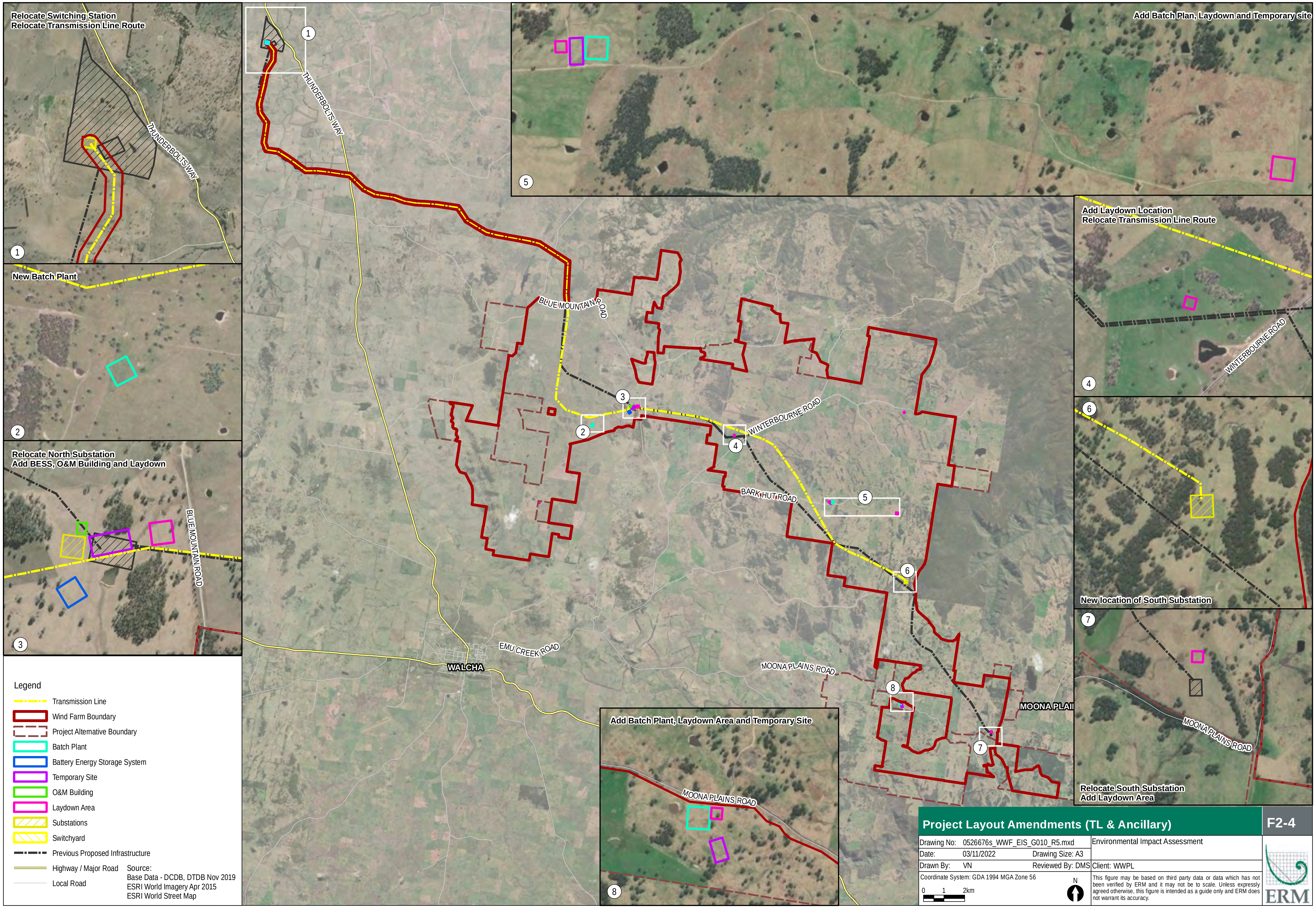

Relocate Switching Station
Relocate Transmission Line Route
THUNDERBOLTS WAY
1
New Batch Plant
2
Relocate North Substation
Add BESS, O&M Building and Laydown
BLUE MOUNTAIN ROAD
3
Add Batch Plan, Laydown and Temporary site
5
Add Laydown Location
Relocate Transmission Line Route
WINTERBOURNE ROAD
4
6
New location of South Substation
7
MOONA PLAINS ROAD
Relocate South Substation
Add Laydown Area
Add Batch Plant, Laydown Area and Temporary Site
MOONA PLAINS ROAD
8
BLUE MOUNTAIN ROAD
WINTERBOURNE ROAD
BARK HUT ROAD
EMU CREEK ROAD
WALCHA
MOONA PLAINS ROAD
MOONA PLAI
Legend
Transmission Line
Wind Farm Boundary
Project Alternative Boundary
Batch Plant
Battery Energy Storage System
Temporary Site
O&M Building
Laydown Area
Substations
Switchyard
Previous Proposed Infrastructure
Highway / Major Road
Local Road
Source:
Base Data - DCDB, DTDB Nov 2019
ESRI World Imagery Apr 2015
ESRI World Street Map
Project Layout Amendments (TL & Ancillary)
F2-4
Drawing No: 0526676s_WWF_EIS_G010_R5.mxd
Date: 03/11/2022
Drawing Size: A3
Drawn By: VN
Reviewed By: DMS
Coordinate System: GDA 1994 MGA Zone 56
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Environmental Impact Assessment
Client: WWPL
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Table 2-6 Rationale of Project Amendments since Scoping Phase

Reference box	Component	Action	Rationale
Figure 2-2			
Box 1	A022	Removed	Improve buffer distance to nearby residences
	A031	Removed	Improve spacing between WTGs
	B023, B024, B025, B027, B028, B030, B032, Access Road	Relocated	Improve spacing between WTGs
Box 2	B036, B037, B038, B039, Access road	Relocated	Improve constructability
Box 3	B011	Relocated	Move further south from dwelling to higher location
	B012, B014, B018, B019, Access track	Relocated	Improve constructability
	B020, B021	Relocated	Minimise Serious and Irreversible Impact (SAII) impact
	B044, B045	Relocated	Move to higher location
	B160	Added	New turbine locations
	B161, 167, 172	Added	New turbine locations
Box 4	B046, B048, B051, B052, B053, B073, B074, Access track	Relocated	Improve constructability
	B049	Removed	Reduce proximity to transmission line plus low wind speed location
	B050, B055	Removed	Poor constructability
	B071	Relocated	Relocate 40 m north west to reduce EMI impact
	B072	Relocated	Relocate ~200 m south to avoid vegetation
Box 5	A114	Removed	Poor constructability
	A117	Removed	Remove to reduce potential for shadow flicker at nearby residences
	B111, B112, B113, B121, B122, Access track	Relocated	Improve constructability
	B115, B116	Relocated	Increase distance between WTG and National Park
Box 6	B128, B130, B131, B132, Access track	Relocated	Improve constructability
	B129	Relocated	Move 50 m east to different paddock for landowner's preference

Reference box	Component	Action	Rationale
Box 7	A149	Removed	Move 95 m south to reduce EMI impact
	A150	Removed	Poor constructability
	B151	Relocated	Improve constructability
	B153	Relocated	Relocated ~600 m west to avoid EMI issues
	B154	Relocated	Relocated ~100 m north to increase buffer from boundary of non-associated dwelling
	Access track	Relocated	To account for removed WTGs
Figure 2-3			
Box 1	A008	Removed	Poor constructability
	A009	Removed	
	B005	Relocated	Improve constructability
	B007	Relocated	Relocated ~160 m to north to reduce PCT impact and improve constructability
	Access track	Relocated	To account for removed WTGs
Box 2	A080	Removed	Removed to reduce sensitive PCT clearing
	B078, B081, B082, B086, B087, B088	Relocated	Improve constructability
	B083	Relocated	Relocate 670 m to west to reduce road length and PCT impact
	Access track	Relocated	To account for removed WTGs
Box 3	A133, A134, A136, A137, A155	Removed	Removed to reduce visual impact from Apsley Falls and Oxley Highway
	A156, A143, A147	Removed	Increase setback from World Heritage Area
	B138, B139, B140, B141, B145	Relocated	Improve constructability
	B144	Relocated	Relocated 57 m north to reduce EMI issues
	Access track	Relocated	To account for removed WTGs
Box 4	B057, B060, Access track	Relocated	Poor constructability / location
Box 5	B063, B064, B065, B066, B068, Access track	Relocated	Poor constructability
Box 6	A103	Removed	Reduce biodiversity impact and accessibility issues.
	B092, B093, B100, B101, B105, Access track	Relocated	Poor constructability
Figure 2-4			
Box 1	Switching Station, Transmission Line Route	Relocate	Reduce visual impact and improve overall design
Box 2	Batch plant	Added	New batch plant location

Reference box	Component	Action	Rationale
Box 3	North Substation	Relocated	Improve construction accessibility and alignment with proposed transmission line
	BESS, O&M Facility, Laydown Area	Added	Improve construction accessibility
Box 4	Laydown Area	Added	New location
	Transmission Line	Relocated	Reduce overall length and reduce biodiversity impact
Box 5	Batch Plant, Laydown Area, Temporary Site	Added	New location
Box 6	South Substation	Relocated	Reduce number of substations and transmission line length
Box 7	Laydown Area	Added	New location
Box 8	Batch Plant, Laydown Area, Temporary Site	Added	New location

2.2.3 Alternative Transport Routes

The Transport Route Assessment Report (refer **Appendix J**) identifies the proposed transport route for oversized and overmass (OSOM) vehicles. The assessment proposes one route out of the Port of Newcastle via Selwyn Street, George Street, Industrial Drive, Maitland Road, New England Highway, John Renshaw Drive, Hunter Expressway, New England Highway.

From that point, the assessment proposes two routes from Belford through to Bengalla, for use depending on the components being transported (**Section 6.4**). These alternate transport routes were proposed to minimise impacts relating to traffic management and biodiversity.

Further discussion of these transport routes is provided in **Section 6.4** and **Appendix J**.

2.3 Key Potential Risks

Key potential risks of the Project on environmental and social aspects are investigated in detail in **Section 6**. Those that require more detailed assessment, due to an increased risk of significant impacts include biodiversity, noise and vibration, landscape and visual, traffic and transport, Aboriginal cultural heritage, and social and economic.

For example, wind farms by their nature require areas of land for the construction WTGs and ancillary infrastructure. Due to this, impacts to biodiversity are typically unavoidable. Regardless; the detailed assessment aimed to avoid highly sensitive areas, minimise the geographic extend of impacts, and recommend management measures to minimise residual indirect impacts.

Construction activities also have the potential to impact Aboriginal cultural heritage items. As such, the detailed Aboriginal cultural heritage assessment aimed to engage with relevant Aboriginal parties, understand the Aboriginal history and cultural sensitivity of the development area, and avoid, minimise and manage any potential risks.

Similarly, WTGs are tall structures, and to maximise energy generation, they tend to be located at the top of ridgelines where wind resources are at their highest (**Figure 3-10**). This increases the potential for visual impacts to nearby residences and landscape features. WTGs also emit a noise, which can be audible is sensitive receivers are in proximity. The detailed visual and landscape and noise and vibration assessments aimed at assessing, avoiding, minimising and managing these impacts.

Construction of a wind farm requires significant transport of plant and material. Components are typically large and lengthy, and require specialised OSOM vehicles to transport them. These vehicles typically need to navigate long distances from a port to the Project site. The number of transport movements required to deliver all project components, plant and equipment is large, and can lead to impacts on traffic volumes and road surfaces. These impacts must be assessed, avoided, minimised and managed.

2.4 Potential Cumulative Impacts

The Project is located in the New England REZ. The objectives of the REZs is to facilitate the coordinated development of renewable energy generation projects, energy storage and transmission. This means that the region is planned to have a significant number of renewable energy developments, as well as other major projects that may lead to cumulative impacts relating to agricultural and land use conflicts. biodiversity, landscape and visual, traffic and transport, noise and vibration, aviation safety, and social and economic. Potential cumulative impacts of the Project are investigated further in **Section 6.14**.

3. PROJECT DESCRIPTION

This section presents a detailed description of the proposed works associated with the construction, operation, maintenance and decommissioning phases of the Project and provides a detailed overview of the proposed wind farm layout and infrastructure components.

3.1 Overview

The Project involves the construction, operation, maintenance and decommissioning of a wind farm with up to 119 WTGs, together with associated and ancillary infrastructure.

The Project design has been revised and refined in response to the identification and assessment of environmental constraints, constructability requirements, and consideration of the outcomes of agency, landowner, and community consultations (refer **Section 2.2** for further discussion of alternatives considered).

The Project consists of the following key components:

- Up to 119 WTGs, each with:
  - Three blades mounted to a rotor hub (hub height of 149 m) on a nacelle above a tubular steel tower, with a blade tip height (blade length plus hub height) of up to 230 m AGL;
  - A gearbox and generator assembly housed in the nacelle;
  - Adjacent hardstands for use as crane pads, assembly and laydown areas;
- Two 33/330 kV electrical substations, including control room, transformers, circuit breakers, switches and other ancillary equipment;
- An operations and maintenance facility;
- A BESS of up to 100 MW/200 MWh capacity (two hours of storage);
- Aboveground and underground 33 kV electrical reticulation and fibre optic cabling connecting the WTGs to the onsite substations (generally following site access tracks);
- 330 kV single or double circuit twin conductor overhead transmission line (transmission line) route of approximately 50 km connecting the two substations to a new electrical switchyard (including circuit breakers, switches and other ancillary equipment), located approximately 7 km south of Uralla and adjacent to TransGrid's 330 kV Tamworth to Armidale transmission line (Line 85);
- Internal access tracks (combined total length of approximately 113 km) connecting the WTGs and associated Project infrastructure with the public road network;
- Upgrades to roads and intersections required for the delivery of OSOM WTG components, transformers and associated construction-phase materials and vehicular movements; and
- Decommissioning of four temporary meteorological monitoring masts and installation of up to two permanent meteorological monitoring masts. The permanent monitoring masts will be located close to a WTG location with a maximum height of 149 m AGL, equivalent to the hub height of the installed WTGs.

The following temporary elements will be required during the construction phase of the Project:

- Site buildings and facilities for construction contractors / equipment, including site offices, car parking and amenities for the construction workforce;
- Mobile concrete batching plant/s to supply concrete for WTG footings and substation construction works;
- Earthworks for access tracks, WTG platforms and foundations, potentially including controlled blasting in certain areas;

- Rock crushing facilities for the generation of suitable aggregates for concrete batching and/or for access track and hardstand construction;
- Hardstand laydown areas for the storage of construction materials, plant, and equipment;
- Up to four temporary meteorological monitoring masts. The temporary monitoring masts will be located close to a WTG location with a maximum height of 149 m AGL;
- External water supply and storage for concrete batching and construction activities;
- The transport, storage and handling of fuels, oils and other hazardous materials for construction and operation of wind farm infrastructure; and
- Beneficial reuse of materials won from within the development footprint during cut and fill and WTG foundation excavation works for use in access track, hardstands and foundation material.

The Project is seeking consent for the subdivision of land for the substations and switchyard.

Ultimately, the Project will be decommissioned and the Project Area will be rehabilitated (refer **Section 3.9**).

Table 3-1 provides an overview of the approximate dimensions of the Project components.

Table 3-1 Project Components and Approximate Dimensions

Project Components and Infrastructure	Approximate Dimensions	Quantity
WTGs		
Rotor diameter	162 m	119 WTGs
Blade length	Blade length of 79.3 m. Distance from the centre-point of the hub to the tip of the blade equals 81 m	
Uppermost blade tip	230 m	
Tower (hub) height	149 m	
WTG hardstand	0.70 ha per WTG required for construction 0.26 ha per WTG during operation after partial rehabilitation following construction	
Ancillary Infrastructure		
100 MW/200 MWh BESS	100 m x 100 m	1
33/330 kV Substation	100 m x 100 m	2
O&M Facility including carpark	50 m x 40 m	1
New 330 kV transmission line	Towers approximately 40 m high, spaced approximately 500 m (subject to terrain) or monopoles approximately 50 m high, spaced approximately 250 m (subject to terrain), within 60 m easement.	50 km
Underground and/or overhead 33 kV cables	Trenching for underground electrical cabling will be approximately 0.6 m wide per circuit by 1.0 m deep. Note: Where ground conditions are not suitable for open cut trench installation, overhead single circuit electricity lines will be installed using concrete poles.	324 km
Switchyard	160 m x 120 m	1
New internal access tracks and drainage	Approximately 15 m wide formation including 5.5 m roadway plus shoulders and drainage as required.	113 km

Project Components and Infrastructure	Approximate Dimensions	Quantity
Permanent meteorological masts (with concrete footings for mast and guy wires)	Sensor height at 149 m on approximately 3 m x 3 m concrete foundation.	Up to 2
Temporary Facilities		
Concrete batching plants	100 m x 100 m	Up to 3
Laydown Areas	6 laydown areas at 50 m x 50 m 2 laydown area at 100 m x 100 m	Up to 8
Site office, car parking and storage areas	180 m x 90 m 120 m x 60 m 100 m x 60 m	Up to 3
Temporary meteorological masts (with concrete footings for mast and guy wires)	Sensor height at 149 m on approximately 3 m x 3 m concrete foundation.	Up to 4
Other Project elements		
Duration of construction phase	About 30 months	
Construction workforce	Up to 400 FTE	
Duration of operation phase	30 Years	
Operational workforce	Up to 39 FTE	
Construction hours	■ Monday to Friday: 7.00 am to 6.00 pm; ■ Saturday: 8.00 am to 6.00 pm; and ■ No works on Sunday or public holidays.	
Capital investment	$1,588,425.000 (excl. GST)	

3.2 Site Setting and Surrounding Land Use

The Project Area is entirely located on land zoned RU1 – Primary Production as shown in **Figure 3-2**.

The area surrounding the Project Area is generally also zoned RU1 – Primary Production, except for the Oxley Wild Rivers National Park to the east and south of the Project Area, which is zoned C1 – National Parks and Nature Reserves.

Walcha town centre is located approximately 6.5 km from the nearest proposed turbine (B034), where there is also a mixture of various land uses, including residential, commercial, industrial, and public recreation.

Table 3-2 below provides a summary of surrounding land use, which is further illustrated in **Figure 3-3**.

Table 3-2 Surrounding Land Use

Land use	Summary
Conservation areas	Oxley Wild Rivers National Park is situated to the east and south of the Project Area and has a total area of 165,000 ha. It lies within the Macleay River catchment and mostly comprises gorges and deep river valleys on the upper reaches of the river and its tributaries, with relatively small areas of peripheral and residual tableland (NSW NPWS, 2005). The National Park was established in 1986 though the amalgamation of several smaller reserves. The park now comprises 12 separate blocks of land and includes a Crown lease in the Styx River area / region, which was declared as part of the national park in 1988. Oxley Wild Rivers National Park was inscribed on the World Heritage List in 1994 as one of six National Parks that make up the Gondwana Rainforests of

Land use	Summary
	Australia World Heritage Area. The Gondwana Rainforests of Australia contains the most extensive areas of subtropical rainforest in the world, large areas of warm temperate rainforests, and the majority of the world's Artic beech cool temperate rainforests. Two portions of the National Park, covering a total area of over 81,000 ha, are also declared as wilderness areas under the *Wilderness Act 1987* (NSW). These are: ■ Macleay Gorges Wilderness, which covers the majority of the central area of the national park and includes a large area of the upper Macleay River catchment. It was declared in 1996 with a total area of 59,338 ha; and ■ Kunderang Wilderness, located to the east of the Macleay Gorges Wilderness, and covering much of the eastern and south-eastern section of the Kunderang Brook catchment. It was declared in 1998 with a total area of 21,937 ha.
Mineral resources	A search of the NSW DPE MinView mapping tool was undertaken in February 2022. The search indicated that there is currently one Exploration Licence (EL) within the Project Area. EL9338 was granted 17 December 2021 to Iolanthe Minerals Pty Ltd. The EL is for a one-year term (expiry date 17 December 2022) for Group One (1) minerals. There is also one EL8479 approximately 1.5 km northeast of the Project Area. EL8479 was granted to Providence Gold and Minerals Pty Ltd on 21 October 2016 and is due to expire on 21 October 2023.
Tourism and viewpoints	The township of Walcha offers a range of accommodation options, including hotels, motels, bed and breakfasts, and a caravan park. Within the wider locality there are a number of farm stay options, including Cheyenne Wilderness Retreat Farmstay, located 6.5 km north of the nearest WTG. Thunderbolts Way also has a tourism offering, as it functions as a scenic route from Sydney to the New England Tablelands and Queensland for those wanting to avoid the Pacific Highway and the New England Highway. Oxley Wild Rivers National Park is a main attraction of the region, which draws tourism through its many natural and cultural features. Accordingly, the *Plan of Management* (NSW NPWS, 2005) for the National Park lists recreation and tourism opportunities as one of its key values, which include: ■ Easily accessible lookouts and associated facilities at spectacular escarpment locations; ■ A range of short to long day and overnight walks; ■ Self-reliant recreation in the extensive network of gorges and wilderness areas; ■ Swimming, canoeing, rafting and 'liloing' along the creeks and rivers; and ■ Extended horse riding, bicycling and walking on the Bicentennial National Trail. Apsley Falls is considered one of the most popular locations and viewpoints within the national park, as it contains sealed 2WD access, walking tracks, septic toilets, and drinking water. Other popular sites within Oxley Wild Rivers National Park include: ■ Budds Mare campground, which offers an unsealed 2WD road, picnic area, walking track to Riverside campground, and views across the Apsley River and Macleay Gorges Wilderness; ■ Tia Falls, which is located among swimming holes, a gorge and a waterfall and offers an unsealed 2WD road, carpark, walking track, lookouts, separate picnic area with tables, gas barbecues and toilets; and ■ The Green Gully track, which is a 65 km walking track through the Apsley-Macleay Gorges.

Land use	Summary
Aviation activities	The Project Area is located within 30 nm (55.56 km) of Armidale Airport. In addition, the following aviation activities and operations are known to be undertaken in the areas surrounding the Project Area: ■ Aerial firefighting operations including firebombing activities; ■ Aerial application operations though fertiliser, pest and crop spraying on agricultural lands; ■ Emergency services operations including the Royal Flying Doctor Service; and ■ Military operations involving helicopters and the use of high-speed low-level military jet aircraft.
Existing electricity transmission network	An existing 330 kV transmission line is located approximately 20 km from the north west corner of the Project Area. The line is referred to as Line 85 and is owned and operated by TransGrid. The Project will connect to the existing TransGrid network through the construction new 330 kV overhead transmission lines and a new switching station south of Uralla.
Quarries	There are a six operating quarries less than 100 km from the Project, which are further discussed in **Section 3.4.7**.

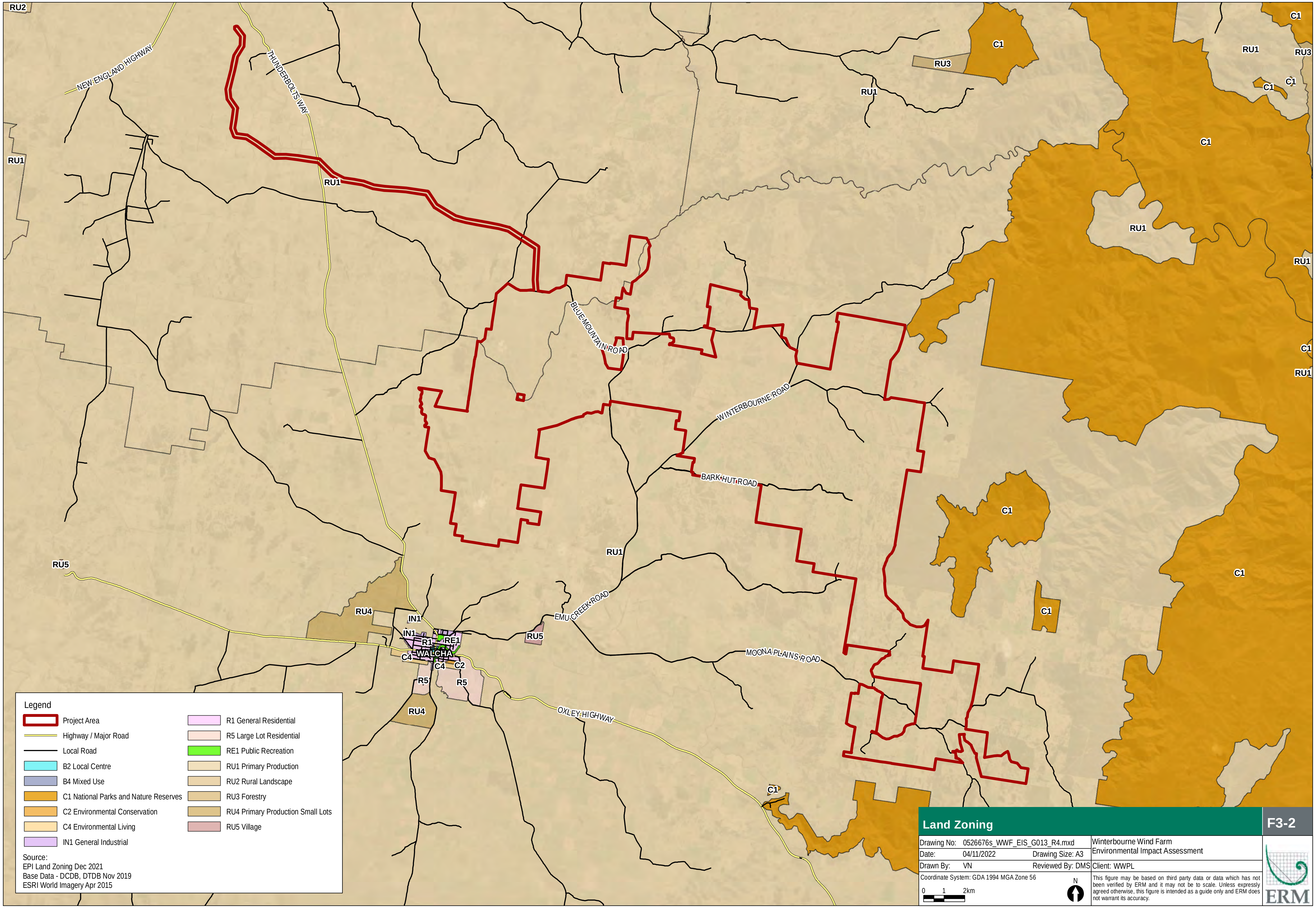
The development of a wind farm and ancillary infrastructure does not present any conflicts with it's current, or potential future land uses. The Project Area is zoned RU1 – Primary production, and the land is currently used for grazing. Wind farms are very much compatible with existing farming operations as the turbines occupy only a small amount of land, and landowners are able to continue normal grazing or cropping activities adjacent to these.

Some sections of the Project Area border the Oxley Wild Rivers National Park, which is zoned C1 – National Parks and Nature Reserves. The development of the Project does not present a conflict to the existing or future use of this National Park. The Project is not proposed to be built on land that has any values that are similar to those of the National Park. The project Area has largely been cleared and disturbed through past agricultural practices. As such, there is no risk that the Project is on land that may one day be incorporated into the National Park. Where relevant, assessments undertaken to inform this EIS has considered impacts on adjacent values. These are discussed further in Section 6.

Figure 3-1 Photographs of Project Locality

(1) Entry to Walcha via Thunderbolts Way (2) Oxley Wild Rivers National Park (3) Apsley Falls (4) Walcha

Photographs by Moir LA (2020)



Land Zoning

F3-2

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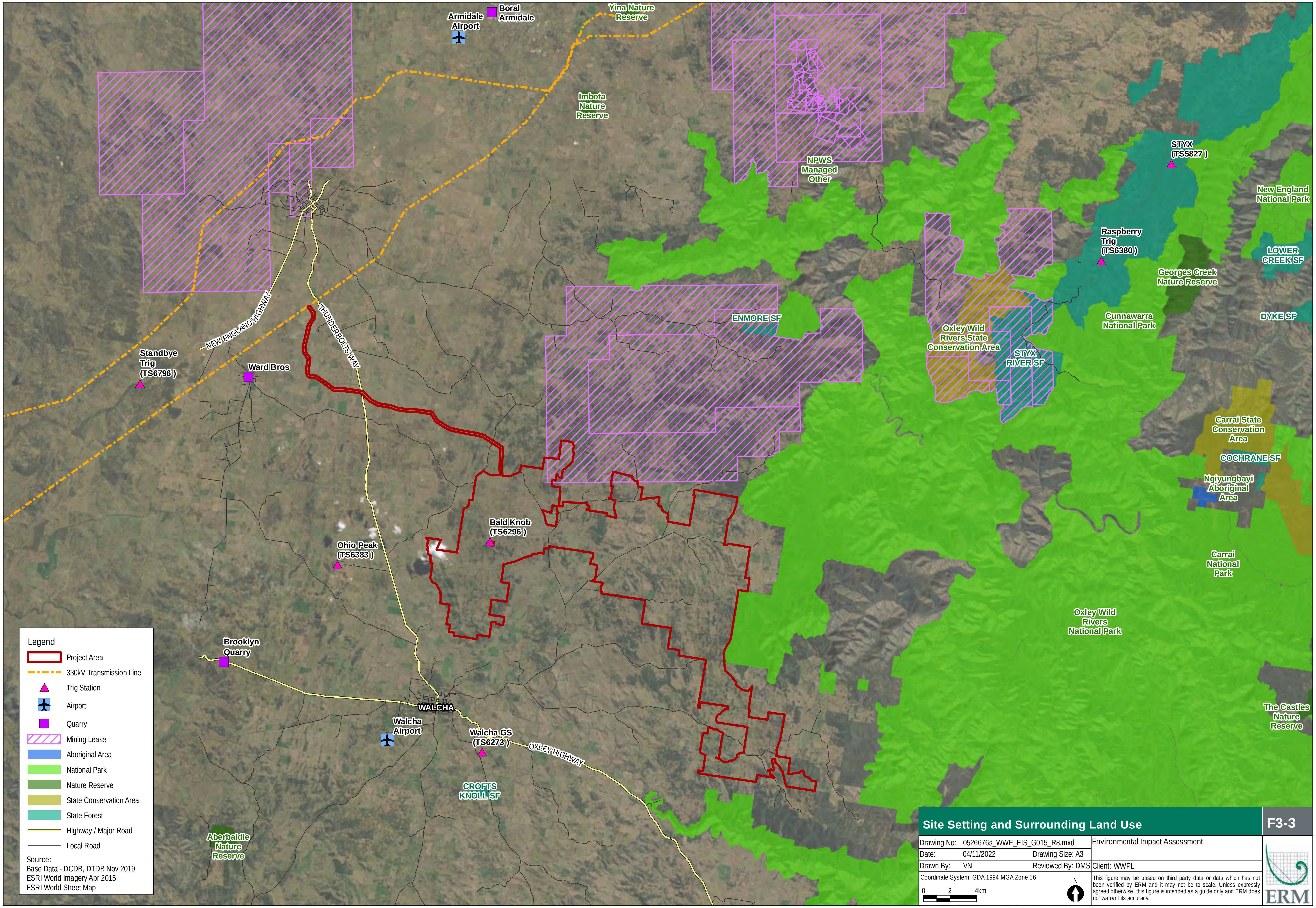

Site Setting and Surrounding Land Use F3-3

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Date: 04/11/2022	Drawing Size: A3	
Drawn By: VN	Reviewed By: DMS	Client: WWPL

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3.2.1 Land Details

3.2.1.1 Associated Dwellings

The land within the Project Area is primarily freehold with a small number of Crown land and roads present within the Development Footprint as shown in **Table 3-3.**

The Proponent has entered into "Option to Lease" Agreements with 34 landholders / entities hosting Project infrastructure within the wind farm site (encompassing 28 landowner groups over 182 individual lots). Cadastral boundaries are shown in **Figure 3-4**.

Table 3-3 Land Title of the Project Area

Landowner Group	Lot number	Deposited Plan	Title
Landowner Group 1	5	866652	Freehold
Landowner Group 2	98, 99, 100	1128816	Freehold
Landowner Group 3	89	756474	Freehold
Landowner Group 4	80, 105	756504	Freehold
Landowner Group 5	1	1154216	Freehold
	91, 92, 93, 94, 96	755820	Freehold
	1, 2	207146	Freehold
Landowner Group 6	95, 96, 97	1128816	Freehold
Landowner Group 7	1	590453	Freehold
	2	710615	Freehold
	50, 58, 81, 95, 117, 118	756477	Freehold
	3	1221142	Freehold
Landowner Group 8	48	756473	Freehold
Landowner Group 9	2	529780	Freehold
	47, 95	756504	Freehold
	351	873508	Freehold
	1, 2, 3, 4	1090942	Freehold
Landowner Group 10	94, 95, 97, 99, 103, 121, 122, 125, 126	756492	Freehold
Landowner Group 11	1	120126	Freehold
	70	661944	Freehold
	37, 38, 39, 44, 45, 46, 67, 68, 112, 113, 123	756477	Freehold
	3	1111348	Freehold
	1	1221141	Freehold
	1	710615	Freehold
Landowner Group 12	1	131437	Freehold
	2	247741	Freehold
	6, 7, 24, 29, 68, 69, 70, 71, 72, 77, 83, 89	756504	Freehold
	1	1175912	Freehold
Landowner Group 13	34, 51, 52	756476	Freehold
	352	873508	Freehold
	123	1062583	Freehold

Landowner Group	Lot number	Deposited Plan	Title
Landowner Group 14	2	595834	Freehold
	81	756504	Freehold
	1	1210945	Freehold
Landowner Group 15	1	121787	Freehold
	56*, 57	756477	Freehold
	2	1199619	Freehold
Landowner Group 16	1	127753	Freehold
	2*	211479	Freehold
	26, 28, 38	756473	Freehold
	103, 109	756474	Freehold
	53, 84, 85, 86, 87	756477	Freehold
	8	1144370	Freehold
	2	1192373	Freehold
	11	1199615	Freehold
Landowner Group 17	131*, 132*	756477	Freehold
	3	1238969	Freehold
	6*	1147105	Freehold
Landowner Group 18	1	1069933	Freehold
Landowner Group 19	29, 32, 33, 36, 37	756473	Freehold
Landowner Group 20	46*	756473	Freehold
	1	595834	Freehold
	2	1234912	Freehold
	51	1126596	Freehold
Landowner Group 21	1, 2	360166	Freehold
	20	756504	Freehold
	3	234456	Freehold
Landowner Group 22	1	529780	Freehold
Landowner Group 23	99	756504	Freehold
	4	234456	Freehold
	1	576324	Freehold
	1	211106	Freehold
	1, 2	810885	Freehold
	3	618977	Freehold
	7	866652	Freehold
Landowner Group 24	55, 101, 102	756504	Freehold
Landowner Group 25	65, 104, 106, 107, 108, 119, 120, 140, 141,462	756492	Freehold
	53	756476	Freehold
	1	344471	Freehold
	5, 12, 13, 17, 18, 19, 60, 68, 69, 70, 72, 73, 74, 75, 76, 77, 101, 121	755820	Freehold

Landowner Group	Lot number	Deposited Plan	Title
	2	344472	Freehold
Landowner Group 26	1	512960	Freehold
Landowner Group 27	2	512960	Freehold
	117	756492	Freehold
	33, 50	756476	Freehold
Landowner Group 28	B	381236	Freehold
	335, 336, 337, 364, 366, 369, 399	756502	Freehold
Landowner Group 29	1	1221143	Freehold
	10	1204696	Freehold

**The Project does not overlap the entire lot*

Additional allotments associated with the proposed transmission line access roads and road upgrades outside the Project Area are detailed in **Table 3-4** and **Table 3-5**, respectively, and are shown in **Figure 3-5** and **Figure 3-6.** These lots are also part of the land to which this application relates.

Table 3-4 Land Title of Transmission Line and Switching Station Access Roads

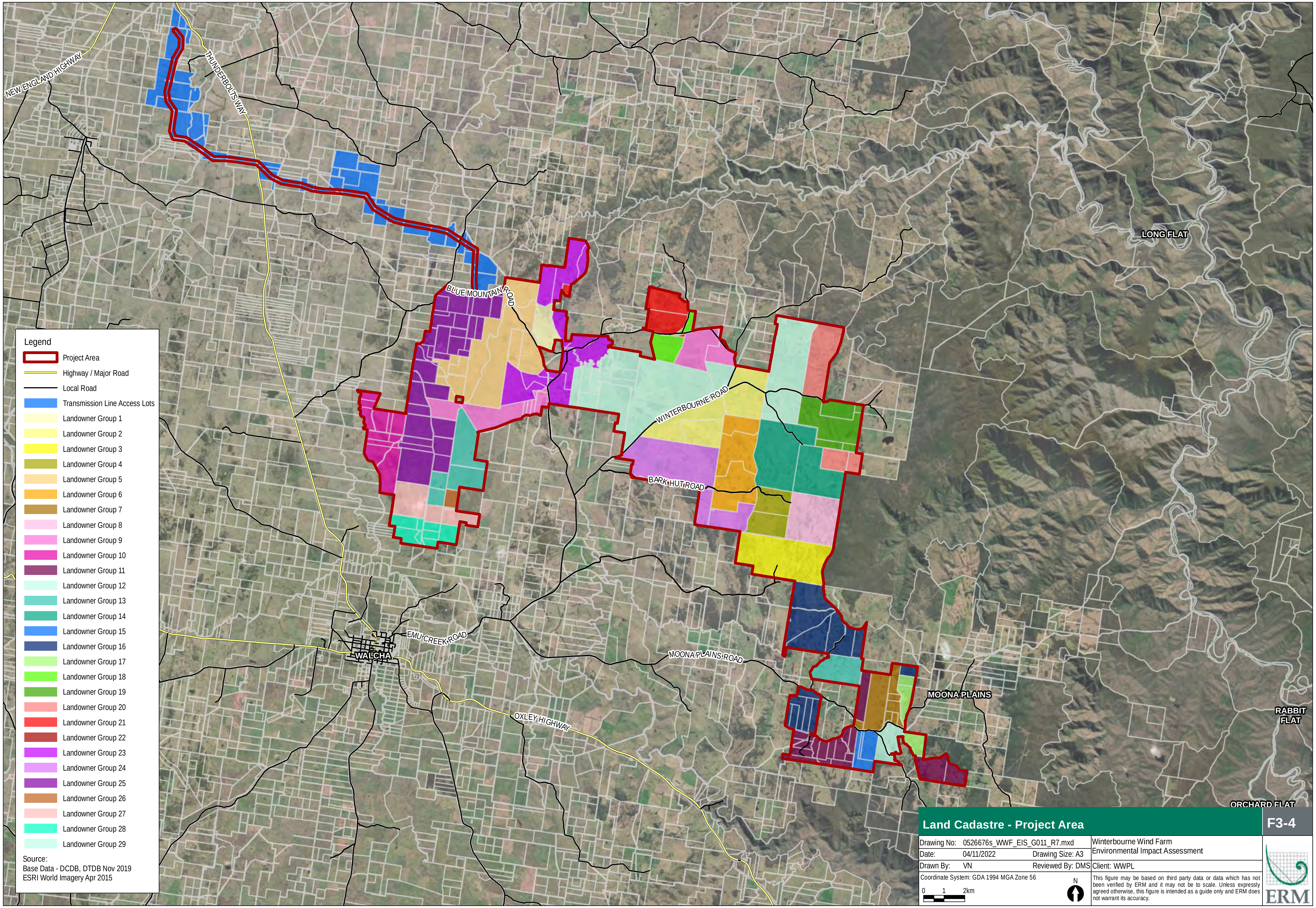
Lot/DP	Lot/DP	Lot/DP	Lot/DP
115/DP755836	198/DP755836	129/DP755836	114/DP755829
1/DP1241971	189/DP755836	2/DP1243987	127/DP755829
147/DP755829	183/DP755836	92/DP755836	206/DP755846
1/DP126202	155/DP755820	199/DP755836	303/DP755836
1/DP172254	39/DP755820	45/DP755820	14/DP755820
154/DP755820	34/DP755820	33/DP755820	78/DP755820
40/DP755820	B/DP372668	1/DP184356	42/DP755820
87/DP755820	116/DP755836	117/DP755836	146/DP755836
302/DP755836	205/DP755846	180/DP755836	9/DP1237026

Table 3-5 Land Title of Road Upgrades

Lot/DP	Lot/DP	Lot/DP	Lot/DP	Lot/DP
7010/DP1058937	7031/DP1058953	5A DP38704	1/DP835733	7016/DP94120
1/DP529780	39/DP756504	1/DP784322	52/DP517948	

3.2.1.2 Crown Land

Broadly speaking, Crown land refers to any land which is held by the Crown and is not held in freehold by another person. Crown land is regulated by relevant State government legislation, principally the *Crown Land Management Act 2016* (NSW) and the *Roads Act 1993* (NSW) and certain requirements must be met before Crown land can be dealt with by, for example, being leased or sold. There is one parcel of Crown land within the Project Area as identified in **Figure 3-7**, as well as a number of Crown Roads. Three of the lots identified in **Table 3-5** (Lot 7010/DP1058937, Lot 7031/DP1058953 and Lot 7016/DP94120) are also Crown land.



NEW ENGLAND HIGHWAY
THUNDERBOLTS WAY
BLUE MOUNTAIN ROAD
WINTERBOURNE ROAD
BARK HUT ROAD
LONG FLAT
EMU CREEK ROAD
WALCHA
MOONA PLAINS ROAD
OXLEY HIGHWAY
MOONA PLAINS
RABBIT FLAT
ORCHARD FLAT
Legend
Project Area
Highway / Major Road
Local Road
Transmission Line Access Lots
Landowner Group 1
Landowner Group 2
Landowner Group 3
Landowner Group 4
Landowner Group 5
Landowner Group 6
Landowner Group 7
Landowner Group 8
Landowner Group 9
Landowner Group 10
Landowner Group 11
Landowner Group 12
Landowner Group 13
Landowner Group 14
Landowner Group 15
Landowner Group 16
Landowner Group 17
Landowner Group 18
Landowner Group 19
Landowner Group 20
Landowner Group 21
Landowner Group 22
Landowner Group 23
Landowner Group 24
Landowner Group 25
Landowner Group 26
Landowner Group 27
Landowner Group 28
Landowner Group 29
Source:
Base Data - DCDB, DTDB Nov 2019
ESRI World Imagery Apr 2015
Land Cadastre - Project Area
F3-4
Drawing No: 0526676s_WWF_EIS_G011_R7.mxd
Date: 04/11/2022
Drawing Size: A3
Drawn By: VN
Reviewed By: DMS
Winterbourne Wind Farm
Environmental Impact Assessment
Client: WWPL
Coordinate System: GDA 1994 MGA Zone 56
0 1 2km
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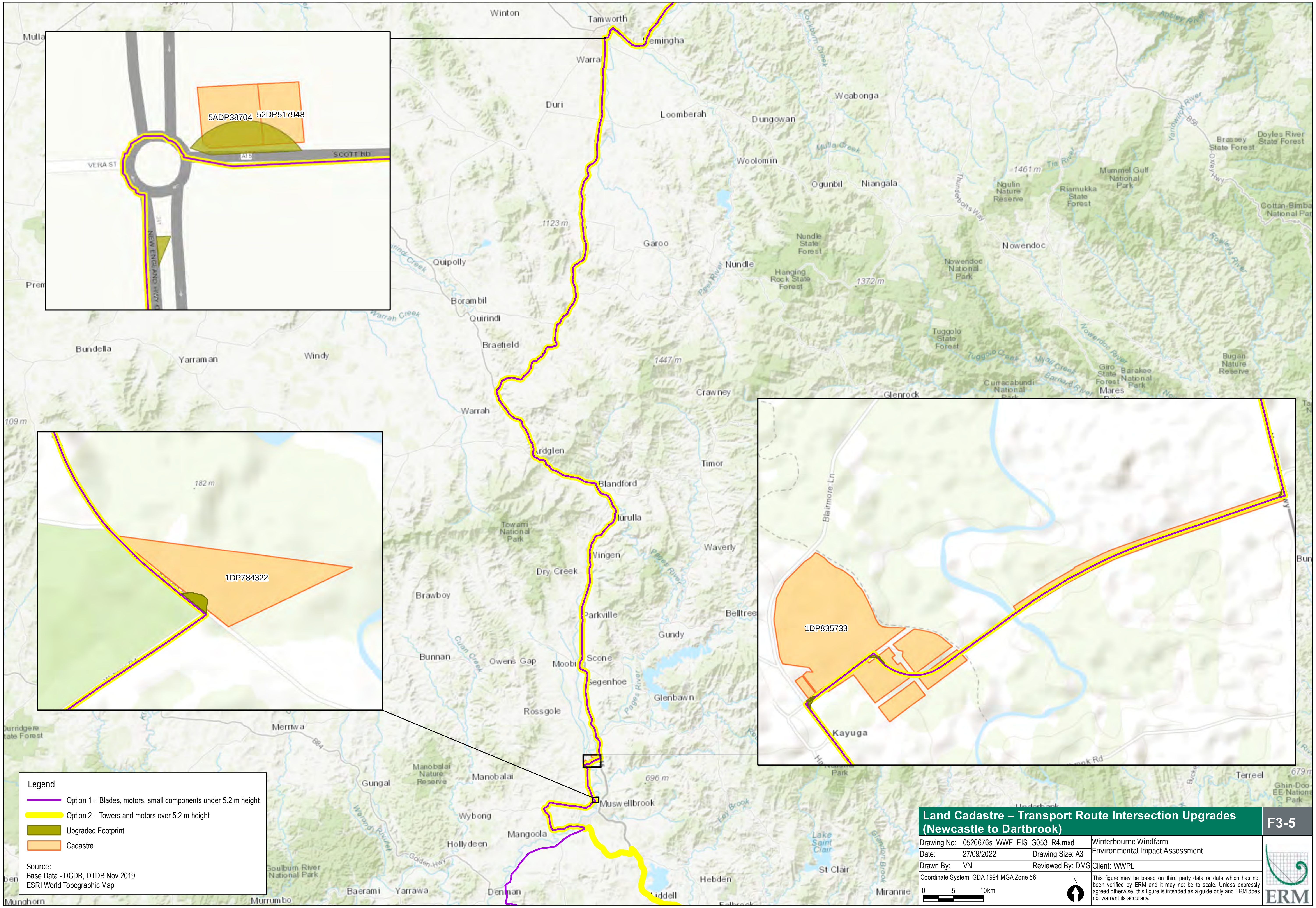

Tamworth
Warral
Duri
Loomberah
Dungowan
Weabonga
Woolomin
Ogunbil
Niangala
Garoo
Nundle
Quipolly
Borambil
Quirindi
Braefield
Bundella
Yarraman
Windy
Crawney
Warrah
Ardglen
Blandford
Murrulla
Timor
Wingen
Waverly
Dry Creek
Brawboy
Parkville
Belltrees
Gundy
Bunnan
Owens Gap
Moobi
Scone
Segenhoe
Glenbawn
Rossgole
Merriwa
Gungal
Manobalai
Wybong
Hollydeen
Mangoola
Muswellbrook
Denman
Baerami
Yarrawa
St Clair
Hebden
Liddell
Terreel
Nowendoc
Kayuga
5ADP38704
52DP517948
VERA ST
SCOTT RD
NEW ENGLAND HWY
1DP784322
1DP835733
Blairmore Ln
Legend
Option 1 – Blades, motors, small components under 5.2 m height
Option 2 – Towers and motors over 5.2 m height
Upgraded Footprint
Cadastre
Source:
Base Data - DCDB, DTDB Nov 2019
ESRI World Topographic Map
Land Cadastre – Transport Route Intersection Upgrades (Newcastle to Dartbrook)
F3-5
Drawing No: 0526676s_WWF_EIS_G053_R4.mxd
Date: 27/09/2022
Drawing Size: A3
Drawn By: VN
Reviewed By: DMS
Coordinate System: GDA 1994 MGA Zone 56
0 5 10km
N
Winterbourne Windfarm
Environmental Impact Assessment
Client: WWPL
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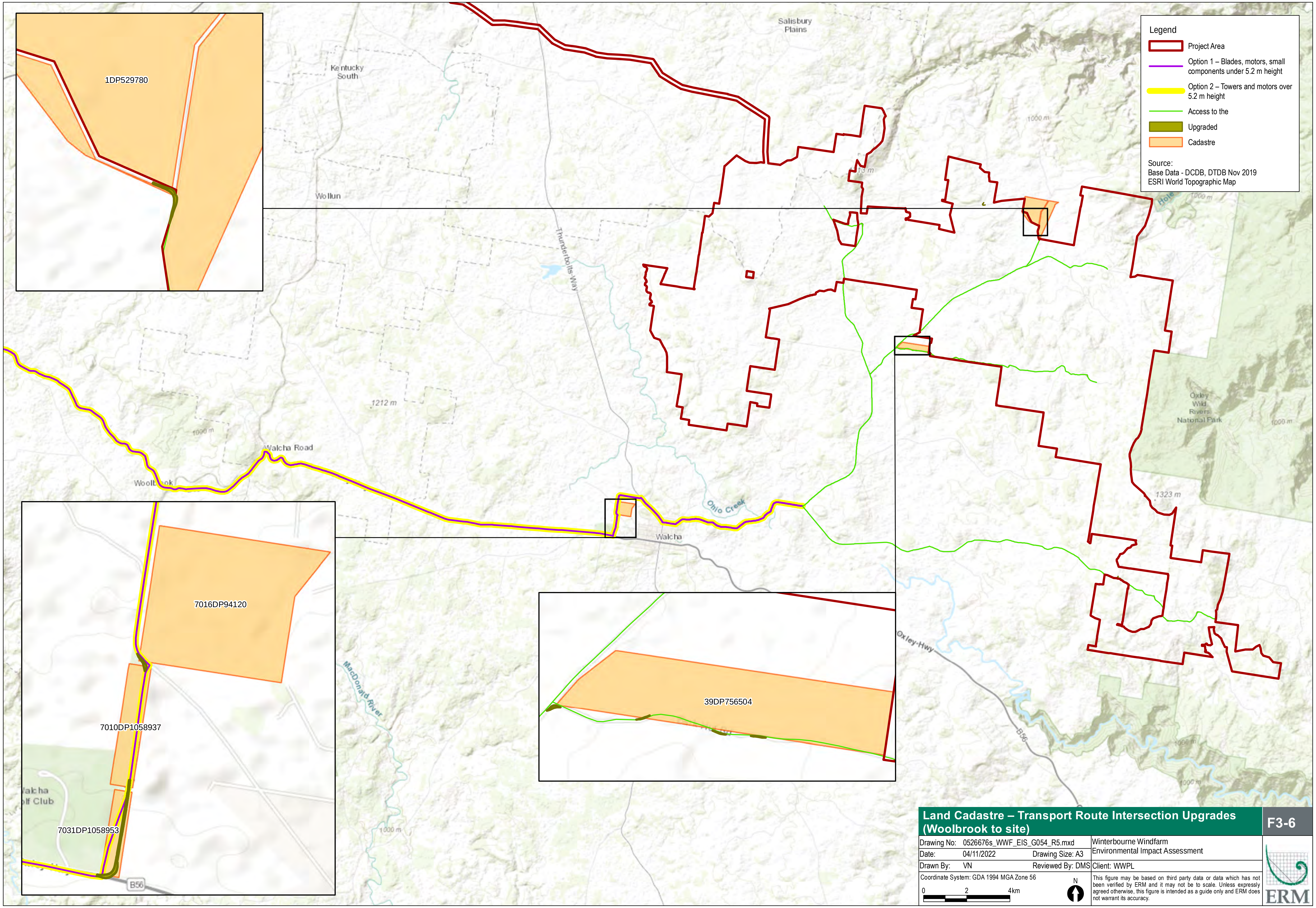


Land Cadastre – Transport Route Intersection Upgrades (Woolbrook to site)

F3-6

Drawing No:	0526676s_WWF_EIS_G054_R5.mxd		Winterbourne Windfarm Environmental Impact Assessment
Date:	04/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: DMS	Client: WWPL

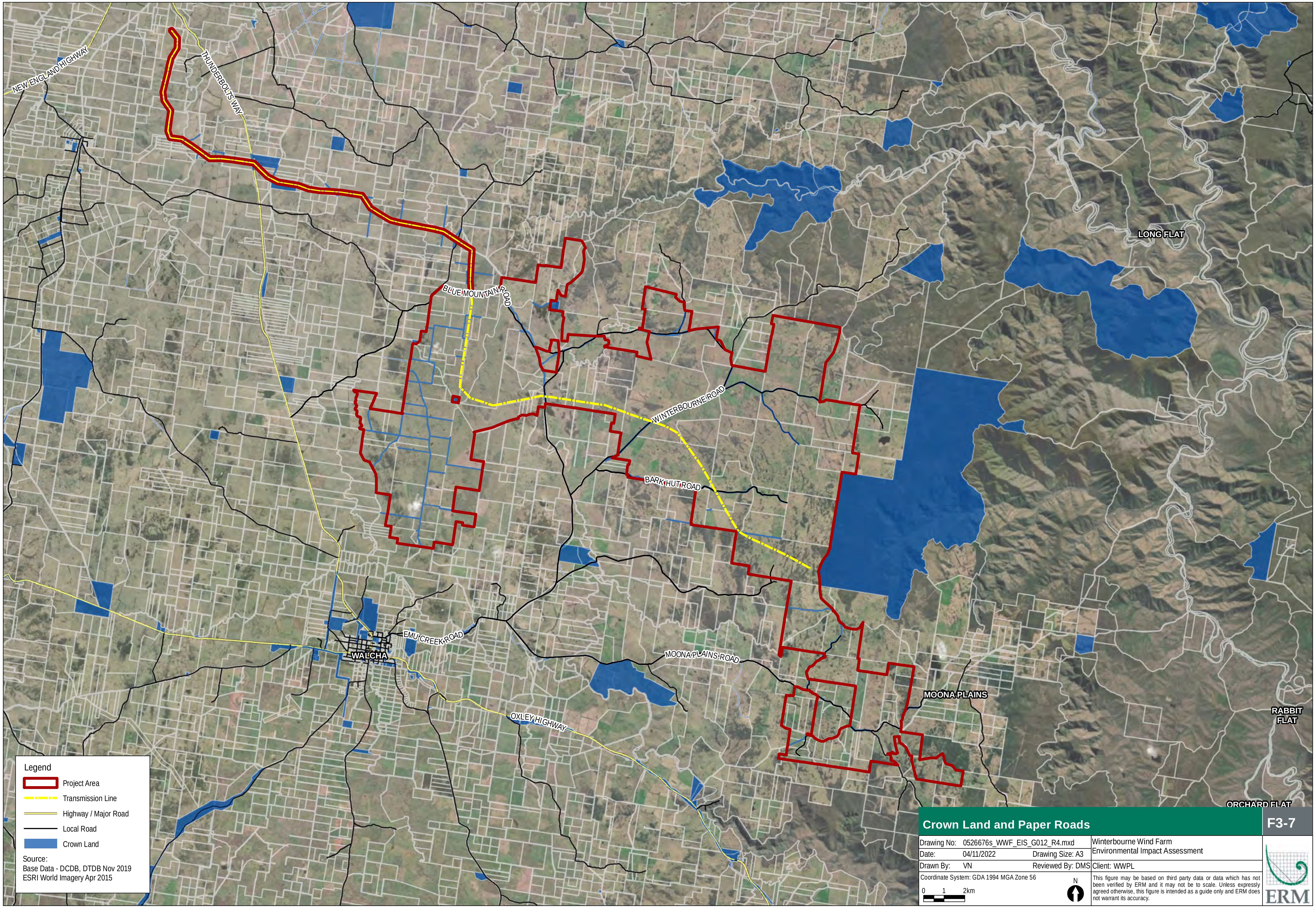
Coordinate System: GDA 1994 MGA Zone 56

0 2 4km

N

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM


NEW ENGLAND HIGHWAY
THUNDERBOLTS WAY
BLUE MOUNTAIN ROAD
WINTERBOURNE ROAD
BARK HUT ROAD
LONG FLAT
EMU CREEK ROAD
WALCHA
MOONA PLAINS ROAD
MOONA PLAINS
OXLEY HIGHWAY
RABBIT FLAT
ORCHARD FLAT
Legend
Project Area
Transmission Line
Highway / Major Road
Local Road
Crown Land
Source:
Base Data - DCDB, DTDB Nov 2019
ESRI World Imagery Apr 2015
Crown Land and Paper Roads
F3-7
Drawing No: 0526676s_WWF_EIS_G012_R4.mxd
Date: 04/11/2022
Drawing Size: A3
Drawn By: VN
Reviewed By: DMS
Winterbourne Wind Farm
Environmental Impact Assessment
Client: WWPL
Coordinate System: GDA 1994 MGA Zone 56
0 1 2km
N
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
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3.2.2 Residential Properties

For the purposes of this EIS, dwellings whose owners are hosting Project infrastructure or have entered into an agreement in relation to the Project are referred to as 'associated' dwellings with all other dwellings within the relevant assessment area (4.55 km) to a wind turbine generator referred to as 'non-associated' dwellings. Some EIS appendix technical studies refer to these as 'involved' and 'non-involved', respectively.

There are:

- 17 associated dwellings located within the Project Area;
- 25 associated dwellings outside of the Project Area but within 3.1 km of a WTG;
- 20 non-associated dwellings within 3.1 km of a WTG; and
- 7 associated dwellings and 23 non-associated dwellings between 3.1 km and 4.55 km of a WTG.

Figure 3-8 shows the location of associated and non-associated dwellings in relation to the Project Area and **Table 3-6** provides the respective distance to the nearest WTG.

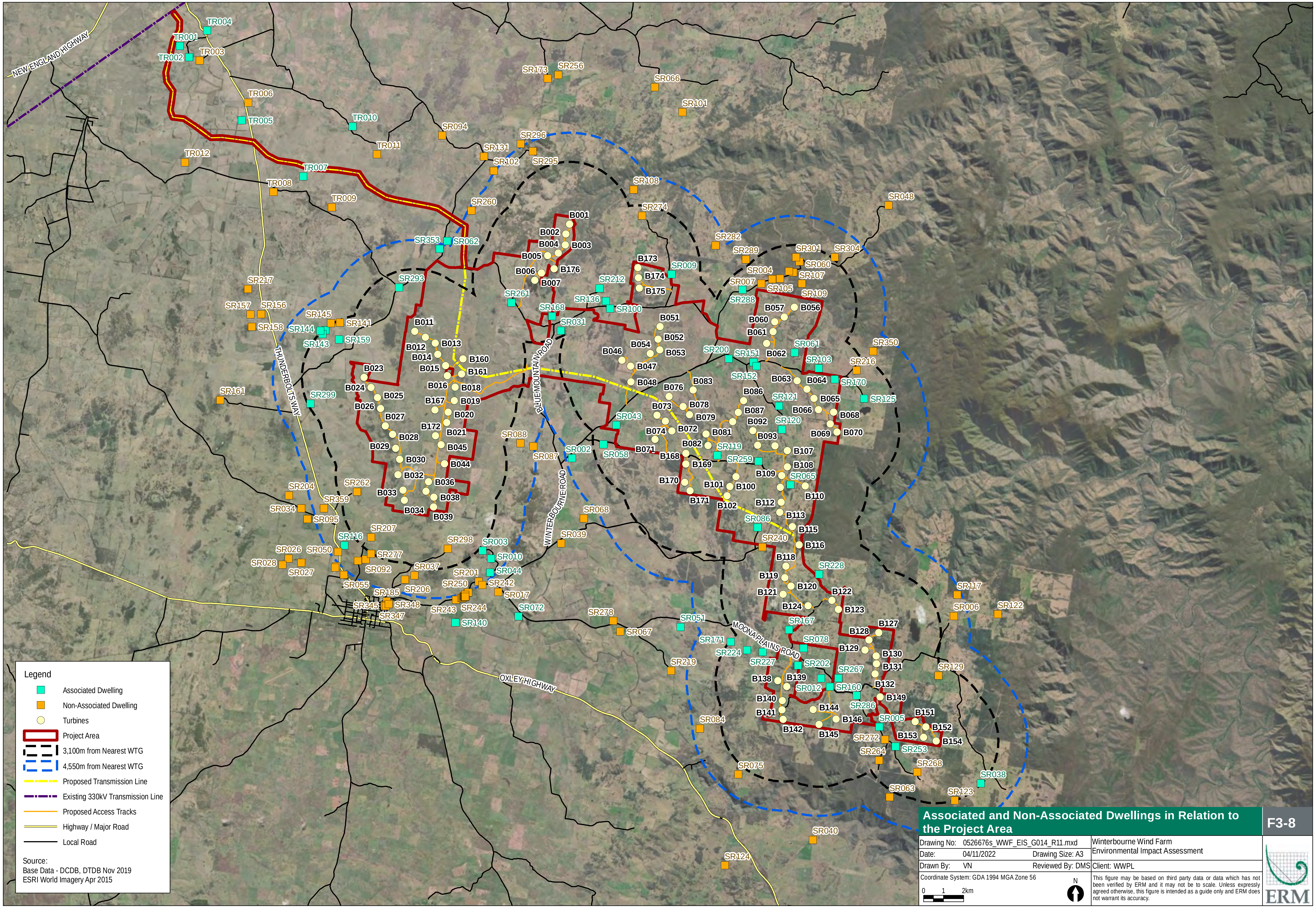
Table 3-6 Distances from Nearest WTG to Residential Dwellings

<table>
<tr><th rowspan="2">WTG No.</th><th rowspan="2">Nearest Dwelling ID</th><th rowspan="2">Dwelling Type</th><th rowspan="2">Distance to nearest turbine (m)</th><th colspan="2">Nearest Dwelling Coordinates (GDA94 zone 56)</th></tr>
<tr><th>X</th><th>Y</th></tr>
<tr><td>B001</td><td>SR212</td><td>Associated</td><td>3,528</td><td rowspan="4">377320.96</td><td rowspan="4">6587670.81</td></tr>
<tr><td>B002</td><td>SR212</td><td>Associated</td><td>3,173</td></tr>
<tr><td>B003</td><td>SR212</td><td>Associated</td><td>2,752</td></tr>
<tr><td>B004</td><td>SR212</td><td>Associated</td><td>2,693</td></tr>
<tr><td>B005</td><td>SR261</td><td>Associated</td><td>2,962</td><td rowspan="3">372931.14</td><td rowspan="3">6586955.85</td></tr>
<tr><td>B006</td><td>SR261</td><td>Associated</td><td>2,108</td></tr>
<tr><td>B007</td><td>SR261</td><td>Associated</td><td>1,619</td></tr>
<tr><td>B011</td><td>SR293</td><td>Associated</td><td>2,321</td><td rowspan="5">367330.78</td><td rowspan="5">6587710.51</td></tr>
<tr><td>B012</td><td>SR293</td><td>Associated</td><td>2,808</td></tr>
<tr><td>B013</td><td>SR293</td><td>Associated</td><td>3,303</td></tr>
<tr><td>B014</td><td>SR293</td><td>Associated</td><td>3,848</td></tr>
<tr><td>B015</td><td>SR293</td><td>Associated</td><td>4,529</td></tr>
<tr><td>B016</td><td>SR261</td><td>Associated</td><td>4,844</td><td>372931.14</td><td>6586955.85</td></tr>
<tr><td>B018</td><td>SR088</td><td>Non-Associated</td><td>4,294</td><td rowspan="4">373384.52</td><td rowspan="4">6579946.52</td></tr>
<tr><td>B019</td><td>SR088</td><td>Non-Associated</td><td>3,920</td></tr>
<tr><td>B020</td><td>SR088</td><td>Non-Associated</td><td>3,927</td></tr>
<tr><td>B021</td><td>SR088</td><td>Non-Associated</td><td>3,816</td></tr>
<tr><td>B023</td><td>SR159</td><td>Associated</td><td>2,266</td><td rowspan="2">364336.80</td><td rowspan="2">6585128.55</td></tr>
<tr><td>B024</td><td>SR159</td><td>Associated</td><td>2,887</td></tr>
<tr><td>B025</td><td>SR299</td><td>Associated</td><td>3,356</td><td>362913.15</td><td>6581916.30</td></tr>
</table>

WTG No.	Nearest Dwelling ID	Dwelling Type	Distance to nearest turbine (m)	Nearest Dwelling Coordinates (GDA94 zone 56)	
				X	Y
B026	SR299	Associated	3,499		
B027	SR262	Non-Associated	3,571	365239.87	6577539.20
B028	SR262	Non-Associated	3,362		
B029	SR262	Non-Associated	2,896		
B030	SR262	Non-Associated	2,670		
B032	SR262	Non-Associated	2,199		
B033	SR262	Non-Associated	2,284		
B034	SR262	Non-Associated	2,399		
B036	SR298	Non-Associated	3,476	369766.46	6574700.74
B037	SR298	Non-Associated	3,061		
B038	SR298	Non-Associated	2,663		
B039	SR298	Non-Associated	2,198		
B044	SR088	Non-Associated	3,928	373384.52	6579946.52
B045	SR088	Non-Associated	3,958		
B046	SR100	Associated	2,633	377860.00	6586658.00
B047	SR043	Associated	3,021	378159.52	6580857.99
B048	SR043	Associated	2,268		
B051	SR100	Associated	2,639	377860.00	6586658.00
B052	SR100	Associated	2,823		
B053	SR100	Associated	3,208		
B054	SR100	Associated	3,000		
B056	SR109	Non-Associated	1,228	387413.18	6587896.75
B057	SR061	Associated	1,847	387047.67	6584465.77
B060	SR061	Associated	1,829		
B061	SR061	Associated	1,499		
B062	SR151	Associated	1,134	384995.73	6583991.92
B063	SR103	Associated	1,234	388249.57	6583682.00
B064	SR103	Associated	1,197		
B065	SR170	Associated	1,400	389046.64	6583130.86
B066	SR170	Associated	1,707		
B068	SR170	Associated	1,629		
B069	SR125	Associated	2,112	390519.46	6582178.72
B070	SR125	Associated	2,148		

WTG No.	Nearest Dwelling ID	Dwelling Type	Distance to nearest turbine (m)	Nearest Dwelling Coordinates (GDA94 zone 56)	
				X	Y
B071	SR043	Associated	2,056	378159.52	6580857.99
B072	SR119	Associated	2,584	383200.24	6579348.31
B073	SR043	Associated	2,091	378159.52	6580857.99
B074	SR043	Associated	2,456		
B076	SR043	Associated	2,986		
B078	SR119	Associated	2,972	383200.24	6579348.31
B079	SR119	Associated	2,460		
B081	SR119	Associated	1,209		
B082	SR119	Associated	678		
B083	SR200	Associated	2,369	383770.53	6584162.49
B086	SR121	Associated	1,787	386274.24	6581816.59
B087	SR121	Associated	2,058		
B088	SR119	Associated	1,845	383200.24	6579348.31
B092	SR120	Associated	1,463	386425.10	6580639.47
B093	SR259	Associated	788	385250.55	6579063.93
B100	SR259	Associated	1,362		
B101	SR119	Associated	1,667	383200.24	6579348.31
B102	SR119	Associated	2,067		
B105	SR120	Associated	884	386425.10	6580639.47
B107	SR120	Associated	1,079		
B108	SR065	Associated	913	386834.62	6577878.88
B109	SR065	Associated	633		
B110	SR065	Associated	749		
B111	SR065	Associated	518		
B112	SR065	Associated	983		
B113	SR086	Associated	1,337	385205.11	6575756.02
B115	SR086	Associated	1,736		
B116	SR228	Associated	1,782	388270.46	6573420.02
B118	SR240	Non-Associated	1,515	385447.47	6574786.29
B119	SR228	Associated	1,713	388270.46	6573420.02
B120	SR228	Associated	1,511		
B121	SR167	Associated	1,798	386777.91	6570665.05
B122	SR228	Associated	1,451	388270.46	6573420.02

WTG No.	Nearest Dwelling ID	Dwelling Type	Distance to nearest turbine (m)	Nearest Dwelling Coordinates (GDA94 zone 56)	
				X	Y
B123	SR228	Associated	1,986		
B124	SR167	Associated	1,518	386777.91	6570665.05
B127	SR267	Associated	3,037		
B128	SR267	Associated	2,441	389226.16	6568249.77
B129	SR267	Associated	1,935		
B130	SR267	Associated	2,197		
B131	SR286	Associated	1,868	390138.00	6567387.00
B132	SR286	Associated	1,413		
B138	SR202	Associated	1,267		
B139	SR202	Associated	1,200	387222.51	6568890.82
B140	SR202	Associated	1,923		
B141	SR202	Associated	2,354		
B142	SR012	Associated	2,779	388365.68	6568246.21
B144	SR160	Associated	1,416	388813.64	6567825.21
B145	SR160	Associated	1,959		
B146	SR286	Associated	1,550	390138.00	6567387.00
B149	SR286	Associated	1,181		
B151	SR253	Associated	1,581		
B152	SR253	Associated	1,797	392084.00	6564851.00
B153	SR253	Associated	1,467		
B154	SR268	Non-Associated	1,815	393158.78	6563576.41
B160	SR261	Associated	3,688	372931.14	6586955.85
B161	SR261	Associated	4,328		
B167	SR088	Non-Associated	4,575	373384.52	6579946.52
B168	SR119	Associated	1,573		
B169	SR119	Associated	1,627	383200.24	6579348.31
B170	SR119	Associated	2,102		
B171	SR119	Associated	2,219		
B172	SR088	Non-Associated	4,255	373384.52	6579946.52
B173	SR009	Associated	1,711		
B174	SR009	Associated	1,666	380922.84	6588365.66
B175	SR009	Associated	1,750		
B176	SR168	Associated	2,361	374957.58	6586278.69



Associated and Non-Associated Dwellings in Relation to the Project Area

F3-8

Drawing No:	0526676s_WWF_EIS_G014_R11.mxd		Winterbourne Wind Farm Environmental Impact Assessment
Date:	04/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: DMS	Client: WWPL

Coordinate System: GDA 1994 MGA Zone 56

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3.2.3 Environmental Setting

The Project Area has historically been used for agricultural purposes, noting land clearing of the area to allow for agricultural utility as shown in **Figure 3-9**.

The Project Area is characterised by hills and ridgelines that rise out of the Walcha Plateau.

The Project Area is located within the Macleay River catchment. While there are a number of small local creeks present within the Project Area, for much of the year they may not have running water. There are no wetland areas or lakes (other than small farm dams) within the Project Area.

The Soil and Land Capability Mapping data for NSW (OEH, 2012) suggests that there is a range of the land and soil capability (LSC) classes within the Project Area, as further discussed in **Section 6.8.3.2.**

A search of the *Australian Soil Classification (ASC) Soil Type Map of NSW* (OEH, 2017) reveals that the Project Area is largely dominated by the Kurosols soil type. Kurosols have strong texture contrast between A horizons and strongly acidic B horizons, and with low water holding capacity Kurosols are often acidic. They tend to have low fertility and land use is generally restricted to grazing pastures.

Figure 3-9 Cleared Agricultural Land

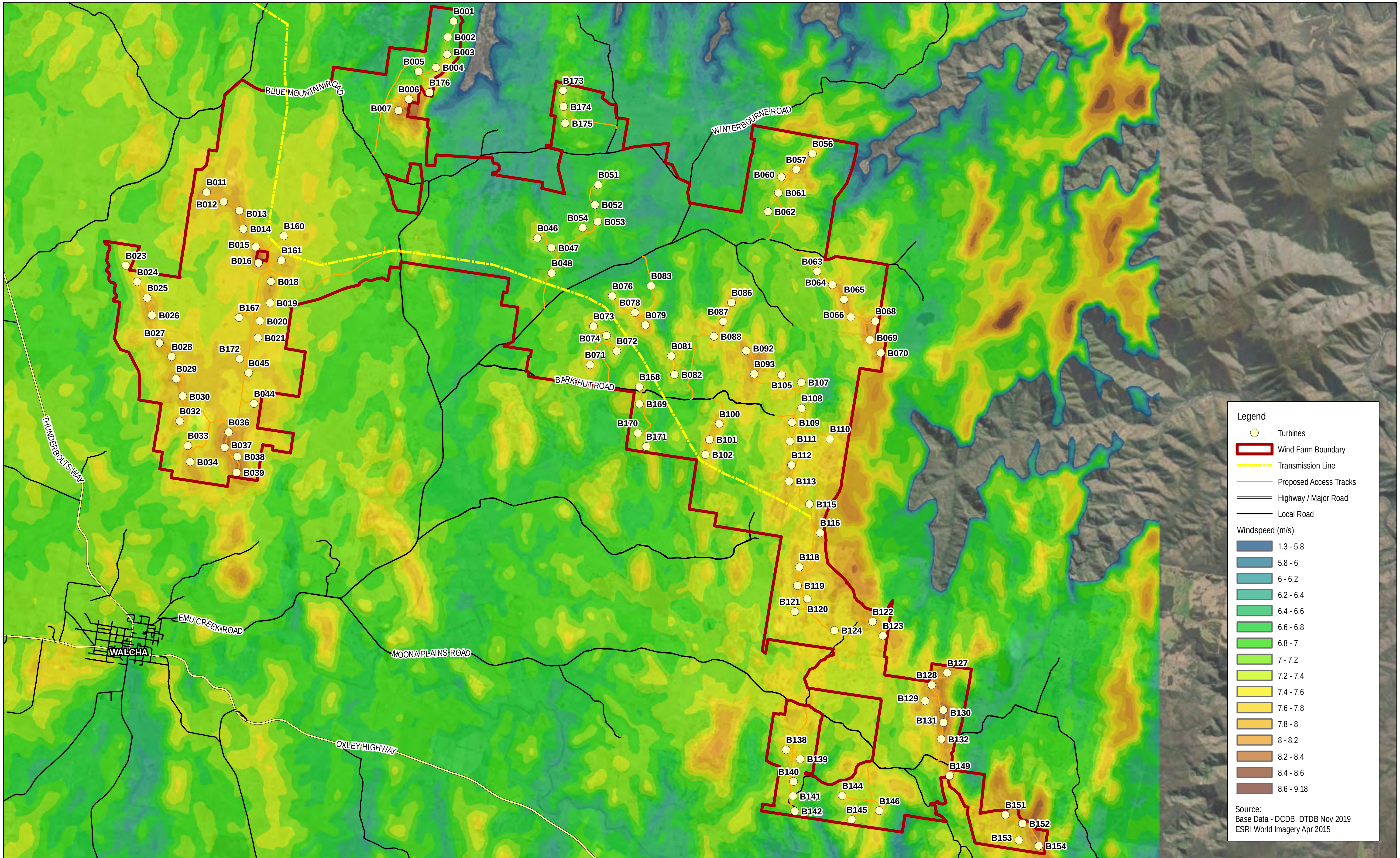
3.2.4 Wind Resource

Australian Energy Market Operator (AEMO) (2020) defines a candidate REZ as an area having annual average wind speeds above 6 metres per second (m/s). Comparatively, the U.S Energy Information Administration (2021) defines optimal wind energy zones areas where annual average wind speed is at least 6.5 m/s.

The Proponent has been monitoring the wind resource of the Project Area since 2009 using onsite meteorological monitoring masts. The Project Area consists of elevated ridgelines with areas of good exposure to prevailing wind directions. The Commonwealth Scientific and Industrial Research Organisation (CSIRO) (2012) has stated that in Australia, most wind farms are situated along ridgelines or coastal cliffs to take advantage of the strong wind resources offered along the high terrain and coastal cliffs, respectively. Ridgelines take advantage of the acceleration of the wind due to the sudden change in topography.

As seen in **Figure 3-10**, the WTG layout has been designed to capture high and consistent wind speeds, typically between 6.5 and 9.5 m/s. Generally, the WTGs are proposed to be located on hilltops and ridgelines where the wind speed tends to be higher and the winds blow more steadily. The placement of the wind turbines in these locations is critical to the viability of the Project. The prevailing wind directions reinforce the suitability of the location and orientation of the turbines in this proposal. However, their location also considers the location of nearby residential dwellings to minimise potential noise and visual impacts, and areas of high biodiversity value to minimise impacts to flora, fauna and vegetation communities.

Monitoring data collected over many years reveals that the daily wind profile in Walcha is highly complementary to wind energy generation; that is, the wind tends to be stronger at night and in the morning, and relatively lower during the day. This means that the proposed Project will, on average, generate energy during periods when solar energy production tends to be low or zero, which will help to ensure diversity in the generation mix as the energy system transitions from fossil fuels to renewable resources.



Wind Speed in Project Area

F3-10

Drawing No:	0526676s_WWF_EIS_G035_R4.mxd		Environmental Impact Assessment
Date:	04/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: DMS	Client: WWPL

Coordinate System: GDA 1994 MGA Zone 56

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3.2.5 Nearby Major Projects

The Project Area is within proximity to several SSD electricity generation projects, which are identified as proposed, under construction, or operational. These include, but are not limited to, wind farms, solar farms, BESS facilities, and a pumped hydro energy storage project.

Section 6.14 provides a detailed discussion of the cumulative impacts of the Project in accordance with the *Cumulative Impact Assessment Guidelines for State Significant Projects* (DPIE, 2021d).

3.2.6 Potential Dwellings

3.2.6.1 Approved Dwellings and Dwellings Under Assessment

Based on a review of publicly-available development application records on the Walcha Council and Uralla Shire Council websites (as at 28 Oct 2022), one parcel within a 5km radius of a proposed turbine (Lot 183 DP756502) was identified as having a development approval for a new (but not yet constructed) dwelling. A new dwelling constructed on this lot would be expected to achieve operational noise criteria and would likely have a medium visual impact. With mitigation measures including building orientation and vegetation screening, a new dwelling on this lot would be expected to have a low visual impact.

No development applications for potential dwellings within 5 km of a proposed turbine location were identified as being currently under assessment.

3.2.6.2 Dwelling Entitlements

Wind Energy Guideline for State significant wind energy development by NSW Planning and Environment, December 2016 states that DPE and the consent authority will consider existing dwelling entitlements on land within the vicinity of the wind energy project in the assessment and determination of wind energy projects.

Existing dwelling entitlements are available under the provisions of Walcha LEP and Uralla LEP and the provisions of Part 3D Inland Housing Code of the *State Environmental Planning Policy (Exempt and Complying Development Codes) 2008* (Inland Housing Code). Exercising existing dwelling entitlements requires development consent under the EP&A Act.

The controls for establishing existing dwelling entitlements in the Walcha LEP, Uralla LEP and the Inland Housing Code are multifaceted and not simply determined by lot size. Additional development standards require the consideration of (among other matters) provisions of previous repealed versions of the LEPs, lot aggregations as at a date in 1995 in the case of Walcha LEP and 1975 in the case of Uralla LEP (existing land holdings). Records of dwelling entitlements are not readily available to the public. Similarly, an assessment of compliance with the requirements and standards of the Inland Housing Code cannot reasonably be undertaken in the absence of detailed information on house designs, site conditions and compliance with standards.

Potential dwelling entitlements were determined by identifying all lots within a 5 km radius of any proposed turbine locations and excluding:

- Crown land or State-owned land;
- Lots with associated dwellings;
- Lots with existing dwellings that have been assessed in this EIS;
- Lots that do not meet the applicable minimum lot size development standard for the erection of dwelling houses under clause 4.2A of the Walcha LEP and Uralla LEP;
- Lots that do not have direct access to a public road or formed Crown road; and
- Lots with over 66% bushfire prone land within the relevant lot.

Applying the above criteria, 15 lots were identified.

Of the 15 lots, 13 lots were assessed as fully achieving the operational noise criteria, with two lots (Lot 64 DP756477 and Lot 30 DP756476) assessed as partially achieving the operational noise criteria.

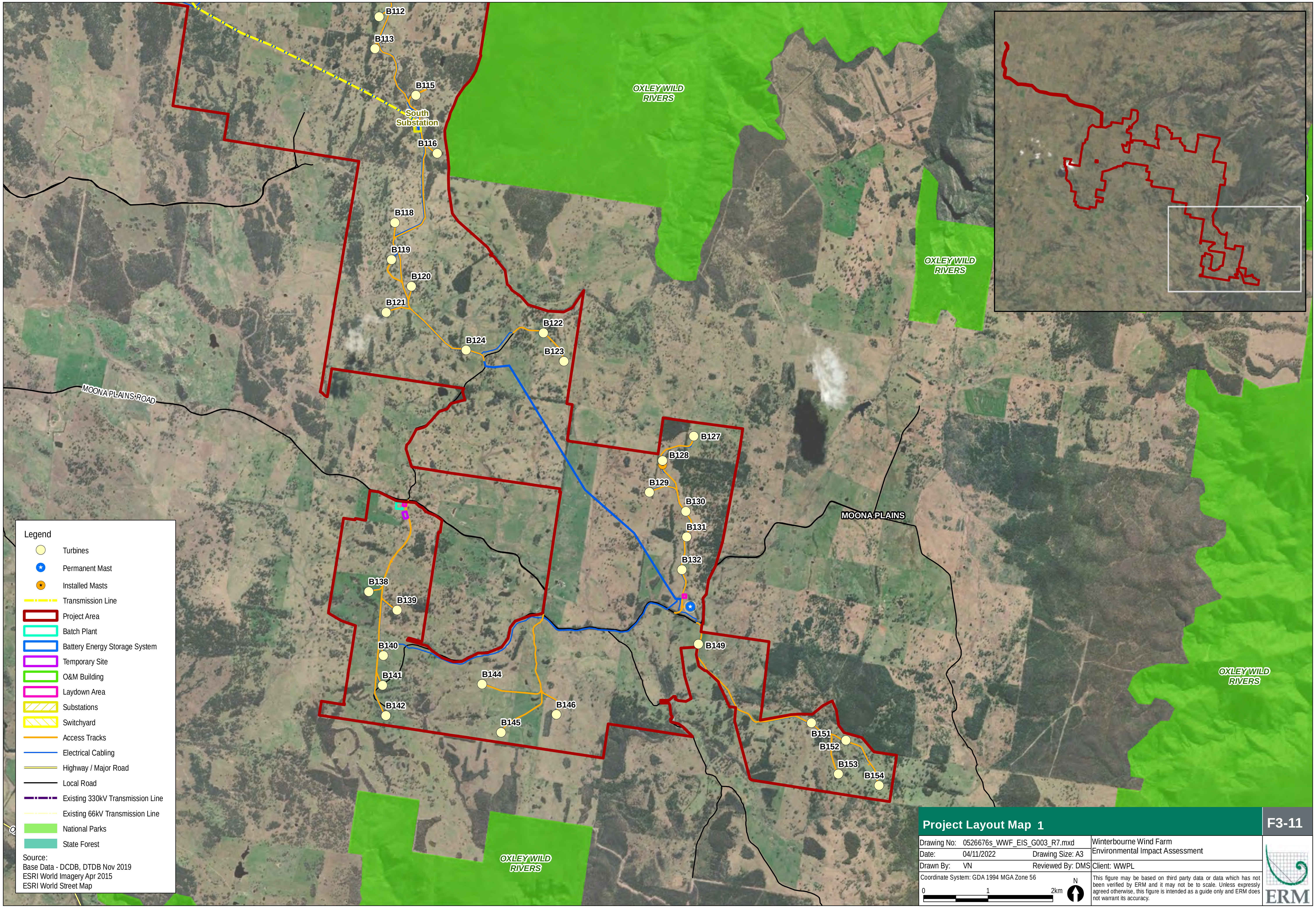
Potential visual impact at these 15 lots is more difficult to assess given that the potential location, orientation, elevation, design and surrounding vegetation of future dwellings is unknown. However, it is reasonable that mitigation methods may be incorporated into the design process for any future development applications for a dwelling on any of these lots to reduce visual impacts to an acceptable level.

3.3 Project Components and Layout

3.3.1 Overview

The Project Area encompasses approximately 22,285 ha. **Figure 3-11, Figure 3-12**, **Figure 3-13** and **Figure 3-14** show the conceptual Project layout including the WTGs, access tracks and supporting infrastructure. The layout of Project infrastructure was determined considering:

- Maximising exposure to the wind resource through suitable positioning of WTGs onsite including elevated locations within the Project Area and suitable spacing between WTGs to reduce turbulence (i.e. “wake effect”);
- Minimising environmental impacts and protecting sensitive areas and receptors identified through specialist assessments discussed in the later sections of the EIS (including but not limited to biodiversity, heritage, visual and noise related issues); and
- Optimising accessibility of Project components through identifying topographic constraints and strategically positioning Project components to minimise earthworks required during construction.


B112
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South Substation
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OXLEY WILD RIVERS
MOONA PLAINS ROAD
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MOONA PLAINS
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OXLEY WILD RIVERS
OXLEY WILD RIVERS
Legend
Turbines
Permanent Mast
Installed Masts
Transmission Line
Project Area
Batch Plant
Battery Energy Storage System
Temporary Site
O&M Building
Laydown Area
Substations
Switchyard
Access Tracks
Electrical Cabling
Highway / Major Road
Local Road
Existing 330kV Transmission Line
Existing 66kV Transmission Line
National Parks
State Forest
Source:
Base Data - DCDB, DTDB Nov 2019
ESRI World Imagery Apr 2015
ESRI World Street Map
Project Layout Map 1
F3-11
Drawing No: 0526676s_WWF_EIS_G003_R7.mxd
Date: 04/11/2022
Drawing Size: A3
Drawn By: VN
Reviewed By: DMS
Winterbourne Wind Farm
Environmental Impact Assessment
Client: WWPL
Coordinate System: GDA 1994 MGA Zone 56
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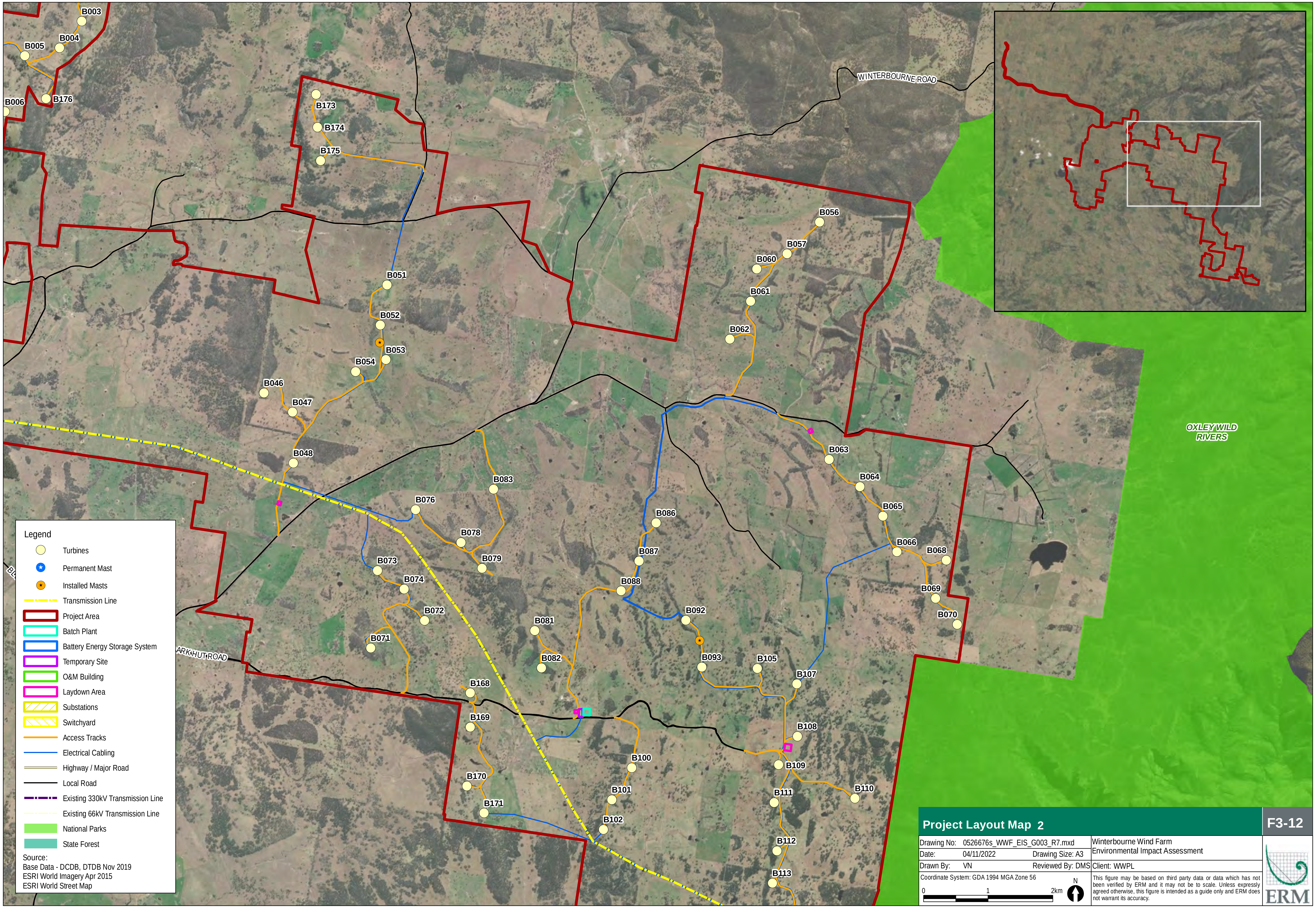
11



WINTERBOURNE ROAD
ARK HUT ROAD
OXLEY WILD RIVERS
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B005
B006
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Legend
Turbines
Permanent Mast
Installed Masts
Transmission Line
Project Area
Batch Plant
Battery Energy Storage System
Temporary Site
O&M Building
Laydown Area
Substations
Switchyard
Access Tracks
Electrical Cabling
Highway / Major Road
Local Road
Existing 330kV Transmission Line
Existing 66kV Transmission Line
National Parks
State Forest
Source:
Base Data - DCDB, DTDB Nov 2019
ESRI World Imagery Apr 2015
ESRI World Street Map
Project Layout Map 2
F3-12
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Date: 04/11/2022
Drawing Size: A3
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Reviewed By: DMS
Coordinate System: GDA 1994 MGA Zone 56
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Winterbourne Wind Farm
Environmental Impact Assessment
Client: WWPL
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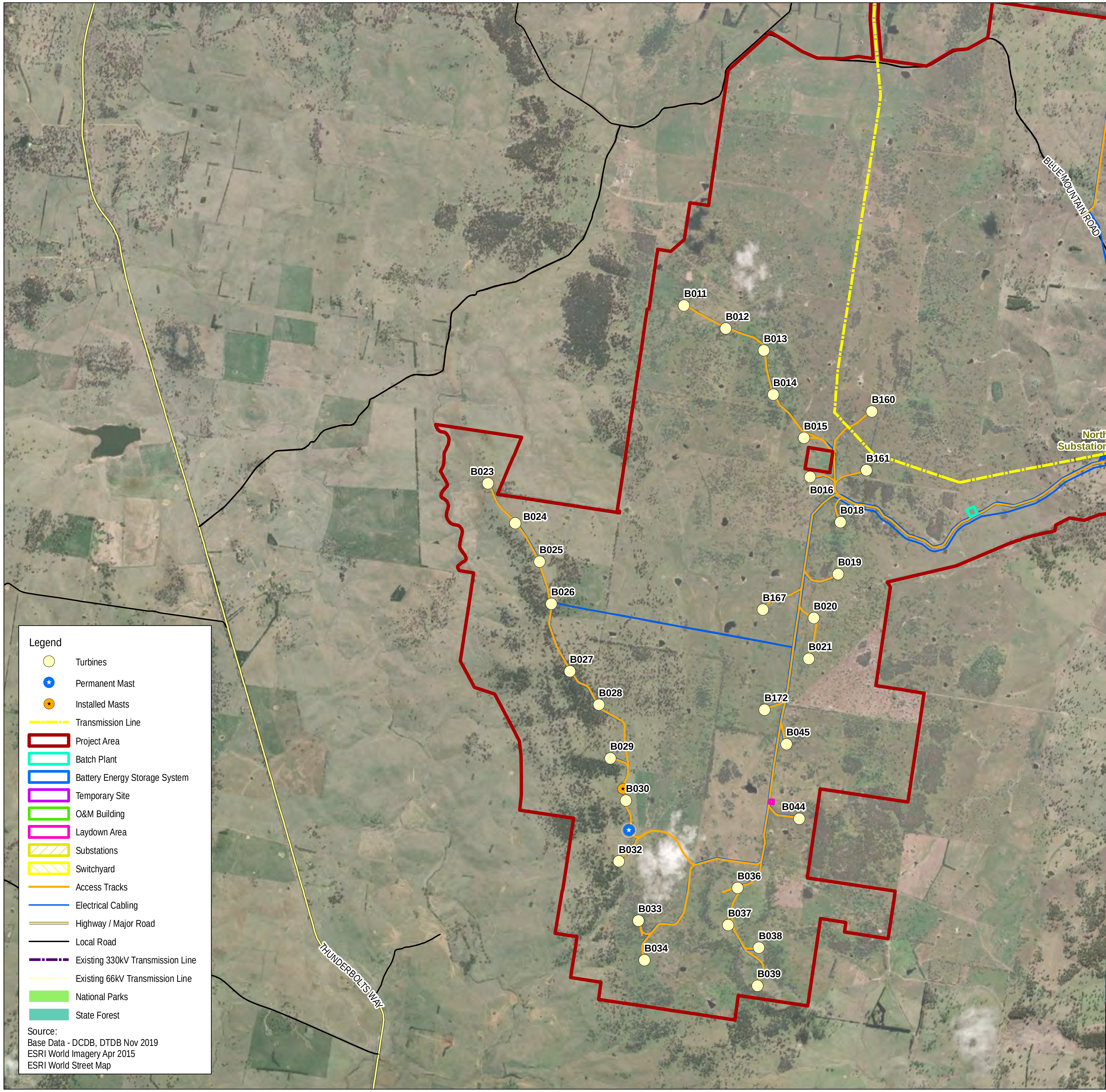

Project Layout Map 3

F3-13

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Date: 04/11/2022 Drawing Size: A3
Drawn By: VN Reviewed By: DMS
Coordinate System: GDA 1994 MGA Zone 56

Winterbourne Wind Farm
Environmental Impact Assessment
Client: WWPL

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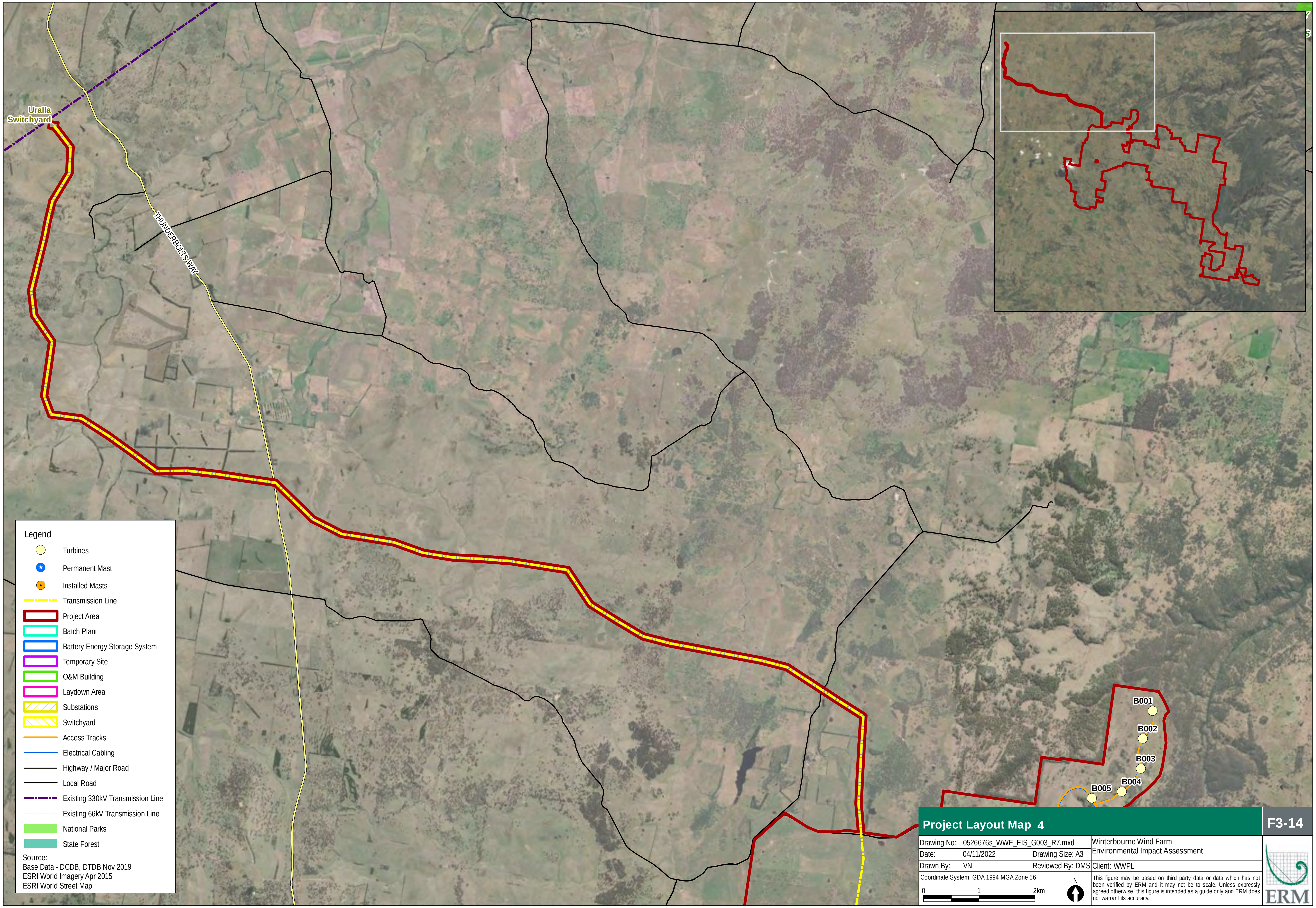

Uralla Switchyard
THUNDERBOLTS WAY
B001
B002
B003
B004
B005
Legend
Turbines
Permanent Mast
Installed Masts
Transmission Line
Project Area
Batch Plant
Battery Energy Storage System
Temporary Site
O&M Building
Laydown Area
Substations
Switchyard
Access Tracks
Electrical Cabling
Highway / Major Road
Local Road
Existing 330kV Transmission Line
Existing 66kV Transmission Line
National Parks
State Forest
Source:
Base Data - DCDB, DTDB Nov 2019
ESRI World Imagery Apr 2015
ESRI World Street Map
Project Layout Map 4
F3-14
Drawing No: 0526676s_WWF_EIS_G003_R7.mxd
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Drawing Size: A3
Drawn By: VN
Reviewed By: DMS
Winterbourne Wind Farm
Environmental Impact Assessment
Client: WWPL
Coordinate System: GDA 1994 MGA Zone 56
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This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
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3.3.2 Wind Turbine Generators

The Project will involve the construction and operation of up to 119 WTGs within the Project Area, each with a 100 m micro-siting buffer from the locations as identified on **Figure 1-2**. Micro-siting is discussed further in **Section 3.3.12**.

The indicative WTG model is the Vestas V162-6.2 MW, which based on current technology represents the 'worst-case' impact assessment for the Project, for example in the modelling of noise and visual impacts on nearby receivers. The WTGs will be semi-variable speed, pitch-regulated machines with the rotor and nacelle mounted on a tower with an internal ladder or service lift. The exact size and type of WTG will be based on subsurface soil conditions and the results of geotechnical surveys undertaken during the detailed design phase, prior to commencement of construction at each WTG site.

Figure 3-15 illustrates typical components of a WTG. **Table 3-7** details specifications of the indicative WTG model. **Table 3-8** provides the central coordinates and maximum elevation of the WTGs, and coordinates of ancillary infrastructure.

Table 3-7 Indicative WTG Model Specifications

Feature	Specifications
Model	Vestas V162-6.2 MW
Power regulation	Pitch regulated with variable speed
Operating data *Rated power* *Cut-in wind speed* *Cut-out wind speed* *Wind class* *Standard operating temperature range*	 6,200 kW 3 m/s 25 m/s International Electrotechnical Commission (IEC) S -20 to 45 degrees Celsius
Sound power *Maximum*	 104.8 dB(A)
Rotor *Rotor diameter* *Swept area* *Aerodynamic brake*	 162 m 20,612 m^2 Full blade feathering with 3 pitch cylinders
Tip height	230 m
Hub height	149 m
Electrical *Frequency* *Converter*	 50/60 Hz Full scale
Gearbox *Type*	 Two planetary stages

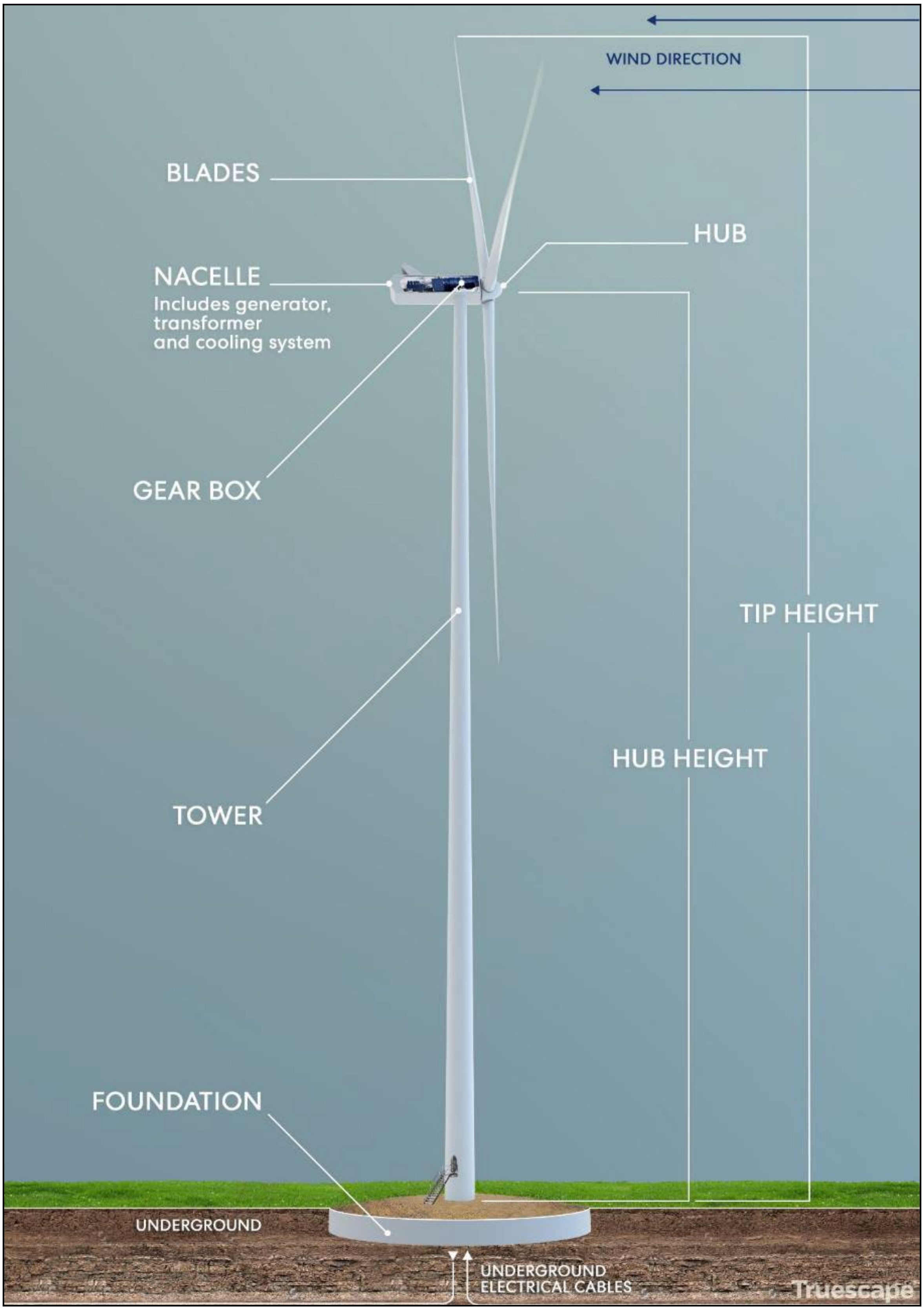
Table 3-8 WTG Coordinates

WTG No.	Coordinates (GDA94 zone 56)		WTG No.	Coordinates (GDA94 zone 56)	
	X	Y		X	Y
B001	375827.46	6590867.59	B081	382629.47	6580413.59
B002	375651.46	6590369.59	B082	382730.47	6579836.59
B003	375617.47	6589832.59	B083	381990.43	6582599.59
B004	375274.47	6589421.59	B086	384506.47	6582080.59
B005	374738.49	6589302.46	B087	384242.47	6581490.59
B006	374431.47	6588436.59	B088	383961.47	6581028.59
B007	374099.47	6588074.59	B092	384963.47	6580576.59
B011	368110.88	6585524.09	B093	385211.47	6579850.59
B012	368646.47	6585229.59	B100	384127.47	6578293.59
B013	369136.47	6584944.59	B101	383820.47	6577800.59
B014	369258.25	6584379.50	B102	383688.47	6577339.59
B015	369651.73	6583821.54	B105	386071.47	6579829.59
B016	369730.54	6583319.68	B107	386684.47	6579592.59
B018	370122.47	6582738.59	B108	386692.40	6578780.42
B019	370090.63	6582072.39	B109	386400.91	6578339.47
B020	369780.47	6581506.59	B110	387580.97	6577819.71
B021	369711.47	6580982.59	B111	386331.47	6577757.59
B023	365589.23	6583239.97	B112	386376.47	6577009.59
B024	365939.97	6582727.61	B113	386307.35	6576513.17
B025	366254.47	6582231.59	B115	386940.47	6575795.59
B026	366404.47	6581688.59	B116	387271.47	6574895.59
B027	366642.47	6580823.59	B118	386618.64	6573825.52
B028	367017.47	6580392.59	B119	386565.35	6573251.42
B029	367162.60	6579705.48	B120	386874.47	6572840.59
B030	367361.71	6579160.55	B121	386482.47	6572438.59
B032	367272.22	6578378.94	B122	388915.79	6572120.03
B033	367522.47	6577618.59	B123	389232.59	6571682.23
B034	367600.47	6577109.59	B124	387720.69	6571854.60
B036	368798.22	6578039.34	B127	391239.47	6570523.59
B037	368676.02	6577560.49	B128	390759.47	6570149.59
B038	369071.87	6577271.67	B129	390555.47	6569655.59
B039	369052.47	6576779.77	B130	391119.47	6569364.59

WTG No.	Coordinates (GDA94 zone 56)		WTG No.	Coordinates (GDA94 zone 56)	
	X	Y		X	Y
B044	369591.47	6578927.59	B131	391131.47	6568968.59
B045	369427.47	6579885.59	B132	391058.47	6568459.59
B046	378439.47	6584089.59	B138	386215.47	6568121.59
B047	378879.47	6583791.59	B139	386652.47	6567834.59
B048	378893.47	6583003.59	B140	386441.47	6567133.59
B051	380340.47	6585756.59	B141	386425.47	6566675.59
B052	380239.47	6585138.59	B142	386478.47	6566206.59
B053	380323.47	6584602.59	B144	387967.47	6566689.59
B054	379854.47	6584417.59	B145	388260.47	6565945.59
B056	387033.80	6586728.89	B146	389117.47	6566220.59
B057	386532.47	6586239.59	B149	391316.47	6567312.59
B060	386060.47	6586005.59	B151	393062.47	6566092.56
B061	385967.47	6585505.59	B152	393593.47	6565825.59
B062	385648.05	6584919.64	B153	393479.47	6565304.59
B063	387182.47	6583061.59	B154	394105.47	6565124.59
B064	387659.47	6582640.59	B160	370522.69	6584162.99
B065	388014.47	6582184.59	B161	370453.18	6583406.89
B066	388231.47	6581631.59	B167	369124.49	6581615.63
B068	388995.47	6581502.59	B168	381630.70	6579450.24
B069	388828.47	6580912.59	B169	381630.45	6578921.59
B070	389164.47	6580511.59	B170	381577.47	6578011.59
B071	380088.47	6580145.59	B171	381841.37	6577593.60
B072	380923.47	6580569.59	B172	369146.47	6580328.59
B073	380193.47	6581344.59	B173	379244.47	6588700.59
B074	380607.47	6581055.59	B174	379265.47	6588195.59
B076	380783.47	6582282.59	B175	379313.08	6587678.05
B078	381487.47	6581776.59	B176	375066.47	6588637.59
B079	381813.47	6581379.59	BESS	373610.77	6583510.32
N Substation	373619.00	6583711.00	Laydown 4	386543.91	6578611.60
S Substation	386963.00	6575283.00	Laydown 5	383269.13	6579164.40
Switchyard	356058.00	6601369.00	Laydown 6	386768.20	6569474.57
Met Mast 1	367401.47	6578783.97	Laydown 7	391098.26	6568054.22
Met Mast 2	391188.85	6567893.25	Laydown 8	369235.11	6579147.70

WTG No.	Coordinates (GDA94 zone 56)		WTG No.	Coordinates (GDA94 zone 56)	
	X	Y		X	Y
O&M Building	373656.09	6583801.25	***Batch Plant 1***	383431.02	6579158.47
Laydown 1	374018.50	6583780.16	***Batch Plant 2***	386687.10	6569454.52
Laydown 2	378678.33	6582386.81	***Batch Plant 3***	371813.24	6582876.05
Laydown 3	386896.54	6583502.97			

Figure 3-15 Typical Components of a WTG (indicative, not to scale)



The final WTG model may differ, depending upon the outcomes of the assessment and approval process as well as latest technology that may also be suitable for the site, and accordingly will be confirmed during the detailed design phase of the Project. The selected WTG model will comply with the relevant building standards and codes, including:

- *IEC WT 01:2001 System for Conformity Testing and Certification of Wind Turbines — Rules and procedures;*
- *IEC 61400-1:2005 Wind turbines Part 1: Design requirements;*
- *IEC 61400-12-1:2005 Wind turbines Part 12-1;*
- *IEC 61400-23 WTG systems – Part 23;*
- *IEC 62305-1/3/4 Protection against lightning*; and
- *IEC 61400-4:2012 Wind turbines — Part 4: Design requirements for WTG gearboxes.*

To achieve visual consistency through the landscape, the WTGs will include:

- Uniformity in the colour, design, height and rotor diameter;
- Use of simple muted colours and non-reflective materials to reduce visibility and avoid drawing the eye (i.e. RAL 7035 light grey);
- Avoidance of unnecessary lighting, signage and logos; and
- Serrated blades to minimise noise attenuation.

Section 3.3.2.4 outlines the process of installing the WTGs.

3.3.2.1 Towers

The WTG tower consists typically of composite metals and may consist of around seven individual flanged sections which are bolted together. The tower could also consist of a concrete bottom section with upper tubular steel sections. The tower supports the WTG nacelle, rotor hub and blades. The towers include an internal ladder and service personnel lift. Each tower is assembled onsite and anchored to a concrete foundation.

3.3.2.2 Foundations

The exact size and type of tower foundation will be based on subsurface soil conditions and the results of geotechnical surveys undertaken during the detailed design phase, prior to commencement of construction at each WTG site.

The three common types of foundations used for WTGs are gravity foundations, rock anchors and pile foundations or a combination of these depending on geotechnical conditions. The most common type of foundation is the gravity foundation in which an area is excavated suitable to support the burying of a “pedestal” design of concrete and reinforced steel sufficient to create a stable foundation. These are typically 3-5 m deep and 20 to 30 m in diameter depending on the tower design. The volume can be between 600-900 m^3 depending on the turbine, geotechnical conditions and other environmental factors.

WTG foundations are excavated using mechanical equipment, assisted by controlled blasting if required due to ground conditions. The exact design of the WTG foundations will depend on localised geotechnical conditions and the final type of foundation adopted. Topsoil and spoil from excavations will be stockpiled for reuse to backfill over the foundation and for vegetation rehabilitation of the Project Area. Excess materials will be utilised at other parts of the Project Area or exported offsite for beneficial reuse at an approved location or licensed landfill facility.

Figure 3-16 shows a typical gravity foundation**.** The gravity foundation is then backfilled so that only the connection to the base tower section is visible above ground as shown in **Figure 3-17**.

Figure 3-16 Typical Foundation in Construction

Figure 3-17 Typical Foundation Post-Construction

3.3.2.3 Nacelle

The nacelle is the housing that sits on the top of the turbine tower and accommodates the generator, gearbox, transformer, control systems, and pitch and yaw drives. The nacelle structure consists of a cast iron base frame and a rear girder structure. The base frame is the foundation for the drive train and transmits forces from the rotor to the tower through the yaw system. The bottom surface is machined and connected to the yaw bearing and the yaw gears are bolted to the base frame. The crane girders are attached to the rear structure.

The nacelle cover is attached to the nacelle structure. The nacelle cover is made of fibreglass. Hatches are positioned in the floor for lowering or hoisting equipment to the nacelle and evacuation of personnel. The roof section is equipped with skylights. The skylights can be opened from inside the nacelle to access the roof and from outside to access the nacelle. Access from the tower to the nacelle is through the base frame.

The Project may require obstacle lighting at night-time or during periods of reduced visibility. The Aviation Impact Assessment (Aviation Projects, 2021) provided in **Appendix K** concluded that the Project will not require obstacle lighting to maintain an acceptable level of aviation safety. However, the Civil Aviation Safety Authority (CASA) may potentially require flashing red medium intensity obstacle lighting where turbines exceed 150 m in blade tip height, as has been the case for other wind farm developments in NSW. If required, obstacle lighting will be installed on top of the nacelle in accordance with CASA requirements and the conditions imposed on any development consent granted. The Landscape and Visual Impact Assessment (LVIA) (refer **Section 6.3**) assesses the impact of lighting.

3.3.2.4 Wind Turbine Rotor and Rotor Nacelle Assembly

The rotor includes the three blades and the hub which connects the blades to the gearbox. The blades consist of fibreglass reinforced with epoxy, carbon fibre and a solid metal tip. A central WTG control unit (microprocessor) controls the rotational speed of the rotor and the pitch of the blades based on the prevailing wind conditions. The blades are continuously positioned to optimise the pitch angle, enabling the rotor to maximise energy production and ensure the safe and reliable operation of the WTG. At wind speeds of 25 m/s the microprocessor controls the pitch of the blades to stop the WTG rotating, which minimises wear on the turbine components.

The rotor is connected to the gearbox through a main shaft and bearing made of cast iron. The main shaft transfers force to the bearing and torque to the gearbox, and the main gear converts the rotation of the rotor to generator rotation which generates electricity. The main shaft, gearbox, generator and transformer are enclosed within the nacelle and are collectively called Rotor Nacelle Assembly. The transformer is required to ‘step-up’ the voltage of the electricity produced by each WTG to the onsite distribution voltage of 33 kV.

3.3.3 Hardstands

A hardstand will be constructed adjacent to the base of each WTG to enable the assembly and erection of the tower, nacelle and blade components. Each hardstand will consist of gravel, which will be compacted and graded suitably to form a roughly rectangular area for storage of WTG equipment and crane assembly prior to installation. The hardstand area will be level with the WTG foundation with a bearing capacity of 250 kPa. In addition, the hardstand will also include arrangements for crane boom assembly and support pad to store blades prior to construction.

The towers, nacelles and blades will be lifted off delivery trucks using mobile cranes. Larger cranes will then assist in the installation of the tower sections, nacelle and blades.

The total area of the hardstand during construction will be approximately 0.70 ha, subject to the topography of the surrounding land. After rehabilitation following the construction process, the hardstand area will reduce to approximately 0.26 ha.

Figure 3-18 illustrates an example hardstand area at the Cherry Tree Wind Farm in Victoria.

A portion of the hardstand will be maintained during Project operations to allow for maintenance and future decommissioning of the WTGs, there may be an opportunity to revegetate the assembly portions of the hardstand to allow grazing activities to resume in these areas if not required for wind farm operations.

Figure 3-18 Typical Hardstand Area

3.3.4 Electrical Reticulation

3.3.4.1 Transmission Line

High Voltage Transmission

A 330 kV single or double circuit, three phase, twin conductor bundle overhead transmission line connection will connect the on-site substations to a new switchyard approximately 7 km south of Uralla, NSW, with a length of approximately 50 km. These are components of the Project to which this application relates.

The indicative design of the overhead 330 kV transmission line is:

- Approximately 40 m high, single circuit lattice steel tower, spaced approximately 500 m apart, subject to terrain and final design;
- Towers generally require concrete footings for each of the four legs and a temporary disturbance area of approximately 30 m in diameter during construction;
- Twin aluminium conductor bundles attached to ceramic insulators in the centre and the ends of the tower cross arm;
- Each conductor bundle will include orange balls for visual identification and an earth shield wire/s, protecting the line from lighting strikes; and
- 60 m wide easement with unformed access tracks up to 3 m wide (equivalent to a farm track) to facilitate operational access by TransGrid (for maintenance, repair and hazard reduction).

Figure 3-19 provides an example of the typical steel lattice tower structure proposed for the transmission line.

It may also be possible to utilise a monopole design in place of a steel lattice tower (refer **Figure 3-20**). Monopoles would be up to 50 m high and spaced approximately 200-250 m apart, subject to terrain. The monopoles would utilise a concrete footing.

Access to the transmission line for construction will be via existing property accesses and farm tracks.

For the safe operation of the transmission line, certain activities will be restricted within the easement area such as planting and growing trees, construction of buildings, or erection of antennae or masts. The transmission line will not affect the ongoing use of the land for agricultural purposes such as grazing.

Figure 3-19 Typical Steel Lattice Tower Structure

Figure 3-20 Typical Steel Pole Structures

Medium Voltage Reticulation

The internal electrical reticulation network, which connects the WTGs to the north and south onsite substations, will comprise approximately 324 km of underground and/or overhead 33 kV cables. WTGs are connected in strings (typically between 3 to 6 WTGs per string), which are then connected to the onsite substations. Where possible the cabling will be in underground trenches, which run parallel to the access track. Where deviation from the access track is required due to geotechnical or other constraints, or to reduce overall cable length, these deviations will be positioned to minimise impact to ecological and heritage areas of high significance.

The trenching for underground electrical cabling will be approximately 0.6 m wide per circuit by 1.0 m deep, located within a works area of approximately 5 m to accommodate the mobile plant and stockpiling of spoil and bedding sand. Trenches will be progressively backfilled during the construction works.

Prior to excavating the cable trench, the topsoil is stripped and windrowed separately from excavated subsoils to preserve soil structure and the seedbank. The electrical reticulation is placed on bedding sands at approximately 750 mm below ground level. Once the cables are installed, another layer of sand may be placed above the cable prior to the trench being backfilled with excavated material with topsoil respread providing a soil profile that assists revegetation of the disturbed areas. Cables will be protected in accordance with *Australian Standard (AS) 3000:2007 Electrical Installations*.

Where ground conditions are not suitable for open cut trench installation, overhead single circuit electricity lines will be installed using concrete poles. The aboveground conductors may have orange balls for visual identification.

Telecommunications

Telecommunications ensure the secure control of the WTGs and substations. This includes emergency shutdowns and management of any maintenance requirements. Fibre optic cables will be installed with the electrical reticulation system.

3.3.4.2 Onsite Substations

Two 33/330 kV substations will be constructed in the development footprint to transform the 33 kV received from the internal electrical reticulation network to the 330 kV transmission voltage.

While the design is yet to be finalised, it is expected that each substation would occupy an area of 100 m x 100 m (approximately 1 ha) and will contain transformers, associated high voltage switchgear and control and protection equipment as well as a communication tower, and drainage and oil containment system. A security fence will surround the substations. Gravel hardstand will be placed under and around the substation compounds to restrict vegetation growth and provide a safe working environment in accordance with the relevant Australian Standards.

Internal structures within the fenced substation compounds will include:

- Control building/control room, switch room with a height of 5 m;
- Two 33/330 kV power transformers with a height of 10 m;
- Approximately six lightning protection masts which are 25 m high;
- Associated high voltage switchgear including busbars, circuit breakers, disconnectors – approximately 10 m high; and
- A communication tower (up to 80 m high).

A 20 m bushfire APZ will surround the substation.

Figure 3-21 provides an example of a wind farm substation.

Figure 3-21 Typical Substation

3.3.5 Switchyard

A switchyard with approximate dimensions of 160 m by 120 m for physical electrical components including required earth works will be located within a site with a maximum expected area of 2 ha. The switchyard will connect the Project transmission line to the adjacent 330 kV TransGrid Tamworth to Armidale overhead transmission line network. Internal road access will be required for the switchyard. **Figure 3-14** shows the wind farm layout plan including the location of the switchyard. A 20 m APZ will surround the switchyard.

Figure 3-22 shows an image of a typical wind farm switchyard**.**

Figure 3-22 Typical Switchyard

3.3.6 Battery Energy Storage System (BESS)

A BESS will be located adjacent to the north substation, occupying an area of approximately 100 m x 100 m. Indicatively, the BESS would utilise lithium-ion technology with a rated capacity of up to 100 MW / 200 MWh (subject to detailed economic and technical considerations). The BESS will likely utilise a pre-assembled and pre-tested, fully integrated system that includes the battery modules, inverters, thermal management system, circuit breakers and other controls.

A battery Heating, Ventilation, and Air Conditioning (HVAC) system will actively cool the BESS. The BESS will be temperature monitored, and the automated control system will stop its operation if the temperature exceeds pre-set levels to prevent overheating (e.g. if all air conditioning units fail). The BESS will include a gravel surface and a 20 m APZ to minimise the risk of fire escaping from the facility and the risk of external fire affecting the facility.

The model and design specification of the BESS will be determined during detailed design. However, the final model and design specifications will remain within the specifications assessed in the State Environmental Planning Policy (SEPP) *SEPP33 Preliminary Hazard Analysis* (PHA) (Sherpa, 2021). **Table 3-9** provides indicative specifications of the BESS.

Figure 3-23 provides an illustration of the indicative BESS model.

Figure 3-24 provides a typical layout of a 100MW/200MWh BESS.

Table 3-9 Indicative BESS Design

Item	Information
Indicative model	Tesla Megapack
Indicative technology	Lithium-ion
Battery enclosure	Outdoor rated cabinets on concrete pad with a gravel bench around it and a security fence. Approximate size of enclosure is 100 m x 100 m
Battery quantity (no. of cabinets, modules)	■ 100 MW / 200 MWh system ■ Each cabinet is 1.25 MW / 2 hours (so 2.5 MWh within each cabinet) ■ 80 cabinets ■ Each cabinet has 15 battery modules and 22 inverter modules ■ Output is 480 V, with external medium voltage transformers to step up to 33 kV
Battery HVAC system type	■ Battery modules, inverters, thermal management and cooling system, and LV circuit breakers, fully integrated and tested at the factory ■ The thermal system includes fully enclosed loop liquid thermal management system, includes ethylene glycol 50/50 mix that runs through battery modules and inverters
Fire protection system	To create a significant fire in the BESS, the enclosure of the battery unit needs to be subject to an extreme external event, such as direct exposure to a large prolonged fire or severe physical impact. A single cell thermal runaway does not propagate to neighbouring cells as demonstrated in testing per UL and IEC standards. Validated large-scale fire testing has shown that in the event of a fire, the battery storage systems perform in a safe and controlled manner, consuming themselves slowly without explosive bursts, deflagrations, or unexpected hazards, and without propagating to neighbouring enclosure units (TESLA, 2020). Installation, operations and maintenance of the battery storage system will be conducted by trained personnel in accordance with relevant procedures. Technical guidance on firefighting measures will be incorporated into an Emergency Response Plan and Fire Management Plan to be prepared prior to construction commencing. Water spray has been deemed safe as an agent for use on exposed Tesla Energy Products and is considered the preferred agent for suppressing lithium-ion battery fires (TESLA, 2020). A cooling water supply will be located onsite, in addition to the implementation of mitigation and management measures provided in **Section 6.5.4.4**.

Figure 3-23 Indicative BESS Model (Tesla Megapack)

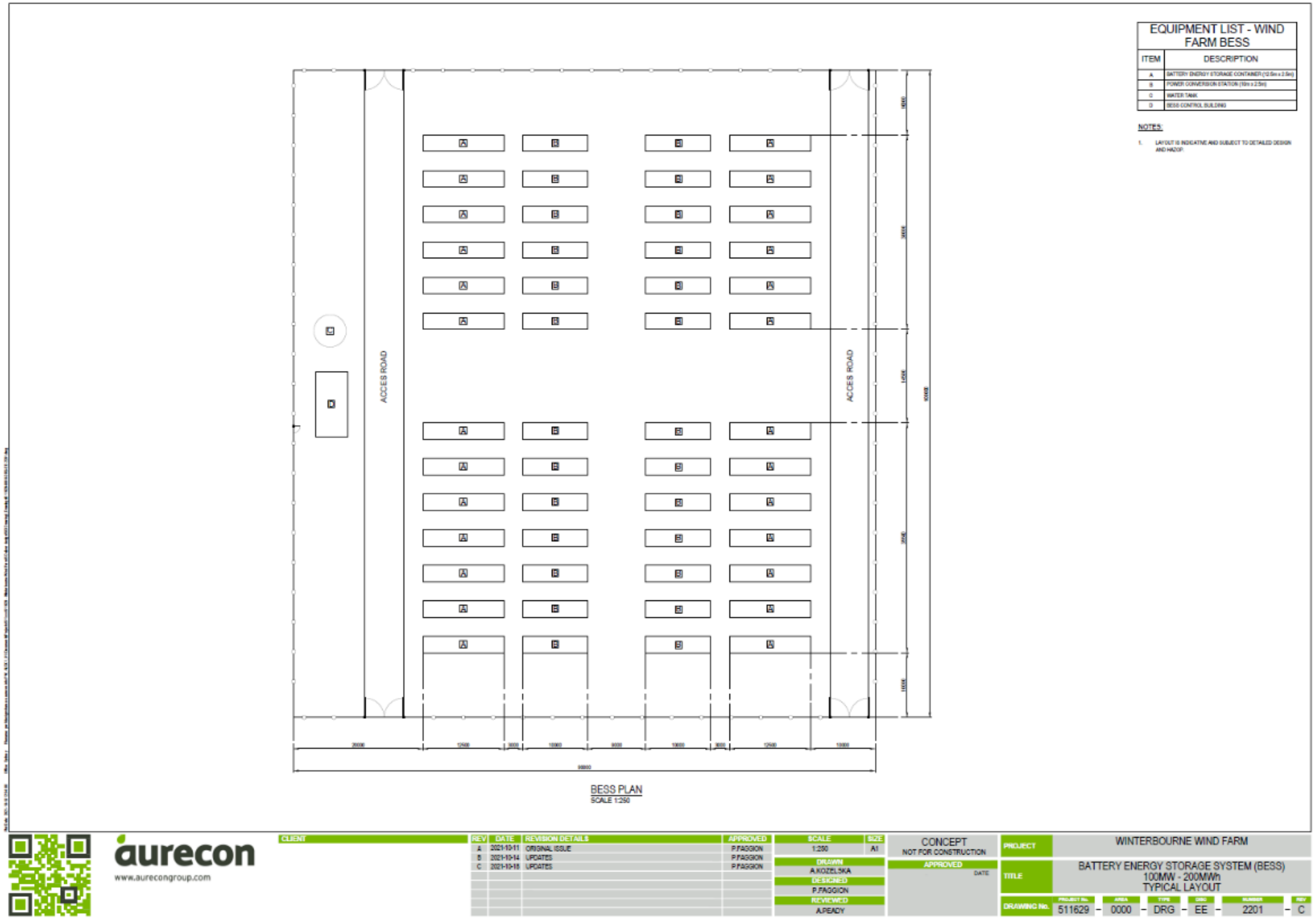


Figure 3-24 BESS 100MW/200MWh Typical Layout

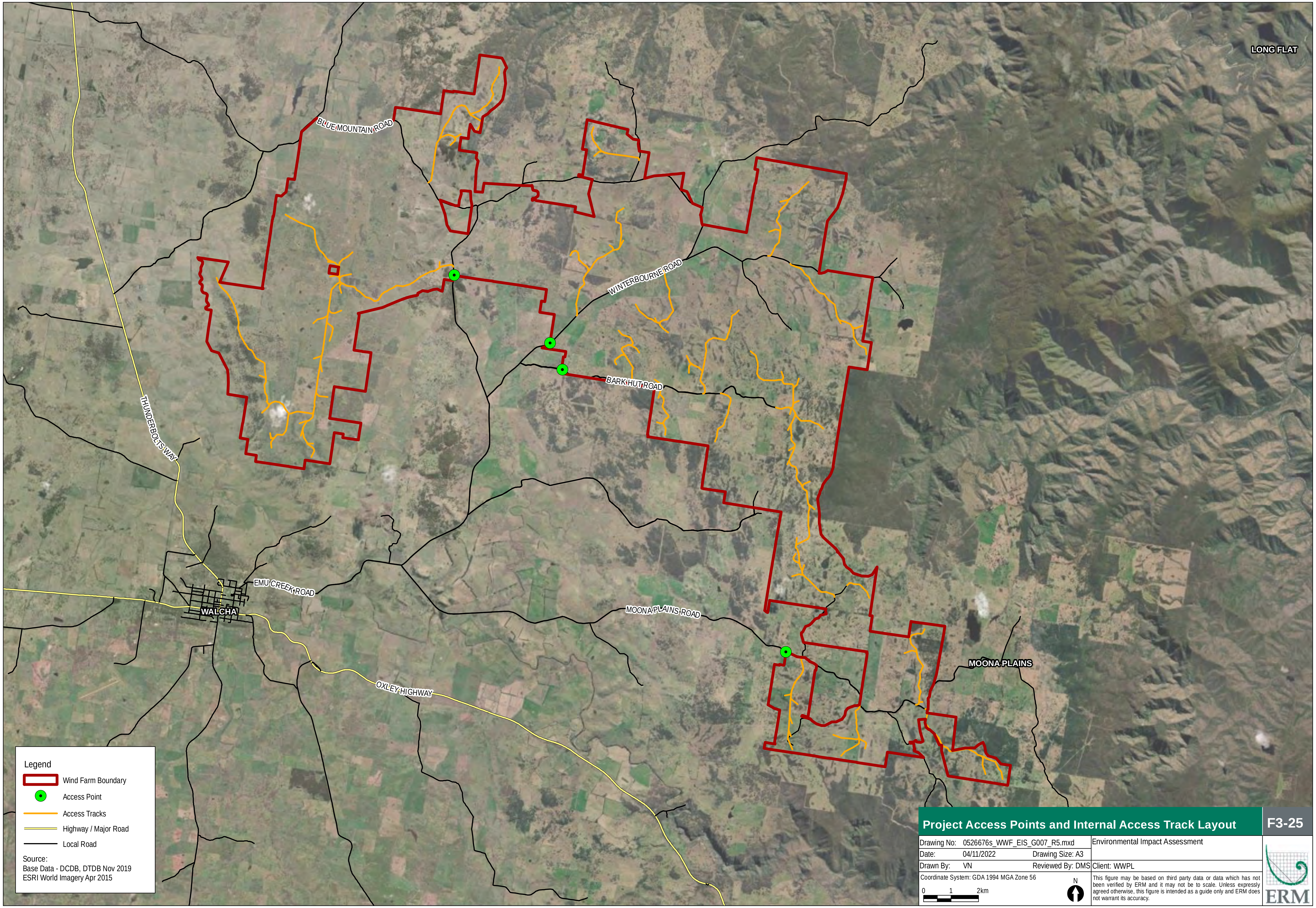
3.3.7 Internal Access Tracks

The construction and maintenance of the Project will require construction of up to approximately 113 km of new private access tracks within the Project Area. These tracks will connect to existing Council roads. The tracks will provide ongoing access to the WTGs and other Project infrastructure including the transmission line. Where practicable, the internal access track network will be aligned along the route of existing farm tracks to reduce impacts to biodiversity and to provide upgraded access for ongoing agricultural activities. Proposed intersections to existing Council roads will include:

- Eight connections off Bark Hut Road;
- Five connections off Moona Plains Road;
- Two connections off Rowleys Creek Road;
- Two connections off Table Top Road;
- Two connections off Winterbourne Road;
- Two connections off Blue Mountain Road; and
- One connection off Uruga Road.

The internal access tracks will typically be 5.5 m trafficable width on straights, with localised widening on curves and where required to support transportation of the over-dimensional WTG component vehicles. The internal access tracks will be constructed using unsealed pavements and will be generally in accordance with the *Australian Road Research Board Unsealed Roads Manual*.

Figure 3-25 shows the proposed internal access track network, in addition to the access points to the Project Area.



Project Access Points and Internal Access Track Layout

F3-25

Drawing No:	0526676s_WWF_EIS_G007_R5.mxd		Environmental Impact Assessment
Date:	04/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: DMS	Client: WWPL

Coordinate System: GDA 1994 MGA Zone 56

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

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3.3.8 Permanent Operations and Maintenance Facility

A permanent site O&M facility, approximately 50 m by 40 m, will be constructed to provide for all operations and maintenance activities associated with the Project. The O&M facility will be located next to the north substation, BESS and laydown area. **Figure 3-26** provides an example of a typical O&M facility**.** The buildings of the O&M facility will contain the control room, switch room, and storage shed with workshops. And indicative layout/plan for the O&M Facility is provided in **Figure 3-27**.

The control room will contain an office, communications equipment, and staff amenities (toilet, kitchen, first aid, potable water supply, etc.). Guttering and a water tank will collect rainwater.

The compound will include a static water supply for firefighting/bushfire management (may be part of above water supply) as well as a septic system. The control room, switch room and storage shed will each contain essential fire safety equipment, including fire extinguishers and hose reels.

Adequate rubbish waste/facilities providing appropriate waste stream separation using onsite skip bins emptied weekly or as required. Waste will not be retained permanently onsite.

Car parking facilities for employee and service vehicles will be located adjacent to the building. The parking and vehicle manoeuvring areas will be sealed with crushed road base or asphalt.

During the long-term operational phase, the O&M facility will cater for approximately 16 permanent staff. Whilst most activity is anticipated to occur during business hours Monday to Friday, access to the Project Area will be required on a 24-hour basis, seven days a week.

The O&M facility will be constructed of low-combustibility or non-combustible materials in accordance with the *National Construction Code* (ABCB, 2022). The office within the O&M facility will be an insulated, free standing construction with steel frame affixed to a concrete base. The building will utilise Colorbond cladding in a colour shade designed to match the surrounding landscape. Internal walls will be wooden frame with insulation. The walls will be clad in plasterboard and painted a shade of white.

The O&M facility warehouse and workshop will be an insulated, free standing construction with steel frame affixed to a concrete base. The building will utilise Colorbond cladding that will be a colour shade designed to match the surrounding landscape. The building will include a large roller shutter door leading externally. The building will also include a climate controlled insulated room consisting of wooden frame clad in plasterboard within the outer shell for storage of smaller components. Additionally, there will be a double skinned/bunded container set on a concrete base for the storage of oils, greases and other liquid substances with a safety shower on the outside of the building.

All buildings will be powered by single phase (240 V) electricity with Wi-Fi internet either by 4G or satellite connectivity and water via tanks that are filled by rain water collected from the roofs or trucked in. The water tanks will be serviced by UV filtration. All buildings will be installed to relevant state and federal safety and environmental regulations and signed off for occupancy.

Figure 3-26 Example O&M Facility

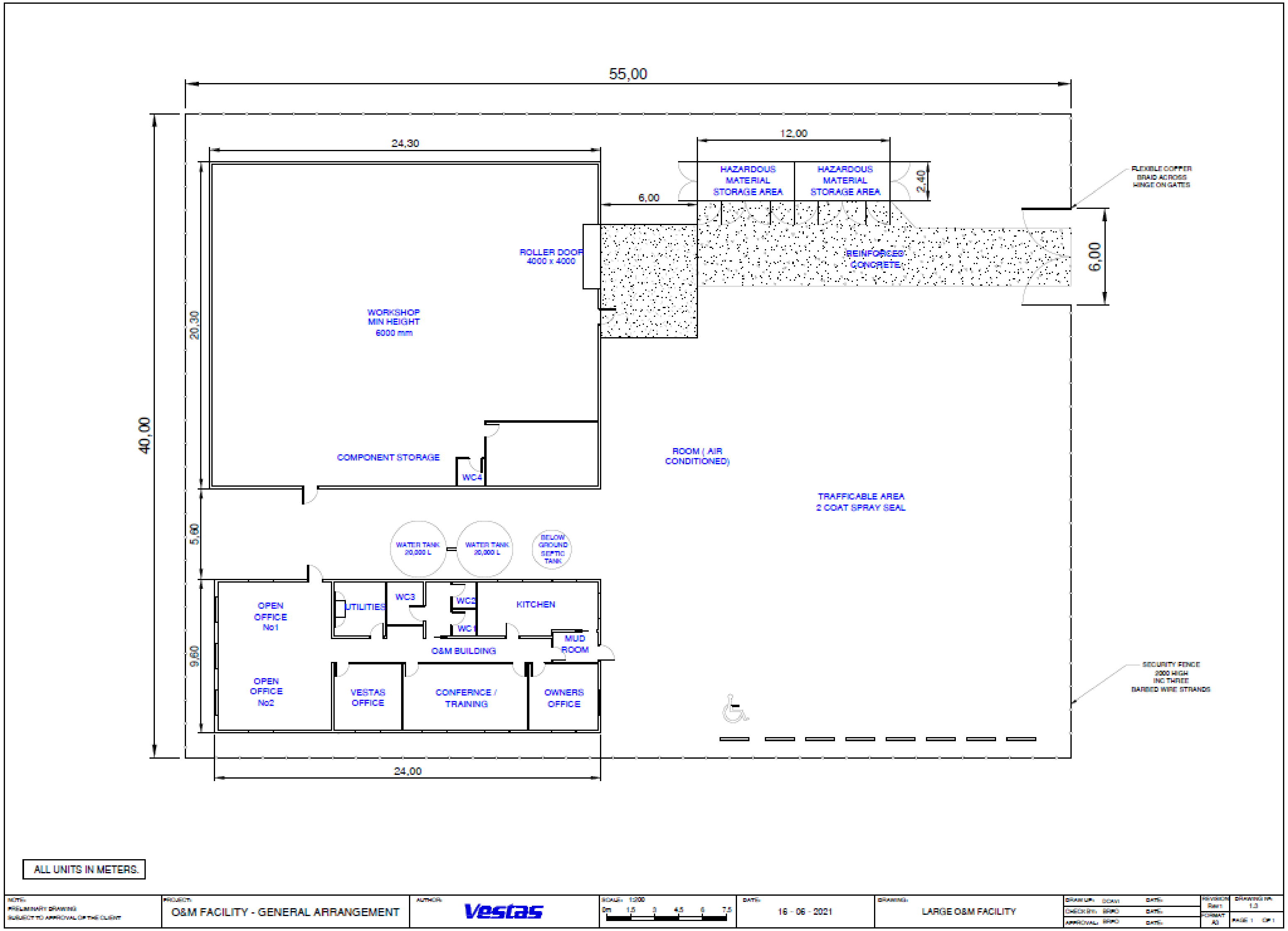


Figure 3-27 Indicative Layout/Plan of O&M Facility

3.3.9 Meteorological Monitoring Masts

The Project includes the commissioning and decommissioning of four temporary meteorological monitoring masts (met mast) for power testing and installation of up to two permanent met masts (refer **Figure 3-11** and **Figure 3-13** for indicative locations). Each met mast will be located close to a WTG location and will have a maximum height of approximately 149 m AGL, equivalent to the hub height of the installed WTGs. The permanent met masts assist in verifying the performance of the WTGs during operation of the Project.

The met masts will be of welded steel lattice construction with hot dip galvanised surface treatment, built on a concrete based and supported by guy wires. The met masts consist of a buried concrete base foundation and guy wires which are attached to buried anchor points. These will be marked using three-dimensional coloured objects attached to the wire or cables (for example spheres or pyramids) if necessary. The Project also includes the decommissioning and removal of four existing met masts used during project development to measure the wind resource within the Project Area. **Figure 3-28** depicts an existing onsite met mast indicative of a typical met mast design.

Figure 3-28 Existing Met Mast Installed Onsite

3.3.10 Lighting

Maintenance lighting will be installed at the substations and at the O&M facility for night work including emergency operations. All maintenance lighting will be designed to reduce disturbance to neighbouring properties and will be used only when there are staff onsite or during emergencies. Continuously operating security lighting would be installed on posts up to 3.5 m high adjacent to security fencing and O&M facility.

3.3.11 Temporary Facilities

Construction of the Project will require a range of temporary buildings and facilities for construction personnel and equipment. These will include a construction compound (including site offices, car parking, and amenities for the construction work force), mobile concrete batching plants, laydown and storage areas for the temporary storage of construction materials, plant, equipment and WTG components, and temporary power supply for construction. **Figure 3-11, Figure 3-12**, **Figure 3-13** and **Figure 3-14** provide indicative location of temporary facilities.

Chain link fencing up to 2 m high and CCTV may be used around the temporary construction compounds, concrete batching plants, and materials storage and laydown areas, as required.

All temporary facilities will be removed and will be revegetated / remediated following commissioning, or as agreed with by the landowner. **Figure 3-29** shows an example concrete batching plant.

Figure 3-29 Example Concrete Batching Plant

3.3.12 Micro-siting

The proposed layout is indicative and subject to detailed design, which will incorporate detailed geotechnical investigations and selection of the final WTG model.

In order to facilitate refinement of the layout during the detailed design process, an allowance for micro-siting of WTGs by up to 100 m radius from the locations identified in the EIS is sought. Other Project infrastructure components, including substations, switchyard, maintenance building, temporary facilities, cabling and access tracks, may also be micro-sited within the assessed study area subject to ensuring that micro-siting does not result in greater impacts than assessed in this EIS and complies with all conditions imposed on any development consent granted for the Project.

The assessment has considered the area potentially subject to micro-siting, by applying a 100 m buffer around the proposed project infrastructure for critical aspects.

The ability to micro-site is required to allow for design refinements to avoid unnecessary excavation, vegetation clearing, to benefit constructability, plant and equipment access, and make general design refinements without the need to modify the application. Micro-siting does not jeopardise the assessment of impacts as the areas within which micro-siting may occur were assessed.

3.4 Project Construction

3.4.1 Duration and Staging

Construction activities will be progressive across the Project Area over a period of up to 30 months, with peak activities to occur over approximately 10 months. Key construction processes, generally in the order that they will occur, include:

- Mobilisation of earthwork plant and equipment;
- Construction of access tracks and hardstand areas;
- Installation of site compounds and concrete batching plants;
- Delivery of WTG and other Project components;
- Construction of met mast footings and WTG footings;
- Construction of substation and switchyard compounds;
- Erection of met masts and WTG components;
- Installation of substation and switchyard infrastructure;
- Installation of internal electricity network (underground cables/overhead power lines); and
- Site rehabilitation and revegetation.

Construction of the substation, 330 kV transmission line connection and switchyard will be undertaken in parallel with the installation of the WTGs and construction of the O&M facility. Construction and operation of the Project may be staged in response to market drivers and specific construction work packages. If construction and / or operation is to be undertaken in stages, notification of such will be provided to DPE.

Figure 3-30 presents the anticipated timing of key Project milestones.

Construction of the wind farm may be staged subject to factors including but not limited to the availability of contractors, equipment, workers and housing, equipment transport constraints, equipment and contractor pricing, energy market pricing and availability of energy offtake, project funding requirements, the final project as approved, and relevant development consent conditions. Some of these factors can only be determined after development consent and with further refinement of project design, procurement and commercialisation. Subject to these factors, if a decision is made to stage the project, the project would likely be constructed in two stages, with the western and northern portions of the project constructed as a first stage, and the southern portion of the project constructed as a second stage. This strategy would allow for construction of the two proposed substations and the transmission line during the first stage to enable connection of the Project Area to the existing grid. The turbines to the south of the southern substation could then be delivered as a second stage, if required, based on the factors outlined above.

3.4.2 Construction Hours

Construction of the Project will generally occur as follows:

- Monday to Friday: 7.00 am to 6.00 pm;
- Saturday: 8.00 am to 6.00 pm; and

- No works on Sunday or public holidays.

These hours are generally in accordance with the *Interim Noise Construction Noise Guideline* (DECC, 2009), with some extended on Saturdays.

Some out-of-hours work may be required, including:

- Logistics and safety requirements imposed by relevant regulatory authorities (e.g. NSW Police);
- Blade and tower transport outside of peak traffic conditions on state and regional roads;
- Emergency work to avoid the loss of lives, property, and/or to prevent environmental harm;
- Works that do not cause noise emissions above 35 dB(A) at any non-associated dwellings not located on the site;
- Weather conditions such as high winds during the day necessitating WTG crane lifts at night;
- Temperature conditions requiring concrete pours during the early morning; and
- Extended concrete pours into the evening to complete a foundation.

If a need to work outside the recommended standard hours is identified, it would be carried out in accordance with the Environmental Management Strategy (EMS) and associated sub-plans.

3.4.3 Construction Workforce

Up to 400 FTE construction jobs will be generated.

Figure 3-31 presents a diagram of the approximate construction workforce by month. The diagram does not include office-based roles.

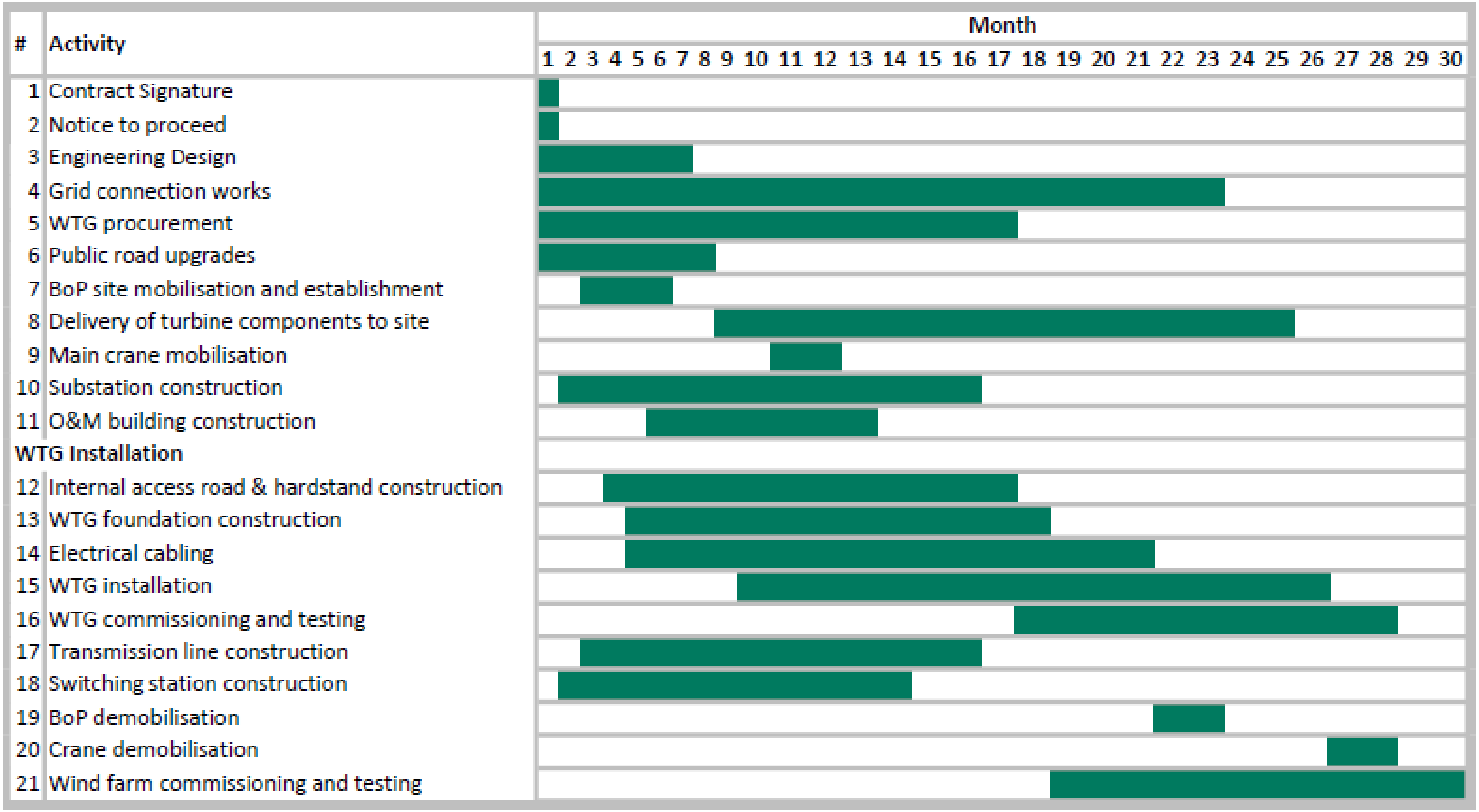


Figure 3-30 Approximate Timeline for Project Construction

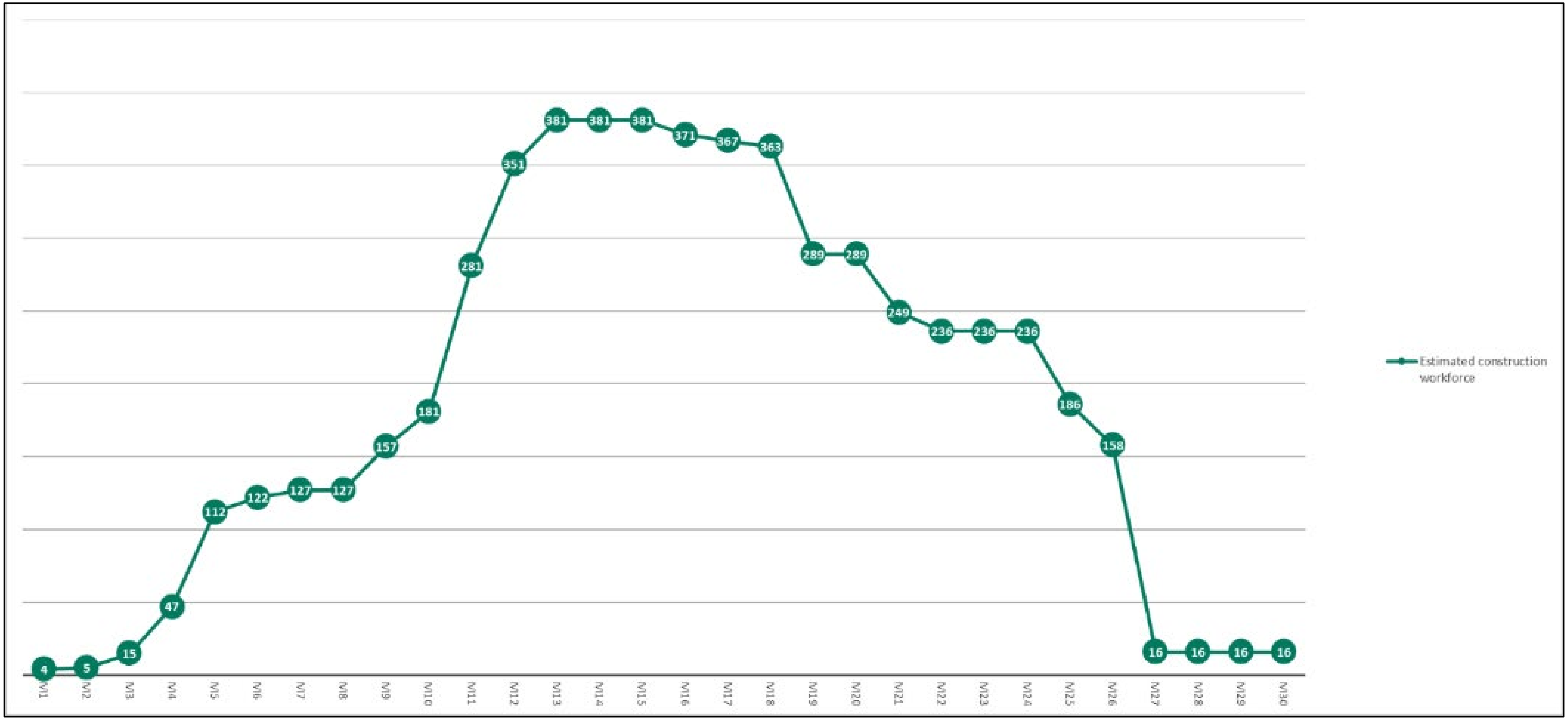


Figure 3-31 Estimated Construction Workforce by Month

3.4.4 Transport Route and Site Access

3.4.4.1 OSOM Transport Route from the Port of Newcastle

The Port of Newcastle will likely be utilised for import and unloading of WTG components. Due to the size of the WTG components and some substation components, RAVs will be required for transportation from the Port of Newcastle to the Project Area. RAVs deliveries are OSOM and require permits that specify the designated route for travel, the number of escorts required and the time in which the RAVs can travel through certain road zones.

Major WTG components to be transported from the Port of Newcastle include:

- Blades;
- Hub;
- Nacelle;
- Power train;
- Cooler top; and
- Tower segments.

There would also be a small number of OSOM deliveries associated with large substation equipment (e.g. battery storage, transformers), O&M facility, and water tanks.

In addition, cranes will be required to move onto the Project to erect the WTG. A number of these will also be transported using RAVs.

The proposed OSOM delivery route from the Port of Newcastle to the Project has been separated into two routes:

- Components including blades, motors and small components under 5.2 m overall height: the transport route would be via Selwyn Street, George Street, Industrial Drive, Maitland Road, New England Highway, John Renshaw Drive, Hunter Expressway, New England Highway, Thomas Mitchell Drive, Denman Road, Bengalla Road, Wybong Road, Kayuga Road, Ivermein Street, Stair Street, Dartbrook mine access Road, New England Highway, Oxley Highway, Saleyards Road, Darjeeling Road, Thunderbolts Way and Jamieson Street; or
- Components including towers and motors over 5.2 m overall height: the transport route would be via Selwyn Street, George Street, Industrial Drive, Maitland Road, New England Highway, John Renshaw Drive, Hunter Expressway, New England Highway, Golden Highway, Denman Road, Bengalla Road, Wybong Road, Kayuga Road, Invermein Street, Stair Street, Dartbrook Mine access Road, New England Highway, Oxley Highway, Saleyards Road, Darjeeling Road, Thunderbolts Way and Jamieson Street.

All RAVs will use the Oxley Highway to the west of Walcha then follow Saleyards Road and Darjeeling Road bypassing central Walcha to Thunderbolts Way and subsequently south to Jamieson Street and onto Ohio Road and Emu Creek Road to access the Project Area.

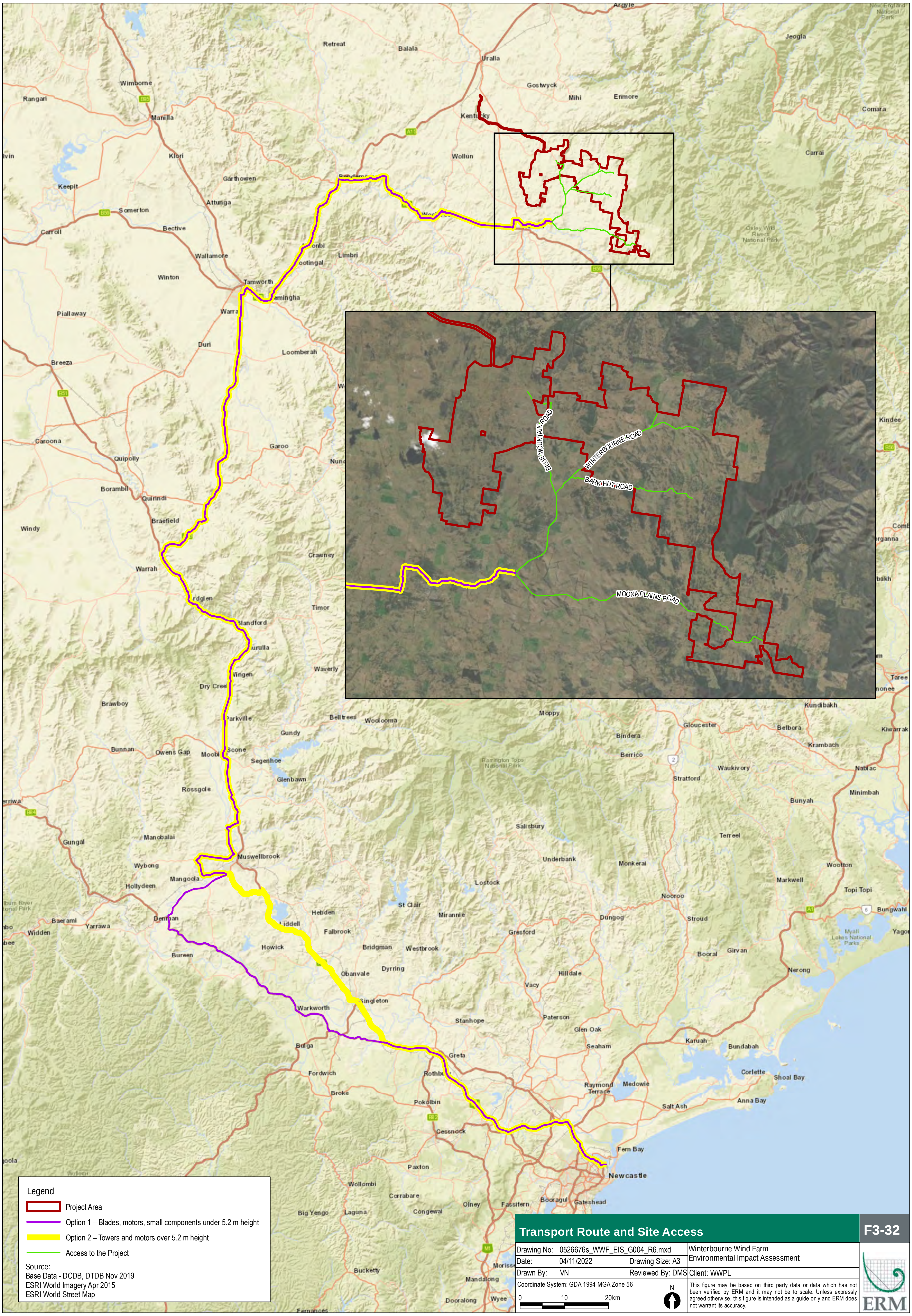
The final RAV route will depend on further consultation and approval from the relevant road authorities including Transport for NSW and local councils as well as private property owners along the route where widening and blade swing area may extend beyond the road reserve boundary.

Whilst RAVs will contribute a smaller percentage of trips to the Project during the construction period, they will be the most critical from a vehicle access perspective and will require some road and intersection upgrades to the existing network (refer **Section 6.4.5.3**).

Figure 3-32 shows the preferred access routes for the blades and the other components, in addition to the Project access route from Thunderbolts Way for construction and operation vehicles.

Heavy vehicles will be required to transport materials and equipment associated with the Project construction. It is anticipated that heavy vehicles will consist of vehicles up to and including 19.0 m long semi-trailers and B-Doubles (standard vehicles) and ‘truck and dogs’, concrete trucks and water tankers. The use of temporary onsite concrete batching plants will reduce the number of external concrete truck movements to and from the Project Area.

Section 6.4 summarises the Traffic Impact Assessment (TIA) prepared by Amber (2022) and the Route Study prepared by RJA (2022) (**Appendix J**).



Legend

- Project Area
- Option 1 – Blades, motors, small components under 5.2 m height
- Option 2 – Towers and motors over 5.2 m height
- Access to the Project

Source:
Base Data - DCDB, DTDB Nov 2019
ESRI World Imagery Apr 2015
ESRI World Street Map

Transport Route and Site Access

F3-32

Drawing No: 0526676s_WWF_EIS_G004_R6.mxd		Winterbourne Wind Farm Environmental Impact Assessment
Date: 04/11/2022	Drawing Size: A3	
Drawn By: VN	Reviewed By: DMS	Client: WWPL

Coordinate System: GDA 1994 MGA Zone 56

0 10 20km

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This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

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3.4.4.2 Site Access from Walcha

Light vehicles comprising light trucks for smaller deliveries and cars, four-wheel drives and utility vehicles attributed to Project personnel will frequent the Project Area during construction and operation of the Project. All vehicles will access the Project from Thunderbolts Way via Jamieson Street, Ohio Road, and Emu Creek Road. The operations and maintenance facility and main construction compound will be located off Blue Mountain Road adjacent to the north substation and BESS facility. Two satellite construction compounds will be located off Bark Hut Road and Moona Plains Road.

Figure 3-25 shows the location of the Project access points. Transport of materials and people from site is addressed in details in **Section 6.4**.

3.4.5 Road Upgrades

RJA (2020) completed a route survey along the transportation routes from the Port of Newcastle to Jamieson Street in Walcha. This includes a swept path analysis for the transportation of the 79 m long blades at key locations along the access route in order to identify ‘pinch points’ and areas where vehicles are able to pull over for fatigue breaks or emergency parking. RJA have identified a number of road upgrades to facilitate the proposed OSOM movements, as presented in **Appendix J**.

Public road upgrades would be required to cater for the delivery of blades, nacelles and towers, and include public roads in Newcastle, Muswellbrook, Tamworth, Walcha and possibly Uralla. The upgrades are required to ensure sufficient space for oversized vehicle passage, including intersection widening, trimming and removal of vegetation, removable signs and infrastructure, and the relocation of overhead wires.

Section 6.4.5.3 and **Appendix J** discuss the upgrades further. The general areas of public roads remain subject to further detailed design and assessment.

3.4.6 Temporary Mobile Concrete Batching Plants and Rock Crushing

The foundations for each WTG will be constructed with steel reinforced concrete. Concrete and aggregate will also be used as required for electrical infrastructure, internal access tracks, the O&M facility, and Project substations and switchyard. Up to three temporary mobile concrete batching plant and rock-crushing facilities will be established within the Project Area. While the exact details of the facilities will be determined during the detailed design phase, typically the area required for the plant and storage of materials will be approximately 100 m by 100 m. The three locations as shown in **Figure 1-3** and include:

- Adjacent to Bark Hut Road, within proximity to a laydown area and a temporary compound;
- Adjacent to Moona Plains Road near the intersection of Rowleys Creek Road, within proximity to a laydown area and a temporary compound; and
- Adjacent to a Project access track, approximately 2 km west of the main construction compound.

The temporary mobile concrete batching plants will be designed to produce sufficient concrete quantity for one foundation per working day, and will comprise:

- Cement silos;
- Stockpile areas for the storage of the aggregates, sand and other raw materials;
- Water tanks;
- Wastewater settling pit (to recycle water and prevent cement wash out overflowing onto unsealed ground and entering waterways);
- Parking for truck mixers and pumps;
- Fuel bunker and bunded area for concrete additives; and
- Rock crushing facility.

The cement and the aggregates needed for concrete production will be sourced locally where possible. Several quarries are available locally as a source of raw materials for concrete production.

It is anticipated the cement will be stored in a silo adjacent to the batching process machinery. Concrete agitator trucks will transfer the concrete from the batch plant to the WTG foundation locations.

Because high quality water is required for concrete production, water for this purpose will likely be sourced offsite and transported to the batching plant via water tanker trucks. Alternatively, it may be possible to utilise suitable quality groundwater from an existing or newly installed bore or bores within the Project Area, subject to appropriate licencing. The Proponent has also discussed sourcing water from the town supply with Walcha Council, and the Council had indicated that it might be possible to purchase water from this source, subject to an evaluation of required volumes and water quality requirements, and appropriate licencing.

Given the demand for concrete and rock for access road and hardstand construction crushing operations will exceed the license threshold of 150 tonnes per day or 30,000 tonnes per year. Therefore, an Environmental Protection Licence (EPL) from the EPA (under the *Protection of the Environment Operations Act 1997* (NSW) (POEO Act), will be required. The daily onsite rock crushing capacity will be quantified following pre-construction geotechnical assessments to determine the availability of suitable onsite material.

3.4.7 Resource Requirements

Construction materials including gravel, aggregate and sand will be required for the concrete batch plant and construction of hardstands to support Project infrastructure, including internal access tracks and installation of electrical cabling. It is anticipated that the road formation will be constructed using a cut and fill balance with excavated materials used for the final hardstand surfaces of the roads, crane pads and laydown areas. The cut / fill volumes are estimated to be approximately 1,258,600 m^3 and 898,700 m^3 of material, respectively.

Use of materials sourced onsite will need to be confirmed through geotechnical testing prior to works commencing. Otherwise gravel, along with aggregate and sand for concrete batching and cable laying, will be sourced externally from existing operating quarries. Existing operating quarries in the Project locality (less than 100 km from site entries) and their material resources are shown in **Table 3-10**.

Table 3-10 Existing Operating Quarries in Project Locality

Facility	Location	Aggregate	Sand	Concrete	Road base
Sheridans Hard Rock Quarry	Cornells Road, Hernani	✓	-	-	✓
Boral Concrete Armidale	28 Drew Street, Armidale	-	✓	✓	-
Highland Quarry	7096 Guyra Ebor Rd, Guyra	✓	✓	-	✓
Scanlons Concrete and Quarry Products	2 Crawford Street, Tamworth	-	✓	✓	-
Namoi Valley Quarry	5483 Oxley Highway, Carroll	✓	-	-	✓
Ward Bros Sand and Gravel Supplies	Killara, Kentucky	✓	✓	-	✓
Brooklyn Quarry	Walcha Road, Walcha	✓	-	-	✓

Construction materials will be transported by trucks and stockpiled within the laydown areas and at the concrete batch plants. Construction equipment such as excavators, bulldozers, trenching machines and trucks will be sourced locally from the New England region, subject to availability and cost considerations. Further, steel used for concrete foundations will be sourced from within NSW, subject to cost and availability.

Approximately 113 megalitres (ML) of water would be required during the construction phase, primarily for concrete (approximately 6 ML), road works and earthworks (approximately 26 ML), and dust suppression (approximately 81 ML). Water for road works and dust suppression can be of lower quality than is required for concrete production. It is anticipated that water required for construction will be supplied from existing or new onsite dams or groundwater bores (subject to seasonal availability and water license permissions) or alternatively from an offsite local source (subject to approval). The Project is also investigating the potential supply of Walcha treated wastewater for use in dust suppression.

The Soils and Water Assessment (ERM, 2022, **Appendix P)** provides a further discussion of water access licenses and other requirements.

A small amount of potable (drinking) water (approximately 3 ML) would be collected in rainwater tanks from temporary site compound buildings or imported during the construction period on an as-needs basis to top up the water tanks.

Potable water will also be required for staff amenities during operation and will be collected in rainwater tanks installed at the O&M facility.

3.4.8 Temporary Site Office, Car Parking and Storage

A temporary construction site office will be erected and maintained for the duration of the construction phase at one of the three compound sites. In addition, temporary contractor parking and facilities and equipment laydown and storage areas are proposed with the indicative locations shown in **Figure 1-3**.

3.4.9 Post Construction Site Rehabilitation

The Project Area will be progressively rehabilitated throughout the course of construction. When construction is completed, all temporary plant and equipment will be removed, and disturbed areas will be revegetated and rehabilitated in consultation with Associated landholders hosting infrastructure. Adequate sediment, soil and erosion controls will be put in place during ground disturbing works and rehabilitation activities in accordance with the *Managing Urban Stormwater: Soils and Construction- Volume 1* (The 'Blue Book') (Landcom, 2004).

Post-construction rehabilitation requirements and processes will be detailed in the EMS to be prepared prior to commencement of construction of the Project and undertaken in accordance with relevant conditions of the development consent for the Project.

3.5 Development Footprint

The Development Footprint for the Project includes the Permanent and Temporary Development Footprints. The Temporary Development Footprint is the area of land that will be temporarily disturbed during construction of the Project and rehabilitated following construction, whilst the Permanent Development Footprint is the area of land that will remain disturbed throughout the operational life of the Project.

The anticipated worst-case Development Footprint for the Project is approximately 581 ha, comprising approximately 2.6% of the total Project Area.

It should be noted that the impact assessment has been undertaken based on the estimated total Development Footprint associated with the Project, notwithstanding that the Temporary Development Footprint will be rehabilitated at completion of construction. The estimated development footprint for key Project components is outlined in **Table 3-11**.

Table 3-11 Estimated Development Footprint of Key Project Components

Project Component		Permanent Footprint (ha)	Temporary Footprint (ha)[1]	Estimated Footprint (ha)[2]
Wind Farm (WF)	WTG hardstand	95.20	90.94	186.14
	New internal access tracks	237.68	-	237.68
	O&M facility	0.2	0.2	0.4
	Substation (north)	1	0.6	1.6
	Substation (south)	1	0.2	1.2
	BESS	1	0.3	1.3
	Temporary facilities: parking, storage / laydown areas and batching plants	-	14.96	14.96
	Met masts	0.002	0.004	0.006
Total WF		*336.09*	*107.20*	*443.29*
Transmission Line (TL)	330 kV transmission line easement disturbance including unformed access track	66.88	-	66.88
	Underground and/or overhead 33 kV cables[3]	67.1	-	67.1
	Switchyard	1.94	-	1.94
Total TL		*135.91*	*-*	*135.91*
Transport route (TR)	Transport route upgrades	2.2	-	2.2
Total TR		**2.2**	**-**	2.2
Total WF + TL + TR		***474.21***	***107.20***	*581.41*

Notes:
1. Temporary footprint areas are areas that will be rehabilitated after completion of construction.
2. Estimated total footprint includes permanent and temporary footprint areas.
3. Calculation does not include underground 33 kV cables which run parallel to the access track.

3.6 Project Commissioning

The commissioning of the Project will involve checks on all high voltage equipment prior to connection to the existing TransGrid transmission line network. Once the electrical reticulation network has been successfully energised, each WTG will be separately commissioned.

3.7 Project Operation

Upon commissioning, the Project will be operational 24 hours per day, seven days per week. The Project will be monitored and controlled by a remote supervisory control and data acquisition (SCADA) from a control room located within the O&M facility. Where required, assistance from an offsite SCADA engineering team may be sought. The SCADA system is designed to maximise the power output, allow for remote control of the WTGs and monitor the efficiency of the power plant.

While the wind farm will be monitored remotely, the WTG and other equipment will require regular maintenance. Site maintenance will be undertaken by site staff on an ongoing basis with activities scheduled consistently throughout the year. Site maintenance will include maintenance of the WTGs, reticulation network, access roads, substations, and transmission line.

The majority of repairs can be undertaken during routine maintenance; however, circumstances may arise where additional specialist technical maintenance staff are required (e.g. such as unplanned equipment failure). For some WTG components, maintenance or replacement may need to be undertaken using a crane.

Daily maintenance will occur during standard working hours. Outside of emergencies or major asset inspection or maintenance programs, night works or work on Sundays or public holidays will be minimal.

3.8 Workforce

Approximately 16 long-term service and maintenance jobs will be created during Project operation to be based in the Walcha area. Operation of the Project will require a range of skills including engineering, trades (electrical, mechanical, construction), operators and administrative staff.

As discussed in **Section 3.3.8**, the O&M facility will provide an office and other staff amenities (i.e. toilet, kitchen, first aid, potable water supply etc.). Permanent parking facilities will be provided adjacent to the O&M facility to accommodate up to 20 light vehicles onsite. Carpooling arrangements to minimise light vehicle traffic generation will be implemented where practicable (refer **Section 755585216.505.755585216.505** for further discussion).

3.9 Decommissioning and Rehabilitation

The WTGs have an expected operating life of up to 30 years, at the end of which there are three main options for consideration:

- Continue the use of the site as a wind farm using the existing WTGs (subject to condition of equipment);
- Replace the WTGs with technology current at that time and continue the use of the site as a wind farm for a further term; or
- Decommission the Project and remove the WTGs and ancillary infrastructure in accordance with the Environmental Management Strategy (EMS) which will be prepared for the Project.

When decommissioning occurs:

- Key stakeholders including landholders will be consulted;
- All above ground structures not required for the ongoing agricultural use of the land, including the WTGs, transformer stations, and substation, will be removed and the land rehabilitated to ensure it can be returned to agricultural use;
- Access tracks and hardstands not requested by the landowner to be retained will be removed and land rehabilitated and returned to agricultural use;
- Below ground infrastructure, including cabling and the WTG foundations, will be left *in situ* to avoid further disturbance and minimise clearing of revegetated areas. The infrastructure will be removed to a minimum of 0.5 m below the ground surface and where required will be covered in clean fill material and topsoil prior to revegetation. Rehabilitated areas will be adequately graded to reflect the slope of the surrounding area and to mitigate the risk of soil erosion.

All materials removed from the Project Area will be sorted and packaged for reuse and/or recycled where possible in accordance with the waste hierarchy.

A Decommissioning and Rehabilitation Plan will be prepared for the Project no less than five years prior to decommissioning and / or in accordance with any project approval requirements. It is anticipated that the decommissioning and rehabilitation phase would take up to 18 months to complete, with the Project Area being returned, as far as practicable, to its condition prior to the commencement of construction.

The Proponent has entered long-term lease agreements with the associated landholders for the construction and operation of the Project. The terms of these agreements make express provision for the Proponent's decommissioning obligations. Until decommissioning is complete, lease fees are payable to the associated landholders.

A preliminary Decommissioning and Rehabilitation Assessment has been prepared for the Project and is included in **Appendix S**.

3.10 Indicative Timeline

The construction phase of the Project is expected to last approximately 24 to 30 months with a peak construction period of 9 to 10 months. Following set up of temporary construction compound areas and ancillary facilities, the upgrade of existing access tracks and construction of new access tracks will be the first construction activities, followed by the phasing of the WTG assembly and installation.

Table 3-12 outlines an indicative timeline for the proposed Project.

Table 3-12 Indicative Timeline

Stage of Proposal	Estimated Date of Completion
Construction start	Late 2023
Mechanical completion	Late 2025
Testing/commissioning completion	Early 2026
Decommissioning	2056 or later subject to approval

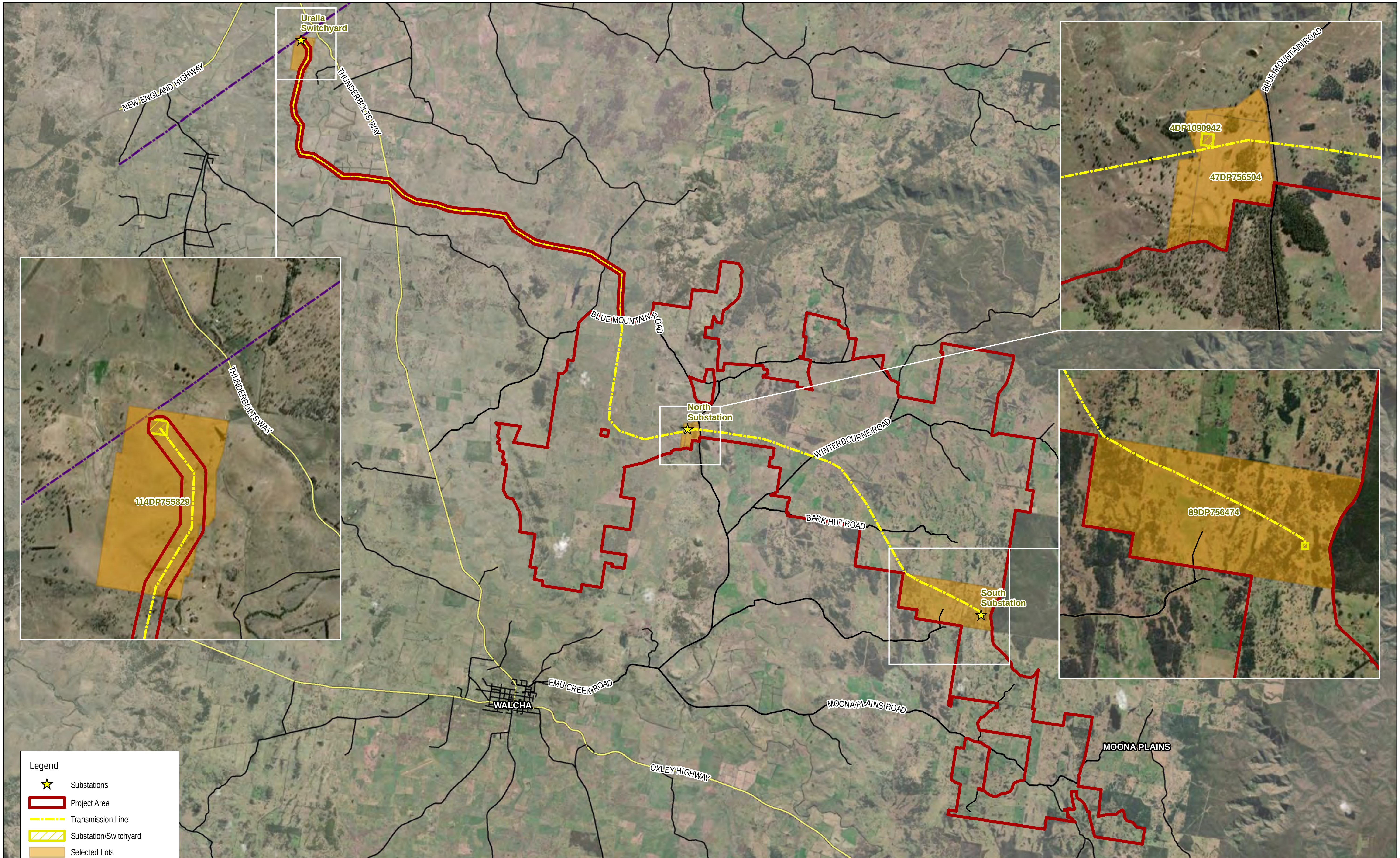
3.11 Future Land Subdivision

TransGrid requires freehold title to the switchyard lot(s) in order to proceed with the construction of the relevant electrical connections and infrastructure. The Project would require the future creation of title(s) in a subdivision of Lot 114 of DP755829 to enable land ownership of the switchyard assets to be transferred to TransGrid. TransGrid will obtain freehold title through either transfer, dedication or acquisition.

The Project may require the creation of title(s) to enable land ownership of the substation assets as follows:

- North substation: Lot 47 of DP756504 and Lot 4 of DP1090942; and
- South substation: Lot 89 of DP756474.

Figure 3-33 identifies the potential subdivision(s).



Potential Subdivision(s)

F3-33

Drawing No: 0526676s_WWF_EIS_G009_R5.mxd	Winterbourne Wind Farm Environmental Impact Assessment
Date: 04/11/2022 Drawing Size: A3	
Drawn By: VN Reviewed By: DMS	Client: WWPL
Coordinate System: GDA 1994 MGA Zone 56	This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM

3.12 Community Benefit Fund

The Proponent intends to establish a Community Benefit Fund (CBF) to fund a broad range of projects and programs for the benefit of the community. The Proponent intends to provide $1,000,000 to the CBF at the commencement of construction, and $750,000 per annum for the life of the Project based on a 600 MW development. For each MW installed above 600 MW, the Proponent would increase the contribution by $1000. The proponent would propose that a committee comprised of local community members, representatives from each Council, and a representative from Vestas be established to review applications/proposals for funding. This committee would make recommendations to Council for allocation of funds from the CBF. The broad intention of the CBF is that funds would be allocated to support non-profit organisations, community programs/events, local businesses, training, and services/infrastructure. The contributions are proposed to be split between with 90% going to the Walcha LGA and 10 % to the Uralla LGA (10%). This division corresponds to the relative geographic/infrastructure split of the proposed project within each LGA.

The CBF would be managed through a Voluntary Planning Agreement (VPA) with Walcha Shire Council and Uralla Shire Council. The VPA will be governed by Subdivision 2, of Division 7.1 of Part 7 of the EP&A Act. The VPA will document the obligations of the Proponent to make initial and ongoing contributions to a CBF. The CBF will be administered by Walcha Shire Council, with provision for annual indexation to CPI, for the operational life of the project through to project decommissioning. The VPA will document Walcha Council’s obligations to hold and pay the funds, to establish a committee to provide recommendations for allocation of funds, and to conduct an annual audit of the funds management.

4. STATUTORY CONTEXT

This section outlines the key statutory requirements for the Project under the Environmental Planning and Assessment Act 1979 and other relevant NSW and Commonwealth legislation.

4.1 Power to Grant Approval

Approval for the Project is sought under Part 4, Division 4.7 of the EP&A Act, which outlines the approval pathway for development deemed to be SSD. Section 4.36(2) of the EP&A Act states:

> *(2) A State environmental planning policy may declare any development, or any class or description of development, to be State significant development.*

Relevant SEPPs include *State Environmental Planning Policy (Planning Systems) 2021* (Planning Systems SEPP) and *State Environmental Planning Policy (Transport and Infrastructure) 2021* (Transport and Infrastructure SEPP).

Under the provisions of section 2.6(1) of the Planning Systems SEPP, a development is classified as SSD if:

> *(a) the development on the land concerned is, by the operation of an environmental planning instrument, not permissible without development consent under Part 4 of the Act, and*
>
> *(b) the development is specified in Schedule 1 or 2.*

Schedule 1, section 20 in Chapter 2 of the Planning Systems SEPP determines 'electricity generating works' to be SSD if it meets the following criteria:

> *Development for the purpose of electricity generating works or heat or their co-generation (using any energy source, including gas, coal, biofuel, distillate, waste, hydro, wave, solar or wind power) that:*
>
> *(a) has a capital investment value of more than $30 million*

The term "capital investment value" is not specifically defined in the Planning Systems SEPP. However, clause 2.2(3) of the Planning System SEPP provides that words and expressions used in Chapter 2 of the Planning Systems SEPP have the same meaning as they have in the standard local environmental planning instrument prescribed by the *Standard Instrument (Local Environmental Plans) Order 2006*. In the Dictionary to the standard instrument, 'electricity generating works' is defined as follows:

> *electricity generating works means a building or place used for the purpose of—*
>
> *(a) making or generating electricity, or*
>
> *(b) electricity storage.*

The Project involves development for the purpose of electricity generating works using wind power, which will have a capital investment value of more than $30 million.

Therefore, the Project is classified as SSD under Part 4 of the EP&A Act.

As such, under s 4.5 of the EP&A Act and section 2.7 of the Planning Systems SEPP, the consent authority is the Minister for Planning and Homes unless any of the following circumstances applies, in which case the consent authority is the Independent Planning Commission:

- Walcha Council or Uralla Shire Council makes a submission by way of objection under the mandatory requirements for community participation;
- at least 50 submissions (other than from a council) are made by way of objection under the mandatory requirements for community participation; or
- the Proponent has disclosed a reportable political donation.

4.2 Permissibility

The permissibility of wind farm developments in NSW is determined by the Transport and Infrastructure SEPP.

Section 2.36(1) of the Transport and Infrastructure SEPP states that 'electricity generating works' may be carried out with development consent on land within a prescribed rural, industrial or special use zone. The Project Area is zoned in its entirety as RU1 – Primary Production under the *Walcha Local Environmental Plan 2012* (Walcha LEP) and the *Uralla Local Environmental Plan 2012* (Uralla LEP).

As RU1 is a prescribed rural zone, the Project is permissible with consent under the provisions of section 2.36(1) of the Transport and Infrastructure SEPP. The construction of the transmission line and switching station is permissible as infrastructure that is ancillary to the dominant use (i.e., the wind farm).

4.3 Other Approvals

Other approvals required under relevant NSW and Commonwealth legislation are detailed in **Table 4-1.**

Table 4-1 Other Required Approvals

Approval Category	Legislation	Requirement
Consistent Approvals Section 4.42 of the EP&A Act outlines that these approvals cannot be refused if necessary for carrying out an approved SSD and are to be consistent with the terms of the SSD approval.	*Roads Act 1993* (NSW)	The Project will require consent from the appropriate roads authority under section 138 of the *Roads Act 1993* for any works undertaken on public roads. The impacts of the Project on roads and traffic are assessed in the TIA (refer **Section 6.4** and **Appendix J**).
	POEO Act	Under the provisions of schedule 1, section 16 of the POEO Act, activities requiring an EPL include crushing, grinding or separating of materials. Under the provisions of schedule 1, section 17 of the POEO Act, activities requiring an EPL include *"electricity works (wind farms)".* Accordingly, an EPL will be required for the Project.
Native Title	*Native Title Act 1993* (Cth)	Under section 13 of the NT Act, an individual can apply to the Federal Court for a determination of native title. A review of the potential for native title found no native title claims over the Project Area (refer **Section 6.6**, **Appendix O**).
EPBC Act Approval	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)	Approval from the Minister for the Commonwealth Department of Environment and Water is required for any action that will, or is likely to have a significant impact on one or more Matters of National Environmental Significance (MNES). The Project was referred under the EPBC Act (EPBC Ref: 2020/8734) and was determined to be a controlled action on 31 August 2020. Supplementary SEARs were issued detailing the requirements of the Commonwealth for the EIS. The Project will be assessed in accordance with the bilateral assessment agreement *Amending Agreement No. 1.* As such, it will be assessed in the manner specified in Schedule 1 to that Agreement including addressing the matters outlined in Schedule 4 of the *Environment Protection and Biodiversity Conservation Regulations 2000* (EPBC Regulations). The controlling provisions that apply to the Project under the EPBC Act were determined to be:

Approval Category	Legislation	Requirement
		■ World Heritage properties (sections 12 and 15A); ■ National Heritage places (sections 15B and 15C); ■ Listed threatened species and communities (sections 18 and 18A); and ■ Listed migratory species (sections 20 and 20A). Refer **Section 6.1, Appendix G** .
Other Approvals / Requirements	*Water Management Act 2000* (NSW)	The Project will require water access licences under the *Water Management Act 2000*. The Soils and Water Assessment (refer **Section 6.8**, **Appendix P**) provides a further discussion on water access licences.
	Conveyancing Act 1919 (NSW)	The final development footprint will require a lease from the owners of the affected land. Lease of a wind farm site is treated as a lease of premises regardless of whether the lease will be for more or less than 25 years. The Proponent will register a plan of subdivision with respect to the wind farm site. Therefore, there will be no basis upon which the Registrar-General may refuse to register the lease under s 23F of the *Conveyancing Act 1919* (NSW).
	Biodiversity Conservation Act 2016 (NSW)	Part 7, s7.9 of the BC Act specifies that 'an application for development consent under Part 4 of the EP&A Act' for SSD must be accompanied by a BDAR report 'unless the Planning Agency Head and the Environment Agency Head determine that the proposed development is not likely to have any significant impact on biodiversity values'. The BDAR (refer **Section 6.1**, **Appendix G**) has been prepared to accompany the EIS and provides a discussion of the management and protection of listed threatened species of native flora and fauna and Threatened Ecological Communities (TECs). The BDAR assesses biodiversity offsets consistent with the Biodiversity Offset Scheme. Given the Project is SSD, entry into the Biodiversity Offset Scheme is automatically triggered.
	Local Government Act 1993 (NSW)	The *Local Government Act 1993* (LG Act) outlines processes for local government and sets out the powers of local councils. Approval is required under section 68 of the LG Act to carry out water supply and sewerage work. Water tanks and septic or pump out sewage may be installed at the O&M Facility for which approval from Walcha Council will be sought.
	Crown Land Management Act 2016 (NSW).	The Project Area includes Crown paper roads. The Project Area also includes a Crown land parcel (Lot 98 DP 721203) (refer **Figure 3-7**), as discussed in **Section 3.2.1.2**. Access rights, in the form of easements or licences, will be obtained as required in relation to all Crown paper roads and land in accordance with the processes contained in the *Crown Land Management Act 2016* (CLM Act).
Approvals not required under SSD Section 4.41 of the EP&A Act states the following approvals; permits etc. are not required for an approved SSD.	*Fisheries Management Act 1994* (NSW)	The Project will not require a dredging or reclamation work permit under section 201, a marine vegetation regulation of harm permit under section 205, or a passage of fish not to be blocked permit under section 219.
	Heritage Act 1977 (NSW)	The Project will not require a Part 4 approval to carry out an act, matter or thing referred to in section 57(1), or an excavation permit under section 139 (refer **Section 6.7**, **Appendix O**).

Approval Category	Legislation	Requirement
	National Parks and Wildlife Act 1974 (NSW)	The Project will not require an Aboriginal heritage impact permit under section 90 (refer **Section 6.6**, **Appendix O**).
	Rural Fires Act 1997 (NSW)	The Project will not require a bushfire safety authority under section 100B, as the development does not involve subdivision for residential or rural residential development. A Bushfire Risk Assessment has been prepared as part of the EIS (refer **Section 6.5.2, Appendix L**).
	Water Management Act 2000 (NSW)	The Project will not require a water use approval under section 89, a water management work approval under section 90, or an activity approval (other than an aquifer interference approval) under section 91.

4.4 Mandatory Matters for Consideration

The consent authority is required to consider a range of matters when deciding whether to grant consent for the Project. These are referred to as mandatory considerations, which are detailed in **Table 4-2**.

Table 4-2 Mandatory Considerations

Statutory Reference	How the Project Meets These
Considerations under the EP&A Act and Regulation	
Section 1.3 - Objects of the Act	Pursuant to section 1.3 of the EP&A Act, the Project meets the objectives of: Section 1.3 (a) as it will allow for the existing land use to continue, while providing associated landowners with an additional source of income. Section 1.3(b) as it will facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in the preparation of this EIS (**Section 7.4**). Section 1.3(c) this EIS has assessed the potential impacts of the project in accordance with the requirements of relevant policy and guidelines, and will provide an economic stimulus to the region through employment, sourcing of local materials, plant and equipment, and the establishment of a Community Benefit Fund (**Section 6**). Section 1.3(e) as it has considered impacts to biodiversity values and has avoided or minimised these through design refinements and recommended mitigation measures (**Section 6.1, Appendix G**). Section 1.3(f) as it has considered impacts to built and cultural heritage values and has avoided or minimised these through design refinements and recommended mitigation measures (**Section 6.6, Section 6.7, Appendix O**). Section 1.3(g) as it has considered visual and landscape impacts and has avoided or minimised these through design refinements or mitigation measures (**Section 6.3, Appendix I**). Section 1.3(h) as it has considered all relevant aspects in the design of buildings associated with the Project, including the health and safety of proposed occupants of buildings (**Section 3.3.8**). Section 1.3 (i) as it has worked and engaged with both State and local government through the development of the Project to date (**Section 5.2, Appendix D**). Section 1.3 (j) as it has worked and engaged with the community and stakeholders through the development of the Project to date (**Section 5.2**).
Section 4.15 - Evaluation	This EIS has considered the relevant provisions of the Planning Systems SEPP, Transport and Infrastructure SEPP, Resilience and Hazards SEPP, Walcha LEP and Uralla LEP (**Section 2.1**). This EIS has considered the likely impacts of the development, including environmental impacts on both the natural and built environment, and social and economic impacts (**Section 6**) in the locality. This EIS has and will continue to consider any submissions made in accordance with the Act or the regulations, and the public interest.

Statutory Reference	How the Project Meets These
Considerations under other legislation	
Civil Aviation Regulations 1988 (Cth)	An Aviation Impact Assessment has been undertaken to support the Project (refer **Section 6.5.1**, **Appendix K**).
Radio Communications Act 1992 (Cth)	An EMI assessment has been undertaken for the Project (refer **Section 6.5.5; Appendix N**).
Biodiversity Conservation Act 2016 (NSW)	A BDAR pursuant to section 7.14 of the BC Act has been undertaken for the Project (refer **Section 6.1**, **Appendix G**).
Considerations under relevant Environmental Planning Instruments (EPIs)	
State Environmental Planning Policy (Resilience and Hazards) 2021 – Chapter 3 Hazardous and offensive development *Chapter 4 Remediation of land*	Chapter 3 of Resilience and Hazards SEPP assesses the potential hazards associated with the Project by providing definitions and guidelines for hazardous industry, offensive industry, hazardous storage establishments, and offensive storage establishments. In accordance with section 3.7 of the Resilience and Hazards SEPP, consideration has been given to current circulars or guidelines published by DPE relating to hazardous or offensive development, including: ■ *Hazardous Industry Planning Advisory Paper No 3 – Risk Assessment* ■ *Hazardous Industry Planning Advisory Paper No 12 – Hazards* Refer to **Section 6.5.4** and/or **Appendix M** for further detail. Chapter 4 of the Resilience and Hazards SEPP promotes the remediation of contaminated land for the purpose of reducing the risk of harm to human health or any other aspect of the environment. Under section 4.6 of the Resilience and Hazards SEPP, a consent authority is required to consider whether a proposed development site is affected by soil or other contaminants before granting consent. The Soils and Water Assessment (**Section 6.8, Appendix P**) provides a further discussion on the potential contamination risk associated with the Project. Noting the agricultural land use across the Project Area, the assessment considered the historical land use that may have resulted in contamination within and surrounding the Project Area.
State Environmental Planning Policy (Biodiversity and Conservation) 2021 – Chapter 3 Koala habitat protection 2020	Chapter 3 of the Biodiversity and Conservation SEPP aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas. Chapter 3 applies to land zoned *RU1 – Primary Production* Zone within the Walcha LGA and Uralla LGA, as defined in Schedule 1 of *State Environmental Planning Policy (Koala Habitat Protection) 2021* (Koala SEPP 2021). Schedule 1 of Koala SEPP 2021 also provides that the Project is located within the Northern Tablelands Koala Management Area. The proposed works include the removal of up to 429.9 ha of native vegetation, and of this, 206.2 ha is considered to be Koala habitat. The impact of the Project on the koala and koala habitat is detailed and assessed in the BDAR (**Section 6.1, Appendix G**).
State Environmental Planning Policy (Primary Production) 2021	The Primary Production SEPP contains planning provisions to manage primary production and rural development, including supporting sustainable agriculture for the protection of prime agricultural land of state and regional significance, as well as regionally significant mining and extractive resources. The Project will not impede agricultural use of the land.
State Environmental Planning Policy (Transport and Infrastructure) 2021	Transport and Infrastructure SEPP provides greater consistency and flexibility in the development of key transport and infrastructure works. Relevantly, Section 2.36(1) provides that the development of electricity generating works may be carried out with consent in a prescribed rural zone, which includes the *RU1 – Primary Production* Zone.
State Environmental Planning Policy (Planning Systems) 2021	**Section 4.1** describes that the Project has met the relevant criteria under the provisions of the Planning System SEPP for it to be classified SSD.
Walcha Local Environmental Plan 2012	The Project is consistent with the provisions of the Walcha LEP 2021 as demonstrated in **Section 2.1**.

Statutory Reference	How the Project Meets These
Uralla Local Environmental Plan 2012	The Project is consistent with the provisions of the Uralla LEP 2021 as demonstrated in **Section 2.1**.
Considerations under Development Control Plans	
Walcha Development Control Plan 2019	The *Walcha Development Control Plan 2019* (Walcha DCP) is the relevant DCP that supports the controls contained within the Walcha LEP under the provisions of Division 3.6 of the EP&A Act. Under section 2.10 of the Planning Systems SEPP, DCPs do not apply to SSD projects.
Uralla Development Control Plan 2011	The *Uralla Development Control Plan 2011* (Uralla DCP) is the relevant DCP that supports the controls contained within the Uralla LEP under the provisions of Division 3.6 of the EP&A Act. Under section 2.10 of the Planning Systems SEPP, DCPs do not apply to SSD projects:

4.4.1 Consideration of Local Environmental Plans

4.4.1.1 Clause 1.2 – Aims of Plan

The aims of the Walcha LEP that are relevant to the Project include:

Part 1, Section 1.2, 2 (a)-

> *To encourage orderly management, development and conservation of resources by protecting, enhancing and conserving-*
>
> *i. Land of significance for agricultural purposes;*

Part 1, Section 1.2, 2 (c)-

> *To facilitate development for a range of business enterprise and employment opportunities; and*

Part 1, Section 1.2, 2 (d)-

> *To ensure development is sensitive to both the economic and social needs of the community…*

The aims of the Uralla LEP relevant to the Project are:

Part 1, Section 1.2, 2 (a)-

> *To encourage orderly management, development and conservation of resources by protecting, enhancing and conserving-*
>
> *i. Land of significance for agricultural purposes;*

Part 1, Section 1.2, 2 (c)-

> *To facilitate development for a range of business enterprise and employment opportunities; and*

Part 1, Section 1.2, 2 (d)-

> *To ensure development is sensitive to both the economic and social needs of the community…*

Part 1, Section 1.2, 2 (e)-

> *To ensure that development has regard to the principles of ecologically sustainable development as has regard to areas subject to environmental hazards and development constraints.*

The Project meets the aims of the Walcha LEP and Uralla LEP as the proposed layout has been designed to maximise the use of existing disturbed areas and to avoid or minimise impact to identified biodiversity and Aboriginal cultural heritage values, and land of significance for agricultural purposes. Progressive design iterations for the turbines, ancillary infrastructure, and the transmission line corridor have continued with key drivers being measures to minimise and avoid environmental and social impacts in line with the Avoid-Minimise-Mitigate-Offset design hierarchy.

Further, the Project will create a range of social and economic benefits which will create substantial capital investment in Walcha, Uralla and the broader New England region, as further discussed in **Section 7.1**. The Proponent commits to implementing a Community Benefit Fund for the life of the Project as described in **Section 3.12**.

A discussion of the principles of ESD is provided in **Section 7.4**.

4.4.1.2 Objectives of Zone RU1 – Primary Production

The objectives of the Walcha LEP and Uralla LEP RU1 Land Zone that area relevant to the Project include:

- To permit development of non-agricultural land uses that are compatible with the character of the zone.

Electricity generating works are permitted with consent on land zoned RU1.

The Project meets the objectives of the RU1 Zone under the Walcha LEP and Uralla LEP, as it will primarily be developed on agricultural land, which has been previously generally disturbed and/or historically cleared. Wind farms are very much compatible with existing farming operations as the turbines occupy only a small amount of land, and landowners are able to continue normal grazing or cropping activities adjacent to these.

The Project will further provide a diversified income stream for rural landholders and neighbours through payments to host landholders and the Neighbour Benefit Fund. The income provided to landowners hosting wind farm infrastructure can help make farms more resilient to the impacts of droughts, fires and commodity price fluctuations.

4.5 Section 4.15 Considerations

When undertaking an assessment of a development application, a consent authority is required, pursuant to section 4.15 of the EP&A Act, to take into consideration a range of matters. The EP&A Act requires that both the natural and built environments and the social and economic impacts in the locality are considered.

The matters outlined in section 4.15(1) have been considered in **Table 4-3** in order to summarise the likely impacts of the Project on the natural and built environment.

Table 4-3 Section 4.15(1) Assessment

Matter for Consideration	Comment
a) the provisions of – (i) any environmental planning instrument.	The provisions of relevant EPIs relating to the Project are summarised and addressed in the statutory compliance table in **Appendix C**
a) the provisions of – (ii) any proposed instrument that is or has been the subject of public consultation under this Act and that has been notified to the consent authority (unless the Planning Secretary has notified the consent authority that the making of the proposed instrument has been deferred indefinitely or has not been approved).	There are no draft environmental planning instruments relevant to the Project
a) the provisions of – (iii) any development control plan.	Development control plans do not apply to SSD under the provisions of section 2.10 of the Planning Systems SEPP. It is noted that the Uralla DCP does not contain guidance on wind farm development, and as such, has not been considered further
a) the provisions of – (iii) any planning agreement that has been entered into under section 7.4, or any draft planning agreement that a developer has offered to enter into under section 7.4.	A Community Benefit Fund is being discussed with Walcha Council. This is further discussed in **Section 3.12**.

Matter for Consideration	Comment
a) the provisions of – (iv) the regulations (to the extent that they prescribe matters for the purposes of this paragraph).	The provisions of the EP&A Regulation and their relevance to the Project are addressed within **Appendix C.** Clause 61 of the EP&A Regulations provides Additional matters that consent authority must consider. None of these matters are relevant to the project.
(b) the likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality.	Assessment of the key environmental and social impacts relating to the Project is provided in **Section 6**, and the corresponding specialist assessments that accompany the EIS.
(c) the suitability of the site for the development.	The suitability of the Project Area for the purposes of a wind farm is discussed in **Section 2**.
(d) any submissions made in accordance with the Act or the regulations.	The EIS will be placed on exhibition by DPE for a minimum period of to 28 days and submissions will be considered by the consent authority during the assessment of the Project.
(e) the public interest.	The EIS and supporting specialist assessments have concluded that the Project is compatible with the existing agricultural uses evident in the area, can appropriately manage potential environmental and social impacts, and accords with the planning and environmental provisions relevant to the Project Area. The principles of sustainable development are key to decision-making processes concerning the development of new energy resources. A key principle underlying the notion of sustainable development is the concept of intergenerational equity. Intergenerational equity is premised on the idea that “the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations”. Intergenerational equality relating to energy production has two requirements: 1) Sustainable mining and use of fossil fuels; and 2) Increasingly substitute energy sources that result in less greenhouse gas emissions for energy sources that result in more greenhouse gas emissions. As a result, the Project is regarded to be in the public interest.

5. STAKEHOLDER ENGAGEMENT

This section provides an overview of the engagement activities carried out before and during the preparation of the EIS. It also provides indicative community engagement planned in the future should the project be approved.

5.1 Introduction

Stakeholder engagement is an integral part of any major development. As part of the development of the Project and preparation of the EIS, consultation has been and will continue to be undertaken with a range of stakeholders including various local and NSW Government agencies, the local community, special interest groups and neighbouring and proximate landholders.

The Proponent is committed to ensuring public concerns and comments are considered, and that attempts are made to avoid, minimise or mitigate potential impacts to the extent possible. **Section 2.2** provides a discussion of amendments made to the Project based on feedback received from stakeholders.

5.2 Engagement Conducted

The *Undertaking Engagement Guidelines for State Significant Projects* (DPIE, 2021b) require upfront and ongoing engagement for all State significant projects.

A Stakeholder Engagement Strategy was prepared for the Project in June 2020. Stakeholder and community engagement for the Project is led by ERM communication and engagement specialists who are trained in best practice methodologies under the International Association for Public Participation. All Project neighbours within 4.55 km of the Project Area were directly engaged, and will continue to be directly engaged through the Project development.

5.2.1 Engagement Objectives

The objectives of the Project as contained in the Stakeholder Engagement Strategy were created prior to the *Social Impact Assessment Guideline: For State Significant Projects* (SIA Guidelines) released in July 2021; however, the Stakeholder Engagement Strategy has been adapted to ensure consistency with the community participation objectives contained in the SIA Guidelines.

The key objectives of the Project's consultation and engagement process are to:

- Develop and maintain positive working relationships with Project stakeholders;
- Proactively identify, understand and manage issues and concerns raised by stakeholders through effective two-way engagement;
- Ensure stakeholders have access to balanced, objective, timely and up-to-date information about the Project and the planning and environmental assessment process;
- Identify and respond to stakeholder issues and concerns, ensuring there are various mechanisms and multiple opportunities for stakeholders to provide feedback on the Project and to inform the Project design;
- Identify long-term community needs and design initiatives that can lead to well-designed support programs for the long-term benefit of the community;
- Ensure compliance with consultative requirements under the SEARs, *Undertaking Engagement Guidelines for State Significant Projects* (DPIE, 2021) and other relevant planning instruments and guidelines;
- Develop a social licence to operate; and

- Ensure stakeholders are adequately informed and have sufficient understanding of:
  - The justification and need for the Project;
  - The well proven technology proposed as part of the Project;
  - How the Project may affect them and how they can be involved in the approval process;
  - How their views are considered in a meaningful way and used in Project planning, refinement, mitigation measures and monitoring and management frameworks;
  - The benefits of the Project, including local investment and employment, reduced GHG emissions, replacement of aging coal fired generation in the NSW context;
  - How the Project can contribute to the local community;
  - How the Project complies with relevant regulatory requirements and policies; and
  - How the requirements of the SEARs and technical assessment lead to further information to be taken into consideration to remove, reduce and offset impacts and improve social and environmental outcomes while maintaining a viable Project.

5.2.2 Stakeholder Identification

Key stakeholders identified as potentially having an interest in the Project are listed in **Table 5-1**. Representatives from each of these stakeholder groups have been engaged with.

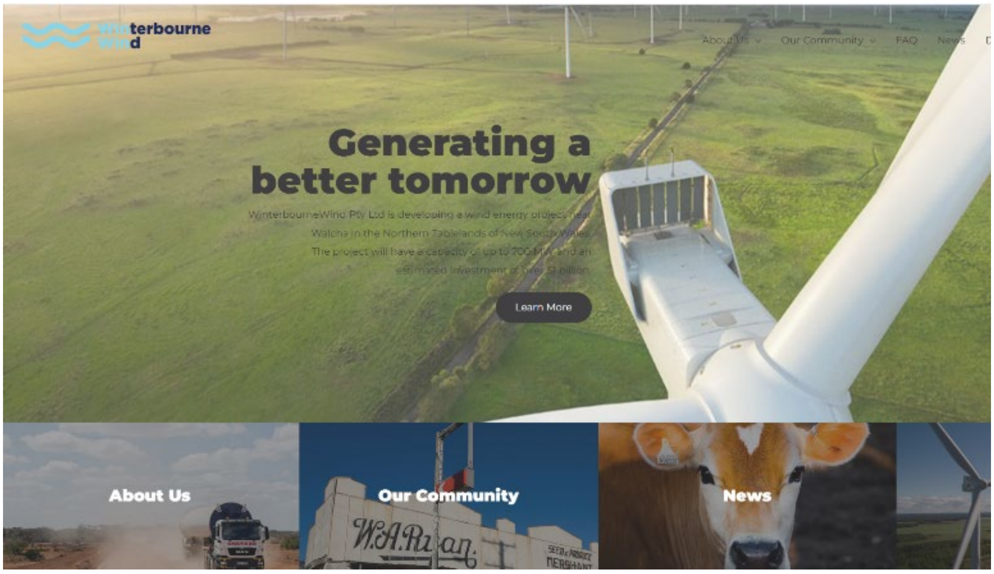
Table 5-1 Key Stakeholders

Stakeholders	Specific Parties
Host landowners	Landowners who have agreed to host infrastructure.
Immediate neighbours	Neighbouring dwellings within 5 km of a potential turbine location.
Aboriginal communities	Traditional Owners, Registered Aboriginal Parties (RAPs) and Aboriginal groups, Summervale Village community (Walcha), Amaroo Local Aboriginal Land Council, Armidale Local Aboriginal Land Council, NSW Aboriginal Land Council, Aboriginal Affairs NSW, Native Title Service Provider for Aboriginal Traditional Owners.
Surrounding communities	Community members who live outside of the 5 km radius of a potential turbine site. The 2021 Community Open Day survey found that there was community interest in the Project beyond a 15 km radius of the Project.
Local community organisations and businesses	New England North West NSW Business Chamber, local business (especially tourism or agriculture), Country Women's Associations, Lions & Rotary Clubs, local action groups, tourism organisations.
Local council, state and federal elected members	Walcha Council Mayor, General Manager and elected councillors, State Member for Tamworth, Federal Member for New England.
State and federal representatives and agencies	Transport for NSW, Department of Planning and Environment, Department of Premier and Cabinet, National Parks and Wildlife Service, NSW Local Land Services, NSW Environmental Protection Authority, Crown Lands, Regional NSW – Mining, Exploration and Geoscience, Department of Primary Industries, TransGrid, Telco Authority, Northern Tablelands Local Land Services, Forestry Corporation, Fire and Rescue NSW, NSW Rural Fire Service, Department of Defence, Civil Aviation and Safety Authority, Airservices Australia, Regional Development Australia, Australian Energy Infrastructure Commissioner (Commissioner), emergency service departments, Office of the Registrar of the Aboriginal Land Rights Act, National Native Title Tribunal
Local media	Apsley Advocate, Walcha News, Local ABC, The Northern Daily Leader, The Armidale Express.
Local schools, religious organisations, clubs	Primary and high schools, such as Walcha Central School and St Patrick's School Walcha. Local churches, such as Saint Andrews Anglican Church, Walcha Presbyterian Church and Walcha Catholic Church. Sporting organisations, such as Walcha Rugby Union Football Club and Walcha Bowling and Recreation Club.
National / state media	National and state newspapers, radio and television.

5.2.3 *Engagement Approach*

A range of engagement tools were deployed to engage with and seek feedback from the various stakeholders as detailed in **Table 5-2**.

Table 5-2 Engagement Approach

Approach	Description
Community Consultative Committee	A Project Community Consultative Committee (CCC) was formed in March 2021. The CCC provides a forum for open dialogue between the Proponent and representatives of the community, stakeholder groups and local councils on issues directly relating to the Project. The CCC has held six (6) CCC meetings to date. The meeting presentations and minutes are available from the Project website: https://www.winterbournewindfarm.com.au/downloads/
Stakeholder Briefings	Specific, targeted meetings were held to discuss the Project and facilitate in-depth engagement and transfer of Project information. This included meetings with various regulatory authorities, as well as with individuals, special interest groups, sensitive receptors and neighbouring properties.
Newsletter	Newsletters help ensure that there is a consistent external message presented on key issues and progress of the Project. Newsletters were sent directly to stakeholders via the local newspaper (Apsley Advocate) and direct mail; published on the Project website, and distributed via an email distribution list throughout preparation of the EIS. The Apsley Advocate and direct mailing distribution reaches approximately 1,925 recipients in the 2354 and 2358 postcodes. The email distribution list includes approximately 100 recipients. Since March 2020, ten newsletters have been prepared and distributed. The newsletters are available from the Project website: https://www.winterbournewindfarm.com.au/downloads/
Media Engagement	Media engagement through media releases and responding to media enquiries.
Website	In mid-January 2020, the Proponent launched a Project website. The website is specific to the Project, and includes links to planning submissions, project updates, newsletters, CCC meeting minutes and presentations, and frequently asked questions (FAQs). The website is: www.winterbournewindfarm.com.au 

Approach	Description
Social Media	A Facebook page and a LinkedIn page were created in January 2020. Regular posts are made to each platform to share project updates and key information, including dates of upcoming community engagement. As of July 2022, the Facebook page has 105 followers, and the LinkedIn page has 123 followers. The Facebook page is: https://www.facebook.com/profile.php?id=100057177711303 The LinkedIn page is: https://www.linkedin.com/company/winterbourne-wind-farm/?viewAsMember=true
Community Open Day 2021	An open invitation was extended to the community to attend Community Open Day sessions on 10 December and 11 December 2021. The sessions enabled stakeholders to speak to members of the Project Team, ask questions and provide feedback. The format of the Community Open Day was a 'drop-in session' with key project information presented on boards and summarised in a FAQ hand-out booklet. Two video presentations alternated in the background, with one providing an overview of the proposed Project while the other demonstrated typical wind farm construction activities. Additionally, the Project's specialist noise expert set up a noise simulator outside of the venue to demonstrate predicted noise levels from the operation of the wind farm at various distances. A total of 68 community members attended the Community Open Days. **Photo 5-1 Community Open Day 2021** 

Approach	Description
	Photo 5-2 Community Open Day 2021 
Walcha Show 2020, 2021, 2022	The Proponent provided a booth over two days at each of the Walcha Show 2020, the Walcha Show 2021, and the Walcha Show 2022. Information was presented on poster boards at all three events, and several members of the project team were available to answer questions and provide information about the Project. The Proponent provided giveaways, held raffles, and sponsored community events at each Show, including the Wood Chopping competitions (2020 and 2021) and the Cattle Dog competition (2022).

Photo 5-3 Information Booth at the Walcha Show 2020

Photo 5-4 Information Booth at the Walcha Show 2021

Photo 5-5 Information Booth at the Walcha Show 2022

Approach	Description
Farmers Market 2021	The Proponent provided a booth at the Walcha Farmers Market in May 2021. Information was presented on poster boards and handout pamphlets, and several members of the project team were available to answer questions and provide information about the Project.
Community Surveys	Four surveys have been prepared which aimed to identify community sentiment towards the Project, as well as to capture community feedback. The surveys were distributed at the Walcha Show 2020, Walcha Show 2021 and Walcha Show 2022, and the Community Open Days in December 2021.
Direct Enquiries	Throughout preparation of the EIS, stakeholders have been able to make direct enquiries to the Project team through the following channels: ■ Phone: 1800 252 040 (business hours only); ■ Email: info@winterbournewindfarm.com.au; ■ Website: https://winterbournewindfarm.com.au/contact-us/; and ■ Post: Level 4, 312 St Kilda Rd, Southbank VIC 3006.
Emails, Phone Calls and Video Calls	The Project Team has liaised with relevant government agencies and community stakeholders via email correspondence and phone calls throughout the scoping phase of the Project and the preparation of the EIS (refer **Section 5.3**). Video calls and phone calls were an important medium to communicate during the COVID 19 lock-down and periods of restricted regional travel.
Technical Specialist Engagement	Specific technical issues raised during consultation have been considered as part of the technical studies, as relevant.
FAQ Booklet	In December 2021, an FAQ booklet was prepared to present key information about Project to help answer common queries and concerns. Hard copies of the FAQ were made available at the Community Open Day 2021 and the Walcha Show 2022. The FAQ booklet is available from the Project website: https://www.winterbournewindfarm.com.au/downloads/

A significant number of individual and group meetings and public information events have been conducted since Project inception. Some of the more significant community consultation events are summarised in **Table 5-3**, while Government and other stakeholder engagement are summarised in **Appendix D**.

Table 5-3 Summary of Community Consultation

Date	Consultation Activity
2 October 2019	Information evening for host landowners
October 2019-December 2020	Neighbour Consultation: Extensive engagement with project neighbours, including 100 engagements (phone, email, in-person)
28 November 2019	Landowner visit to Sapphire Wind Farm in Glen Innes, NSW
11 December 2019	Information evening for host landowners
13-14 March 2020	Information booth at the Walcha Show 2020
1 November 2020	Proponent opens local Walcha office
January-June 2021	Neighbour Consultation: Extensive engagement with Project neighbours, including 131 engagements (phone, email, in-person)
12-13 March 2021	Information booth at the Walcha Show 2021
18 March 2021	CCC meeting #1
22 April 2021	WinterbourneWind Office Open Day
15 May 2021	WinterbourneWind stall at Farmer's Market
7 June 2021	CCC meeting #2
23 June 2021	Information evening for host landowners
June-December 2021	Neighbour Consultation: Extensive engagement with project neighbours, including 405 engagements (phone, email, in-person)
6 September 2021	CCC meeting #3
1 November 2021	CCC meeting #4
10-11 December 2021	Community Open Days held at Walcha Bowling Club. The Proponent staff, technical experts, and information displays available to community.
January-April 2022	Neighbour Consultation: Extensive engagement with project neighbours, including 64 engagements (phone, email, in-person)
2 February 2022	CCC meeting #5
11-12 March 2022	WinterbourneWind information booth at the Walcha Show 2022
2 May 2022	CCC meeting #6

5.3 Community Views

Throughout the engagement activities described in **Section 5.2**, the Project development team received feedback on a variety of issues from the community as summarised in **Table 5-4**. The majority of interest was received from community members that were within 5 km of the project, with moderate interest from community members that resided between 5 and 100 km form the Project.

Table 5-4 Community Views

Theme / Topic	*Comment Raised*	*Where addressed*
Strategic Context	^Decreased reliance on coal	Section 3, Section 7
	^Reliable and cheaper access to power	
Design	Location of the wind farm is too close proximity to Walcha	Section 2
	Number of turbines proposed too large	Section 2, Section 7
	Why proposed turbines reduced from 126 to 119	Section 6.1.4, Section 7.2
	How size, location, type and colour of the turbines were selected to ensure minimal visual impact	Section 2, Section 6.3
	Proposed height / size of turbines should be reduced	Section 3
	Wind farm will create an industrial landscape in Walcha	Section 6.3
	^Reduction in proposed turbine height from 250 m to 230	Section 6.3, Section 7.2
Statutory issues	^Interest in being a property host for Biodiversity Offsets	Section 5
Community engagement	^During the Community Open Days 2021, many community members found that listening to the noise simulation machine mitigated their noise impact concerns	
	Community member believed there had been lack of engagement with Walcha Council	
	Request to see more members of the community on the CCC	
	A community member claimed that neighbours of White Rock Wind Farm and Crookwell Wind Farm had complained that noise levels from these projects are louder than what was projected in the EIS	
Economic, environmental and social impacts		
Biodiversity	Impacts associated with bird strike and local bat habitat. Particular concern was given to the Wedge Tail Eagle, as the Oxley Wild Rivers National Park is a breeding ground for this species	Section 6.1
	Impacts on biodiversity, including threatened species, particularly given proximity to Oxley Wild Rivers National Park	
	Impacts on the Koala and relevant findings from ecological surveys	
	Extent of vegetation and habitat clearing and mitigation of impacts	

Theme / Topic	Comment Raised	Where addressed
Noise & Vibration	Increased noise associated with construction and operation of the wind farm	Section 6.2
Landscape & Visual	View of turbines from local residences given specific local context including topography and vegetation.	Section 6.3
	View of turbines from areas of public interest, including from the Walcha township, Old Brookmount Road, Oxley Highway, Emu Creek Road, Thunderbolts Way, and from public viewpoints within the Oxley Wild Rivers National Park	
	Visual impact of transmission line in rural setting	
	^Many community members responded to the photomontages presented at the Community Info Day positively, citing that the turbines appeared to ‘blend’ into their surrounds	
	^Turbines will improve the visual amenity of the landscape (e.g. symbol of a cleaner future)	
Traffic & Transport	Road safety concerns for walkers, joggers, and bike riders using Darjeeling Road	Section 6.4
	Traffic impact on school children on bus runs, particularly at the Walcha Showgrounds	
	Capacity of local roads to accommodate increased traffic volumes	
	Construction traffic damaging local roads and commitment from Proponent to undertake road dilapidation surveys and other mitigation measures	
	Increase in commute time for regional workers and transport services (e.g. livestock, general freight) over 2 year construction period	
	Impact on emergency services during construction period	
	Cumulative impact on roads	
Hazards – Aviation	Need for aviation lighting	Section 6.5.1
Heritage	Process to be followed around management of cultural artefacts identified during site surveys	Section 6.6
Soil & Water	Water use volumes and sources	Section 6.8
Waste	Volume of turbine waste	Section 6.11
	Will the turbine blades be able to be recycled and where is the proposed burial site for the turbine blades	
	Concrete foundations left in situ perceived as litter and will reduce amenity	

Theme / Topic	Comment Raised	Where addressed
Social & Economic	Concern regarding how the town will support the influx of construction workers, particularly around accommodation	Section 6.12
	Decrease in tourism	
	Impacts to community identity	
	What does the Proponent have in place to create local jobs that stay in Walcha and which are not serviced from larger centres (Tamworth, Armidale etc.)	
	Claims that wind farms in Victoria increased rent	
	The Project creating divided views within the community	
	Change from a ‘rural community’ to an ‘industrial energy hub’	
	Exclusion from Neighbour Benefit Fund while turbines are in view	
	^Opportunity for new business, and support existing business in the local area (e.g. work wear shops, hospitality industry etc.)	
	^Financial benefits	
	^Young people joining the community	
Cumulative Impact	Cumulative impact of other proposed development within the region impacting road network	Section 6.14
Decommissioning	Cost of decommissioning at end of life of the Project	Section 3.9
	Responsibility of decommissioning at end of life of the Project	
	Decommissioning process and liability of council and landholders in the event of the developers failing to make adequate provision /plans to cover the cost of decommissioning and rehabilitation	
	One community member enquired about the establishment of a fund to cover decommissioning costs	
	Decommissioning process and liability of council and landholders in the event of the developers failing to make adequate provision /plans to cover the cost of decommissioning and rehabilitation	

5.4 Engagement to be Conducted

Ongoing engagement with stakeholders will be undertaken during the EIS exhibition and assessment phase. This engagement will be in accordance with the *Undertaking Engagement Guidelines for State Significant Projects* (DPIE, 2021b), which require that engagement is open and inclusive, easy to access, relevant, timely and meaningful.

This engagement will include:

- Ongoing meetings with Walcha Council and Uralla Shire Council;
- Project updates to the Project CCC;
- Maintaining the Project website and other social media channels for the Project;
- Project updates uploaded to Project website and advertised in the Apsley Advocate local newspaper;
- Continuation of consultation with community and regulatory stakeholders via various forums, including meetings, presentations, drop-in sessions, attendance at community events;
- Ongoing monitoring of 1800 phone, email and post box for complaints and other feedback from the community; and
- Regularly monitor, review and adapt the Stakeholder Engagement Strategy over time to ensure it remains effective and encourages community participation. The effectiveness will be judged against the provisions of the Undertaking Engagement Guidelines for State Significant Projects (DPIE, 2021b), community and stakeholder feedback. Reviews will be conducted at least annually, or as necessary based on information obtained through engagement activities.

6. ASSESSMENT OF IMPACTS

This Section 6 provides an assessment of impacts relevant to each aspect as detailed in the SEARs and Supplementary SEARs. Unless stated otherwise, the impact assessment has been under within the Development Site (i.e., Development footprint plus a 100 m buffer either side).

6.1 Biodiversity

6.1.1 Introduction

A Biodiversity Development Assessment Report (BDAR) was prepared by NGH and is provided in **Appendix G**. The BDAR assessed the potential impacts associated with the Project to biodiversity values and identifies mitigation and risk management measures to be implemented during construction and operation of the Project to minimise these impacts.

The BDAR addresses the project-specific SEARs issued in September 2020 as well as Supplementary SEARs provided by DAWE.

The BDAR is supported by a *Land Category Assessment* and *Desktop Haulage Route Upgrade Risk Assessment* (both Appended to the BDAR).

The BDAR was prepared accordance with the following:

- *Biodiversity Conservation Act 2016* (NSW) (BC Act);
- *Biodiversity Conservation Regulation 2017* (NSW);
- Biodiversity Assessment Method (BAM) (DPIE, 2020b) applies to the Project under the transitional provisions in section 6.31 of the *Biodiversity Conservation Regulation 2017*;
- *Developments adjacent to National Parks and Wildlife Service Lands* (DPIE, 2020e); and
- EPBC Act.

6.1.2 Methodology

6.1.2.1 Study Areas

The biodiversity features and values associated with the Project have been assessed through desktop and field methods at various scales.

The *Development Footprint* is defined as the area of land that is directly impacted by the Project and includes areas where vegetation may be removed. It captures all temporary and permanent impact areas required for the Project, from construction through to operation.

Concept design work was completed to confirm a conservative maximum Development Footprint to be assessed. The Project layout presented in this EIS and the Development Footprint derived from it was developed by the Project team, which included wind farm designers and civil designers, with input from ecologists and other specialists to minimise impacts as much as practicable.

The *Development Site* for the biodiversity assessment includes the Development Footprint, plus a 100 m buffer around all areas of the Development Footprint. This is also referred to as the *Study Area*. The Development Site is the area in which Stage 1 of the BAM has been applied to assess the biodiversity values of the land where direct and indirect impacts may occur.

The *Assessment Area* includes all land within a 500 m buffer of the Development Site, as appropriate for linear development under the BAM, for which landscape features such as native vegetation cover, bioregions, waterways and other features are described.

6.1.2.2 Desktop Assessment and Background Sources

The BDAR was based on detailed desktop assessment of key maps, tools and field surveys as detailed in section 1.3 of the BDAR in **Appendix G**.

Based on the desktop review, 48 species were identified as requiring targeted surveys in accordance with the BAM and provisions of the EPBC Act.

6.1.2.3 Field Surveys

Field surveys were carried out between 2019 and 2022 by ecologists from NGH, Nature Advisory and ERM. A full description of the survey methodology is provided in the BDAR (refer **Appendix G**) and is summarised below.

Vegetation Surveys

Plant community delineation and mapping of vegetation zones involved review and field validation of state vegetation mapping (VIS_ID 524, DPIE 2010). Field validation was based on survey events using rapid surveys and collection of representative BAM plots in each vegetation zone. Investigations commenced in 2019 (ERM, 2020) and continued through 2020, 2021 and 2022.

Each field event incorporated the survey of vegetation at locations where distinct Plant Community Types (PCTs) were observed within the Development Site, noting the extent and structure of existing vegetation and dominant species within each stratum. Signs of disturbance such as clearing, fire damage or weed invasion were also noted.

A full detailed description of the survey methodology and the criteria used to assign the vegetation condition classes is detailed in the BDAR (refer **Appendix G**).

Targeted Species Surveys

Targeted surveys for species credit species were undertaken in accordance with Section 5.3, *Threatened Species Survey Requirements* of the BAM, including undertaking surveys during the nominated survey period specified for each species and in accordance with survey guidelines unless otherwise stated. Field surveys were carried out during optimal seasonal conditions and weather conditions. The survey effort, timing and locations for threatened flora and fauna are outlined in the BDAR in **Appendix G**.

Survey methods included:

- Ultrasonic bat call recording;
- Koala Spot Assessment Technique;
- Diurnal bird surveys and Bird Utilisation Surveys (BUS);
- Nocturnal spotlight surveys and transects;
- Nocturnal call playback;
- Arboreal and terrestrial mammal camera trapping;
- Nocturnal aural-visual frog surveys;
- Targeted searches for reptiles;
- Targeted searches for mammals;
- Opportunistic scat searches;
- Two-phase grid-based systematic survey for threatened flora; and
- Hollow-bearing tree density assessment and searches for stick nests.

Field survey effort across the Project Area between 2020 and 2022 with detail on the survey methods and corresponding effort is provided in **Table 6-1**.

Table 6-1 Field Survey Methods and Effort

Survey type	Person hours
BAM plots	714.50
Amphibian and reptile surveys	235.75
Glossy Black-cockatoo & Owl surveys	114.00
Targeted orchid surveys	136.00
Roadside assessments	32.00
Flora surveys	286.25
Threatened eucalypt surveys	157.50
Reptile surveys	48.00
BUS	240.00
White-throated Needletail targeted surveys	120.00
Threatened flora surveys - vegetation mapping	277.50
Fauna habitat surveys	100.00
Threatened flora point searches	106.50
Hollow-bearing tree surveys	95.50
TOTAL	**2,663.50**

6.1.3 Existing Environment

6.1.3.1 Landscape Features

The landscape context for the Project was assessed within the Assessment Area according to Part 4 of the BAM and is detailed in **Table 6-2**.

Table 6-2 Landscape Context for the Study Area

Landscape feature	Description
Interim Biogeographic Regionalisation for Australia (IBRA) bioregion and sub-region	The Project Area falls within the New England IBRA Bioregion and the following three IBRA Subregions: ■ Armidale Plateau ■ Walcha Plateau ■ Yarrowyck – Kentucky Downs
NSW Landscape Regions (Mitchell Landscapes)	NSW Landscape Regions within the Project Area include: ■ Moonbi – Walcha Granites ■ Niangala Plateau and Slopes ■ Tia Tops ■ Uralla Basalts and Sands

Landscape feature	Description
Rivers and streams	There are first order and second order unnamed tributaries located across the Development Site; however, these are generally ephemeral gullies and are characteristic of the ridgeline topography. There are 14 named tributaries classified as Strahler third order or above within the Development Site that are classified as 'key fish habitat' including: ■ Boundary Creek ■ Brookmount Creek ■ Cook Station Creek ■ Dog Trap Creek ■ Draytons Creek ■ Graveyard Creek ■ Grose Creek; ■ Jacks Creek ■ Lambing Flat Creek ■ Mihi Creek ■ Salisbury Waters ■ Snake Creek ■ Stockyard Creek ■ Winterbourne Creek For much of the year these creeks may have no running water.
Wetlands	No Ramsar Wetlands or Nationally Important Wetlands have been mapped within the Assessment Area. There are no mapped wetlands within the Study Area for the wind farm infrastructure or transmission line.
Areas of geological significance	No karsts, caves, significant crevices or cliffs occur within the Assessment Area.
Protected areas	■ There are no protected areas within the Development Site. However, the Oxley Wild Rivers National Park is situated to the east of the Development Site. Carrai National Park and Willi Willi National Park are further to the east of the Project Area. The BDAR assesses potential indirect impacts to the Oxley Wild Rivers National Park (refer **Appendix G**). Impacts were assessed in accordance with Developments Adjacent to National Parks and Wildlife Service Lands (DPIE, 2020), including: − Erosions and sediment control – the Applicant has made commitments through this EIS to implement erosions and sediment control that meets industry guidelines; − Stormwater Runoff – stormwater runoff during construction would be managed though erosions and sediment control practices. Hardstands and other impervious surfaces would be designed to direct stormwater runoff to treatment areas as necessary; − Wastewater – during construction, wastewater (including from the concrete batching plant) would be treated and disposed of at a registered facility. Wastewater during operations would be managed according to Council requirements; − Biosecurity – appropriate construction site hygiene measures would be implemented to prevent entry of new weeds to the area such as the use of wash bays for vehicles; − Bush fire – internal roads would be constructed, including an upgrade of some existing public roads which would facilitate better access to the western perimeter of Oxley Wild Rivers National Park for emergency services personnel. New roads would be all-weather access and of adequate width to enable fire-fighting vehicles to access and manoeuvre. In addition, static water supply would be provided within the Project Area and would be dedicated for use by emergency services (refer section 3.4.4 of **Appendix L**); − Boundary encroachments – all activities will occur within the Project Area assessed in this EIS. APZs would not extend beyond the Project Area;

Landscape feature	Description
	− Amenity – visibility of the Project from the Oxley Wild Rivers National Park is limited due to the distance, local screening factors, and topography (refer **Appendix I**). Noise levels within the Oxley Wild Rivers National Park are 40 dB(A) or less at areas commonly used, therefore Project noise levels would be well within the rise and fall of the ambient environment (refer section 10.2 of **Appendix H**); − Biodiversity connectivity – Patches of woodland provide habitat connectivity between Oxley Wild Rivers National Park and the eastern boundary of the Project. The Project is unlikely to cause obstruction to ecological or biological processes within the Oxley Wild Rivers National Park (refer section 7.5.3 of **Appendix G**), and opportunities for creating more linkages where practicable would be considered (refer section 8 of **Appendix G**); − Cultural heritage – no activities would occur within the Oxley Wil Rivers National Park, and accordingly impacts to cultural heritage values in the Oxley Wild Rivers National Park are deemed unlikely (refer section 3.3.3 of **Appendix O**); and − Traffic and transport – impact of vehicle strike with fauna during the construction and operation presents a low risk with the implementation of mitigation measures (refer section 5.1.6 of **Appendix G**).
Percent native vegetation cover	Significant clearing has affected about 24% of the Assessment Area, with the remaining 76% mapped as containing woody and non-woody native vegetation.
Connectivity features	Much of the Development Site has been cleared or thinned of native vegetation due to agricultural practices; however, significant tracts of relatively uninterrupted bushland occur along the eastern boundary from Oxley Wild Rivers National Park extending into New England National Park and Werrikimbe National Park. This bushland is a prominent connectivity feature in the landscape. From the east, this connectivity feature extends into the Development Site as areas of intact bush land to remnant trees with a cleared understory. There are no significant core habitat areas to the west of the site that indicate that the Project Area bisects any regional corridor for wildlife moving into and out of the national parks. Sub-regional and local corridors do however exist; for wildlife moving from the Project Area into and out of the national parks, and on a smaller scale, between habitat patches on the site. Waterways also provide connectivity in this landscape.

6.1.3.2 Native Vegetation

The Development Site is characterised by past clearing and ongoing agricultural and farming practices. To determine the type and quality of existing vegetation, all vegetation within the Development Site (4,262.5 ha area) was mapped. The majority (72% or 3,055 ha) of the mapped vegetation within the Development Site is classified as native. The remaining 28% of vegetation (1,208 ha) is classified as non-native vegetation dominated by exotic pasture grasses and weeds (refer **Table 6-3**).

The native vegetation within the development footprint consists of remnant, or less disturbed, treed areas, occurring predominantly at higher elevations where topography and landform are prohibitive to anthropogenic land use. These patches of native vegetation range from low condition (with heavy weed infestation supporting little native species richness or diversity) to high condition (with high native species floristic and structural diversity and low weed infestation).

The non-native vegetation within the Development Site consists of cleared paddocks with improved pasture species. A Land Category Assessment was undertaken to classify the cleared paddocks within the Study Area as Category 1 (exempt land) or Category 2 (regulated land), based on the presence of exotic (refer Appendix D to the BDAR). Any land classified as Category 1 Land is considered non-native and is excluded from further assessment under the BAM (with the exception of prescribed impacts as stated in Section 6 of the BC Act). Based on the Land Category Assessment, 1,208 ha of the Study Area was classed as Category 1 Land.

Table 6-3 Vegetation Condition Class within Development Footprint

Vegetation classes	Development Site (ha)	Percentage of mapped vegetation in the Development Site
New England Dry Sclerophyll Forests in treed and derived native grassland conditions	1,365.7	32.04%
New England Grassy Woodlands in treed and derived native grassland conditions	1,385.3	32.50%
Northern Tableland Wet Sclerophyll Forest in treed and derived native grassland conditions	152.7	3.58%
Montane Bogs and Ferns	17.5	0.41%
Tableland Clay Grassy Woodland in treed and derived native grassland conditions	133.5	3.13%
Category 1 land – not native, dominated by exotic pasture grasses and weeds.	1,207.8	28.34%
TOTAL	**4,262.5**	**100%**

Following floristic surveys, 10 native PCTs were identified within the Development Site, in various vegetation zones based on condition classes as defined in the BDAR in **Appendix G**:

- 1194: Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest on ranges of the NSW North Coast Bioregion and eastern New England Tableland Bioregion;
- 997: New England stringybarks - peppermint open forest of the New England Tableland Bioregion;
- 970: Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tableland Bioregion;
- 766: Carex sedgeland of the slopes and tablelands;
- 568: Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion;
- 567: Broad-leaved Stringybark - Yellow Box shrub/grass open forest of the New England Tableland Bioregion;
- 565: Silvertop Stringybark - Mountain Gum grassy open forest of the New England Tableland Bioregion;
- 534: New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion;
- 526: Mountain Ribbon Gum - Messmate - Broad-leaved Stringybark open forest on granitic soils of the New England Tableland Bioregion; and
- 510: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion.

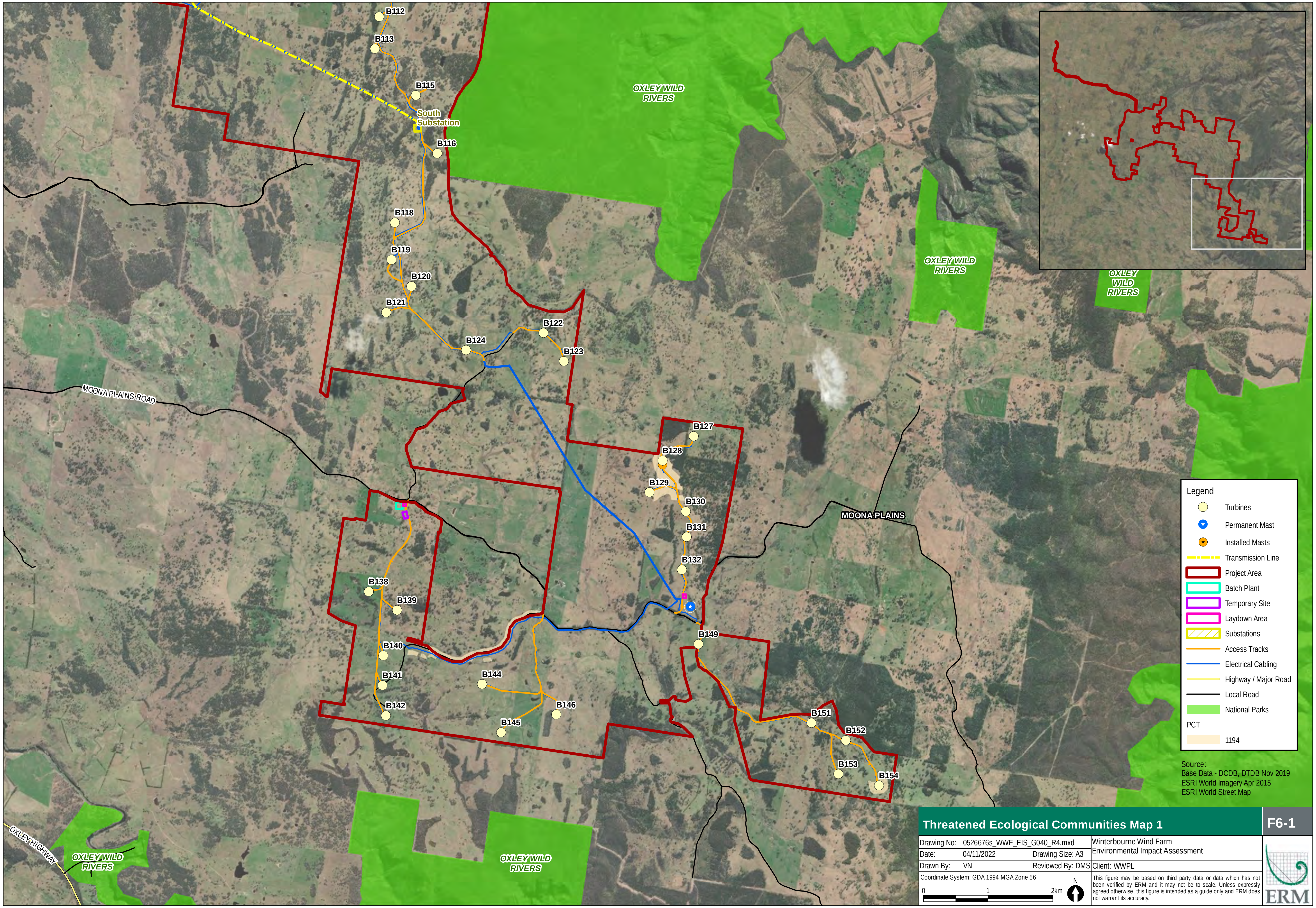
6.1.3.3 Threatened Ecological Communities

Field surveys and ground-truthed vegetation mapping confirmed the presence of three Threatened Ecological Communities (TEC) listed under the BC Act and/or the EPBC Act within the Development Footprint and detailed in **Table 6-4** and shown in **Figure 6-1**, **Figure 6-2**, **Figure 6-3** and **Figure 6-4**.

Table 6-4 Threatened Ecological Communities within the Development Footprint

PCT	TEC scientific name	Conservation status		Area (ha)
		EPBC	BC Act	
PCT 534 New England Peppermint grassy woodland on sedimentary or basaltic substrates of the New England Tableland Bioregion	New England Peppermint (*Eucalyptus nova-anglica*) Woodland on Basalts and Sediments in the New England Tableland Bioregion	CE	CE	14.4
PCT 510 Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion	White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions	CE	CE	20.1
PCT 1194 Snow Gum - Mountain Gum - Mountain Ribbon Gum open forest on ranges of the NSW North Coast Bioregion and eastern New England Tableland Bioregion	Ribbon Gum—Mountain Gum—Snow Gum Grassy Forest/Woodland of the New England Tableland Bioregion	E	-	23.6

[1]*CE = Critically endangered; E = Endangered.*



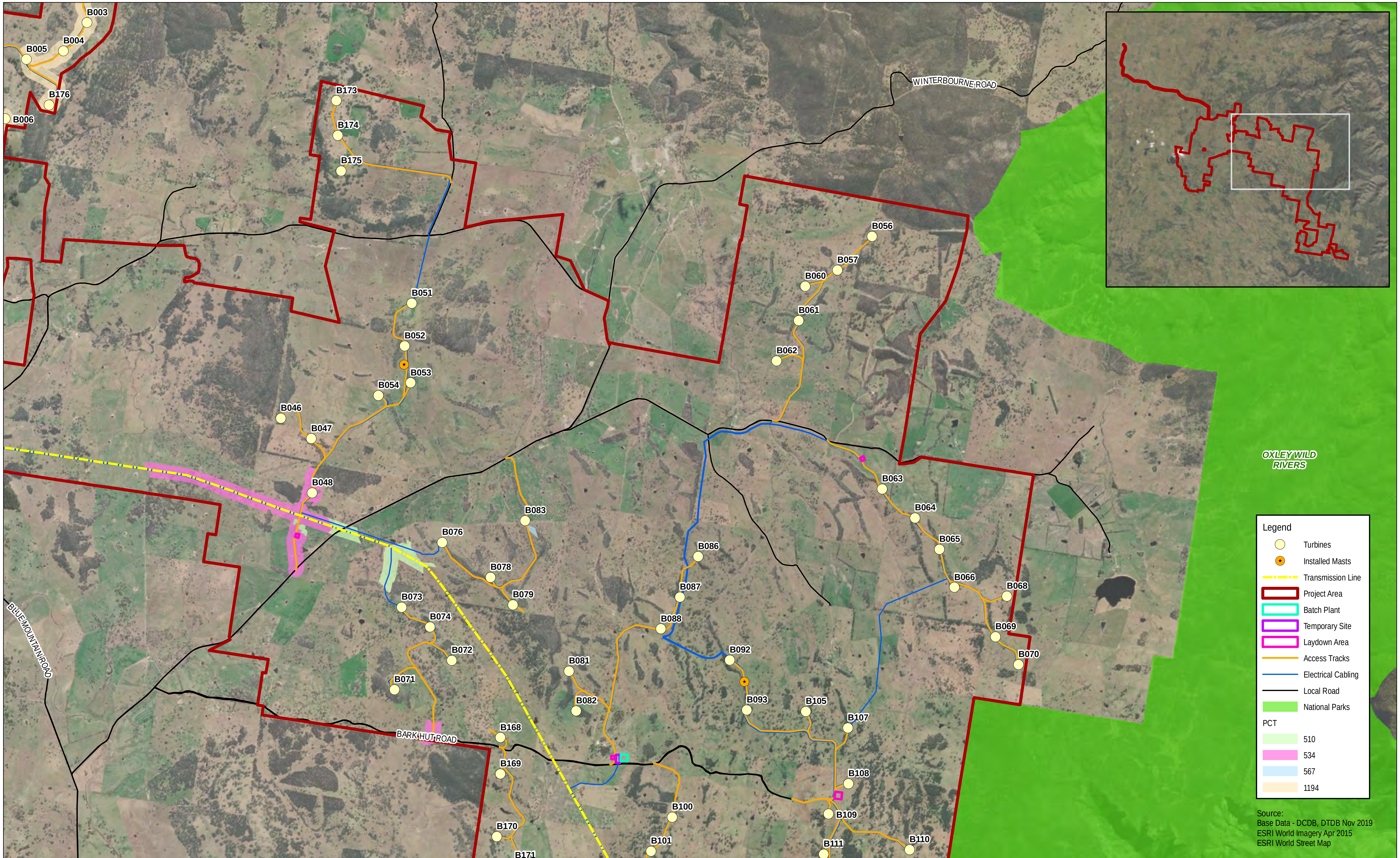
Threatened Ecological Communities Map 1

F6-1

Drawing No: 0526676s_WWF_EIS_G040_R4.mxd		Winterbourne Wind Farm Environmental Impact Assessment
Date: 04/11/2022	Drawing Size: A3	
Drawn By: VN	Reviewed By: DMS	Client: WWPL

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

1



Threatened Ecological Communities Map 2

F6-2

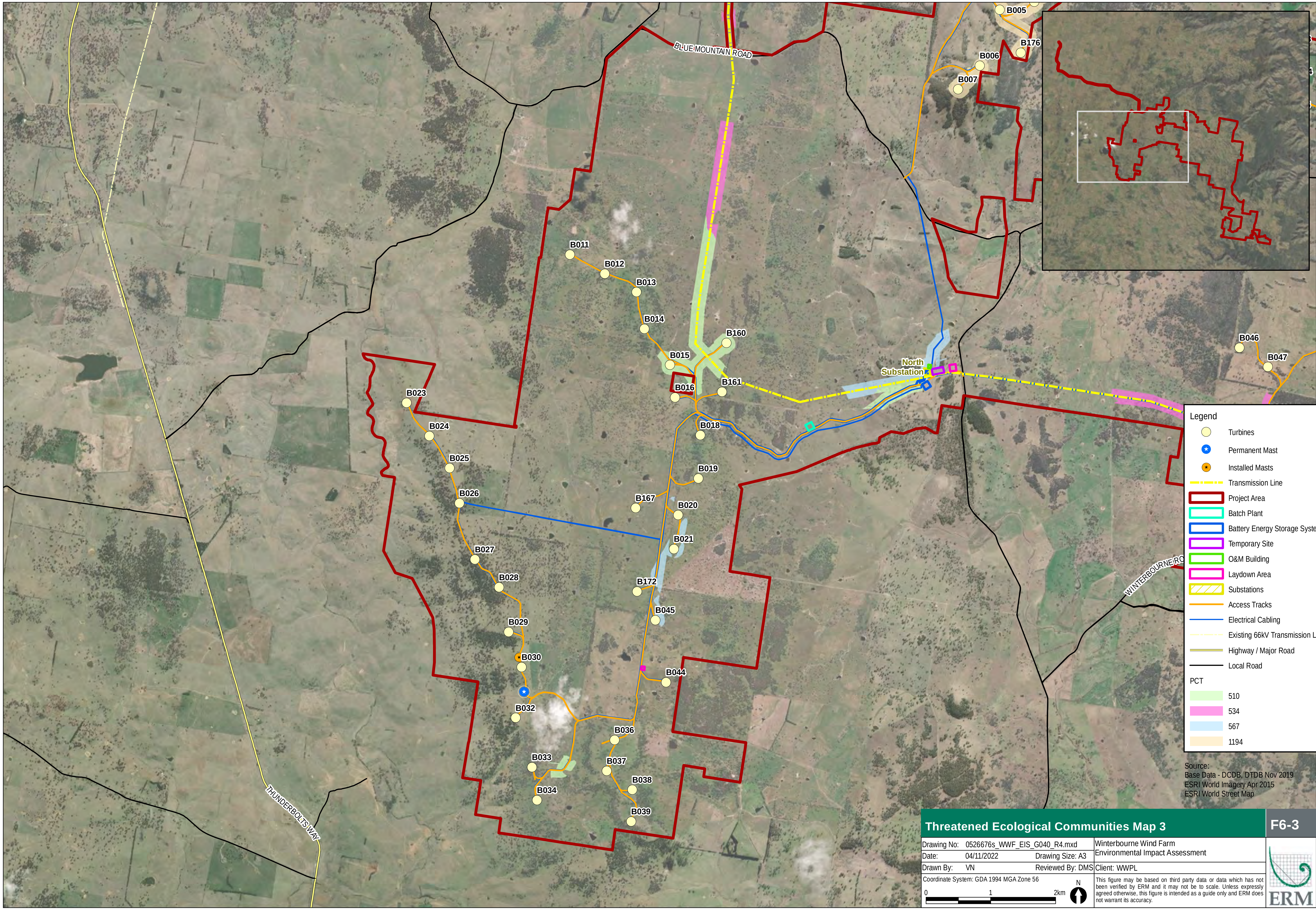
Drawing No:	0526676s_WWF_EIS_G040_R4.mxd		Winterbourne Wind Farm Environmental Impact Assessment
Date:	04/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: DMS	Client: WWPL

Coordinate System: GDA 1994 MGA Zone 56

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM

2


BLUE MOUNTAIN ROAD
THUNDERBOLTS WAY
WINTERBOURNE RO
B005
B176
B006
B007
B011
B012
B013
B014
B015
B016
B018
B019
B020
B021
B023
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B030
B032
B033
B034
B036
B037
B038
B039
B044
B045
B046
B047
B160
B161
B167
B172
North
Substation
Legend
Turbines
Permanent Mast
Installed Masts
Transmission Line
Project Area
Batch Plant
Battery Energy Storage System
Temporary Site
O&M Building
Laydown Area
Substations
Access Tracks
Electrical Cabling
Existing 66kV Transmission Line
Highway / Major Road
Local Road
PCT
510
534
567
1194
Source:
Base Data - DCDB, DTDB Nov 2019
ESRI World Imagery Apr 2015
ESRI World Street Map
Threatened Ecological Communities Map 3
F6-3
Drawing No: 0526676s_WWF_EIS_G040_R4.mxd
Date: 04/11/2022
Drawing Size: A3
Drawn By: VN
Reviewed By: DMS
Coordinate System: GDA 1994 MGA Zone 56
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Winterbourne Wind Farm
Environmental Impact Assessment
Client: WWPL
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
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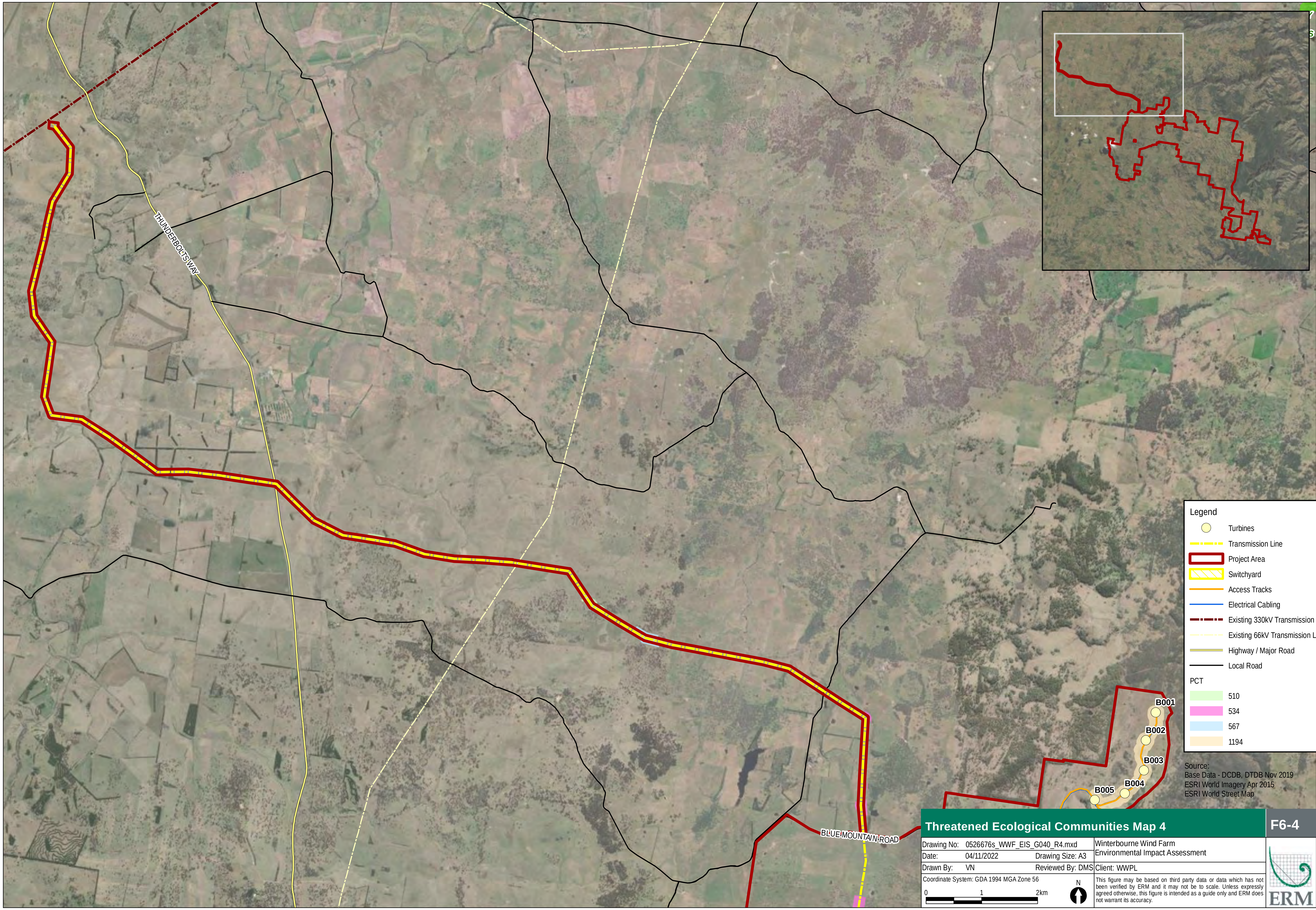


Threatened Ecological Communities Map 4

F6-4

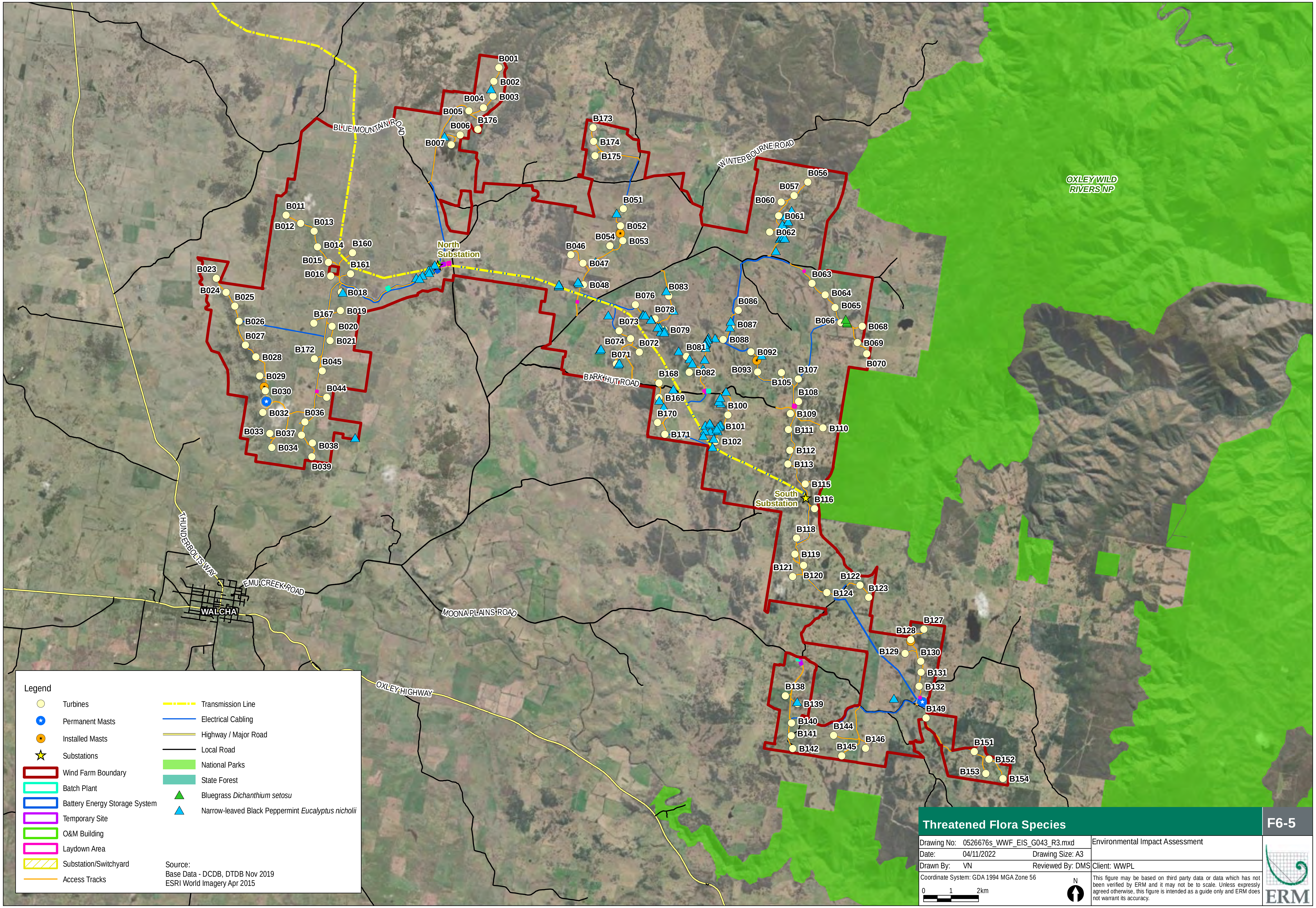
Drawing No:	0526676s_WWF_EIS_G040_R4.mxd		Winterbourne Wind Farm Environmental Impact Assessment
Date:	04/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: DMS	Client: WWPL
Coordinate System: GDA 1994 MGA Zone 56			This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM

4

6.1.3.4 Threatened Flora Species

Two (2) threatened flora species, Narrow-leaved Black Peppermint (*Eucalyptus nicholii*) and Bluegrass (*Dichanthium setosum*), were identified within the Development Footprint (refer **Figure 6-5**).



Threatened Flora Species

F6-5

Drawing No: 0526676s_WWF_EIS_G043_R3.mxd		Environmental Impact Assessment
Date: 04/11/2022	Drawing Size: A3	
Drawn By: VN	Reviewed By: DMS	Client: WWPL
Coordinate System: GDA 1994 MGA Zone 56		This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

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N

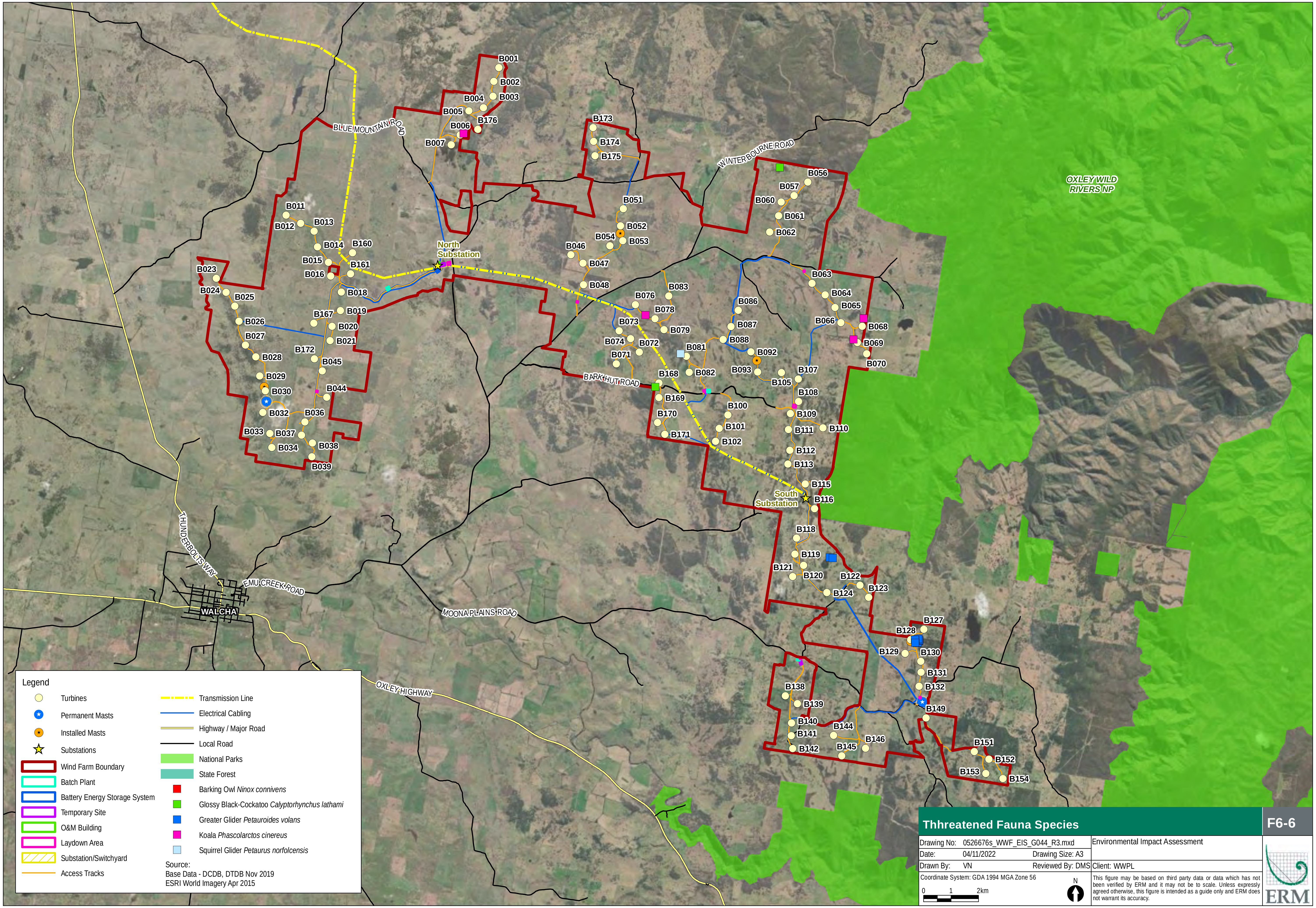
ERM

6.1.3.5 Threatened Fauna Species

Based on the desktop review, 54 species were identified as candidate threatened fauna species requiring targeted surveys in accordance with the BAM and provisions of the EPBC Act. Of these, six were excluded due to geographical and habitat constraints. Under the BAM all threatened entities are allocated to one of two biodiversity credit classes: ‘ecosystem’ or ‘species’ credit species:

> *Ecosystem credit species are species where the likelihood of occurrence of a species or elements of the species’ habitat can be predicted by PCT and landscape features, or for which targeted survey has a low probability of detection.*
>
> *Species credits species are species where the likelihood of occurrence of a species or elements of suitable habitat for that species cannot be confidently predicted by PCT and landscape features, and can be reliably detected by survey. The BAM requires either a targeted species survey or an expert report to determine the presence of a species credit species.*

Five threatened fauna species considered species credit species were confirmed during the field investigations for this Project as summarised in **Table 6-5** and **Figure 6-6**.


Thhreatened Fauna Species
F6-6
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Drawing Size: A3
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Reviewed By: DMS
Environmental Impact Assessment
Client: WWPL
Coordinate System: GDA 1994 MGA Zone 56
0 1 2km
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This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM
Legend
Turbines
Permanent Masts
Installed Masts
Substations
Wind Farm Boundary
Batch Plant
Battery Energy Storage System
Temporary Site
O&M Building
Laydown Area
Substation/Switchyard
Access Tracks
Transmission Line
Electrical Cabling
Highway / Major Road
Local Road
National Parks
State Forest
Barking Owl Ninox connivens
Glossy Black-Cockatoo Calyptorhynchus lathami
Greater Glider Petauroides volans
Koala Phascolarctos cinereus
Squirrel Glider Petaurus norfolcensis
Source:
Base Data - DCDB, DTDB Nov 2019
ESRI World Imagery Apr 2015
OXLEY WILD RIVERS NP
North Substation
South Substation
WALCHA
BLUE MOUNTAIN ROAD
WINTERBOURNE ROAD
BARK HUT ROAD
THUNDERBOLTS WAY
EMU CREEK ROAD
MOONA PLAINS ROAD
OXLEY HIGHWAY

Table 6-5 Threatened Species Habitat within the Development Footprint.

Species name	Habitat within the Development Footprint	Area of habitat (ha)
Koala (*Phascolarctos cinereus*)	The Koala Habitat Protection SEPP was used to inform the species polygon for Koala. All woodland zones contain Koala 'use trees' listed for the Northern Tablelands region, and therefore all woodland zones within the Development Site have been included in the species polygon for Koala. This includes all the scattered trees that were entered into the BAM-C.	206.9
Greater Glider (*Petauroides volans*)	Habitat for Greater Glider within the Development Footprint is limited to treed areas with good connectivity as the species are poor disperses and unable to traverse large disconnects in canopy. Up to 205.7 ha of potential foraging habitat would be removed within the Development Footprint, which is about 14% of the total available habitat identified within the Development Site (1,487.55 ha). Although foraging resources are poor in quality due to historical disturbance (i.e. bushfire and drought), they may contain forage species preferred by Greater Glider which provide seasonally important resources and provide shelter for the population to move across the landscape. The species polygon for this species incudes areas of all woodland/forest vegetation zones that the species could reasonably be expected to access.	206.5
Squirrel Glider (*Petaurus norfolcensis*)	Habitat for Squirrel Glider within the Development Footprint is limited to treed areas with good connectivity. Up to 205.7 ha of foraging habitat would be removed within the Development footprint, which is 14% of the total available habitat identified within the Development Site (1,487.55 ha). Squirrel Glider was detected aurally (heard warning call) and on a camera trap.	206.5
Glossy Black-cockatoo (*Calyptorhynchus lathami*)	Glossy Black-cockatoo foraging habitat is present in the form of *Allocasuarina sp*. and *Casuarina sp*. One Hollow-Bearing Tree (HBT) large enough to be potential breeding habitat for Glossy Black-cockatoo was recorded within the Development Site. It did not fall within the development footprint area or turbine location but in the outer edge of the Development Site. Glossy Black-cockatoos were observed opportunistically but not detected during targeted stag watches or habitat searches.	33.76
Barking Owl (*Ninox connivens*)	The targeted survey could not rule out the presence of Barking Owl breeding habitat due to the observed presence of the species during field work (outside of the breeding period) and the fact that suitable foraging habitat is also present. To create species polygons, all hollow bearing trees identified within the Development Site were buffered by 100 m, and the resulting area was then clipped to woodland vegetation zones within the Development Footprint and the hectare areas were entered into the BAM-C in order to generate credits for this species. As suitable data indicating hollow sizes was not available, all HBTs were buffered as a precautionary approach.	17.70

6.1.3.6 Bird Utilisation

A BUS was undertaken consistent with the requirements for a "Level One" bird risk assessment in accordance with *Wind Farms and Birds - Interim Standards for Risk Assessment* issued by the Australian Wind Energy Association (AusWEA, 2005) and endorsed by the Clean Energy Council's Best Practice Guidelines for Wind Energy Developments in Australia (2018).

BUS and raptor surveys were undertaken over 3 years and 3 seasons to determine the potential collision risk of the target species recorded flying at the rotor swept area (RSA) height (40-150 m).

The Wedge-tailed Eagle (*Aquilla audax*) and Nankeen Kestrel (*Falco cenchroides*) were both observed regularly flying at RSA height which will lead to interactions with turbines and may result in collisions. The Wedge-tailed Eagle was the most abundant raptor species observed (74.3% of all raptors) utilising the site.

Waterbirds were found to be largely confined to some small farm dams and were mainly common farmland species. One individual was seen flying at RSA height during the surveys.

Four threatened bird species were recorded during BUS, namely Varied Sitella (*Daphoenositta chrysoptera*), Speckled Warbler (*Pyrrholaemus sagittatus*), Diamond Firetail (*Stagonopleura guttata*) and Glossy Black-Cockatoo (*Calyptorhynchus lathami*). None of these species behave in a manner that puts them at risk of collision with operating WTGs. One additional threatened bird species, Little Eagle (*Hieraaetus morphnoides*), was identified incidentally flying over the Project area; however, the level of activity was not considered enough to indicate breeding habitat was present within the Development Site.

The risk associated with WTG collision and indirect effects for the Project, for most assessed bird and bat species, was rated as negligible.

6.1.3.7 Matters of National Environmental Significance

The following EPBC Act listed species and TECs were recorded during surveys undertaken to inform known the EIS:

- Threatened Ecological Communities:
  - New England Peppermint (*Eucalyptus nova-anglica*) Grassy Woodlands;
  - White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland.
- Listed threatened/migratory species:
  - Spotted-tailed Quoll (*Dasyurus maculatus*);
  - Koala (Phascolarctos cinereus);
  - Greater Glider (*Petauroides volans*);
  - Narrow-leaved Black Peppermint (*Eucalyptus nicholii*); and
  - Bluegrass (Dichanthium setosum).

In addition, several other threatened species are thought to have some habitat (foraging) within the Development Site; however, neither these species nor their associated breeding habitats were detected during field surveys. Regardless, an Assessment of Significance was prepared for each of these species:

- White-throated Needletail (*Hirundapus caudacutus*) – foraging habitat above the development site;
- Grey-headed Flying-fox (*Pteropus poliocephalus*) – foraging habitat present onsite, no breeding habitat detected;
- Regent Honeyeater (*Anthochaera phrygia*) – foraging habitat present onsite, no mapped breeding habitat in this locality;

- Fork-tailed Swift (*Apus pacificus*) – migratory foraging habitat present onsite;
- Latham's Snipe (*Gallinago hardwickii*) – migratory foraging habitat present onsite;
- Painted Honeyeater (*Grantiella picta*) - foraging habitat present onsite; and
- Swift Parrot (*Lathamus discolor*) - foraging habitat present onsite, no mapped breeding habitat in this locality.

6.1.3.8 World Heritage Areas

The project is situated to the west of Oxley Wild Rivers National Park, which forms part of the World Heritage-listed Gondwana Rainforest. Under the Natural World Heritage listing criteria, the Gondwana Rainforests are listed under three criteria (vii, ix and x; UNESCO, 2022):

> *(viii) to be outstanding examples representing major stages of earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features.*
>
> *(ix) to be outstanding examples representing significant on-going ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals.*
>
> *(x) to contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation.*

UNESCO (2022) detail the formal Statement of Outstanding Universal Value for the overall World Heritage property. The specific contribution of the Oxley Wild Rivers National Park component to the Outstanding Universal Value (World Heritage value) of the Gondwana Rainforest of Australia is outlined below. This contribution relates to geomorphology, ecological and biological processes, and biodiversity. The natural values of the area, many of which form part of its World Heritage value, are summarised below, along with... other values:

- Diverse plant communities including rainforests, eucalypt forests and woodlands, heath and swamps, some of which are rare and/or restricted;
- Examples of dry, subtropical, warm temperate and cool temperate rainforest types, including an unparalleled sample of the transition of dry rainforest along gradients of moisture, exposure and soil depth;
- Significant areas of old growth including well developed moist forests that contain some of the tallest trees in NSW;
- Areas of tall moist tablelands forest, most of which has been cleared in surrounding lands;
- A large number of threatened fauna species and rare and threatened plant species, the centre of distribution of several restricted and threatened species and limits of distribution of several species; and
- Endemic invertebrate species in the Kunderang Brook Karst System (and probably in the rainforest areas).

Significant landscape values include:

- Spectacular gorges, cliff lines and deep, steep sided valleys illustrating on-going geomorphological processes associated with the Great Escarpment;
- Numerous high waterfalls;
- Panoramic views from locations along the escarpment edge; and
- Attractive tall moist forests and rainforests and diverse vegetation types across the landscape.

World heritage areas are an MNES. The Gondwana Rainforest of Australia is additionally listed as a World Heritage Place on the National Heritage list, which is also an MNES.

The closest proposed turbine location is approximately 1.2 km north of the to the World Heritage Area boundary area is approximately 1.2 km north of the area in the southern part of Project Area.

6.1.4 Assessment of Potential Impacts

6.1.4.1 Avoidance and Minimisation

Measures to avoid and minimise impacts have been included throughout the development of the design for the Project. The current Development Footprint has been designed through numerous iterations which have considered ecological as well as engineering and technical constraints.

Site Selection

The Project area has been selected to balance the social, environmental and economic aspects of the Project and enable an outcome which benefits the community, the region, and NSW.

A number of key factors were assessed to determine site suitability, identifying the Project area as a suitable location. Those specifically relating to biodiversity include:

- Alternative project locations that would avoid or minimise impacts on biodiversity values;
- Alternative modes or technologies that would avoid or minimise impacts on biodiversity values;
- Alternative transport routes for project components that would avoid or minimise impacts on biodiversity values;
- Alternative sites within a property on which the proposal is located that would avoid or minimise impacts on biodiversity values; and
- Suitable existing road access to the wind farm site, minimising the need for clearing for new access.

Wind Farm Layout

Multiple iterations of the layout of the WTG and ancillary infrastructure occurred between 2019 and 2022. Through this process, the total proposed number of WTG was reduced from 130 to 119.

A design workshop was held in June 2021 during which the location of each WTG and ancillary infrastructure was assessed by a multi-disciplinary team including ecologists, landscape architects, engineers and planners. This enabled the Proponent to identify the most appropriate location for each WTG where environmental impacts were avoided and/or mitigated without negatively impacting feasibility from engineering and planning perspectives. The outcome of this workshop resulted in further avoidance and minimisation of impacts to ecological values. The changes in the wind farm layout that occurred between the Scoping Report and EIS are presented in **Table 6-6**.

Table 6-6 Project Design Iterations Responding to Ecological Constraints

Design stage	Key Project elements	Design changes in response to ecological constraints	Enhanced biodiversity outcome
Scoping Report Addendum	V1.0 layout: ■ 130 turbines ■ 746.6 ha native vegetation impacts ■ Project Area 24,000 ha.	n/a	n/a

Design stage	Key Project elements	Design changes in response to ecological constraints	Enhanced biodiversity outcome
Exhibited Project (EIS)	V2.0 layout: ■ 119 turbines ■ 429.9 ha native vegetation impacts ■ Project Area 22,285 ha ■ Development Site 4,425 ha ■ Development Footprint 586.17 ha.	Compared to V1.0: ■ Removed 11 turbines ■ Reduced Project Area by 2,115 ha.	■ Reduced impacts on native vegetation by 316.7 ha ■ Reduced impacts on SAII by 91.1 ha ■ Reduced impacts on TEC by 115.0 ha.

It is noted that access tracks and cabling have been designed to traverse the shortest feasible distance and consider topographic constraints in order to minimise the overall impact area for these services and provide the most cost effective and constructible routes. Where feasible, the access tracks were designed to follow existing farm tracks to reduce biodiversity impact.

The key avoidance and minimisation outcomes resulting from design refinements are summarised as:

- Avoidance of 316.7 ha of native vegetation, reducing impacts on native vegetation by 42%;
- Avoidance of 91.1 ha of habitat of SAII species, reducing impacts on SAII by 68%;
- Avoidance of TEC (which includes areas that are SAII), reducing impacts on TEC by 115 ha; and
- 15 of the 52 identified locations of *E. nicholii* were fully avoided.

Specific examples of design changes due to changes from the June 2021 workshop include:

- Turbine B007 was relocated to reduce impacts on native vegetation;
- Turbines B020 and BO21 were relocated to minimise impacts on SAII;
- Turbine B072 was relocated to avoid native vegetation;
- Turbines B080 and A103 were removed to avoid impacts on ecological values; and
- Turbines B115 and B116 were moved to increase the distance of infrastructure from protected areas.

Access Roads – Construction and Operation

Existing road infrastructure has been prioritised for construction access and operational tracks. This includes locating primary construction access routes along existing public access roads including Winterbourne Road, Bark Hut Road, Hazeldene Road and Blue Mountains Road. Road upgrades required to meet the needs of the Project will be undertaken. These will also provide a benefit to the existing community and surrounding land uses. The alignment of proposed access tracks within the Project Area largely follows existing cleared sections.

6.1.4.2 Significant Impact Assessment – MNES

Under the Agreement Bilateral between the Commonwealth and New South Wales, the EIS must address the items specified in Schedule 4, item 3.01 to the EPBC Regulations 2000, relating to relevant impacts of the action. These are discussed in **Table 6-7**.

Table 6-7 Potential Impacts of the Action

EPBC Regulation Item 3.01 Requirement	Potential Impacts of the Action
(a) A description of the relevant impacts of the action	Potential impacts of the action relevant to MNES include: ■ Modify, destroy, remove, isolate or decrease the availability or quality of threatened species habitat; ■ Disrupt lifecycle (breeding, feeding, migration or resting); and ■ Reduce the area of occupancy of an important population.
(b) A detailed assessment of the nature and extent of the likely short term and long term relevant impacts	A detailed assessment of impacts is provided in Appendix G.
(c) a statement whether any relevant impacts are likely to be unknown, unpredictable or irreversible;	This EIS and Appendix F have been prepared in accordance with relevant legislation and guidelines. As such, it is considered unlikely that relevant impacts are unknown or unpredictable. Clearing of areas of habitat where WTG and other permanent infrastructure will be sighted will be irreversible.
(d) Analysis of the significance of the relevant impacts; and	A significant impact assessment in accordance with the MNES Significant Impact Guidelines 1.1, is provided in **Appendix G**, and summarised below.
(e) Any technical data and other information used or needed to make a detailed assessment of the relevant impacts.	The technical data and information used to make the detailed assessment of impacts is provided in **Appendix G**.

Significant impact assessments have been undertaken for these species and TECs and are provided in **Appendix G**. The assessment was undertaken in accordance with the MNES Significant Impact Guidelines 1.1 (DPE, 2013), and concluded that for:

- New England Peppermint (*Eucalyptus nova-anglica*) Grassy Woodlands, the Project would impact on 14.4 ha, which was considered likely to generate a significant impact to the community;
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland, the Project would impact on 20.1 ha, which was considered likely to generate a significant impact to the community;
- Spotted-tail Quoll *Dasyurus maculatus* the Project would result in the loss of up to 426 ha of potential habitat for this species which may lead to a long-term decrease in the local population, reduce the area of occupancy of the local population and interfere with the recovery of this species, therefore a significant residual impact was considered likely;
- Koala *Phascolarctos cinereus* the Project would result in the loss of up to 206.73 ha of potential habitat for this species which may lead to a long-term decrease in the local population, reduce the area of occupancy of the local population and interfere with the recovery of this species, therefore a significant residual impact was considered likely;

- Greater Glider *Petauroides volans* the Project may lead to impacts on this species relating to malnourishment or decreased reproductive output, therefore a significant residual impact was considered likely;
- Narrow-leaved Black Peppermint *Eucalyptus nicholii* the Project would result in the loss of 13 individuals of this species which may lead to a long-term decrease in the local population, reduce the area of occupancy of the local population, and interfere with the recovery of this species, therefore a significant residual impact was considered likely;
- Swift Parrot *Lathamus discolor* a significant residual impact was considered unlikely;
- Regent Honeyeater *Anthochaera phrygia* a significant residual impact was considered unlikely;
- Painted Honeyeater *Grantiella picta* a significant residual impact was considered unlikely;
- Bluegrass *Dichanthium setosum* a significant residual impact was considered unlikely;
- White-throated Needletail *Hirundapus caudacutus* a significant residual impact was considered unlikely;
- Fork-tailed Swift *Apus pacificus* a significant residual impact was considered unlikely;
- Latham's Snipe *Gallinago hardwickii* a significant residual impact was considered unlikely; and
- Grey-headed Flying-fox *Pteropus poliocephalus* a significant residual impact was considered unlikely.

Impacts would be managed through the BOS under the NSW Bilateral Agreement.

6.1.4.3 Impacts on Existing Environment

Native Vegetation

A total of 429.9 hectares of native vegetation exists within the Development Footprint. It has been conservatively assumed that all this native vegetation will need to be cleared although, as noted, during future iteration of the detailed design the extent of native vegetation required to be cleared during construction may be further reduced.

The 429.9 hectares of native vegetation which is contained in the Development Footprint represents 14% of the approximately 3054.7 ha of native vegetation contained within the Development Site.

Existing vegetation integrity scores for clearing for each vegetation zone are documented in **Table** 6-8**.** All zones would have a future vegetation integrity score of zero.

Table 6-8 Vegetation Integrity Scores within the Development Footprint

Zone ID	PCT/Zone	Area development footprint (ha)	Current vegetation Integrity Score
1	510_DNG* low	8.96	25.4
2	510_Woodland moderate	11.14	64.5
3	526_DNG poor	28.56	5.5
4	526_Woodland high	40.77	60.7
5	534_DNG low	3.32	22.5
6	534_Woodland moderate	11.10	50.3
7	565_DNG moderate	6.19	38.4
8	565_Woodland moderate	13.47	57.2
9	568_Grassland poor	12.84	14.7
10	568_Woodland high	8.77	63.1

Zone ID	PCT/Zone	Area development footprint (ha)	Current vegetation Integrity Score
11	766_Riparian low	1.60	20.8
12	970_Grassland poor	34.84	8.2
13	970_Woodland moderate	37.99	41.5
14	997_Grassland poor	6.03	11.6
15	997_Woodland moderate	10.27	41.6
16	1194_Grassland poor	17.95	12.3
17	1194_Woodland moderate	5.65	58.2
18	567_Grassland TEC	97.12	39.7
19	567_Woodland TEC	31.76	46.0
20	567_Grassland low	2.96	11.1
21	567_Woodland low	35.03	70.7

**Derived Native Grassland (DNG).*

Threatened species

Table 6-9 presents a summary of direct impacts to habitat for threatened fauna within the Development Footprint as assessed in the BDAR. These species are defined as 'species credit species' under the BAM and habitat is mapped separately, as their occurrence in an area cannot be reliably predicted from PCT mapping.

Table 6-9 Direct Impacts to Habitat for Species Credit Species

Species Credit Species	Total impact
Glossy Black Cockatoo (*Calyptorhynchus lathami*)	33.8 ha
Bluegrass (*Dichanthium setosum*)	13.2 ha
Narrow-leaved Black Peppermint (*Eucalyptus nicholii*)	13 trees
Barking owl (*Ninox connivens*)	17.7 ha
Greater glider (*Petauroides volans*)	206.5 ha
Squirrel Glider (*Petaurus norfolcensis*)	206.5 ha
Koala (*Phascolarctos cinereus*)	206.9 ha

Threatened Ecological Communities

Targetted surveys confirmed the presence of the following EPBC Act TECs:

- New England Peppermint (*Eucalyptus nova-anglica*) Grassy Woodlands; and
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland.

Potential direct impacts to these TECs as a result of the project are summarised in **Table 6-10**.

Table 6-10 Potential Direct Impacts to TECs

Species Credit Species	Total impact
New England Peppermint (*Eucalyptus nova-anglica*) Grassy Woodlands	14.4 ha
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	20.1 ha

6.1.4.4 Serious and Irreversible Impact Entities

All threatened entities impacted by the proposal have been considered if they form or have potential to be Serious and Irreversible Impact (SAII) entities.

Two (2) TECs listed as potential SAII entities would be impacted by the Project:

- New England Peppermint (*Eucalyptus nova-anglica*) Woodland on Basalts and Sediments in the New England Tableland Bioregion; and
- White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions.

With regard to New England Peppermint (*Eucalyptus nova-anglica*) Woodland on Basalts and Sediments in the New England Tableland Bioregion, the additional impact assessment for SAII determined that:

- The 14.4 ha of this TEC (comprising 3.32 ha grassland and 11.1 ha woodland) that will be removed may result in some minor edge effects in the remaining TEC. However, it can be seen from aerial imagery (**Appendix G**) that the development footprint goes through already fragmented areas and therefore impacts to community structure, connectivity and edge effects will be minimal;
- The area of this TEC that will be removed is unlikely to significantly alter the composition of the community structure. Areas to be removed are highly fragmented and the species remaining do not appear biased to particular flora species. The composition is not anticipated to change significantly due to the development footprint targeting areas already fragmented with no particular bias for unique TEC characteristics supporting threatened or rare species;
- The area of this TEC that will be removed will have minimal impacts to ecological processes such as habitat provision for other threatened flora and fauna as this TEC is not in a condition that supports unique or rare species or ecological processes;
- The area of this TEC that will be removed will have some minor impacts to habitat for threatened and protected fauna. This would include Greater Glider, Koala and Squirrel Glider. As much of their habitat is to be retained within the Project area and considering the already fragmented nature of this landscape it is unlikely to be a significant impact on the quality of habitat for these species; and
- The area of this TEC that will be removed will have some minor impacts on habitat connectivity for threatened and protected fauna. This would include Greater Glider, Koala and Squirrel Glider. As much of their habitat is to be retained within the Project area and considering the already fragmented nature of this landscape it is unlikely to be a significant impact on the fragmentation of this already fragmented landscape. The development footprint is located in the most fragmented areas of habitat. It is unlikely to have significant impacts on seed dispersal.

New England Peppermint (*Eucalyptus nova-anglica*) Woodland on Basalts and Sediments in the New England Tableland Bioregion is not listed as an SAII under Principal 4, clause 6.7(2)(d) of the BC Regulations. The listing advice suggests that this habitat is responsive to restoration. The listing advice also suggest that this TEC may cover up to 14,000 ha. The potential clearing of 14.4 ha within the development footprint represents 0.1% of this area. It was estimated through interrogation of spatial databases that in the immediate vicinity (500 m) of the development footprint, there is approximately 582.3 ha of this TEC.

With regard to White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions, the additional impact assessment for SAII determined that:

- The 20.1 ha of this TEC comprising PCT 510 and 128.88 ha of this TEC comprising PCT 567 that will be removed may result in some edge effects in the remaining TEC. However, interrogation of aerial imagery indicates that the development footprint goes through already fragmented areas, therefore impacts to community structure, connectivity and edge effects will be minimal. The majority of the TEC areas are grassland or sparsely wooded areas and thus edge effects are already present;
- The area of this TEC that will be removed is unlikely to significantly alter the composition of the community structure. Areas to be removed are highly fragmented and the species remaining do not appear biased to particular flora species. The composition is not anticipated to change significantly due to the development footprint targeting areas already fragmented with no particular bias for unique TEC characteristics supporting threatened or rare species. Even with the woodland in moderate to high condition it does not have a unique suite of species;
- The 42.91 ha of TEC woodland that will be removed will have minimal impacts on ecological processes such as habitat provision for other threatened flora and fauna as this TEC is not in a condition that supports unique or rare species or ecological processes;
- The 42.91 ha of TEC woodland that will be removed will have some minor impacts on habitat for threatened and protected fauna. This would include Greater Glider, Koala and Squirrel Glider. As much of their habitat is to be retained within the Project Area and considering the already fragmented nature of this landscape it is unlikely to be a significant impact on the quality of habitat for these species; and
- The 42.91 ha of TEC woodland that will be removed will have some minor impacts on habitat connectivity for threatened and protected fauna. This would include Greater Glider, Koala and Squirrel Glider. As much of their habitat is to be retained within the Project Area and considering the already fragmented nature of this landscape it is unlikely to be a significant impact to this already fragmented landscape. As can be seen from the figure above the development footprint is located in the most fragmented areas of habitat. It is unlikely to have significant impacts on seed dispersal.

The TEC is not listed as an SAII under Principle 4, clause 6.7 (2)(d) of the BC Regulations. The National Recovery Plan for this TEC states that the Development of conservation management plans for protected/high quality sites, including actions that relate to the maintenance or enhancement of habitat for component species will ensure the long-term viability of the TEC. This suggests the TEC is responsive to management. It was estimated through interrogation of spatial databases that in the immediate vicinity (500 m) of the development footprint, there is approximately 545.73 ha of this TEC.

6.1.4.5 Collision and Barotrauma Risk

The results of the BUS and the Collision Risk Assessment indicate three species were considered to have a medium risk, and nine species were considered to have a low risk of WTG collision and indirect effects across the Project Area.

Microchiropteran Bats

The Project has the potential to cause impacts to threatened microbats recorded within the Development Footprint. Indirect impacts may occur through collisions with turbine blades. However, the Project is considered unlikely to result in any serious and irreversible impacts to threatened microbats.

Threatened microbats considered to be at a low collision risk as a result of the Project include:

- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*);
- Little Bent-winged Bat (*Miniopterus australis*);
- Large Bent-winged Bat (*Miniopterus magnater*);
- Yellow-bellied Sheathtail Bat (*Saccolaimus flaviventris*); and
- White-striped Freetail Bat (*Tadarida australis*).

There are no known maternity roost sites for any threatened bat species within the Development Footprint. Prior to surveys, it was considered possible that Large Bent-winged Bat may migrate between the coast and inland maternity cave(s) across the Project area. The closest maternity cave is 60 km east (Willi Willi Cave).

Survey results suggest that it is unlikely that the Project area is within a migratory route for this species, given low detection and no activity spikes during expected migration time periods. As no maternity roosts will be impacted, the Project is not considered to result in an impact to the lifecycle or population dynamics of threatened microbat species.

Raptor and Migratory Birds

The SEARs and the BAM require an impact assessment to migratory species and any resident raptors that may be subject to indirect impacts associated with blade strike during the operational phase of the project. The results of the BUS and the Collision Risk Assessment indicate the risk associated with WTG collision and indirect effects for most assessed bird species is negligible.

Three species were identified as having moderate risk associated with collision with turbine blades during the operation of the Project:

- Glossy Black-cockatoo (*Calyptorhynchus lathami*);
- White-throated Needletail (*Hirundapus caudacutus*); and
- Wedge-tailed Eagle (*Aquila audax*).

Additional species were identified as having a low risk associated of collision with turbine blades during the operation of the Project:

- Barking Owl (*Ninox connivens*);
- Little eagle (*Hieraaetus morphnoides*);
- Powerful Owl (*Ninox strenua*); and
- Commonly occurring raptors (e.g. Nankeen Kestrel, Brown Falcon and Black-shouldered Kite).

6.1.4.6 Matters of National Environmental Significance

Appendix G identified the potential for a significant impact to the following MNES:

- Threatened Ecological Communities:
  - New England Peppermint (*Eucalyptus nova-anglica*) Grassy Woodlands;
  - White Box-Yellow Box-Blakely’s Red Gum Grassy Woodland and Derived Native Grassland.
- Threatened/Migratory Species:
  - Spotted-tailed Quoll (*Dasyurus maculatus*);
  - Koala (Phascolarctos cinereus);
  - Narrow-leaved Black Peppermint (*Eucalyptus nicholii*); and
  - Bluegrass (Dichanthium setosum).

In the World Heritage context there are broadly two categories of potential impact to consider which relate to geomorphology, ecological and biological processes, and biodiversity:

- Actions arising from the Project Area but which have the potential to impact on World Heritage values and attributes inside the World Heritage Area (e.g. Bushfires); and
- Actions arising from the Project Area which have the potential to impact on World Heritage values and attributes which extend outside the World Heritage Area (e.g., wildlife Mammals or birds which are part of the World Heritage biodiversity and whose home range may extend into the Project Area, or which may disperse or traverse across the Project Area).• which forage, sometimes inhabit/nest or traverse in the vicinity of the project area).Such potential impacts are discussed in earlier chapters of this report, as well as in other studies.

As noted in table 7-6 of **Appendix G**, there are a range of potential impacts on the World Heritage Area that might arise from actions inside the project area. These include bushfire, chemical pollution, flooding and sediment flow, changes to groundwater and the spread of weeds and pathogens. In most cases, it has been assessed that no impacts will arise because of measures taken on site to prevent impacts occurring within the World Heritage Area. For example, chemicals will be stored according to requirements for hazardous materials, including the use of bunding to contain any spills on the site.

In the case of flood impacts, the risk has been assessed as being very low, and site management will help maintain soil stability to prevent sediment flows. However, it is recognised that natural flooding has previously occurred in the region, and will no doubt arise in the future, especially under the influence of climate change.

6.1.5 Mitigation Measures

Impacts to biodiversity (as described above) will be mitigated through the implementation of specific mitigation and management measures as described below. As part of the detailed design, the applicant will continue to investigate options to further avoid and minimise impacts to biodiversity values.

A Bird and Bat Management Plan will be prepared prior to the commencement of construction to continually assess the assumptions of this impact assessment. The plan will include methods for monitoring bat mortality, acceptable thresholds for mortality and adaptive management regimes if thresholds are exceeded.

To mitigate impacts to native vegetation a Biodiversity Management Plan (BMP) will be developed in consultation with relevant regulators, prior to commencement of the action. The BMP will detail restoration and rehabilitation measures to be implemented and will include the following:

- Details about rehabilitation of any areas identified during detailed design as opportunities to improve connectivity;
- Ensure areas disturbed during construction that are no longer required for operations (hardstand and road batters, cabling routes and temporary facilities) are stabilised and rehabilitated progressively during construction and preferably re-vegetated with appropriate species (native in native dominated areas) as soon as practical;
- Specific adherence to best practice design and construction measures for works in and near waterways (including design, instream works procedures and restoration of areas disturbed within riparian corridors);
- Landscape plantings and/or seeding within disturbed areas will be comprised of local indigenous species with the primary objective of addressing erosion and sedimentation issues, but also to be consistent with the biodiversity values of the existing surrounding vegetation (e.g. species selections are to be consistent with the surrounding PCT composition, as well as meeting requirements for supplementation of feed tree species for threatened fauna, i.e. Koala);
- Detail appropriate planting and maintenance techniques for the different areas of the site; and
- Include monitoring to meet clear targets with respect to ground cover establishment.

Management measures were recommended by the BAM accredited assessor for the Project. These measures have been implemented effectively elsewhere to manage impacts to biodiversity values. All management measures will need to be endorsed by the DPE. Measures that will be adopted within the BMP to minimise the impact on biodiversity are detailed in **Table 6-11**.

Table 6-11 Biodiversity Mitigation Measures

Mitigation measure	Proposed techniques	Timing	Responsibility
Avoidance of impacts			
Avoid impacts	■ Reduce the construction footprint and associated clearing requirements during detailed design ■ Preferentially avoid identified threatened species habitat (i.e. mapped species polygons) and HBT	Pre-construction	Proponent
Impacts to fauna and flora through vegetation clearing and habitat removal			
Timing works to avoid critical life cycle events such as breeding or nursing	■ Where practical, hollow-bearing trees would not be removed during breeding season, to mitigate impacts on hollow dependent fauna ■ Pre-clearance surveys should be conducted prior to clearing to check hollows for fauna	Construction	Construction contractor
Delineation of ‘no-go areas’	■ Approved clearing limits to be clearly delineated with temporary fencing or similar prior to construction commencing ■ No stockpiling or storage within dripline of any mature trees ■ No stockpiling or storage within riparian buffers	Construction	Construction Contractor
Staff training and site briefing to communicate environmental features to be protected and measures to be implemented	■ Site induction; and ■ Toolbox talks	Construction	Construction Contractor
Installation of wildlife crossing infrastructure in areas where the clearing widths are greater than 40 m	■ If construction constraints require clearing widths greater than 40 m, the project will commit to the installation of crossing infrastructure, such as glider poles and removable rope bridges, to ensure that Greater Glider can safely move across the project footprint	Construction	Proponent
Instigating clearing protocols including pre-clearance surveys, daily surveys and staged clearing, the presence of a trained ecological or licensed wildlife handler during clearing events	■ Development of a pre-clearing checklist and tree clearing procedure ■ Staged clearing, supervised by Ecologist or trained spotter catcher to allow for resident fauna to relocate or be relocated where required	Construction	Construction contractor

Mitigation measure	Proposed techniques	Timing	Responsibility
Construction protocols to prevent fauna mortality in trenches	■ Trenches will be backfilled as soon as practicable to minimise chance of fauna becoming trapped ■ Trench sections left overnight would be inspected early in the morning by an ecologist or suitably qualified person. Any trapped fauna is to be removed ■ The use of ramps or ladders to facilitate trapped fauna escape is recommended (dependent on size of trench needed)	Construction	Construction contractor
Relocation of habitat features (fallen timber, hollow logs) from within the development footprint to retained areas within the development site	■ Tree-clearing procedure including relocation of habitat features to adjacent area for habitat enhancement ■ Opportunities for the salvage and re-use of important habitat features, including tree-hollows and bush rock, will be identified in the BMP ■ All fauna should also be relocated during clearing	Construction	Construction contractor
Minimising impacts of WTG strikes on protected animals	■ Prepare a bird and bat adaptive management plan	Construction	Construction Contractor
Indirect impacts on wildlife and vegetation			
Light shields or daily/seasonal timing of construction and operational activities to reduce impacts of light spill	■ Minimise night works, where practicable ■ Direct lights away from vegetation, where practicable	Construction/ operation	Construction contractor
Sediment controls to control the quality of water released from the development site into the receiving environment	■ Prepare an erosion and sediment control plan and implement recommended measures ■ Maintaining grass cover across the site as far as practicable during construction, particularly within the existing waterways, would help maintain soil stability during floods, and would improve soil permeability ■ Implement spill management procedures ■ Store any potential pollutants in accordance with HAZMAT requirements	Construction	Construction contractor
Adaptive dust monitoring programs to protect air quality	■ Daily visual monitoring of dust generated by construction activities ■ Construction to cease if significant dust is observed being blown from development footprint until control measures are implemented ■ All project activities to be undertaken with the objective of preventing visible dust emissions from the development footprint	Construction	Construction contractor

6.1.6 Biodiversity Offset Requirements

For residual impacts that cannot be avoided or fully mitigated, offsets will be required to ensure no net loss of biodiversity.

Table 6-12 sets out the maximum offsets that may be required for the Project.

During the detailed design phase of the Project, some refinements to the BAM Calculator may be required to confirm the final biodiversity credit requirements.

Table 6-12 Biodiversity Offsets Credits

PCT/ID	Zone area (ha)	Vegetation Integrity Score	Estimate Ecosystem Credits
510-Grassland low	8.96	25.4	142
510_Woodland moderate	11.15	64.5	450
526_Woodland high	40.88	60.7	1085
534_Grassland low	3.32	22.5	47
534_Woodland moderate	11.10	50.3	349
565_Grassland moderate	6.19	38.4	89
565_Woodland moderate	13.84	57.2	297
568_Woodland high	8.80	64.4	248
766_Riparian low	1.60	20.8	17
970_Woodland moderate	37.99	41.5	690
997_Woodland moderate	10.27	41.6	187
1194_Woodland moderate	5.65	58.2	164
567_Greassland_TEC	97.1	39.7	2411
567_Woodland_TEC	31.8	46.0	914
567_Woodland high	35.5	70.7	1097

Species / Common name	Biodiversity risk weighting	Area (ha) or individuals lost	Estimated Species Credits
Calyptorhynchus lathami / Glossy Black-Cockatoo	2	33.8	987
Dichanthium setosum / Bluegrass	2	13.2	180
Eucalyptus nicholii / Narrow-leaved Black Peppermint	2	13	26
Ninox connivens / Barking Owl	2	17.7	530
Petauroides volans / Greater Glider	2	206.5	5697
Petaurus norfolcensis / Squirrel Glider	2	206.5	5697
Phascolarctos cinereus / Koala	2	206.9	5709

6.2 Noise and Vibration

6.2.1 Introduction

A Noise and Vibration Impact Assessment (NVIA) (**Appendix H**) was undertaken to address the project-specific SEARs and assess the predicted noise and vibration levels at sensitive receivers, during the construction and operation phases, in accordance with the relevant noise and vibration criteria.

6.2.2 Existing Environment

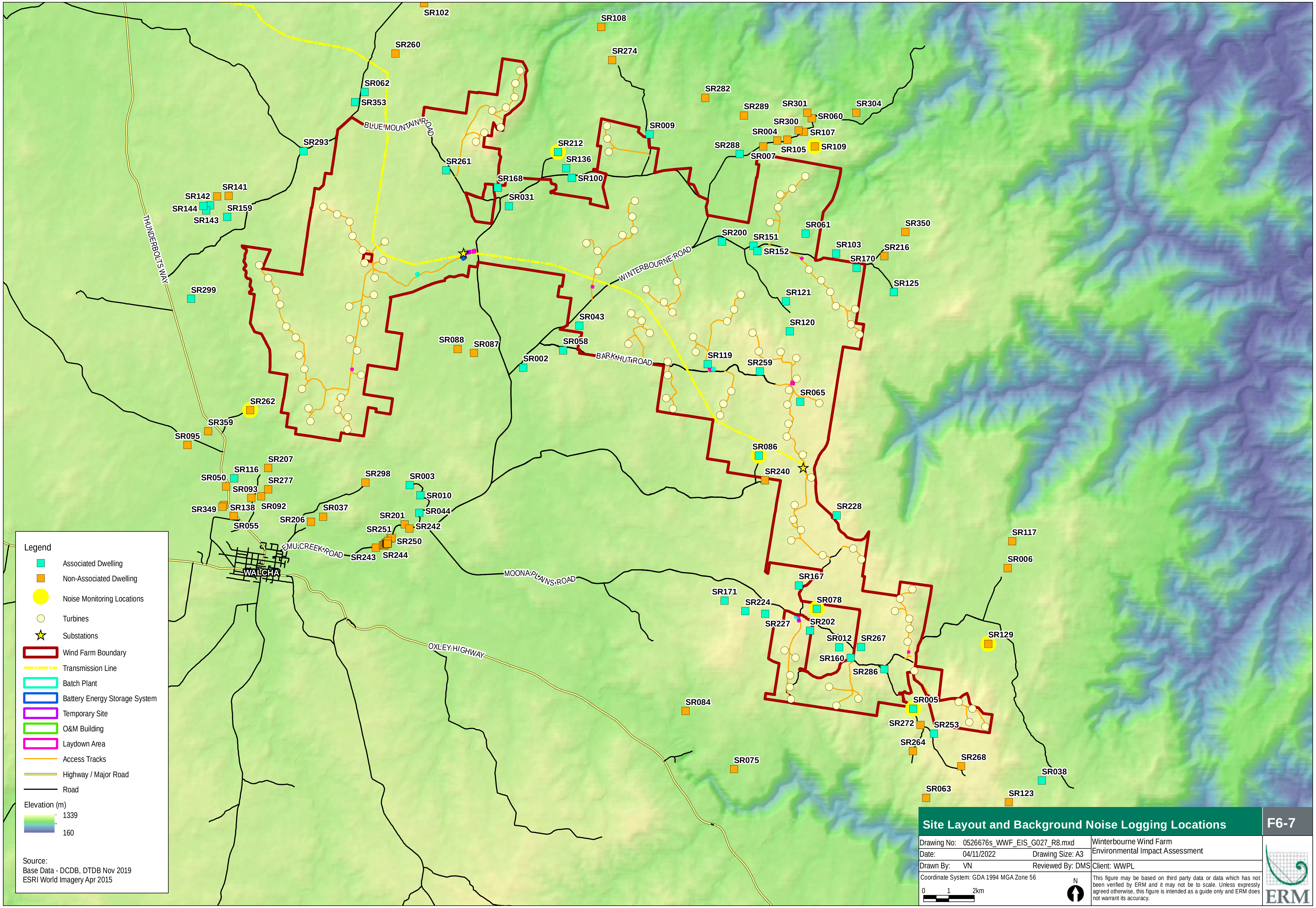
Background noise monitoring was conducted at seven dwellings in the vicinity of the Project, between 28 November 2020 and 1 February 2021. The monitoring was conducted in accordance with the *SA Noise Guidelines*, as adopted by the *Wind Energy: Noise Assessment Bulletin for State Significant Wind Energy Development* (DPE, 2016) (Noise Bulletin).

The locations for background noise monitoring were selected based on preliminary noise predictions of the initial wind farm layout. Preference was given to dwellings with the highest predicted noise levels in each direction of the wind farm and without agreements, subject to landowner's consent to install monitoring equipment. The seven monitoring locations are summarised in **Table 6-13** and shown in **Figure 6-7**.

Table 6-14 presents the findings of the background noise monitoring at a range of wind speeds within the operating range of the Project. Noise levels above 35 dB(A) were measured across the entire wind speed range. This indicates that background noise levels are not entirely controlled by the wind speed, and that other factors such as insects are also likely to contribute to the background noise levels.

Table 6-13 Monitoring Locations and Periods

Dwelling ID	*Coordinates (UTM WGS84 56J)*		*Monitoring Period*
	Easting	*Northing*	
SR005	391269	6565826	28/11/2020 - 1/2/2021
SR078	387492	6569749	28/11/2020 - 1/2/2021
SR086	385205	6575756	28/11/2020 - 1/2/2021
SR109	387413	6587897	1/2/2021 - 18/3/2021
SR129	394221	6568377	28/11/2020 - 29/1/2021
SR212	377321	6587671	28/11/2020 - 29/1/2021
SR262	365240	6577539	28/11/2020 - 1/2/2021



Site Layout and Background Noise Logging Locations

F6-7

Drawing No:	0526676s_WWF_EIS_G027_R8.mxd		Winterbourne Wind Farm Environmental Impact Assessment
Date:	04/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: DMS	Client: WWPL

Coordinate System: GDA 1994 MGA Zone 56

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM

Table 6-14 Background Noise Levels (dB(A))

Dwelling ID	Background Noise Level (dB(A)) for Integer Hub Height (155 m AGL) Wind Speed									
	3m/s	4m/s	5m/s	6m/s	7m/s	8m/s	9m/s	10 m/s	11m/s	12m/s
SR005	39	39	39	39	39	39	39	39	38	38
SR078	30	30	31	32	33	34	34	35	36	36
SR086	32	32	33	33	34	34	34	35	35	34
SR109	26	26	27	28	29	30	31	32	33	34
SR129	30	30	31	31	32	33	34	35	36	36
SR212	27	27	28	29	30	32	33	34	34	34
SR262	27	28	28	29	30	30	31	32	33	34

6.2.3 Assessment of Impacts

6.2.3.1 WTG Operation

The criteria for the assessment of WTG operational noise are contained in the Bulletin and SA Noise Guidelines. These require that operational noise impacts from wind farms at non-associated dwellings should not exceed an outdoor noise level of 35 dB(A) or the background noise ($L_{A90,\ 10\ minute}$) by more than 5 dB(A), whichever is the greater.

Where a dwelling is associated with the wind farm because the landowner has entered into a commercial agreement with the developer, the Bulletin and SA Noise Guidelines require less onerous noise criteria. The SA Noise Guidelines reference the sleep disturbance levels in the World Health Organisation (WHO) Guidelines for Community Noise (WHO Guidelines) (1999). The WHO Guidelines set an outdoor level of 45 dB(A) to protect against sleep disturbance and this level has been applied to all associated dwellings.

The operational noise criteria for non-associated dwellings have been determined from the results at each relevant background noise monitoring location as provided in **Table 6-15**.

Table 6-15 Projected Noise Criteria WTG Noise

Dwelling ID	Wind Speed (m/s) at 155 m									
	3	4	5	6	7	8	9	10	11	12
*SR005**	43	43	43	43	43	43	43	43	43	43
SR078	35	35	36	37	38	39	39	40	41	41
SR086	37	37	38	38	39	39	39	40	40	39
SR109	35	35	35	35	35	35	36	37	38	39
SR129	35	35	36	36	37	38	39	40	41	41
SR212	35	35	35	35	35	37	38	39	39	39
SR262	35	35	35	35	35	35	36	37	38	39

* *Although the background noise levels at SR005 would result in a higher criterion at low wind speeds, the lowest integer wind speed background noise level has been used to determine the criterion for all wind speeds. The approach has been taken given the results indicate background noise levels are not controlled by wind speed.*

The assessment of WTG noise was made based on the following:

- A representative contemporary WTG selection comprising a Vestas V162-6.2 MW with serrated blade edges and a hub height of 149 m; and
- Sound Power Levels as provided in **Table 6-16** for the "Normal" operating mode.

Table 6-16 WTG Sound Power Levels: Normal Operating Mode

SWL (dB(A)) for each One-third Octave Band Centre Frequency	Hub Height (149 m) Wind Speed (m/s)								
	4	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
25 Hz	54.6	54.7	56.4	59.5	62.4	64.8	65.4	65.6	65.3
31.5Hz	58.9	59.1	60.8	63.9	66.7	69.1	69.7	69.9	69.6
40 Hz	63	63.2	65	68	70.9	73.3	73.8	73.9	73.7
50 Hz	66.5	66.8	68.5	71.6	74.4	76.8	77.4	77.4	77.2
63 Hz	69.8	70.1	71.9	75	77.8	80.1	80.7	80.7	80.5
80 Hz	72.9	73.2	75	78.1	80.9	83.2	83.7	83.7	83.5
100 Hz	75.4	75.8	77.6	80.6	83.4	85.8	86.3	86.3	86
125 Hz	77.7	78	79.9	82.9	85.7	88	88.5	88.5	88.3
160 Hz	79.8	80.1	82	85	87.8	90.1	90.6	90.6	90.4
200 Hz	81.3	81.7	83.6	86.6	89.4	91.7	92.2	92.1	91.9
250 Hz	82.6	82.9	84.8	87.8	90.6	92.9	93.4	93.3	93.2
315 Hz	83.6	83.9	85.8	88.8	91.6	93.9	94.4	94.3	94.2
400 Hz	84.2	84.5	86.4	89.4	92.2	94.5	95	94.9	94.8
500 Hz	84.5	84.8	86.7	89.7	92.5	94.7	95.2	95.2	95.2
630 Hz	84.5	84.7	86.6	89.6	92.4	94.7	95.2	95.2	95.2
800 Hz	84.1	84.3	86.2	89.2	92	94.3	94.8	94.8	94.8
1 kHz	83.4	83.5	85.4	88.4	91.2	93.5	94	94.1	94.2
1.25 kHz	82.4	82.5	84.4	87.4	90.2	92.5	93	93.1	93.2
1.6 kHz	80.9	80.9	82.8	85.8	88.6	91	91.5	91.6	91.8
2 kHz	79.3	79.2	81.1	84.1	86.9	89.3	89.8	89.9	90.2
2.5 kHz	77.3	77.1	79	82	84.9	87.2	87.8	87.9	88.3
3.15 kHz	75	74.7	76.5	79.6	82.4	84.8	85.3	85.6	86
4 kHz	72.2	71.7	73.6	76.7	79.5	81.9	82.5	82.7	83.3
5 kHz	69.2	68.7	70.5	73.6	76.5	78.9	79.5	79.8	80.4
6.3 kHz	65.9	65.2	67	70.1	73	75.4	76	76.4	77.1
8 kHz	62	61.2	63	66.1	69.1	71.5	72.1	72.6	73.4
10 kHz	58.1	57.2	58.9	62.1	65	67.5	68.1	68.7	69.5
Total SWL (dB(A))	**94.1**	**94.3**	**96.2**	**99.2**	**102**	**104.3**	**104.8**	**104.8**	**104.8**

The Bulletin requires that the WTG noise level be adjusted where excessive levels of tonality and/or low frequency noise is identified to a maximum adjustment of 5 dB(A). This assessment was made based on the assumption that the turbine model selected for the Project will be free of any excessive levels of tonality. The assumption has been confirmed for the representative WTG model by reviewing the 1/3 octave band data.

The noise modelling is intended to provide a conservative worst-case assessment of operational noise and therefore includes several assumptions corresponding to the worst-case conditions (resulting in the highest noise level at dwellings).

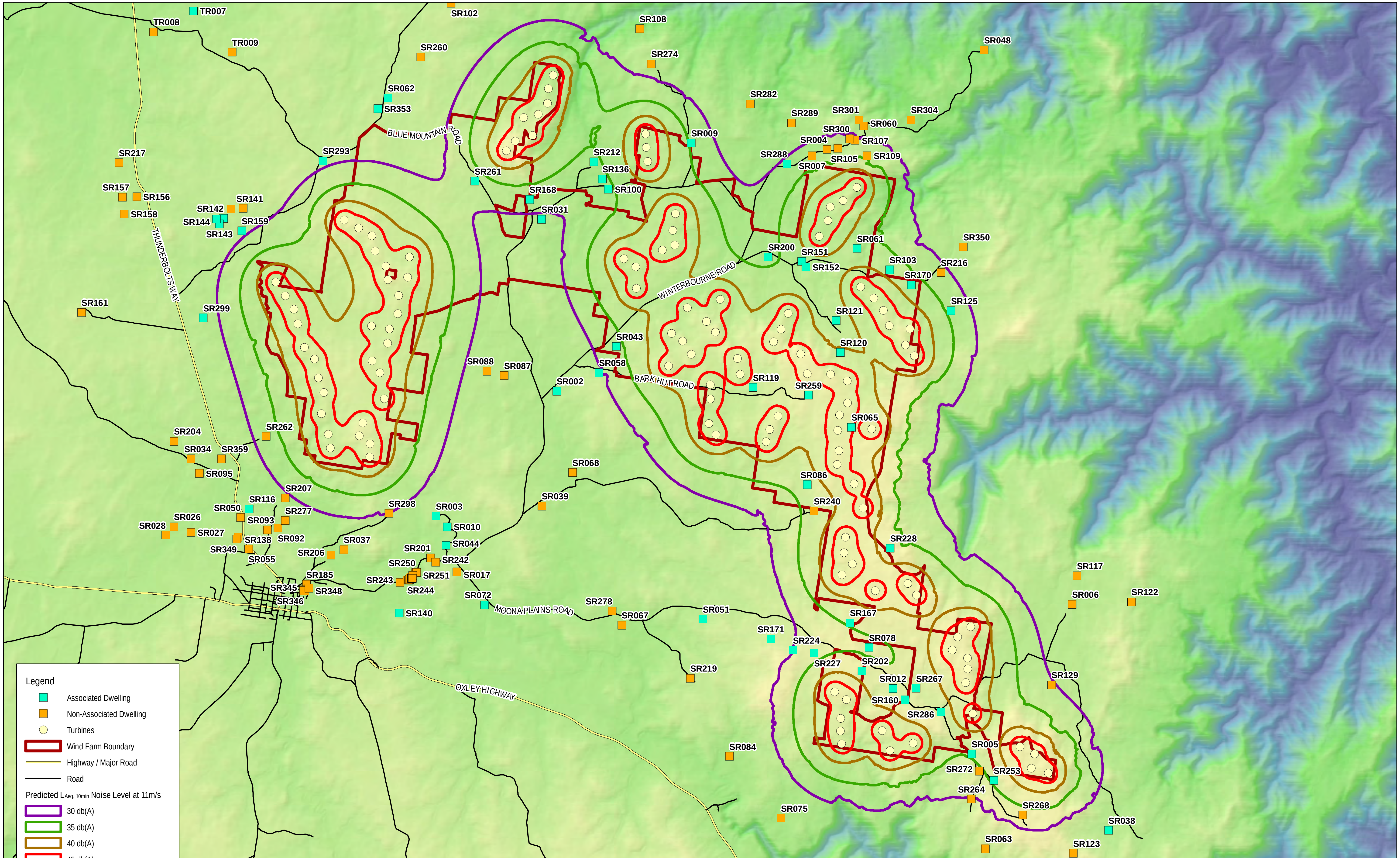
Table 6-17 exhibits the noise level predictions from the operation of WTG outside each dwelling for all integer wind speeds from cut in to rated power. The below table is restricted to dwellings where the predicted noise level is greater than 30 dB(A). The highest predicted low frequency noise level at non-associated dwellings is less than 53 dB(C) (at SR240), which is less than the 60 dB(C) criterion. Therefore, a penalty for excessive low frequency noise is not applicable and no adjustment has been made to the predictions provided above.

Based on the predictions, without any noise mitigation measures, the noise from the 119 WTGs will achieve the operational noise criteria at all assessed non-associated dwellings (refer **Figure 6-8**).

Table 6-17 Noise Predictions at Non-Associated Dwellings*

Dwelling ID	Noise Level at Hub Height integer wind speeds, 149 m AGL (dB(A))																	
	4m/s		5m/s		6m/s		7m/s		8m/s		9m/s		10m/s		11m/s		12m/s	
	Criterion	Prediction	Criterion	Prediction	Criterion	Prediction	Criterion	Prediction	Criterion	Prediction	Criterion	Prediction	Criterion	Prediction	Criterion	Prediction	Criterion	Prediction
SR004	35	22	35	22	35	24	35	27	35	30	36	32	37	32	38	32	39	32
SR007	35	22	35	22	35	24	35	27	35	30	36	32	37	33	38	33	39	33
SR105	35	22	35	22	35	24	35	27	35	30	36	32	37	33	38	33	39	33
SR107	35	21	35	21	35	23	35	26	35	29	36	31	37	31	38	31	39	31
SR109	35	23	35	23	35	25	35	28	35	31	36	33	37	34	38	34	39	34
SR129	35	20	36	20	36	22	37	25	38	28	39	30	40	31	41	31	41	31
SR216	35	21	35	21	35	23	35	26	35	29	36	31	37	31	38	31	39	31
SR240	37	26	38	26	38	28	39	31	39	34	39	36	40	37	40	37	39	37
SR262	35	22	35	22	35	24	35	27	35	30	36	32	37	33	38	32	39	32
SR264	43	20	43	20	43	22	43	25	43	28	43	30	43	30	43	30	43	30
SR268	43	22	43	23	43	25	43	28	43	30	43	33	43	33	43	33	43	33
SR272	43	24	43	24	43	26	43	29	43	32	43	34	43	35	43	35	43	34
SR300	35	20	35	20	35	22	35	25	35	28	36	30	37	31	38	31	39	31

** This table is restricted to dwellings where the predicted noise level is greater than 30 dB(A).*



Noise Prediction Contours (Wind Speed of 11m/s at Hub Height)

F6-8

Drawing No: 0526676s_WWF_EIS_G028_R8.mxd		Winterbourne Wind Farm Environmental Impact Assessment
Date: 04/11/2022	Drawing Size: A3	
Drawn By: VN	Reviewed By: DMS	Client: WWPL

Coordinate System: GDA 1994 MGA Zone 56

0 1 2km

N

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM

6.2.3.2 Ancillary Electrical Infrastructure

Ancillary electrical infrastructure includes two substations, a switching station and a BESS facility in the locations illustrated in **Figure 1-3**. Noise sources from ancillary infrastructure have been assessed against the objective noise criteria under the *NSW EPA Noise Policy for Industry* (2017) (NPI, 2017). The switching station does not include any significant noise generating equipment and has not been considered as a noise source.

The NPI establishes noise trigger levels based on the lower of the following two methods:

- The existing background noise environment (intrusiveness noise levels); and
- The amenity for particular land uses (amenity noise levels).

The minimum Rating Background Level (RBL) under the NPI was applied for the assessment, being 30 dB(A) during the evening and night and 35 dB(A) during the day. Predictions for the substations have been made based on a high-voltage transformer with an overall capacity of 350 MVA. The noise from the BESS facility has been predicted based on a capacity of 100 MW / 200 MWh (2-hour facility).

A noise level of less than 20 dB(A) is predicted for the non-associated dwelling with the highest prediction (SR088) under worst case weather conditions, therefore easily achieving the criteria.

Transformers may have audible tonality when in proximity, although the potential for it to be a dominant characteristic is diminished at the separation distances to the dwellings. The audibility of tonality from a noise source is very dependent on the frequency it occurs at and the masking effect that other background noise has in the environment. Given the low predicted noise levels, it is unlikely that a penalty would apply to the noise level. However, if a 5 dB(A) adjustment were to be conservatively applied, the 35 dB(A) criterion would still easily be achieved. Given the closest non-associated residence is in the order of 1,600 m from any of the substation options, at these distances the noise level from operation of transformers is predicted to be less than 20 dB(A) and tonality is unlikely to be a significant character.

6.2.3.3 Construction Noise

The *Interim Construction Noise Guideline* provides an emphasis on implementing “feasible” and “reasonable” noise reduction measures and does not set mandatory objective criteria. The *Interim Construction Noise Guideline* establishes “management levels” based on the existing RBL. The minimum RBL is 30 dB(A) for the evening and night and 35 dB(A) for the day.

Based on the above, the construction noise management levels and the requirement for “feasible” and “reasonable” noise reduction measures are summarised in **Table 6-18**.

Table 6-18 *Interim Noise Construction Noise Guideline* Requirements

<table>
<tr><th>Time of Day</th><th>Management level
$L_{Aeq,\ 15\ min}$</th><th>How to Apply</th></tr>
<tr><td rowspan="2">Recommended standard hours:

Monday to Friday
7 am to 6 pm
Saturday
8 am to 1 pm
No work on Sundays or public holidays</td><td>Noise affected
RBL + 10 dB = 45 dB(A)</td><td>The noise affected level represents the point above which there may be some community reaction to noise
■ Where the predicted or measured $L_{Aeq,\ 15min}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level
■ The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details</td></tr>
<tr><td>Highly noise affected
75 dB(A)</td><td>The highly noise affected level represents the point above which there may be strong community reaction to noise
■ Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account:
– Times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences
– If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times</td></tr>
<tr><td>Outside recommended standard hours</td><td>Noise affected
RBL + 5 dB = 35dB(A)</td><td>A justification would typically be required for works outside the recommended standard hours:
■ The proponent should apply all feasible and reasonable work practices to meet the noise affected level
■ Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community</td></tr>
</table>

The predicted noise from construction activity is presented as a typical worst case (highest noise level) scenario for the various stages of construction. The predictions are based on weather conditions that are the most conducive for the propagation of noise. Other weather conditions would result in lower noise levels than those predicted for day-time construction.

All non-associated dwellings are:

- Separated by 1,225 m or more from the closest proposed WTG location (the closest non-associated dwelling is SR109, located approximately 1,227 m from turbine B056); and,
- Separated by 3,320 m or more from the closest temporary concrete batching and crushing plants (the closest non-associated dwelling to a temporary concrete batching plant is SR088 at approximately 3,326 m).

The predicted noise level from various construction activities at the closest non-associated dwelling (at a separation distance of 1,225 m) are shown in **Table 6-19.** The required separation distance in order to achieve the noise affected level of 45 dB(A) during standard hours (the day period) is also provided. The predictions for each “Phase” are conservative and based on the assumption that all equipment stated is being operated concurrently and cumulatively.

Table 6-19 Predicted Construction Noise Levels During Standard Hours

Phase	Noise Management Level	Main Plant and Equipment	Predicted Noise Level at Closest Non-Associated Dwelling	Outcome/Action
Site Set-Up and Civil Works	45 dB(A)	■ Generator ■ Transport truck ■ Excavator ■ Low loader	43 dB(A)	Achieves management level at all non-associated dwellings
Road Construction		■ Mobile crushing and screening plant ■ Dozer ■ Roller ■ Low loader ■ Tipper truck ■ Excavator ■ Scraper ■ Transport truck	49 dB(A)	Predicted to exceed management level at dwellings within 1,800 m of the construction activity. (16 non-associated dwellings, SR004, SR037, SR050, SR055, SR092, SR093, SR105, SR107, SR109, SR138, SR206, SR240, SR268, SR272, SR277, SR349).
Excavation and foundation construction		■ Excavator ■ Front end loader ■ Mobile crushing and screening plant ■ Truck-mounted concrete pump ■ Concrete mixer truck ■ Mobile crane ■ Transport truck ■ Tipper truck	48 dB(A)	Predicted to exceed management level at dwellings within 1,700 m of the construction activity. (3 non-associated dwellings, SR105, SR109, SR240).
Electrical installation		■ Rock trencher ■ Concrete mixer truck ■ Low loader ■ Tipper truck ■ Mobile crane	49 dB(A)	Predicted to exceed management level at dwellings within 1,800 m of the construction activity. (7 non-associated dwellings, SR004, SR105, SR107, SR109, SR240, SR268, SR272).
Turbine Delivery and Erection (at the turbine locations)		■ Extendable trailer truck ■ Low loader ■ Mobile crane ■ Support crane ■ Grinder ■ Rattle Gun	43 dB(A)	Achieves management level at all non-associated dwellings
Concrete Batching and Crushing		■ Mobile crushing and screening plant ■ Front end loader ■ Truck	31 dB(A)	Achieves criterion at all non-associated dwellings.

In addition to construction activities during the day period, a small number of activities may need to be undertaken outside of these "standard hours". The predicted noise level for these activities is provided in **Table 6-20**.

Table 6-20 Predicted Construction Noise Levels Outside of Standard Hours

Phase	Noise Management Level	Main Plant and Equipment	Predicted Noise Level at Closest Dwelling	Outcome/Action
Batching	35 dB(A)	■ Front end loader ■ Truck	30dB(A)	■ Achieves criterion at all non-associated dwellings
Concrete Pour		■ Generator ■ Truck ■ Concrete pump	38 dB(A)	■ Predicted to exceed management level at dwellings within 1,900 m of the construction activity ■ (8 non-associated dwellings, SR004, SR105, SR107, SR109, SR240, SR268, SR272, SR300)
Turbine Delivery and Erection (at the turbine locations)		■ Extendable trailer truck ■ Low loader ■ Mobile crane ■ Support crane ■ Grinder ■ Rattle Gun	43 dB(A)	■ Predicted to exceed management level at dwellings within 3,000 m of the construction activity ■ (19 non-associated dwellings, SR004, SR007, SR060, SR105, SR107, SR109, SR129, SR141, SR207, SR216, SR240, SR262, SR264, SR268, SR272, SR274, SR298, SR300, SR301)

Based on the predicted noise levels, it is expected that construction:

- During standard hours will potentially be at noise levels of greater than the 45 dB(A) management level for some activities at a limited number of non-associated dwellings (eight locations). However, the predicted noise levels are significantly less than 75 dB(A) (the point where there may be strong community reaction to noise); and
- Outside of standard hours will potentially be at noise levels of greater than 35 dB(A) for some activities. That is, the noise from temporary batching, concrete pouring and turbine erection may exceed 35 dB(A) at up to 20 non-associated dwellings.

For construction with noise levels detailed above, the Interim Noise Construction Noise Guideline requires the developer to apply all feasible and reasonable work practices, and to inform the residents of the proposed construction work. Details of the feasible and reasonable mitigations which will be implemented are provided in **Section 6.2.4**.

6.2.3.4 Construction Vibration

For construction activity occurring during the day time, the DECC 2006 can be interpreted to provide the vibration criteria at the dwellings, based on the core document used as the technical basis for the Technical Guideline, the *British Standard BS 6472-1992 Evaluation of human exposure to vibration in buildings (1-80Hz)*, as provided in **Table 6-21**.

Table 6-21 Vibration Criteria

Continuous Vibration Vertical (rms)		Impulsive Vibration Vertical (rms)		Vibration Dose Value for Intermittent Vibration	
Preferred	**Maximum**	**Preferred**	**Maximum**	**Preferred**	***Maximum***
0.01 m/s²	*0.02 m/s²*	*0.3 m/s²*	*0.6 m/s²*	*0.2 m/s$^{1.75}$*	*0.4 m/s$^{1.75}$*

It is expected that the main sources of construction vibration will be the rock trenching equipment and roller operation during the road and hard stand construction. The level of vibration at a distance will be subject to the input of the equipment and the local ground conditions. Typically, the distances required to achieve the construction vibration criteria provided in DECC 2006 are in the order of 20 m. At a distance of 100 m, vibration from these activities is unlikely to be detectable.

Based on the separation distances between the construction activities and the nearest dwelling in excess of 100 m, vibration levels are predicted to easily achieve the criteria.

6.2.3.5 Blasting

The separation distances between any potential blasting activity associated with construction and the nearest dwellings are of the order of magnitude (e.g., hundreds of metres) for which ground vibration and air-blast levels have been adequately controlled at other sites.

Given the range of factors associated with both the generation and control of blasting, it is recommended that in the event of blasting occurring, a monitoring regime will be implemented to ensure compliance with the Australian and New Zealand Environment Council – *Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration*. The separation distances between any potential blasting activity associated with construction and the nearest dwellings are of the order of magnitude for which ground vibration and air-blast levels have been adequately controlled at other sites.

6.2.3.6 Traffic and Transport Noise

The traffic associated with the wind farm will predominantly occur during construction and will include semi-trailers, low loaders, trucks, mobile cranes, water tankers, four-wheel-drive vehicles and passenger vehicles.

The NSW Road Noise Policy criteria for *“Local Roads - Existing residences affected by additional traffic on existing local roads generated by land use developments*” are equivalent (LA_{eq}, 1hour) noise levels of no greater than 55 dB(A) during the day-time (7 am to 10 pm) and 50 dB(A) during the night-time (10.00 pm to 7.00 am). This noise level is to be achieved outside, at a distance of 1 m from the façade of a dwelling and at a height of 1.5 m from the floor.

The traffic noise assessment considers the noise at the closest (worst case) dwelling to any road/track, understood to be a setback distance in the order of 25 m from a highway and 10 m within the townships along the access route.

It is predicted that for a dwelling set back 25 m from a highway, the 55 dB(A) criterion will be achieved in all hours when there are no more than 20 passenger vehicle movements and 6 heavy vehicle movements per hour directly associated with the Project. For a dwelling within a township (10 m from the roadside), the criterion will also be achieved in all hours when there are no more than 20 passenger vehicle movements and 6 heavy vehicle movements in one hour.

The above assessment demonstrates that the NSW Road Noise Policy can be satisfied with relatively large number of vehicle movements. It is also noted that roads such as the highways would already be exposed to levels of traffic which exceed these trip numbers.

Notwithstanding, during the peak of construction the number of vehicles associated with the wind farm development using the preferred access route is predicted to exceed the above traffic volumes. During this time, morning traffic levels are expected to reach 105 light vehicle trips (workers accessing site) and 32 large vehicles within one hour. For this level of activity, a noise level of 60 dB(A) is predicted at 25 m from a highway and 62 dB(A) at 10 m from the road within a township. For other roads or tracks where dwellings are located further from the road, the above number of vehicle movements can double for every doubling of the distance between the road and dwelling.

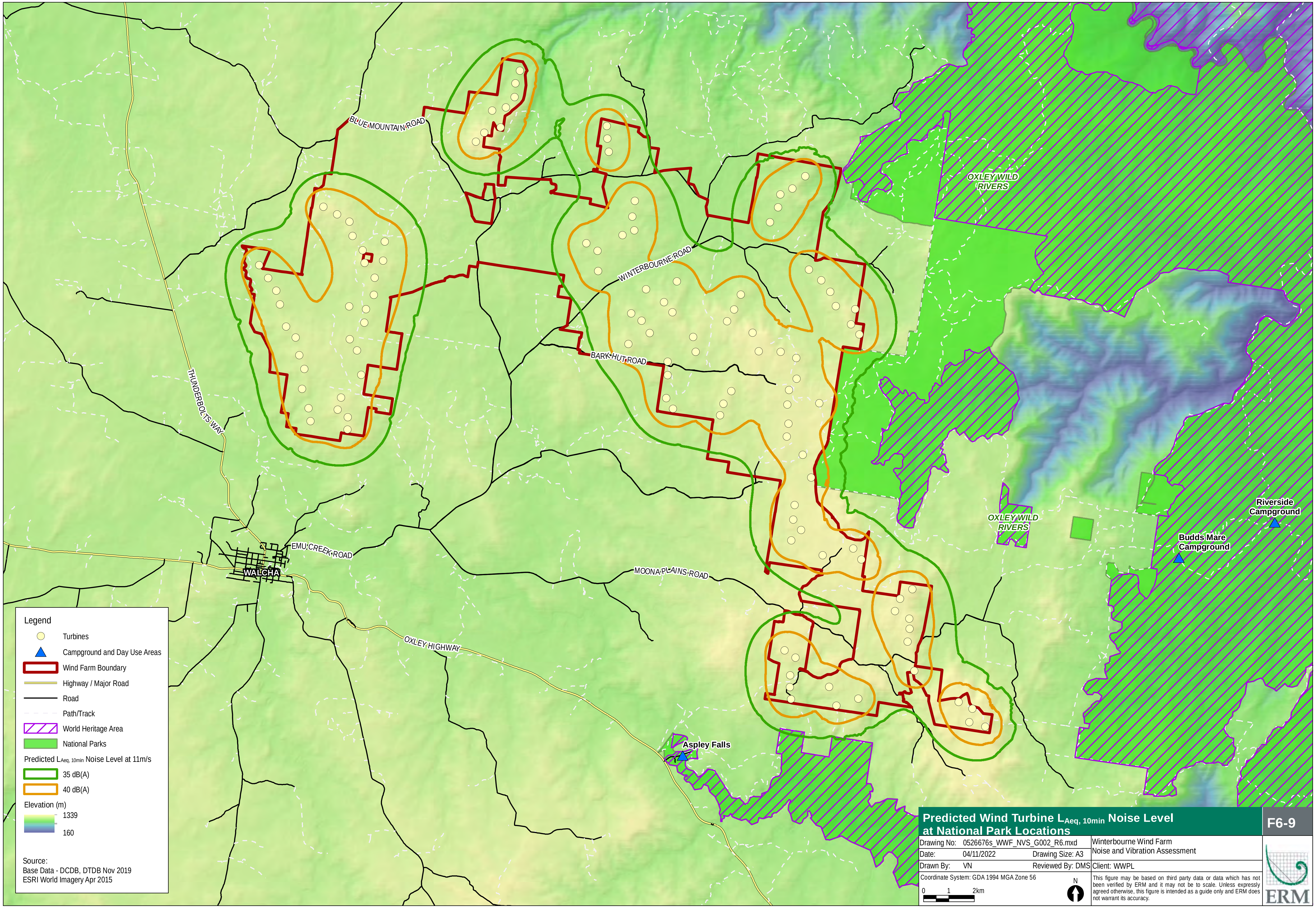
6.2.3.7 National Park Amenity

In addition to the noise impact at dwellings, the SEARs require consideration of the impact on amenity/recreational uses within the Oxley Wild Rivers National Park (including walking tracks, campgrounds and lookouts).

In the absence of any tailored legislative objective requirements for National Parks, and based on campgrounds being more aligned with the amenity expected at permanent dwellings, the noise level at the closest campgrounds have been considered against wind farm assessment criteria which would otherwise apply at dwellings. That is, a baseline noise criterion of 35 dB(A) has been considered at the campgrounds to satisfy the SEARs.

Based on the WTG noise predictions provided in Section 5 of the NVIA, a 35 dB(A) and 40 dB(A) noise contour (for the highest noise level wind speed, being 11 m/s) was overlaid on a map of the Oxley Wild Rivers National Park. The map in **Figure 6-9** demonstrates that the closest campground to the wind farm (Apsley Falls) is well outside of the 35 dB(A) contour, easily achieving the baseline criterion which would apply at a land use such as a dwelling. In this instance, the 40 dB(A) contour is outside of the National Park which indicates wind farm noise levels will be well within the rise and fall of the ambient environment (due to sources such as wind in trees, birdsong and insects) along walking trails and at lookout locations.

It is considered that the Project will not impact on amenity/recreational uses within the Oxley Wild Rivers National Park (including walking tracks, campgrounds and lookouts).



Predicted Wind Turbine $L_{Aeq,\ 10min}$ Noise Level at National Park Locations
F6-9
Drawing No: 0526676s_WWF_NVS_G002_R6.mxd
Date: 04/11/2022
Drawing Size: A3
Drawn By: VN
Reviewed By: DMS
Winterbourne Wind Farm
Noise and Vibration Assessment
Client: WWPL
Coordinate System: GDA 1994 MGA Zone 56
0 1 2km
N
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM
Legend
Turbines
Campground and Day Use Areas
Wind Farm Boundary
Highway / Major Road
Road
Path/Track
World Heritage Area
National Parks
Predicted $L_{Aeq,\ 10min}$ Noise Level at 11m/s
35 dB(A)
40 dB(A)
Elevation (m)
1339
160
Source:
Base Data - DCDB, DTDB Nov 2019
ESRI World Imagery Apr 2015
BLUE MOUNTAIN ROAD
WINTERBOURNE ROAD
BARK HUT ROAD
THUNDERBOLTS WAY
EMU CREEK ROAD
MOONA PLAINS ROAD
OXLEY HIGHWAY
WALCHA
OXLEY WILD RIVERS
OXLEY WILD RIVERS
Riverside Campground
Budds Mare Campground
Aspley Falls

6.2.4 Mitigation Measures

Impacts relating to noise and vibration (as described above) will be mitigated through the implementation of specific mitigation and management measures as described below. As part of the detailed design, the applicant will continue to investigate options to further avoid and minimise impacts relating to noise.

The mitigation measures outlined in **Table 6-22** will be incorporated and implemented through the construction phase. Detailed mitigation measures will be determined by the construction team once the actual construction activities and schedule have been determined.

Table 6-22 Noise Mitigation Measures

Mitigation Measure	Description
WTG operation	
Pre-construction noise assessment	To ensure the project achieves the noise criteria, a pre-construction noise assessment will be undertaken based on the final turbine selection, layout and turbine specific sound power levels which are guaranteed by the manufacturer for the project. In addition, operational noise monitoring will be carried out following commissioning of the Project to verify compliance with the noise criteria.
Ancillary infrastructure	
Update assessment as required	The assessment of noise from the substations and BESS facility will be updated should the size of the BESS or substation transformer(s) be increased or the sound power level change from that assumed in the NVIA
Construction Activity	
“Feasible and reasonable” noise control strategies	“Feasible and reasonable” noise control strategies to minimise noise during construction may include engineering measures such as the construction of temporary acoustic barriers, the use of proprietary enclosures around machines, the use of silencers, the substitution of alternative construction processes and the fitting of broadband reversing signals. It may also include administrative measures such as inspections, scheduling (discussed below) and training to establish a noise minimisation culture for the works
Scheduling	Construction works, including heavy vehicle movements into and out of the site, will generally restricted to the hours between 7.00 am and 6.00 pm Monday to Friday, and between 8.00 am and 6.00 pm on Saturdays. Works carried out outside of the hours will be limited to: ■ Works that do not cause noise emissions above 35 dB(A) at any nearby non-associated dwellings, or ■ The delivery of materials as requested by Police or other authorities for safety reasons, or ■ Emergency work to avoid the loss of lives, property, and/or to prevent environmental harm, or ■ Works where a proponent demonstrates and justifies a need to operate outside the recommended standard hours, including: – Weather conditions such as high winds during the day necessitating WTG crane lifts at night – Temperature conditions requiring concrete pours during the early morning – Extended concrete pours into the evening to complete a foundation If a need to work outside the recommended standard hours of construction is identified, this work would be carried out in accordance with plans prepared for the Project
Location of fixed noise sources	Locate fixed noise sources such as crushing and screening plant, concrete batching plant, generators and compressors at the maximum practicable distance to the nearest dwellings, and where possible, use existing topography (or raw or processed materials) to block line of sight between the fixed noise source and the dwelling

Mitigation Measure	Description
Acoustic screens	Provide acoustic screens or mounding for *fixed* crushing and screening plant and concrete batching plant wherever these noise sources are located within 2,400 m of a non-associated dwelling and do not have direct line of sight blocked by site topography to that dwelling, in accordance with the following requirements: ■ Locate the acoustic screens or mounding as close as practicable to the noise source ■ Construct from mounding using excavated soil from the site or a material with a minimum surface density of 10 kg/m^2, or use proprietary barriers such as the FlexShield "Sonic Quilt" ■ Construct to a minimum height that blocks direct line of sight between the noise source and any non-associated dwellings within 2,400 m ■ Construct such that air gaps or openings at joints between sections of the acoustic screens are minimised
Enclose generators and compressors	Provide proprietary acoustic enclosures for site compressors and generators located within 2,400 m of a non-associated dwelling
Alternative processes	Investigate and implement alternative processes where feasible and reasonable, such as hydraulic or chemical splitters as an alternative to impact rock breaking, or the use of broadband reversing alarms in lieu of the high-pitched alarms (subject to an appropriate risk assessment ensure the alarms are installed and operated in accordance with all relevant occupational, health and safety legislative requirements)
Site management	■ Select and locate centralised site activities and material stores as far from dwellings as practicable ■ Care should be taken not to excessively drop excavated materials from a height into a truck ■ Plant known to emit noise strongly in one direction, such as the exhaust outlet of generator set, shall be orientated so that the noise is directed away from noise sensitive areas if practicable ■ Machines that are used intermittently shall be shut down in the intervening periods between works or throttled down to a minimum ■ Implement worksite induction training for staff.
Equipment and vehicle management	■ Ensure equipment has Original Equipment Manufacturer mufflers (or better) installed ■ Ensure equipment is well maintained and fitted with adequately maintained silencers which meet the Original Equipment Manufacturer design specifications. This inspection should be part of a monitoring regime ■ Ensure silencers and enclosures are intact, rotating parts are balanced, loose bolts are tightened, frictional noise is reduced through lubrication and cutting noise reduced by keeping equipment sharp ■ Use only necessary power to complete the task ■ Inspect, as part of a monitoring regime, plant and equipment to determine if it is noisier than other similar machines and replace or rectify as required
Community consultation	Implement the following noise related elements into the overall community consultation process. The aim of the consultation is to ensure adequate community awareness and notice of expected construction noise
Traffic	
Traffic management	Care should be taken, particularly through towns and around site entry and exit points, to avoid excessive acceleration of trucks and the use of truck engine brakes in close proximity to dwellings and that such behaviour should be reinforced through worksite induction training

Mitigation Measure	Description
Reduce construction traffic noise	In accordance with the general principles of dealing with temporary construction noise impacts as compared to permanent operational noise, where the NSW Road Noise Policy criteria are exceeded (during the peak construction period), the following mitigation measures should be employed to reduce construction traffic noise: ■ Communicate with the affected community in accordance with the provisions above ■ Establish and maintain a route into the site so that heavy vehicles do not enter noise sensitive areas for access where practicable ■ Incorporate information regarding the route to all drivers prior to accessing the site and the need to minimise impacts through driver operation at certain locations ■ Schedule construction traffic deliveries such that it is as evenly dispersed as practicable ■ Restrict construction to the day-time operating hours for the construction site, subject to the justifications for activity outside of this time as detailed in the construction management plan
Construction vibration	
Construction vibration	If construction activities producing high levels of vibration occur within 100 m of a dwelling, such as upgrading existing roads (which may be within 25 m of the closest dwelling), it is recommended that a monitoring regime is implemented during these times to ensure compliance with DECC 2006
Blasting	
Blasting	Given the range of factors associated with both the generation and control of blasting, in the event of blasting occurring, a monitoring regime will be implemented to ensure compliance with the Australian and New Zealand Environment Council (ANZEC) – *Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration* (ANZEC, 1990)

6.3 Landscape and Visual

6.3.1 Introduction

A LVIA was undertaken by Moir Landscape Architecture (Moir LA) to assess the potential visual impacts associated with the Project. The LVIA provides a comprehensive assessment of potential visual impacts associated with the Project on the landscape character, landscape values, landscape amenity and any scenic vistas. The LVIA is provided in **Appendix I**.

6.3.2 Methodology

This LVIA was prepared in accordance with the *Wind Energy: Visual Bulletin* (DPE, 2016b) (Visual Bulletin). The following literature also assisted the formulation of the study methodology:

- Scottish Natural Heritage, *Visual Representation of Wind Farms - Good Practice Guidance* (Scottish Natural Heritage, 2017);
- Environment Protection and Heritage Council, *Draft National Wind Farm Development Guidelines* (Environment Protection and Heritage Council, 2010);
- Landscape Institute and Institute of Environmental Management & Assessment, *Guidelines for Landscape and Visual Impact Assessment* Third edition (Landscape Institute and IEMA, 2013); and
- Clean Energy Council, *Best Practice Guidelines for Wind Energy Development* (CEC, 2018).

In accordance with the Visual Bulletin, the visual assessment includes:

- A baseline study that includes analysis of the landscape character, scenic quality, and visibility from viewpoints of different sensitivity levels;
- Establish visual influences zones from viewpoints using data collected in the baseline study;

- Assessment of the proposed layout against visual performance objectives; and
- Justification for the final proposed layout and identification of mitigation and management measures.

Extensive field work and photographic survey work for the Project was undertaken in 2020 and 2021 from both public and private properties.

Specific assessment was undertaken on the potential for impact on the nearby Gondwana Rainforests of Australia World Heritage Area. The assessment was undertaken in consideration of the UNESCO World Heritage and Wind Planning document and the specific SEARs relating to locations within the World heritage area.

6.3.3 Existing Environment

The Visual Bulletin requires that a 'visual baseline study' be undertaken to establish the existing landscape and visual conditions. **Table 6-23** provides an overview of the visual baseline study and where the inputs have been addressed.

Table 6-23 Visual Baseline Study Inputs

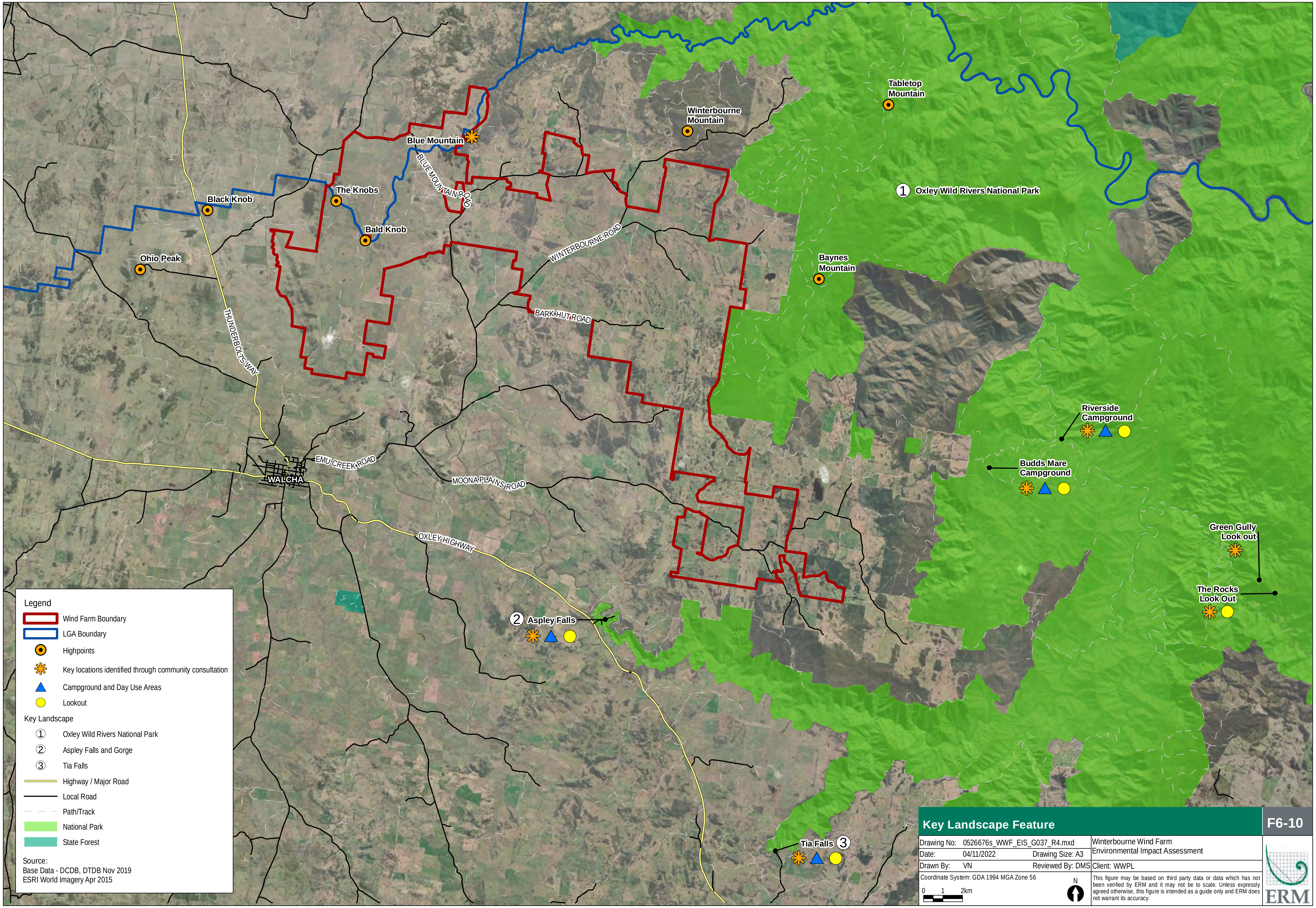
Visual baseline study input	Where addressed
Sensitive land use designations: ■ *Map Layer identifying National and State Sensitive Land Use Designations and LEP Zones.*	Section 5.2 of LVIA (refer **Appendix I**)
Landscape character type: ■ *Describe the broad area of land in which the wind energy project is located.*	Section 5.3 of LVIA (refer **Appendix I**)
Key landscape features: ■ *Identify areas of visual interest or quality that stand out visually in the landscape.*	Section 5.4 of LVIA (refer **Appendix I**)
Landscape character unit (LCU) classification: ■ *Landscape is categorised into LCU and Scenic Quality Ratings are applied to each LCU.*	Section 5.5 and Appendix B of LVIA (refer **Appendix I**)
Viewpoint inventory and sensitivity levels: ■ *Undertake a viewpoint inventory from public and private locations and establish the Visual Influence Zones for each.*	Section 8.0 of LVIA (refer **Appendix I**)
Visibility distance zones: ■ *Undertake visibility or view shed mapping when assessing what may be visible from a given viewpoint looking in all directions.*	Section 7.0 of LVIA (refer **Appendix I**)

6.3.3.1 Existing Landscape and Key Features

Areas of land to the east of the Project are zoned as C1 – National Parks and Nature Reserves, including the Oxley Wild Rivers National Park. Parts of Oxley Wild Rivers National Park are included on the World Heritage List as part of the Gondwana Rainforests of Australia World Heritage Area. Gondwana Rainforests of Australia World Heritage Area was inscribed on the World Heritage List in 1986, and extended in 1994, because it satisfies three of the four criteria for natural values of outstanding universal significance. It contains:

- Spectacular gorges, cliff lines and deep, steep sided valleys illustrating on-going geomorphological processes associated with the Great Escarpment;
- Numerous high waterfalls;
- Panoramic views from locations along the escarpment edge; and
- Attractive tall moist forests and rainforests and diverse vegetation types across the landscape.

Oxley Wild Rivers National Park contains significant landscape values, which allows for numerous recreation and tourism opportunities ranging from short to overnight walks, camping, swimming, bicycling, kayaking etc. The key landscape features are displayed in **Figure 6-10**.


Tabletop Mountain
Winterbourne Mountain
Blue Mountain
BLUE MOUNTAIN ROAD
The Knobs
Black Knob
Bald Knob
Ohio Peak
Oxley Wild Rivers National Park
WINTERBOURNE ROAD
Baynes Mountain
BARK HUT ROAD
THUNDERBOLTS WAY
Riverside Campground
Budds Mare Campground
EMU CREEK ROAD
WALCHA
MOONA PLAINS ROAD
OXLEY HIGHWAY
Green Gully Look out
The Rocks Look Out
Aspley Falls
Tia Falls
Legend
Wind Farm Boundary
LGA Boundary
Highpoints
Key locations identified through community consultation
Campground and Day Use Areas
Lookout
Key Landscape
Oxley Wild Rivers National Park
Aspley Falls and Gorge
Tia Falls
Highway / Major Road
Local Road
Path/Track
National Park
State Forest
Source:
Base Data - DCDB, DTDB Nov 2019
ESRI World Imagery Apr 2015
Key Landscape Feature
F6-10
Drawing No: 0526676s_WWF_EIS_G037_R4.mxd
Date: 04/11/2022
Drawing Size: A3
Drawn By: VN
Reviewed By: DMS
Winterbourne Wind Farm
Environmental Impact Assessment
Client: WWPL
Coordinate System: GDA 1994 MGA Zone 56
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This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
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6.3.3.2 Community Landscape Values

Community consultation was undertaken by the Proponent to establish an understanding of the landscape values held by the local and broader community. A questionnaire was developed to gain an understanding of the key landscape features, areas of scenic quality and key public viewpoints valued by the community. The results of the questionnaire assisted to identify key areas of concern and ensure the LVIA provided a comprehensive assessment considering community landscape values.

The findings of the questionnaire indicated that most respondents (78%) from the community consider community and family ties as most valued in their local area, followed by views and landscape (30%). When questioned about the landscape characteristics of most importance to the community, prominent hills and ridgelines were found to be of highest value (47%), followed by river corridors and water bodies (27%). Apsley Falls was identified by several community respondents as a specific landscape feature of importance.

6.3.4 Assessment of Impacts

6.3.4.1 Visual Magnitude

The analysis of visual catchment included the use of two preliminary assessment tools in accordance with the Visual Bulletin: (1) visual magnitude and (2) multiple WTG effect.

Application of the Preliminary Assessment Tools to the Project identified dwellings which require further assessment in accordance with the Visual Bulletin. Non-associated dwellings identified within 3,100 m (black line of visual magnitude) and between 3,100 – 4,550 m (blue line of visual magnitude) of the nearest proposed turbine are shown on **Figure 6-11**.

Visual magnitude is based on a 2D assessment of the Project, and does not consider topography, vegetation or other screening factors which may reduce the potential for viewing turbines. The Visual Magnitude Threshold is based on the height of the proposed WTGs to the tip of the blade and distance from dwellings or key public viewpoints.

The proposed WTGs have a design tip height of 230 m. The ‘black line intersects at 3,100 m and the ‘blue line’ intersects at 4,550 m.

The visual magnitude assessment identified:

- 20 non-associated dwellings within 3,100 m of a WTG location (within the black line); and
- 23 non-associated dwellings within 3,100 – 4,550 m of a WTG (within the blue line and outside the black line).

Further discussion on the dwelling assessments is provided in **Section 6.3.4.6**.

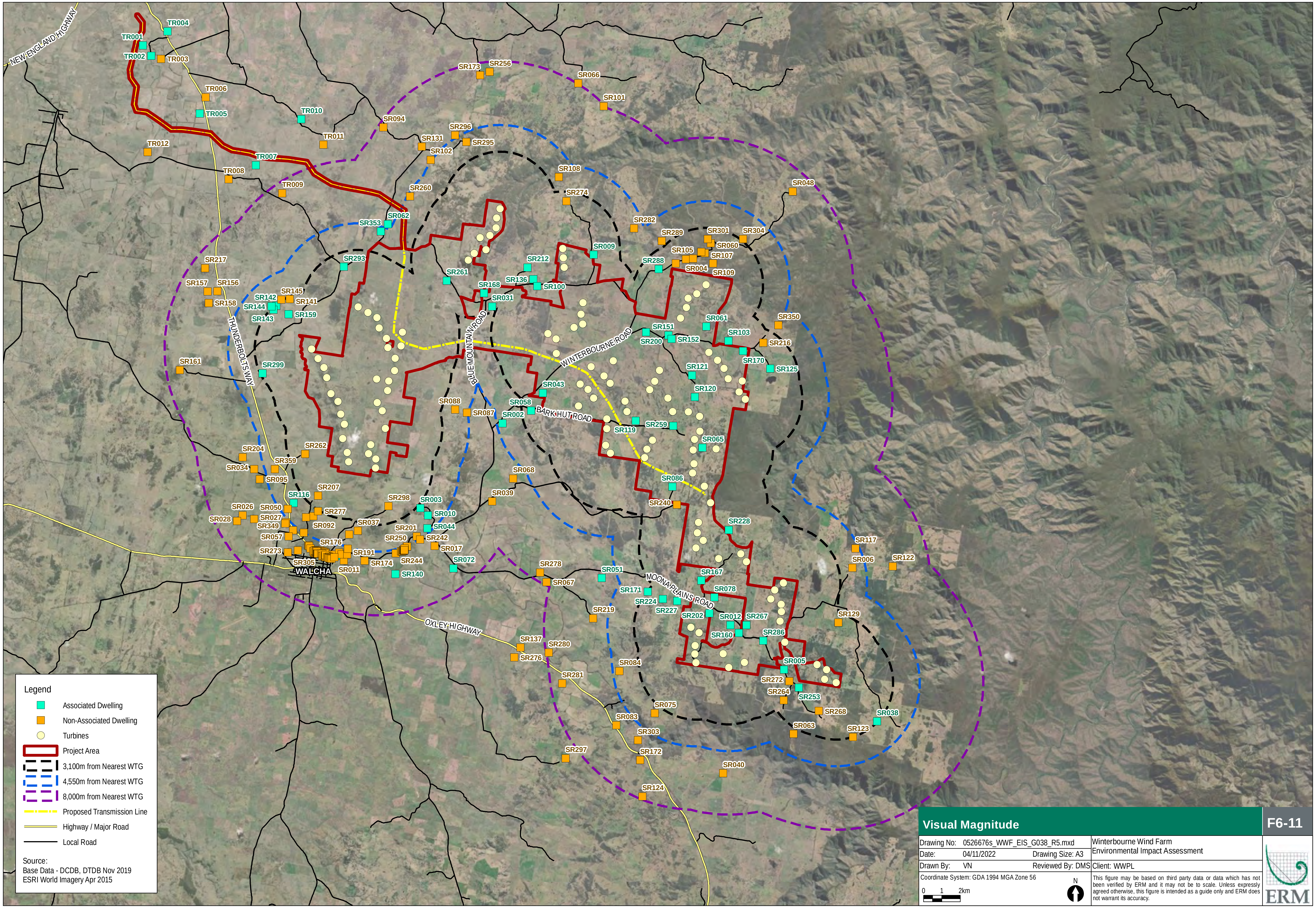
6.3.4.2 Multiple Wind Turbine Tool

The *Multiple Wind Turbine Tool* provides a preliminary indication of potential cumulative impacts arising from the Project. To establish the degree to which dwellings or key public viewpoints may be impacted by multiple WTG, the Proponent must map into six sectors of 60° any proposed turbines and any existing or approved turbines within 8 km of each dwelling or key public viewpoint.

When applied to the Project, the analysis identified 12 non-associated dwellings with more than two sectors of turbines within 8,000 m. Of the dwellings identified:

- 11 dwellings have turbines in up to three 60º sectors (up to 180º); and
- One dwelling in up to four 60º sectors (up to 240º).

The remaining dwellings within 8,000 m of the nearest turbine had two or less 60º sectors, which is deemed acceptable in accordance with the Visual Bulletin. **Figure 6-12** provides an overview of the number of 60º sectors visible from each of the dwellings identified within 8,000 m.


NEW ENGLAND HIGHWAY
THUNDERBOLTS WAY
BLUE MOUNTAIN ROAD
WINTERBOURNE ROAD
BARK HUT ROAD
MOONAPLAINS ROAD
OXLEY HIGHWAY
WALCHA
Legend
Associated Dwelling
Non-Associated Dwelling
Turbines
Project Area
3,100m from Nearest WTG
4,550m from Nearest WTG
8,000m from Nearest WTG
Proposed Transmission Line
Highway / Major Road
Local Road
Source:
Base Data - DCDB, DTDB Nov 2019
ESRI World Imagery Apr 2015
Visual Magnitude
F6-11
Drawing No: 0526676s_WWF_EIS_G038_R5.mxd
Date: 04/11/2022
Drawing Size: A3
Drawn By: VN
Reviewed By: DMS
Winterbourne Wind Farm
Environmental Impact Assessment
Client: WWPL
Coordinate System: GDA 1994 MGA Zone 56
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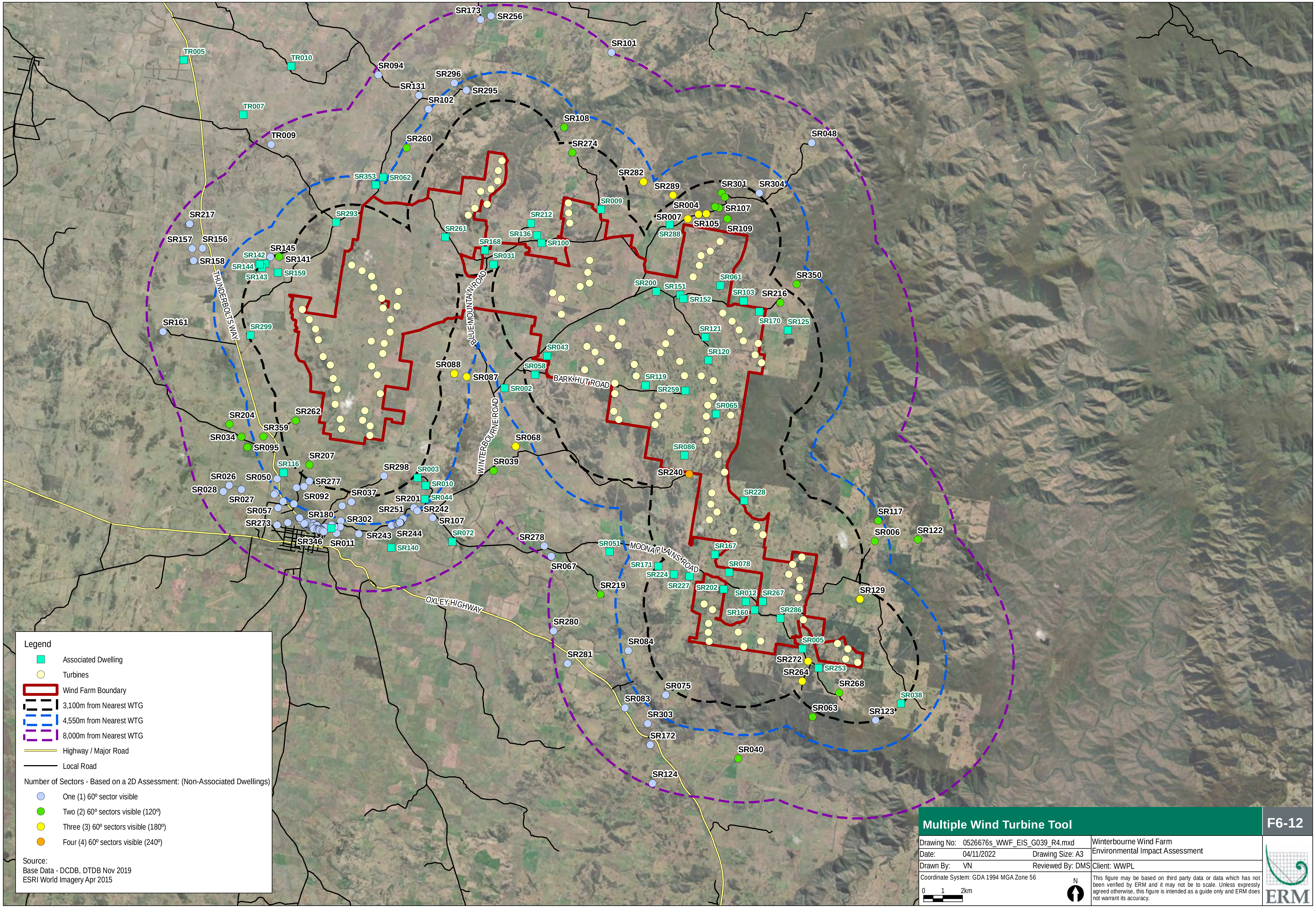

Multiple Wind Turbine Tool

F6-12

Drawing No:	0526676s_WWF_EIS_G039_R4.mxd		Winterbourne Wind Farm Environmental Impact Assessment
Date:	04/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: DMS	Client: WWPL

Coordinate System: GDA 1994 MGA Zone 56

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6.3.4.3 Zone of Visual Influence

Two Zone of Visual Influence (ZVI) diagrams were prepared for the Project, to illustrate the theoretical visibility of the Project from hub height and blade tip. The ZVI does not consider the potential screening effect of structures or vegetation which may screen views to the Project. The ZVI has been assessed to approximately 10 km from the Project.

Figure 6-13 depicts the areas of land from which the Project may be visible and provides an indicative number of WTGs based on the tip height (230 m). **Figure 6-14** illustrates the areas of land from which the Project Area would be visible at hub height (149 m).

Due the elevated locations of the proposed WTGs and the maximum blade tip height, the ZVI depicts a large percentage of land immediately surrounding the proposed development from which WTGs would theoretically be visible.

The ZVI indicates the Project will not be visible from large areas of land to the north and east of the Project Area, in particular land associated with Oxley Wild Rivers National Park. The ZVI further indicates the highest level of visibility is likely to be experienced from elevated areas of land within the Project Area, to the south of Oxley Highway and to the west.

6.3.4.4 Viewpoint Analysis

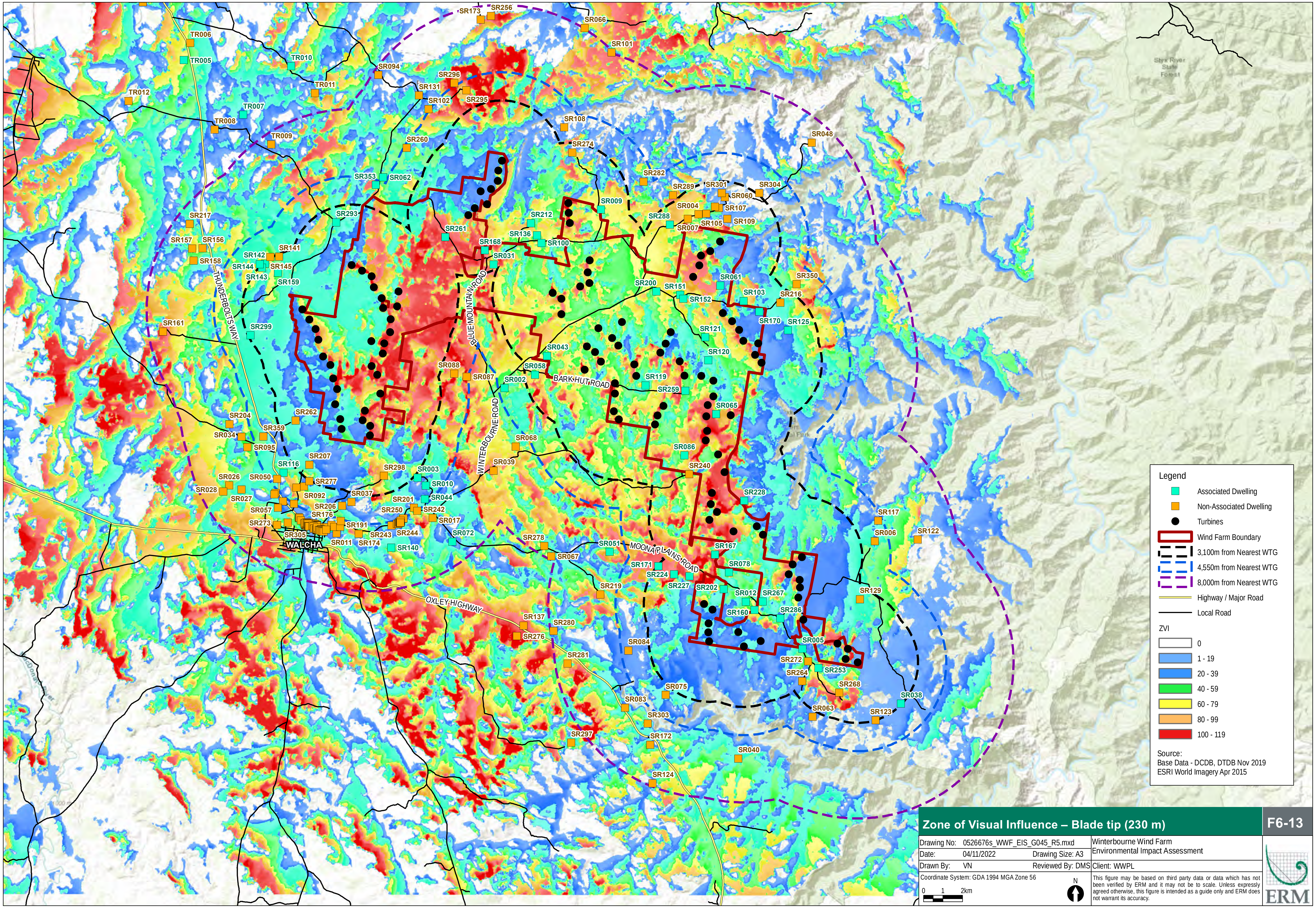
Viewpoints were taken predominantly on accessible public land (typically walking tracks, roads, and lookouts), while some were recorded from private property with consent from landowners. The visual impact of the viewpoint was assessed both on site and through a desktop assessment utilising topographic and aerial information.

A total of 56 viewpoints were assessed from varying distances and locations surrounding the Project Area. The locations of viewpoints are shown in **Figure 6-15**. In accordance with the objectives of the Visual Bulletin, each viewpoint was assessed against the objectives for the Visual Influence Zone (VIZ). Each viewpoint was assigned a VIZ of High, Medium, or Low based on its view sensitivity level, distance zone and scenic quality class combinations.

The following provides a brief overview of the viewpoint analysis:

- **Visual Influence Zone 2 (Medium) (VIZ2):** A total of 24 viewpoints were rated as VIZ2. Each of these were assessed against the performance objectives outlined in the Visual Bulletin; and
- **Visual Influence Zone 3 (Low) (VIZ3):** A total of 32 viewpoints were rated as VIZ3 in accordance with the methodology in the Visual Bulletin. There are no performance objectives for VIZ3 as per the Visual Bulletin.

Detailed assessment of each viewpoint is provided in Appendix C of the LVIA (refer **Appendix I**).



Zone of Visual Influence – Blade tip (230 m)

F6-13

Drawing No: 0526676s_WWF_EIS_G045_R5.mxd		Winterbourne Wind Farm Environmental Impact Assessment
Date: 04/11/2022	Drawing Size: A3	
Drawn By: VN	Reviewed By: DMS	Client: WWPL
Coordinate System: GDA 1994 MGA Zone 56		This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

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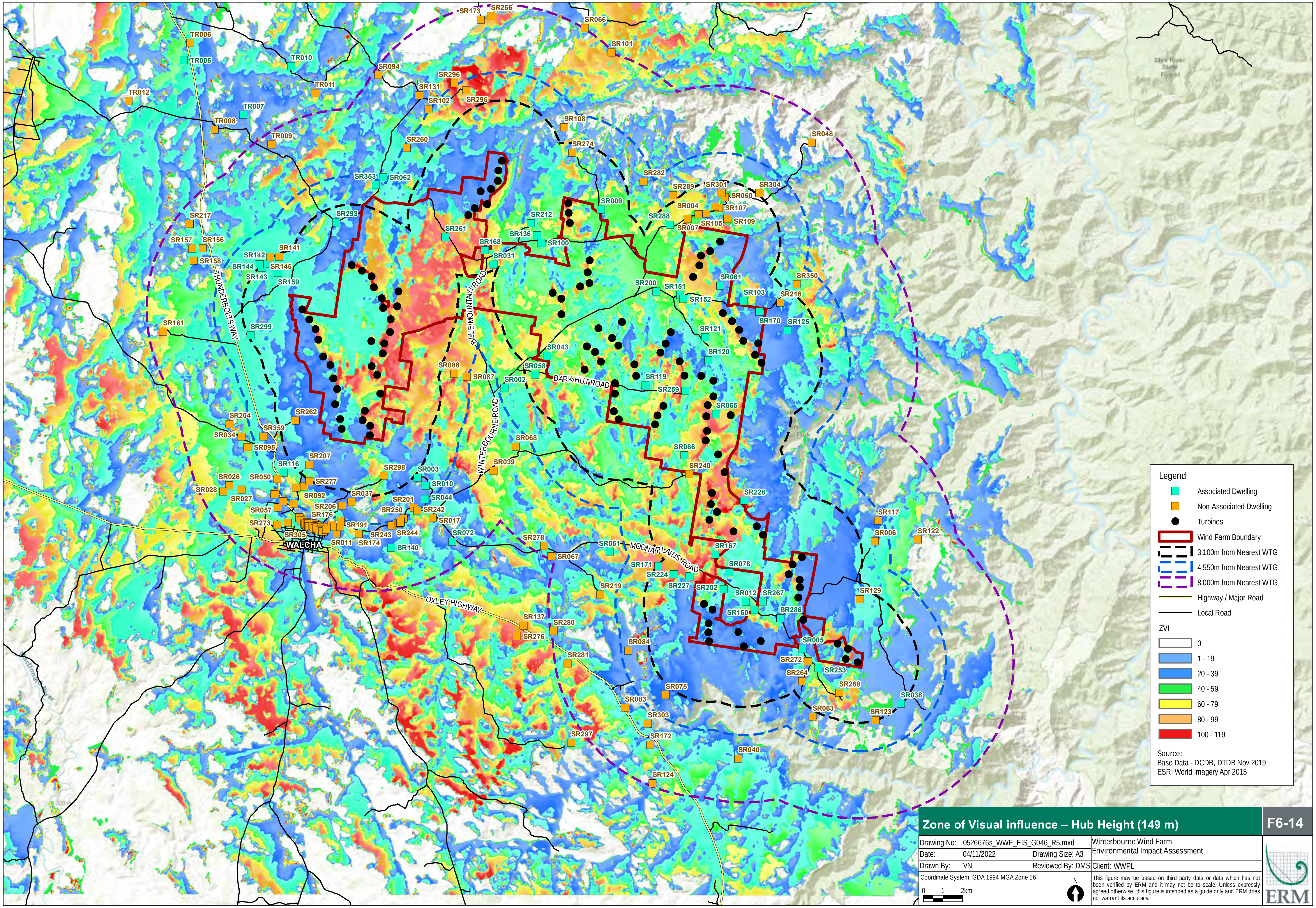

Zone of Visual influence – Hub Height (149 m)

F6-14

Drawing No: 0526676s_WWF_EIS_G046_R5.mxd		Winterbourne Wind Farm Environmental Impact Assessment
Date: 04/11/2022	Drawing Size: A3	
Drawn By: VN	Reviewed By: DMS	Client: WWPL

Coordinate System: GDA 1994 MGA Zone 56

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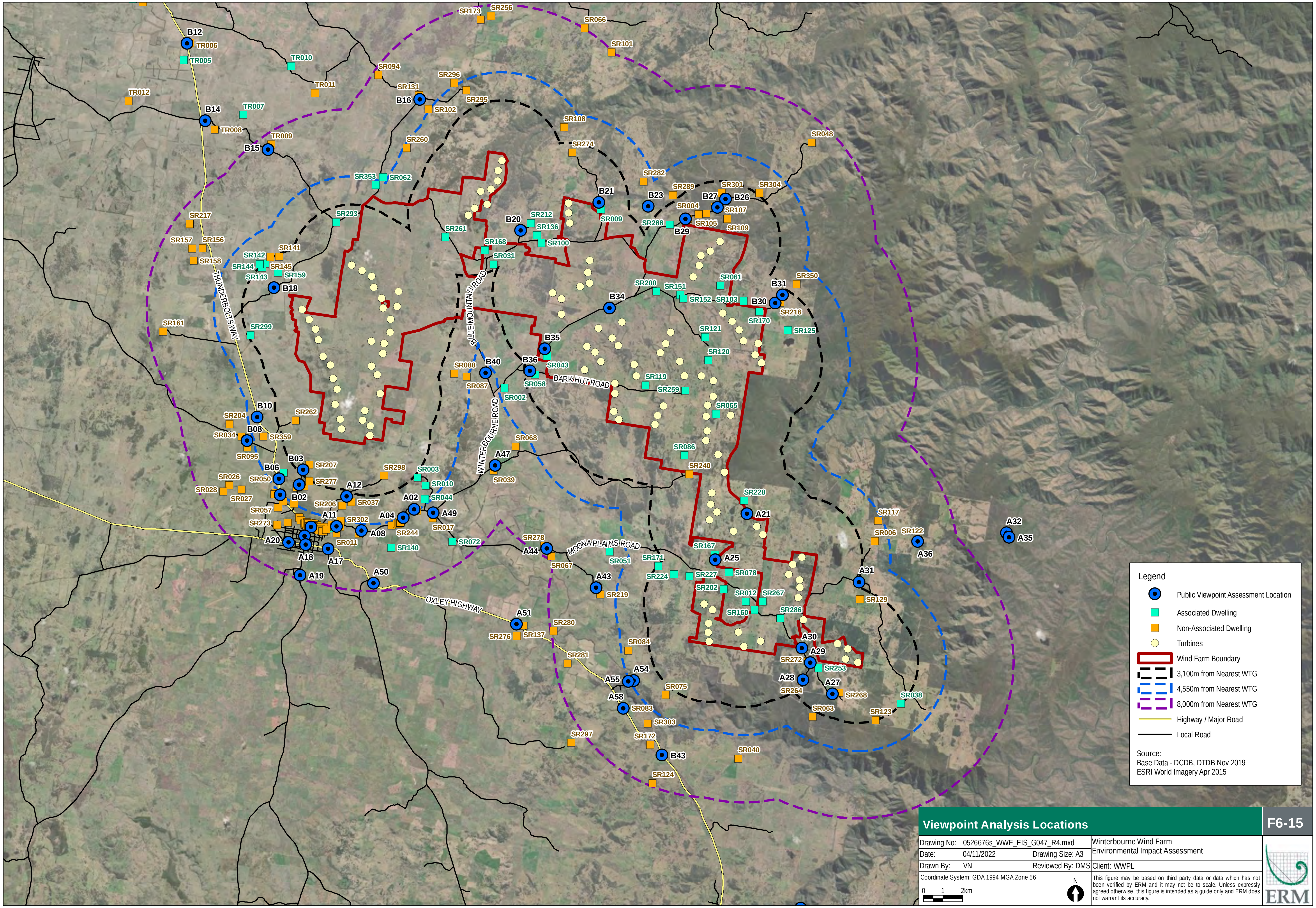

Viewpoint Analysis Locations

F6-15

Drawing No:	0526676s_WWF_EIS_G047_R4.mxd		Winterbourne Wind Farm Environmental Impact Assessment
Date:	04/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: DMS	Client: WWPL
Coordinate System: GDA 1994 MGA Zone 56			This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

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6.3.4.5 Photomontages and Wireframes

Photomontages are used to illustrate the likely view of a proposed development as it would be seen in a photograph. The photomontages are based on a worst-case scenario of a maximum turbine height dimension of 230 m with a hub height of 149 m and rotor diameter of 162 m, without the inclusion of the proposed mitigation methods.

Photomontages and wireframes were prepared for 11 public and nine private viewpoints to best illustrate the potential appearance of the wind farm from varying distances and locations with differing views. This included four photomontages/wireframes relevant to Oxley Wild Rivers National Park and the Gondwana Rainforests of Australia World Heritage Area. These locations were selected based on feedback received from the community. Exact photomontage locations were selected on site to represent a worst-case scenario for the viewpoint location. Localised screening factors such as vegetation were avoided (where possible) to ensure maximum exposure to the Project. **Figure 6-16** provides a summary of the photomontages and wireframes produced.

Wire frame diagrams indicate the 3D shape of the landscape in combination with additional elements. They can be used as a substitute for photomontages in areas where dense vegetation limits the capacity to align photographs accurately (i.e. due to dense vegetation). Wire frame images can be seen as a worst-case scenario as they do not consider factors such as vegetation, building structures.

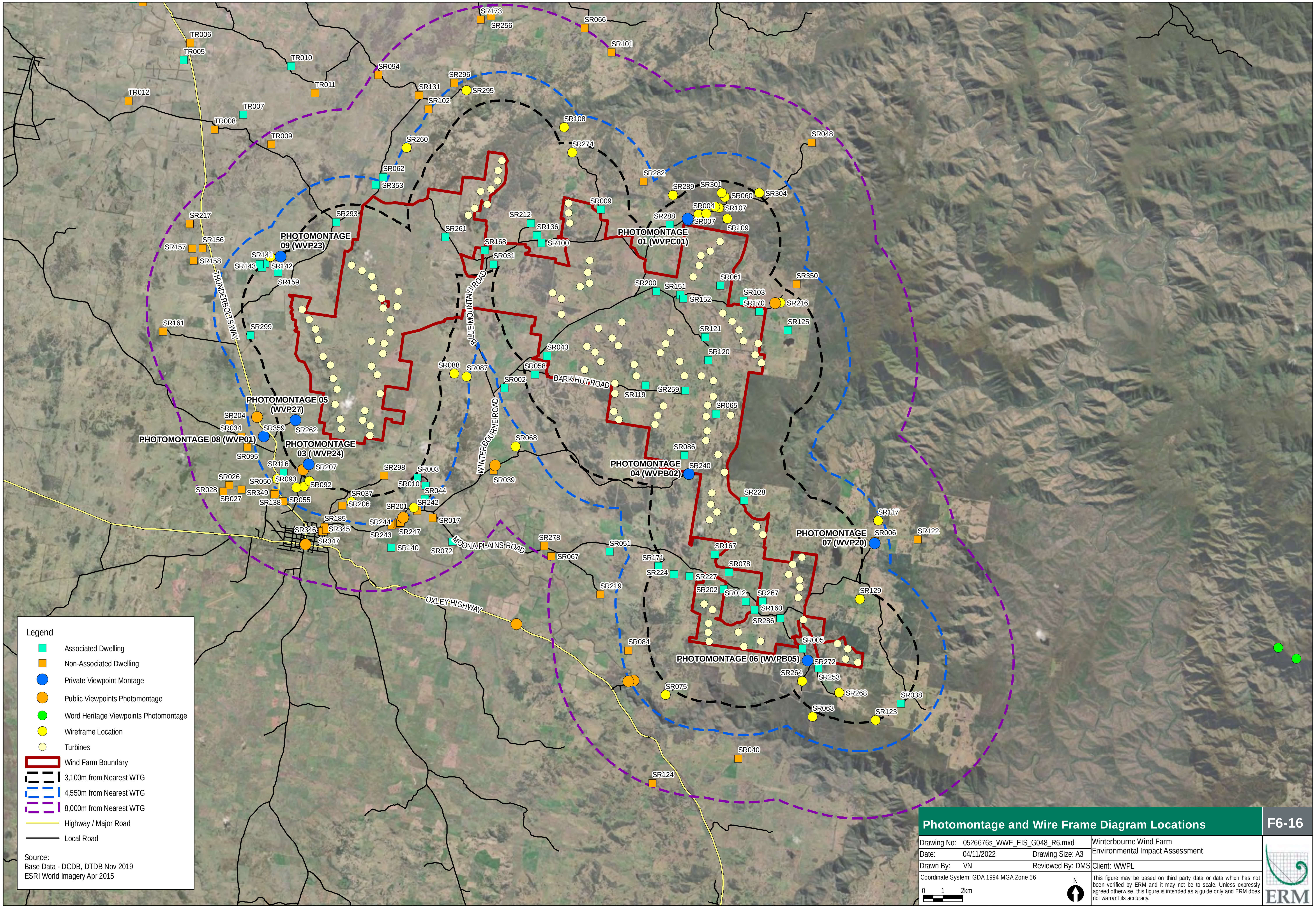
Wire frame diagrams were utilised in the LVIA to assist in the assessment of the Project from inaccessible locations. In instances where access to a private property was not granted, wire frame diagrams have been utilised as an assessment tool to provide a worst-case scenario view of the proposal. Two wire frame diagrams have been prepared to demonstrate the visual impact of the Project on the Gondwana Rainforest Area.

Photomontage and wire frame diagram locations for the Project are shown in **Figure 6-16**. Photomontages and wire frame diagrams for public viewpoints and selected non-associated residences are included in Appendix D of the LVIA (refer **Appendix I**).

Table 6-24 Overview of Photomontages and Wireframe Diagrams

Representative Dwelling / Location	Corresponding Photomontage/ Wireframe	Representative Dwelling / Location	Corresponding Photomontage/ Wireframe
SR007*	Photomontage 01 Photomontage 02	SR204*	Photomontage 15
SR207*	Photomontage 03	SR216*	Photomontage 16
SR240*	Photomontage 04	McMillan Lookout, Walcha*	Photomontage 17
SR262*	Photomontage 05	SR039	Photomontage 10
SR272*	Photomontage 06	SR137*, SR276	Photomontage 11
SR006*	Photomontage 07	Fitzroy Street, Walcha	Photomontage 13
SR359*	Photomontage 08	Aspley Gorge Bridge, Walcha	Photomontage 18
SR141*	Photomontage 09	Green Gully Lookout	Wireframe 01
SR250*, SR251*	Photomontage 12	The Rocks Lookout	Wireframe 02
SR207*, SR277*	Photomontage 14		

*within 4.55 km of a wind turbine



Photomontage and Wire Frame Diagram Locations

F6-16

Drawing No:	0526676s_WWF_EIS_G048_R6.mxd		Winterbourne Wind Farm Environmental Impact Assessment
Date:	04/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: DMS	Client: WWPL
Coordinate System: GDA 1994 MGA Zone 56			This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

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6.3.4.6 Dwelling Assessments

The Preliminary Assessment Tools, as discussed in **Section 6.3.4.1** and **Section 6.3.4.2**, defined the visual catchment and identified non-associated residences within the Study Area which require further assessment. These include:

- 20 non-associated dwellings within 3,100 m of a WTG location (within the black line);
- 23 dwellings within 3,100 – 4,550 m of a WTG (within the blue line); and
- 1 non-associated beyond 4,550 m of a WTG with more than two sectors identified.

With the advice of Moir LA, the Proponent offered on-site visual assessments from private properties within 4,550 m of the Project. With consent from landowners, Moir LA undertook detailed site inspection for a total of 26 non-associated dwellings across several separate visits from October 2021 to January 2022. An overview of the visual assessment for each of these dwellings has been outlined in Appendix E of the LVIA (refer **Appendix I**).

Dwellings within 3,100 m

A total of 20 non-associated dwellings were identified within 3,100 m of a WTG. Of these, access was granted to a total of 16 non-associated dwellings.

The purpose of the site inspections was to undertake photographic assessments from areas identified by the landowner as having concern for visual impact and ground truth information identified through the desktop assessment. Where access was not granted to the property, Moir LA undertook desktop assessment utilising 3D and the most current available aerial imagery. Of those assessed:

- Seven were rated as nil / negligible visual impact rating;
- Five were rated as having a low visual impact rating;
- Five were assessed as having a moderate visual impact rating; and
- Three were assessed as having a high visual impact rating (however with the mitigation described in **Section 6.3.5**, would reduce to moderate).

Dwellings within 3,100 - 4,550 m

A total of 23 dwellings were identified within 3,100 – 4,550 m of a proposed WTG. On-site visual assessments were offered to most of these dwellings with potential visual impacts identified. Access was granted by six landowners and Moir LA attended these properties between 15-17 June 2020 to undertake a detailed site inspection.

Of those assessed:

- Eight were assessed as having nil / negligible visual impact rating;
- Six were assessed as having a low visual impact rating;
- Seven were assessed as having a moderate visual impact rating; and
- Two were assessed as having a high visual impact rating (however with the mitigation described in **Section 6.3.5**, would reduce to moderate).

Dwellings more than 4,550 m

One non-associated dwelling was identified more than 4,550 m of a proposed WTG with more than two sectors identified. The LVIA found this dwelling as having a low visual impact rating.

In addition to the detailed assessment of dwellings identified within the visual catchment, Moir LA undertook an extensive Viewpoint Analysis which provides representative visual assessments from dwellings more than 4,550 m of the Project (refer **Section 6.3.4.4**).

6.3.4.7 Landscape Character

The Project will be located within a predominantly rural landscape that has not been identified as significant or rare. The broad landscape character is dominated by established rural land which consists primarily of modified undulating hills. Generally, the Scenic Quality Classes of the LCU within the Project Area have been rated as moderate with some areas defined as moderate to high.

The proposed WTGs are generally positioned within a landscape that has remained largely unchanged for decades. While there is little doubt that the Project would become a feature of the area, it is likely the character of areas which are valued for their high landscape quality and utilised for recreation and tourism will remain intact. Regionally, significant landscape features identified would remain dominant features of the landscape and it is unlikely the proposal would degrade the scenic value of these landscape features. Appendix F of the LVIA provides an overview of the assessment of the potential visual impacts on the existing landscape character of the local area for each LCU. **Table 6-25** provides a summary of the findings.

Of the nine LCU's identified and assessed, the Project is likely to be visible from all, to varying degrees. However, due to the undulating topography surrounding the Project Area, there are limited opportunities to view the Project in its entirety.

Table 6-25 Summary of Visual Impacts on LCUs

LCU	Scenic Quality Rating	Landscape Scenic Integrity	Key Landscape Features
LCU01: Oxley Wild Rivers	Moderate / High	The Project will form a minor element in the overall visual landscape. The landscape elements which contribute to the scenic quality of the LCU will remain unchanged.	The key features of this LCU include dramatic gorges, elevated, densely wooded, and rugged ridgelines contrasted by waterfalls and rivers. These features will remain unchanged. The Project will form a minor element in the overall visual landscape and will not disrupt the key landscape features.
LCU02: Walcha Village	Moderate	The Project will not alter the scenic integrity of the Walcha Village LCU.	The Project is unlikely to significantly alter or disrupt the identified key landscape features of the LCU.
LCU03: Moona Plains	Low / Moderate	The current landscape character and scenic quality of the Moona Plains LCU is likely to be slightly altered in some locations due to the Project.	Although the Project is likely to slightly alter views within the LCU from some limited locations to the northeast, the identified undulating landform will remain the key landscape feature within the Moona Plains LCU.
LCU04: Oxley Highway	Low	The Project will not alter the scenic integrity of the Oxley Highway LCU.	Although the Project is likely to slightly alter views from limited locations, the identified landscape features will remain the key features of the landscape within this LCU.
LCU05: Thunderbolts Way Pastures	Low / Moderate	The current landscape character and scenic quality of the Thunderbolts Way Pastures LCU is likely to be slightly altered in some locations, particularly sections of Mirani and Hillview Roads in proximity to the Project.	Although the Project is likely to alter views from some limited locations, the identified landscape features will remain the key feature of the landscape within this LCU.
LCU06: Rowleys Creek Road	Moderate	The current landscape character and scenic quality of the LCU is likely to be altered in some locations, particularly sections in proximity to the Project.	Views toward the ridgeline and undulating landform will remain a key feature, however the proposed WTGs will also become a dominant visual element.

LCU	Scenic Quality Rating	Landscape Scenic Integrity	Key Landscape Features
LCU07: Winterbourne Road	Low / Moderate	The current landscape character and scenic quality of the LCU is likely to be altered in some locations because of the Project.	Views toward the ridgeline and undulating landform will remain a key feature, however the proposed WTGs will also become a dominant visual element.
LCU08: Apsley River	Low / Moderate	The Project will form a minor element in the overall visual landscape. The landscape elements which contribute to the scenic quality of the LCU will remain unchanged.	The Project will form a minor element in the overall visual landscape and will not disrupt the key landscape features.
LCU09: Salisbury Plains	Low	The Project and ancillary infrastructure will form a minor element in the overall visual landscape. The scenic quality of the LCU will be slightly altered because of the proposal.	The Project is unlikely to significantly alter or disrupt the identified key landscape features of the LCU.

6.3.4.8 Shadow Flicker and Blade Glint

Shadow flicker refers to the visual effect that occurs when rotating turbines cause moving shadows as the blades pass in front of the sun. The shadow flicker assessment for the Project is based on a worst-case scenario considering topography alone.

No dwellings have the potential to experience more than 30 hours of potential shadow flicker per year. Further analysis of shadow flicker is detailed in Section 11 of the LVIA (refer **Appendix I**). The shadow flicker assessment identified that small extents of Winterbourne Road, Blue Mountain Road, Chinnocks Road and Table Top Road have potential to experience shadow flicker. As the roads have a low frequency of use the potential impact is likely to be low.

Blade glint (also referred to as blade reflectivity) refers to the regular reflection off one or more rotating blades. All major WTG blade manufacturers currently finish their blades with a low reflectivity treatment, which prevents reflective glint from the surface of the blades and the possibility of a strobing reflection when the turbine blades are spinning. The WTGs selected for the Project will be finished with a low reflectivity surface treatment in accordance with the requirements of the Visual Bulletin. Therefore, the risk of blade glint from the Project is very low.

6.3.4.9 Night Lighting

Night lighting has the potential to result in the alteration of the night-time landscape character of the region. Potential light sources include aviation hazard lighting and night lighting for safety and security on ancillary structures.

The Aviation Impact Assessment found that aviation hazard lighting is not required for WTGs and met masts to maintain an acceptable level of safety to aircraft. However, the requirement for aviation hazard lighting on WTGs for the Project is subject to the advice of the Civil Aviation Safety Authority (CASA). It is noted that the turbines proposed will be up to 230 m in height and CASA generally recommends night lighting if an obstacle exceeds 160 m above ground level.

In addition to aviation hazard lighting on WTGs, night lighting is likely to be required on ancillary infrastructure including switching stations, collector substations and facilities buildings. It is unlikely the proposed night lighting associated with the ancillary infrastructure would create a noticeable impact on the existing night-time landscape.

Detailed analysis of night lighting impacts is provided in Section 12 of the LVIA (refer **Appendix I**).

6.3.4.10 Ancillary Infrastructure

In addition to the proposed WTGs, the ancillary infrastructure is likely to contrast with the existing visual landscape. Due to the large scale and elevated siting of the Project, access roads, transmission lines and other ancillary structures have been assessed for a potential to alter the existing visual landscape.

Transmission lines

Opportunities to view the transmission lines are limited due to distance, topography, and vegetation. As transmission lines are an existing infrastructure element in the landscape, the introduction of new transmission line would not be a significant or contrasting element in the landscape. The visual impact of the transmission lines is expected to be low.

Internal Electrical Reticulation Network

The internal 33 kV cables will generally be located within underground trenches and therefore the visual impact would be negligible. Where the cables are required above ground, effort will be made to ensure visual impacts are minimised. If deemed necessary, mitigation methods such as screen planting could be employed to reduce any potential visual impacts.

Switchyard

The switchyard is sited on a slight rise to the west of Thunderbolts Way. Existing roadside vegetation is likely to fragment views available to motorists travelling along Thunderbolts Way. The nearest non-associated dwelling is to the north-east of the switchyard approximately 830 m to the north-east. Views from this dwelling are likely to be fragmented by roadside vegetation associated with Thunderbolts Way.

Operations and Maintenance Facility

The O&M facility will be located off Blue Mountain Road next to the north substation, BESS, and laydown area. Views toward the O&M facility are unlikely from the surrounding area due to topography. If deemed necessary, mitigation methods such as screen planting could be employed to reduce any potential visual impacts.

BESS

The proposed BESS will be located to the south of the north substation, occupying an area of approximately 100 m x 100 m. The BESS is likely to be screened by topography and vegetation.

Substations

The North Substation is located west of Blue Mountain Road and is situated within a relatively flat area surrounded by local vegetation rises. The nearest non-associated dwelling is located approximately 3.7 km south of the substation. Views toward the substation from this dwelling are unlikely due to the topography and distance.

The South Substation is in an isolated and vegetated area northeast of Old Brookmount Road within undulating landform. The nearest non-associated dwelling is located approximately 1.5 km south-west of the substation. Views to the substation are unavailable due to a combination of topography and the dense vegetation to the south-west of the substation.

Meteorological Monitoring Masts

The Permanent Mast 1 is proposed along the western boundary of the Project Area, and Permanent Mast 2 is proposed near the southern Boundary of the Project Area. Due to the elevated location and height, the masts are likely to be visible from the closest non- associated dwellings. However, existing vegetation is likely to fragment views and the masts are therefore likely to have a low visual impact.

Access Tracks

Generally, the internal access tracks will be sited to reduce potential vegetation loss and limit earth work requirements. Due to the existing agricultural land use of the Project Area, farm roads traversing the landscape form a significant part of the existing landscape character. The proposed access tracks are likely to be viewed as part of the existing character of the landscape and therefore the visual impact would be low.

6.3.4.11 Visual Impacts on Gondwana Rainforests of Australia World Heritage Area

The SEARS specifically requests for a detailed assessment of the visual impacts of the Project for the Gondwana Rainforest of Australia World Heritage Area (WHA).

The main publicly accessible location within the Gondwana Rainforest is the Green Gully Track. The Green Gully Track is an isolated and challenging 65km hike that generally takes 4-5 days to complete and is recommended for experiences bushwalkers. The walking track explores the Apsley-Maclaey gorges and includes both high elevation forests, ridgelines, fern lines gullies and streams. A number of partially cleared, informal look out areas, including the Rocks Lookout, provide views to the surrounding dramatic gorges and rocky outcrops. A number of small huts located along the trail provide visitors an area to rest along the way. The trail itself is heavily wooded, with the exception of the surroundings to the huts and lookout areas.

A desktop assessment was undertaken using wireframes at both the Green Gully and 'Rocks' Lookout. These can be found within **Appendix I**.

From these locations the turbines are located in excess of 20km of the viewpoints with the majority of the hike generally featuring dense vegetation. It was determined using the desktop assessment that due to a combination of distance and existing vegetation it will be unlikely to view the Project from either the Green Gully Lookout or 'Rocks' Lookout or from within the Gondwana Rainforest Area.

In addition to what was requested in the SEARs, assessment was undertaken on the potential for impact on the entire WHA, in particular the areas directly to the east and south of the Project where, in some instances, the boundary of the WHA is within 2 km of the turbines. This assessment was undertaken in the context of the UNESCO World Heritage and Wind Planning document which provides commentary on the assessment of wind energy projects in close proximity to listed World Heritage areas in Europe. Although the document focuses primarily on impacts on cultural heritage the concept of Outstanding Universal Value (OUV) is relevant in this case. The concept of OUV relates to the values of listed World Heritage Areas being representative of all the values of the World Heritage beyond the specific nature of each sites listing. The document states in explaining the concept of OUV that;

"*The value of a listed property is also universal and outstanding. To say that a World Heritage property is 'outstanding' means that it is the most representative example due to its status as a heritage type. 'Universal', for its part, means that the value of the property is recognizable to all of humanity, and not exclusively cultural, for instance, and that the property is representative of its culture of origin.*"

In relation to the Project, the concept of OUV is a relevant consideration in that the experience of the WHA, beyond the biodiversity values, should not be diminished or modified by change either inside or outside of the WHA boundary.

As part of the desktop assessment a ZVI was produced with a focus on theoretical visibility from the World Heritage Area and Oxley Wild Rivers National Park (Refer Figure 34). That ZVI demonstrated that the turbines would not be visible from the majority of the WHA however there is the potential for views from the eastern edge and from the southern edge. There is also the potential for views from high points within the WHA.

Considering the dense bushland character of the WHA it is likely that views from theoretically exposed locations would be either completely screened or fragmented by vegetation or, on potentially open ridgeline areas, be relatively brief and distant views in the context of the journey in and out of these locations. It is unlikely that the presence of the turbines in these views would impact on the existing landscape character or immersive experience of hiking to these locations.

From the identified walking trails assessed the ZVI demonstrated that views to the turbines from the walking trails within the WHA were either largely screened by topography or most likely to be significantly fragmented and diminished by vegetation and distance. Theoretical opportunities for views were also only identified in a few brief locations in the context of the broader journey of each trail (refer to figures 35-40 of **Appendix I**).

The majority of the eastern and southern edge of the WHA is bounded by either National Park or private rural land. There are currently no identified walking trails in these areas and public access is also limited, excluding the Oxley Walking trail and the Aspley Falls Bridge assessed in VP29 and Photomontage 18A.

Due to distance and nature of the development, the construction of the Project will not have any physical impact on the values of the WHA as this is substantially tied to the relict Gondwana Rainforest that is an ancient natural environment. In regards to the Overall Outstanding Value of the WHA it is the conclusion that the Project will not negatively impact or diminish these values as the accessible experiences of the WHA either do not have views to the proposal due to topography or are so distant and densely vegetated that the presence of the turbines in any views would be insignificant in the context of the location and broader views.

6.3.5 Mitigation Measures

Visual impacts (as described above) will be mitigated through the implementation of specific mitigation and management measures as described below. As part of the detailed design, the applicant will continue to investigate options to further avoid and minimise visual impacts.

The mitigation measures described in **Table 6-26** will reduce the visual impact of the Project whilst enhancing the visual character of the surrounding environment. These are discussed in detail in Section 16 of the LVIA (refer **Appendix I**).

Table 6-26 Visual Mitigation Measures

Issue	Mitigation Measures
Project Layout and Design – Wind Farm Layout and Size	The layout and size of the wind farm is a significant factor in the visual impact on the landscape. The following principles should guide the design process of the wind farm: ■ Controlling the location of different turbine types, densities, and layout geometry to minimise the visual impacts ■ The lines of turbines should reflect the contours of the natural landscape as best as possible ■ Ensure the turbines are evenly spaced to give a regular pattern creating a better balance within the landscape The Project has undergone significant changes through the development period. The resulting layout has a substantially smaller development footprint than that previously considered. The above design principles have been considered in the siting of the proposed turbines to provide a balanced appearance along the ridgeline.
Project Layout and Design – WTG Design and Colouring	The turbines will have a light grey (RAL 7035) finish. The following factors have been considered in the Project design to achieve a visual consistency through the landscape: ■ Uniformity in the colour, design, rotational speed, height, and rotor diameter ■ The use of simple muted colours and non-reflective materials to reduce distant visibility and avoid drawing the eye ■ Blades, nacelle, and tower to appear as the same colour ■ Avoidance of unnecessary lighting, signage, logos

Issue	Mitigation Measures
Screen Planting	Visual screen planting is a beneficial mitigation method used to assist in reducing the visual impact of the wind farm and ancillary infrastructure. In circumstances where residences are subject to a high level of visual impact, screen planting is an option proposed to assist in mitigating views of turbines from residential properties To achieve visual screening planting between the intrusive element and the homestead, tree planting will be undertaken in consultation with the relevant landowners to ensure that desirable views are not inadvertently eroded or lost in the effort to mitigate views of the turbines.
Residence Supplementary Planting	Due to the vegetated character of adjoining areas, the Project is likely to be fragmented or screened by vegetation from many dwellings. Where turbines are located close to the dwelling or existing vegetation is thin, supplementary planting is a mitigation method that would further reduce potential visibility and ensure longevity of the intervening vegetation
Onsite Mitigation Methods – Non-Associated Dwellings	Non-associated dwellings within 3,100 m: ■ Screen planting was identified as a potential mitigation for four non-associated dwellings ■ Supplementary planting has been suggested for five dwellings Non-associated dwellings between 3,100 m – 4,550 m: ■ Screen planting was identified as a potential mitigation for six non-associated dwellings ■ Supplementary planting has been suggested for five dwellings
Night Lighting – Aviation Hazards Lighting	To assist in the amelioration of the effect of aviation hazards lighting on WTGs, the following mitigation measures are proposed subject to CASA requirements: ■ If used, air navigation lights are required to be spaced over the array, particularly at the extremities. They are not required on every tower. Careful consideration will be given to the turbines upon which aviation lighting is installed to avoid unnecessary impact upon residences ■ Treatment of the rear of blades with a non-reflective coating to reduce reflection off the rotating blade at night ■ Use of the lowest candela intensity allowed by CASA ■ According to the CASA requirements, shielding may be provided to restrict the downward spill of light to the ground plane by ensuring that no more than 5% of the nominal light intensity should be emitted at or below 5° below horizontal ■ No light will be emitted at or below 10° below horizontal
Night Lighting – Ancillary Structures	To assist in the amelioration of the effect of night lighting on ancillary structures, the following mitigation measures are proposed where necessary: ■ Security lighting throughout the wind farm, switching station and the substation will be minimised to decrease the contrast between the wind farm and the night-time landscape of the area ■ Motion detectors should be used to activate night-time security lighting when required ■ Lighting will be designed to ensure it does not spill onto nearby roads or residences
Ancillary Infrastructure – Transmission Lines	■ The route for any proposed overhead transmission lines should be chosen to reduce visibility from surrounding areas ■ The route for any proposed overhead transmission lines should be chosen to minimise vegetation loss ■ Subtle colours and a low reflectivity surface treatment should be used on power poles to ensure that glint is minimised
Ancillary Infrastructure – Access Roads	■ Where possible utilise or upgrade existing roads, trails, or tracks to provide access to the proposed turbines to reduce the need for new roads ■ Allow for the provision for downsizing roads or restoring roads to existing condition following construction where possible ■ Any new roads will minimise cut and fill and avoid the loss of vegetation ■ Utilise local materials where practical

Issue	Mitigation Measures
Ancillary Infrastructure – Ancillary Structures	■ Siting will consider minimising vegetation loss ■ Screen planting will further reduce residual visual impacts ■ Controlling the type and colour of building materials used with a recessive colour palette will to be used which blends into the existing landscape ■ Avoidance of unnecessary lighting, signage on fences, logos ■ Minimise cut and fill and loss of existing vegetation throughout the construction process ■ Boundary screen planting is an effective mitigation method which will be utilised to ameliorate potential visual impacts resulting from the construction of ancillary structures with a small vertical scale such as collector substations, switching stations and the O&M building

6.4 Transport and Traffic

6.4.1 Introduction

Amber Organisation (Amber) prepared a Traffic Impact Assessment (TIA) to evaluate the potential construction, operational, and decommissioning traffic impacts, and the access arrangements of the Project. The TIA responds to the SEARs and was prepared in consultation with relevant road authorities.

The TIA assesses the potential traffic and transport impacts of the Project and provides appropriate mitigation and management measures to ensure that any potential impacts can be minimised or avoided. The TIA is provided in **Appendix J**.

6.4.2 Methodology

The TIA incorporated the following scope of works:

- Review of existing traffic and road safety data, including road accident history (crash data) for potential oversized and over mass vehicle routes and historical traffic count data;
- Site inspection of the road network and proposed vehicular access routes to the Project, which focused on the intersection design, sight distances, and suitability of the proposed routes for the delivery of construction materials and turbines;
- Assessment of traffic impacts during construction and operation phases, regarding vehicle types, nominated transport routes, traffic volumes, and site access arrangements;
- Assessment of traffic capacity based on the volume capacity ratio (V/C), rural road Level of Service and the environmental capacity for urban areas based on the Guide to Traffic Generating Developments (RTA, 2002);
- A swept path analysis of the largest Restricted Access Vehicle (RAV) to access the site, to identify any constraints at intersections along the nominated transport route, including detailing required road upgrade works; and
- Consultation with key stakeholders.

6.4.3 Existing Environment

6.4.3.1 Local Road Network

State roads are the major arterial links throughout NSW and within major urban areas. Regional roads are routes, together with the State roads, that provide the main connections to and between smaller towns and districts and perform a sub arterial function in major urban areas. New England Highway, Oxley Highway, and Thunderbolts Way comprise the State and Regional road network of relevance to the Project, and a full description of this network is provided in section 4.2.1 of the TIA.

The local road network comprises of both sealed and unsealed roads. The sealed local roads are generally described as being in good condition, though the seal is observed to be thinning in some locations. A description of the sealed local road network is provided below:

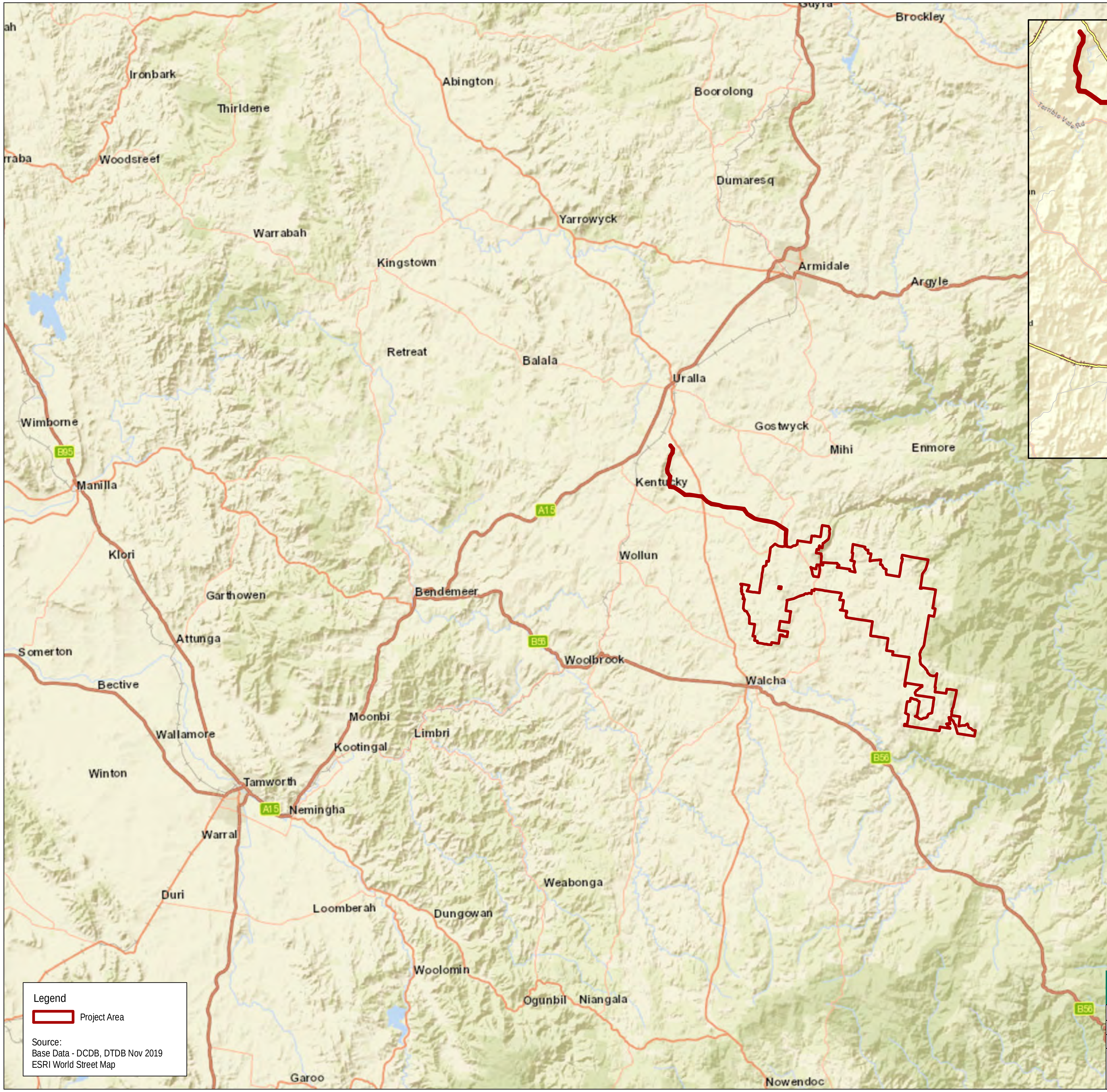
- Saleyards Road and Darjeeling Road: Both local roads have a sealed carriageway width of approximately 7.0 m and accommodate two-way vehicle movement. Saleyards Road extends north from Oxley Highway and connects with Darjeeling Road, which in turn connects with Thunderbolts Way. Saleyards Road and Darjeeling Road provide a route around the north-western side of Walcha;
- Jamieson Street: Extends east from Thunderbolts Way for approximately 600 m before continuing as Ohio Road for 300 m, and then continues further east as Emu Creek Road. Within the Walcha township the roads have a sealed carriageway width of approximately 12 m, accommodating two-way vehicle movement, and has a speed limit of 50 km/hr. Northeast of Walcha the speed limit increases to 100 km/hr;
- Emu Creek Road: To the east of the Walcha township has a sealed carriageway width of 6.0 m and continues as Winterbourne Road approximately 9.3 km northeast of Walcha. Winterbourne Road crosses the Emu Creek where it has a concrete surface which has a carriageway width of approximately 6.0 m. Winterbourne Road becomes a gravel surface at its connection with Table Top Road and maintains a carriageway width of approximately 6.0 m. Winterbourne Road extends through the Project Area and terminates at Cheyenne Boundary Trail; and
- Moona Plains Road: Extends south east from Emu Creek Road. Moona Plains Road has a sealed carriageway width of approximately 7.0 m and accommodates two-way vehicle movement. Moona Plains Road extends through the Project Area and terminates at its connection with Bukeiro Road.

Unsealed roads comprise the remainder of the local road network and are described as generally being in good condition. A description of the unsealed roads is provided below (distances approximate):

- Blue Mountain Road: Extends north from Winterbourne Road to its connection with Hazeldean Road and then extends in a north west alignment to its termination at Hillview Road. It has a carriageway width of approximately 6 m but in some locations, this narrows to 4.2 m, including at a sealed causeway which is located 2.5 km north west of Winterbourne Road;
- Hazeldean Road: Extends in a general east-west alignment between Blue Mountain Road and Winterbourne Road. It has a carriageway width of 7 m;
- Uruga Road: Extends north from Hazeldean Road for 5 km to its termination. It has a carriageway width of 7 m;
- Bark Hut Road: Extends east from Winterbourne Road for 8.2 km to its termination. It has a carriageway width of 6 m for 2 km which then narrows to 4.0 m;
- Table Top Road: Extends east for 9.3 km from Winterbourne Road to its termination at Puppy Hill Trail. It has a carriageway width of 6.5 m which narrows to 3 m. The bridge over the Winterbourne Creek has a trafficable width of 4.1 m; and
- Rowleys Creek Road: Extends north from Moona Plains Road for 4.1 km to its termination. It has a carriageway width of 3.0 m.

The intersections within the local road network are all priority controlled. A description of the key intersections within the surrounding area of the Project is provided in section 4.2.3 of the TIA.

Figure 6-17 show the state, regional and local road network within the vicinity of the Project Area.



Site and Surrounding Road Network

F6-17

Drawing No: 0526676s_WWF_EIS_G018_R4.mxd		Environmental Impact Assessment
Date: 04/11/2022	Drawing Size: A3	
Drawn By: VN	Reviewed By: DMS	Client: WWPL

Coordinate System: GDA 1994 MGA Zone 56

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM

6.4.3.2 Road Upgrades

Walcha Council advised that the following road upgrades are proposed or have recently been completed within the vicinity of the Project:

- Rehabilitation of Thunderbolts Way: The upgrades were completed in summer 2021/2022; and
- Upgrade of the intersection of Jamieson Street and Thunderbolts Way: The intersection is proposed to be provided with a new seal and line-marking including a dedicated right turn lane from Thunderbolts Way. In addition, the existing barrier in the south-eastern corner of the intersection will be set back from the carriageway.

6.4.3.3 Traffic Volumes

Traffic volume data for the State and Regional Road Network was collected from the TfNSW Traffic Volume Viewer. A summary of the traffic volumes is provided within **Table 6-27**, where growth rates have been applied to calculate the current estimated traffic volumes.

Table 6-27 State and Regional Road Traffic Volumes

Road	Survey Location	Survey Year	Recorded Volume	Growth Factor	Current Estimated Traffic Volume
New England Highway	140 m south of Caroline Street, Bendemeer	2019	4,301 vpd 78% light 22% heavy	1.5%	4,365 vpd
	1.66 km west of Glenburnie Road, Kentucky	2008	3,623 vpd*	1.5%	4,331 vpd
	100 m west of Hill Street, Uralla	2011	8,093 vpd*	1.5%	9,253 vpd
	560 m west of Arding Road, Arding	2011	6,128 vpd 91% light 9% heavy	1.5%	7,007 vpd
Oxley Highway	100 m west of Tower Street, Walcha	2011	1,019 vpd 90% light 10% heavy	1.0%	1,114 vpd
	1.66 km east of Back Woolbrook Road, Woolbrook	2011	622 vpd 83% light 17% heavy	1.0%	680 vpd
Thunderbolts Way	2.45 km north of Mirani Road, Walcha	2011	1,121 vpd 91% light 9% heavy	1.0%	1,226 vpd

** Light and heavy vehicle percentages were not provided*
vpd = vehicles per day

The traffic volume data indicates that the State and Regional road network currently carries a modest level of traffic which is well within the existing road capacity. The higher traffic volume recorded on New England Highway west of Hill Street is indicative of the survey location within the Uralla township. Traffic volumes within the township are expected to be higher given the local traffic present.

Traffic volume data for the Local Road Network was provided by Walcha Council on 2 September 2020 for all local roads within the proximity of the Project. The traffic volume information is summarised in **Table 6-28**.

Table 6-28 Local Road Traffic Volumes

Road	Traffic Volume (vpd)	Heavy Vehicle Percentage
Saleyards Road	90	45%
Darjeeling Road	120	40%
Jamieson Street	720	18%
Ohio Road	400*	15%
Emu Creek Road	123	13%
Winterbourne Road	40	20%
Moona Plains Road	62	45%
Blue Mountain Road	30*	40%
Bark Hut Road	30*	40%
Hazeldean Road	30*	30%
Table Top Road	30*	40%
Rowleys Creek Road	20*	40%
Uruga Road	20*	40%

** No data available so estimate provided by Council*

The traffic volume data suggests that the road network currently carries a low level of traffic. Jamieson Street, Ohio Road and Emu Creek Road carry a higher level of traffic as they provide access to nearby residential properties within the Walcha Township. Overall, the local road network generally carries a low level of traffic that is well within the operating capacity of the road network.

6.4.3.4 Access and Other Transport

The following provides a summary of restricted vehicle access, school buses, and walking and cycling in the local area:

- Restricted Vehicle Access: The existing B-double (26 m length) approved routes in the broader vicinity of the Project are detailed on the TfNSW combined Higher Mass Limits and Restricted Access Vehicle Map website. All roads within the vicinity of the Project are rated to accommodate B-double vehicles;
- Public Transport / School Bus: Oxley Explorer and Moona Bus provide school bus services on the local road network within the vicinity of the Project. The school bus is expected to be operating on the local road network from 8:00 am to 8:35 am and from 3:05 pm to 3:40 pm. The schedule and bus route are provided within Appendix C of the TIA which shows the bus route extending from Moona Plains Road to Walcha via Emu Creek Road and Jamieson Street; and
- Walking and Cycling: Footpaths are typically provided on both sides of all roads within the Walcha township. Excluding these facilities there are no pedestrian or cyclist facilities provided within the surrounding area nor in the vicinity of the Project Area.

6.4.4 Transport Route Assessment

The Port of Newcastle is the preferred port where the WTG components (e.g. tower sections, nacelles, hubs, and blades) will be shipped to and then transported by road to the Project Area. A detailed Route Assessment for the transportation of the OSOM turbine and transformer components from the Port of Newcastle was completed by Rex J Andrews (RJA) and is provided in Appendix A of the TIA. The following section provides an overview of the assessment.

6.4.4.1 Background

Load Details

The assumed dimensions and loads for the major components of the turbines and ancillary infrastructure to be transported from the Port of Newcastle to the Project Area are detailed in **Table 6-29**.

Table 6-29 Indicative Load Dimensions and Masses

Component	Height	Width	Length	Weight
Blades	4.0 m	4.5 m	81.0 m	28,100 kg
Hub	4.0 m	4.4 m	5.0 m	64,000 kg
Nacelle	4.4 m	4.2 m	18.2 m	83,670 kg
Power Train	3.0 m	2.7 m	7.5 m	97,500 kg
Cooler Top	3.0 m	2.3 m	5.2 m	2,333 kg
*Tower**	4.4-6.0 m	4.4-6.0 m	11.5-30.0 m	~81,000 kg

** The tower is comprised of approximately seven sections with varying diameters and weights*

There would also be a small number of OSOM deliveries associated with the following components:

- Large substation equipment including battery storage, transformers and switching equipment;
- Substation, switching station, warehouse, and office buildings; and
- Water tanks.

In addition, cranes will be required to move onto the Project Area to erect the WTGs. A number of these are expected to be transported using OSOM vehicles.

Typical Delivery Vehicles

Restricted Access Vehicles (RAVs) (i.e. OSOM vehicles) with escort vehicles will be used to deliver the turbine components to the Project Area. Use of RAVs will require some road and intersection upgrades to the existing network. The most difficult part of the turbine to transport are the blades, which are transported in one piece and form the longest component. The other components can typically be assembled onsite.

The final selection of transport vehicle would be considered in consultation with authorities as part of the development of the Traffic Management Plan and route approvals. This assessment has been undertaken based on the vehicles provided within the RJA Report which is understood to represent the worst-case scenario. It is noted that the blades would be transported using an extendable trailer which would significantly reduce turning constraints on the return journey.

6.4.4.2 OSOM Traffic Volumes

The overall traffic generation per WTG is expected to be 15 to 20 trucks. Of this, it is expected that a maximum of 17 trucks will be OSOM trucks with the remainder being general construction heavy vehicles (e.g. flatbed trucks and articulated vehicles).

Overall, the expected number of OSOM deliveries to the Project from the Port of Newcastle is expected to be approximately 1,592 deliveries over 10 months during construction.

A detailed breakdown of the large plant components and associated traffic volumes and OSOM vehicle movements is provided within Appendix D of the TIA.

6.4.4.3 OSOM Vehicle Route – Newcastle to Walcha

The following provides an assessment of the preferred access route from the Port of Newcastle to Walcha. The preferred access route has been identified within a Route Assessment prepared by RJA and is provided within Appendix A of the TIA.

Preferred Access Route

The proposed OSOM vehicle access route from the Port of Newcastle to the Project has been separated into two routes as follows:

- Blade Route: The route is proposed to be utilised by vehicles transporting the blades which are transported in one piece and form the longest component; and
- All other components: A second and more direct route is proposed for all other components bypassing the township of Muswellbrook. Vehicles will be able to utilise Oxley Highway to access the site.

The preferred access route is shown in **Figure 3-32** and further described in **Section 3.4.4**.

Route Survey

RJA completed a route survey along the transportation route from the Port of Newcastle to Jamieson Street in Walcha. This included identifying ‘pinch points’ and areas where vehicles are able to pull over for fatigue breaks or emergency parking. As part of the pinch point identification, RJA also identified a few infrastructure upgrades to facilitate the proposed OSOM movements, presented in Appendix A of the TIA. These identified ‘pinch points’ have been used to form the required traffic management arrangements including under bridges and through road narrowing.

Amber has undertaken an assessment and driven the routes identified by RJA to confirm the preferred access route via Oxley Highway. The assessment identified no further upgrades to the road network to that identified in the RJA Report.

6.4.4.4 Local Transport Route Options

An assessment of four local transport route options has been undertaken by RJA and Amber regarding the delivery of WTG components. The routes are as follows:

- Route 1: Jamieson Street, Emu Creek Road, Winterbourne Road, and Blue Mountain Road;
- Route 2: Jamieson Street, Emu Creek Road, Winterbourne Road and Table Top Road / Hazeldean Road;
- Route 3: Jamieson Street, Emu Creek Road and Moona Plains Road; and
- Route 4: Jamieson Street, Emu Creek Road, Winterbourne Road, Bark Hut Road, Internal Access Road, Rowleys Creek Road.

Overall, the assessment found that the local road access routes can accommodate OSOM WTG with only minor road works, including road widening, tree removal, and the relocation or widening of cattle stops.

6.4.5 Traffic Assessment

6.4.5.1 Traffic Generation

Traffic generated by the Project can be separated into three distinct stages:

- The peak traffic generating potential for the wind farm is during construction through trips associated with staff access and the delivery of construction material, plant, and WTG components;

- During operation, the Project is expected to generate a minimal amount of traffic with only a small number of maintenance staff accessing the Project each day; and
- Decommissioning of the Project is anticipated to generate a similar level of traffic to the construction stage, although the number of OSOM vehicle movements can be reduced by cutting the redundant WTG blades into smaller sections prior to transport.

Construction Traffic

The physical construction of the Project is anticipated to occur over a period of approximately 30 months, with peak construction activities to occur over approximately 10 months. The proposed working hours are as follows:

- Monday to Friday: 7 am – 6 pm;
- Saturday: 8 am – 6 pm; and
- No work on Sundays or public holidays.

Any construction outside of these normal working hours would only be undertaken with prior approval from relevant authorities and consultation with impacted road users.

Approximately 400 staff will be onsite during the peak construction phase, with the peak construction period expected to take approximately 10 months. Construction staff are expected to be transported from the nearby towns including Armidale, Tamworth, Uralla, and Walcha.

Construction traffic generated by the Project can broadly be separated into the following categories:

- Light vehicles associated with transporting staff to/from the Project, including shuttle buses and personal vehicles as well as light delivery trucks;
- Medium and Heavy Rigid Trucks (MRV) and (HRV) (as defined within AS 2890.2:2018) will be used to deliver raw materials and smaller plant and have a typical length between 8-13 m;
- Truck and Dog vehicles consist of a rigid truck towing either a dog trailer or a pig trailer and are not more than 19 m in length. A dog trailer is a trailer with axles at either end of the trailer, a pig trailer has the axles centred on the trailer. These vehicles will be utilised to transport most materials to/from the site;
- Articulated Vehicles (AV as defined within AS 2890.2:2018) will be used to transport larger plant and consist of a truck and a single trailer with a total length of 19 m;
- B-Doubles (B-Double as defined within AS 2890.2:2018) will also be used to transport larger plant. B-Doubles consist of a truck and two trailers and have a maximum length of 26 m; and
- OSOM vehicles associated with the delivery of the larger plant and equipment.

OSOM vehicles will contribute the smallest percentage of trips to the Project during the construction period and are subject to separate permit applications and regulations.

Overall, it is anticipated that during peak construction the Project could generate up to 288 heavy and 270 light vehicle movements per day. **Table 6-30** summarises the traffic movements expected to be generated during construction.

Table 6-30 Traffic Generation During Construction

Vehicle Type	Average Construction Vehicle Movements		Peak Construction Vehicle Movements	
	Daily (vpd)	Peak Hour (vph)	Daily (vpd)	Peak Hour (vph)
Light Vehicle	200	70	270	105
MRV/HRV (Heavy vehicle)	56	8	100	12
Truck and Dog	90	12	142	14
AV	22	2	34	4
AV/ B-Double (Heavy vehicle)	8	2	12	2
Total	376	94	558	137

vpd = vehicles per day
vph = vehicles per hour

The Project is expected to generate a maximum of 137 vehicle movements during the daily peak hours of the peak construction period, reducing to 94 vehicle movements during the average construction periods.

Operational Traffic

During operation, the Project is expected to generate a minimal level of traffic associated with technical servicing and maintenance personnel. The Project is expected to generate approximately 16 vehicle movements per day, which would result in a negligible change to the traffic environment.

Decommissioning Traffic

Traffic generation during decommissioning would be similar to traffic generation during the average construction period.

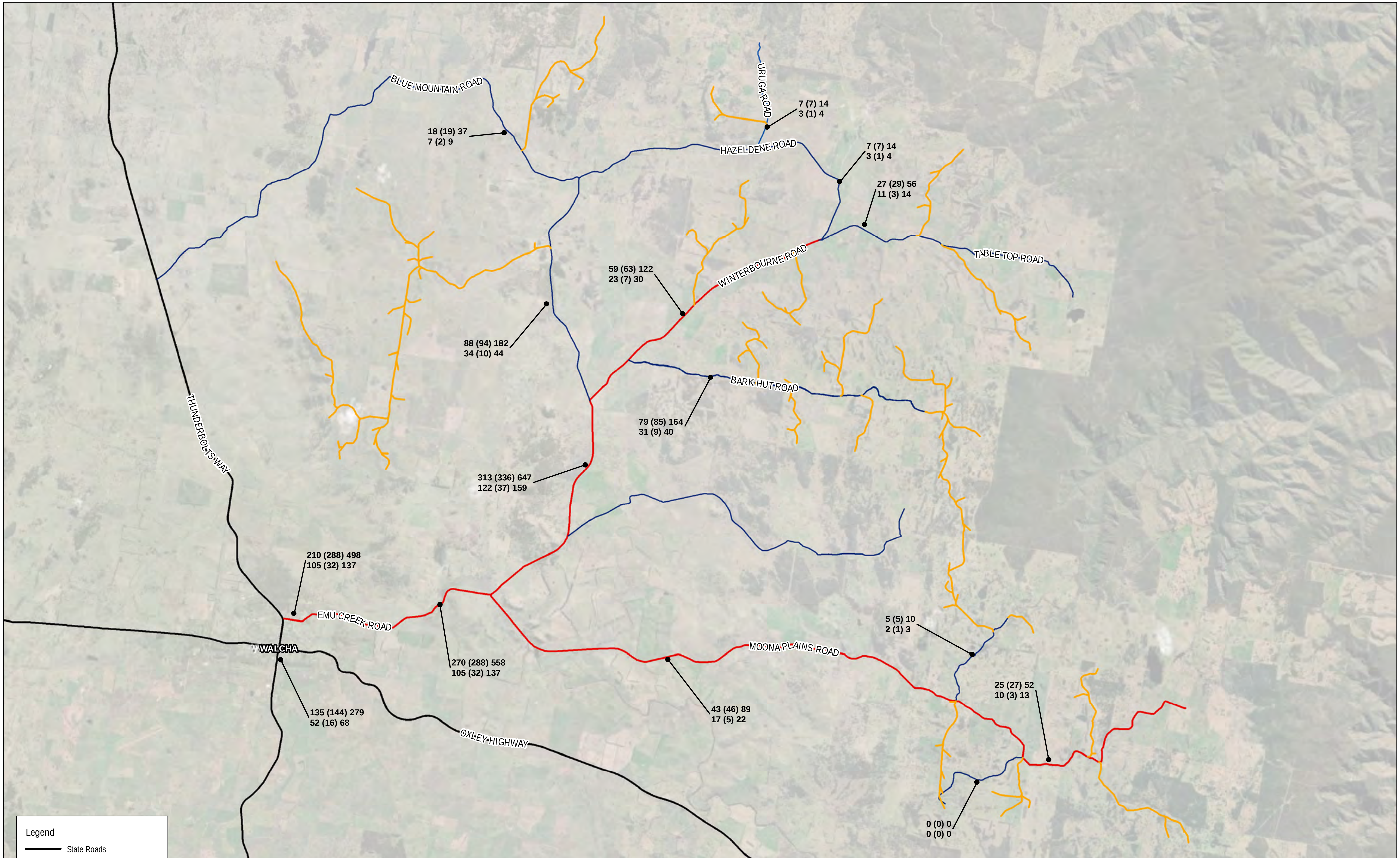
6.4.5.2 Traffic Distribution

Vehicles travelling to Walcha from the west (Tamworth) will utilise New England Highway and Oxley Highway, while vehicles travelling from the north (Uralla and Armidale) will utilise Thunderbolts Way. Heavy vehicles travelling via the Oxley Highway will utilise Saleyards Road and Darjeeling Road to access Thunderbolts Way.

All vehicles are proposed to access the Project Area via Jamieson Street, Ohio Road, and Emu Creek Road, to reach the main site compound at the intersection of Winterbourne Road and Blue Mountain Road. Vehicles will access the western portion of the Project Area via Blue Mountain Road (Route 1) the northern portion via Winterbourne Road (Route 2), the central eastern portion via Bark Hut Road (Route 4) and the south-eastern portion via Moona Plains Road (Route 3).

The peak hour for Project construction will occur at the start and end of the day when staff are transported to/from the Project Area. While most staff will typically arrive onsite between 6:00 am and 7:00 am, generally they will have staggered finish times. For the purposes of this assessment, it has been assumed that all staff depart between 5:30 pm and 6:30 pm and the evening peak traffic volumes is 80% of the morning peak volume.

The predicted peak construction traffic volumes on the surrounding road network are shown within **Figure 6-18**, and the existing traffic volumes plus predicted peak construction traffic volumes on the surrounding road network are shown within **Figure 6-19**.



Distribution of Predicted Peak Construction Traffic Volumes on the Surrounding Road Network F6-18

Drawing No: 0526676s_WWF_EIS_G019_R2.mxd	Environmental Impact Assessment
Date: 06/10/2022 Drawing Size: A3	
Drawn By: VN Reviewed By: DMS	Client: WWPL

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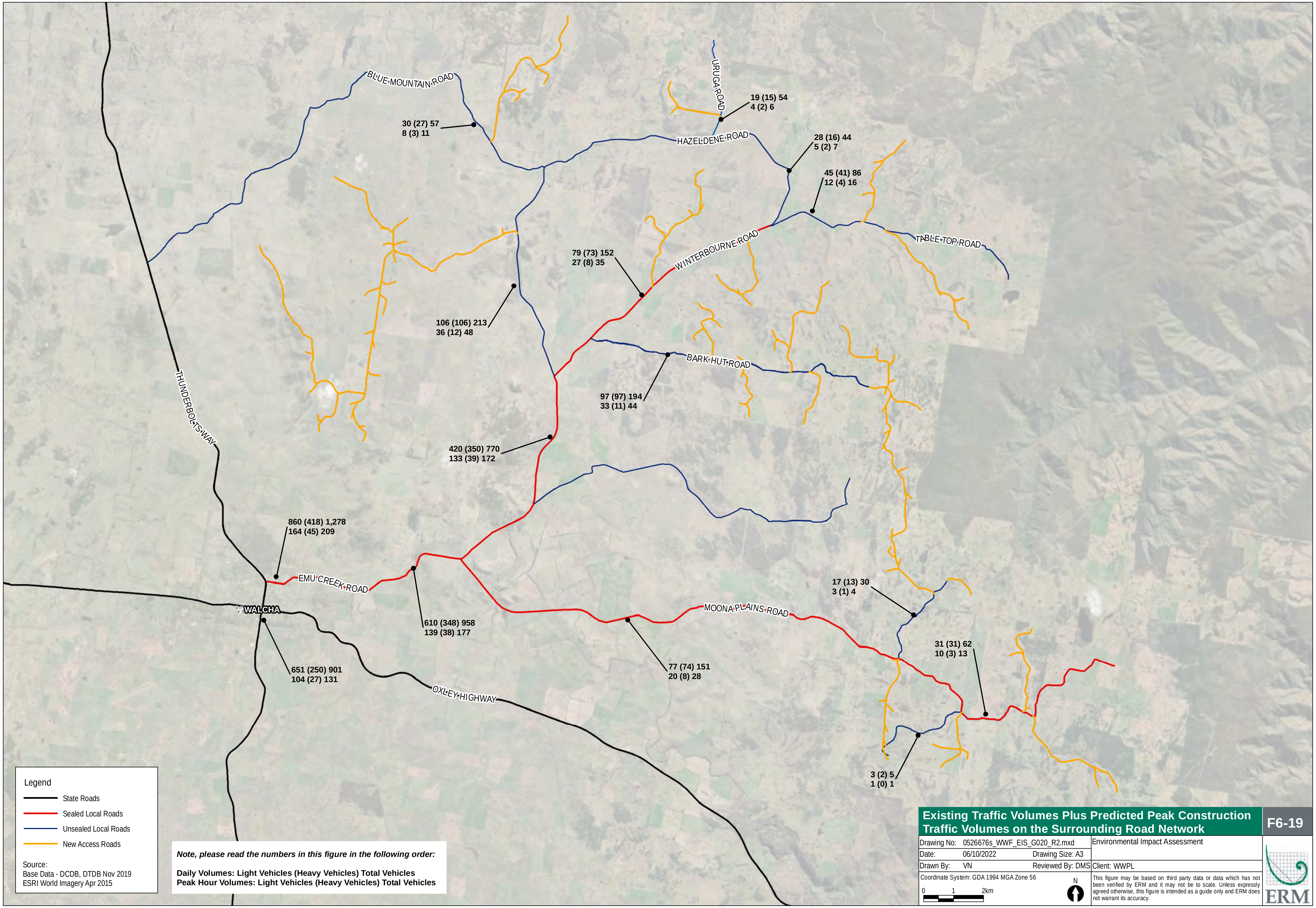


Note, please read the numbers in this figure in the following order:

Daily Volumes: Light Vehicles (Heavy Vehicles) Total Vehicles
Peak Hour Volumes: Light Vehicles (Heavy Vehicles) Total Vehicles

Existing Traffic Volumes Plus Predicted Peak Construction Traffic Volumes on the Surrounding Road Network | **F6-19**

Drawing No: 0526676s_WWF_EIS_G020_R2.mxd		Environmental Impact Assessment	
Date: 06/10/2022	Drawing Size: A3		
Drawn By: VN	Reviewed By: DMS	Client: WWPL	
Coordinate System: GDA 1994 MGA Zone 56		This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.	ERM

6.4.5.3 Traffic Impacts

Access Route Road Surface

Figure 6-19 demonstrates that the unsealed road network is not anticipated to accommodate more than 200 vehicle movements per day excluding Blue Mountain Road which is expected to accommodate 213 vehicles per day during peak construction. The TIA considers that the existing road surface is acceptable to accommodate the traffic generated by the construction of the Project.

All roads within the vicinity of the Project Area are rated to accommodate B-double vehicles. The TIA also considers that the roads, with the inclusion of the proposed upgrades identified, are suitable to accommodate the proposed traffic volumes.

Intersection Assessment

To determine the traffic impact generated during the construction of the Project, an assessment of the operation of the intersection of Thunderbolts Way with Jamieson Street was undertaken for the peak hours of construction traffic, which is expected to occur between 6.00 am – 7.00 am and between 5.30 pm – 6.30 pm.

Overall, construction traffic is expected to have a minimal impact on the operation of the intersection. Given the intersection accommodates the highest level of traffic of all the intersections used by construction vehicles within the vicinity of the Project, it is concluded that the intersections of the local roads northeast of Walcha are all expected to continue to operate with a good level of service. Further, the road network can accommodate the traffic generated by the Project during construction.

Turning Treatments

An assessment of the turning treatments was undertaken at the intersection of Thunderbolts Way with Jamieson Street. Given the low level of traffic currently experienced on Thunderbolts Way and Jamieson Street, and the minimal increase in the number of turning treatments generated by the construction traffic, the intersections would require a Basic Right Turn (BAR) and a Basic Left Turn (BAL) turn treatment.

The intersection of Thunderbolts Way and Jamieson Street is essentially provided with the basic turn treatments due to the wide carriageway width of Thunderbolts Way, with each lane having a width of approximately 6.5 m. Accordingly, the intersection turning facilities are appropriate and are in line with the Austroads requirements.

Walcha Council's proposed amendments to the intersection are expected to provide a safer environment by providing a new road surface and associated line-marking and setting back the barrier on the south-eastern corner of the intersection. In addition, a dedicated right turn lane will be provided for vehicles turning from Thunderbolts Way.

Proposed Road Upgrades

Proposed road upgrades have been identified that would be required to cater for the delivery of WTG components. The upgrades are required to ensure access for OSOM vehicles, including intersection widening, trimming / removal of vegetation, relocation of signage and street furniture, and the relocation of overhead wires. The upgrades have been identified based on the largest turbine blade length currently under consideration, being 79 m. Should a different turbine model / size be selected, the necessary road upgrade works will be revised, prior to construction.

Proposed road upgrade works have been detailed in the RJA Route Assessment (Appendix A of the TIA). Proposed road upgrades have been assessed for impacts relating to other aspects (e.g., biodiversity, heritage) as detailed in the respective impact assessments.

Road Safety

The assessment concluded that the traffic generated by the construction, operation and decommissioning of the Project can be accommodated on the road network in a safe manner. A summary of the key safety matters is provided below:

- One railway crossing is located on the access route on Selwyn Street near the Port of Newcastle which can be crossed in a safe manner;
- The access route for OSOM vehicles is proposed to avoid areas during peak times where vulnerable road users are present;
- Peak school bus times are proposed to be avoided where possible by OSOM and heavy vehicles to limit the impact to vulnerable road users;
- Access to key properties accommodating emergency service vehicles is proposed to be maintained at all times;
- The road network will continue to operate with a good level of service;
- Suitable sight distance is generally provided at key intersections and accesses and where insufficient sight distance has been identified mitigation measures are proposed to ensure the road network continues to operate in a safe manner; and
- The surrounding road network currently operates in a relatively safe manner given the road classifications and there are no crash trends.

Accordingly, Project traffic is anticipated to be able to be accommodated in a safe manner subject to the adoption of mitigation measures as detailed in **Section 6.4.6**. The operation of the Project and the management of development traffic was concluded to be in line with TfNSW Future Transport 2056 and the Towards Zero vision.

6.4.6 Mitigation Measures

Impacts relating to traffic and transport (as described above) will be mitigated through the implementation of specific mitigation and management measures as described below. As part of the detailed design, the applicant will continue to investigate options to further avoid and minimise impacts.

A Traffic Management Plan (TMP) will be prepared prior to construction. The contractor would be responsible for obtaining all required approvals and permits from relevant road authorities and for complying with conditions specified in the approvals. The TMP will provide additional information regarding the traffic volumes and distribution of construction vehicles that is not available at this time, including:

- Road transport volumes, distribution and vehicle types broken down into:
  - Hours and days of construction; and
  - Schedule for phasing/staging of the Project.
- The origin, destination, and routes for:
  - Employee and contractor light traffic;
  - Heavy vehicle traffic; and
  - OSOM traffic.

Recommended measures that will be adopted within the TMP to minimise the impact of construction traffic along the road network are detailed in **Table 6-31**.

Table 6-31 Transport and Traffic Mitigation Measures

Issue	Mitigation measures
Signage	Temporary signage within the township of Walcha will be provided, including directional signage for construction vehicles to Project access points, and will be maintained in consultation with Walcha Council. General sign posting of the access roads with appropriate heavy vehicle and construction warning signs shall also be undertaken. Specific warning signs advising of the changed traffic operations and heavy vehicle movements are to be appropriately located on approaches to and from the transport routes on Council roads. These will notify existing road users of changed traffic conditions. The use of day warning notices where signs are activated on a specific day to warn local road users of construction activities will also be utilised.
Onsite Measures	Onsite mitigation measures targeted at safety and reducing the impact of onsite transport will include: ■ On-site speed restrictions ■ Transport access control to and from the Project ■ Onsite transport movement communications protocols ■ OSOM vehicle movement plans ■ Construction of access track routes in proximity to environmentally sensitive areas to be guided by relevant specialists ■ Appropriate dust suppression measures, including: - Vehicles will drive at slower speeds when travelling on unsealed roads to reduce dust. Standard mitigation measures such as a water trucks to dampen the roads and reduce the amount of dust in the air can also be considered - Vehicles entering/exiting the Project with loose materials will be covered ■ Maintenance program for on-site access tracks to ensure safe access ■ Implementation of a proactive erosion and sediment control plan for onsite roads, hardstands, and laydown areas ■ Loading and unloading is proposed to occur within the Project. No street or roads will be used for material storage at any time ■ Sufficient car parking will be provided on-site to ensure vehicles do not park on the surrounding road network ■ All car parking and loading areas will be designed in accordance with the relevant *Australian Standard (2890 series)* and Council requirements ■ At the conclusion of the construction phase, any tracks not required for subsequent operation and maintenance of the Project will be restored and revegetated
Driver Protocols	Onsite driver protocols will be prepared for implementation and a driver code of conduct established including the following: ■ Drivers travelling to or from the Project will do so safely, in full compliance with the law, including in respect of speed limits, following distances, forward sight when overtaking, being able to stop within the length of road visible (or half the length on roads without centrelines), and not driving carelessly or dangerously ■ When aware of any emergency vehicles (including vets responding to emergency calls), approaching from in front or behind, drivers must pull over well in advance to provide unimpeded movement ■ Drivers must reduce their speed and/or stop in accordance with the law when passing a school bus which is slowing down, stopped, or accelerating in relation to picking up or setting down children ■ Drivers must reduce their speed in accordance with the law when: - Passing children walking, cycling, or waiting on the side of the road - Passing an oncoming school bus - Passing someone riding or leading a horse along the road - Approaching an area where a stock shift is known to be occurring ■ Truck drivers must not use engine brakes in built up areas, except where the load being carried, and the grade of the road make use of such braking necessary for safe driving

Issue	Mitigation measures
	■ Truck drivers travelling on school bus routes at the same time as an oncoming school bus to use their CB radio to identify the location of the bus and pull over in a safe location before the school bus reaches and passes them ■ Truck drivers are to let traffic behind them pass at regular locations including those opportunities that occur at intersections, wide driveways, sections of road with adequate forward sight distance, gravel pits, etc. ■ Disciplinary procedures shall include consideration of a requirement that a vehicle tracking system (with driver behaviour functionality) be installed in the vehicle of any driver who is the subject of a credible complaint or identified breach of the road rules or the TMP. Any subsequent breaches identified by the system shall result in disciplinary action
OSOM Operating Protocols	Management of vehicular access to and from the Project is essential to maintain the safety of the public as well as the labour force. Driver protocols for delivery of larger plant shall include the following: ■ The arrangements for the delivery of OSOM loads and turbine components to the Project should avoid peak periods of traffic on the network and minimise as far as practicable disruption and disturbance to residents ■ OSOM load permits for turbine components shall be appended to the TMP ■ Pilots shall be in radio contact with other trucks to ensure passing occurs at safe and convenient locations ■ In the event of a breakdown, accident or road failure, the transporter crew shall do the following: - Park the pilot vehicles in locations where they maximise safety, considering overhanging components, and blind bends on approaches - Contact emergency services (including Police) as appropriate - Contact the project manager - Contact the Council or other road controlling authority as may be appropriate in the case of the incident - Contact the site manager to advise all other project traffic, and local traffic via CB radio as appropriate in the case of the incident - Follow all instructions from Police and the road controlling authority ■ In the case of an accident, the vehicles involved should not be moved until instructed by Police ■ Utilisation of only the designated transport routes ■ Construction vehicle movements are to abide by finalised schedules as agreed by the relevant authorities
Shuttle Bus Pick-up / Drop-off Locations	■ Shuttle buses may be used to transport staff to and from the Project Area during construction. The exact location of the pick-up and drop-off points will be detailed within the TMP in consultation with the relevant local councils ■ Armidale Regional Council has proposed the pick-up and drop-off location within the town centre adjacent to the information building, which provides ample parking (including for larger vehicles such as campervans) and public bathrooms. Uralla Regional Council has proposed the location be adjacent to Fuller Park which provides car parking and bus stop facilities. Alternatively, large public car parking areas can be adopted. No recommendations have been provided by Tamworth Regional Council. Shuttle buses will pick staff up from within the Walcha town centre when travelling to and from the Project
School Bus Routes	The following mitigation measures will be incorporated into the TMP during OSOM deliveries: ■ Drivers must reduce their speed and or stop in accordance with the law when passing a school bus which is slowing down, stopped, or accelerating in relation to picking up or setting down children ■ Drivers must reduce their speed in accordance with the law when passing children on the side of the road or passing an oncoming school bus ■ Truck drivers travelling on school bus routes at the same time as an oncoming school bus to use their CB radio to identify the location of the bus and pull over in a safe location before the school bus reaches and passes them Adoption of the above measures will ensure safety is maintained to vulnerable road users alighting the school buses during delivery of larger plant

Issue	Mitigation measures
Road Upgrades	Prior to the commencement of construction, the Proponent will undertake road upgrades developed in consultation with relevant road authorities. Works will be undertaken by a suitably qualified contractor subject to the relevant authorisation. Site establishment and construction works may be undertaken in parallel with the road upgrades subject to preparation, approval, and implementation of a TMP. Project access points will be gated, secured and signposted. The specific road infrastructure upgrades that may be required and/or would need to be considered by the chosen transport contractor prior to commencement of construction would be developed in consultation with the relevant Council and designed to their satisfaction. Reference should be made to the RJA Route Assessment and its findings for potential road infrastructure upgrades. It is acknowledged that some of the works identified by the RJA Report may have already been undertaken recently due to other projects in the area and thus an updated site assessment in consultation with relevant road authorities would identify the required road infrastructure upgrades dependant on the actual road conditions pre-construction.
Unsealed Roads	The following measures should be adopted to minimise the impact of construction traffic along unsealed roads: ■ Vehicles will drive at slower speeds when travelling on unsealed roads. This can reduce the amount of dust created and the amount of dirt tracked onto the public road network. Standard mitigation measures such as a water trucks to dampen the roads and reduce the amount of dust in the air, can also be considered to reduce dust levels ■ Neighbours of the Project will be consulted and notified regarding the timing of major deliveries which may require additional traffic control and disrupt access
Access	The TIA (refer Section 9.1 of **Appendix J**) provides a number of mitigation measures for each of the identified access locations in the Project Area which do not provide sufficient sight distances outlined within the Austroads Guideline. Where relevant, these mitigation measures to allow suitable sight lines include: ■ 40 km/hr speed limit ■ Maintaining vegetation at a low height ■ Amendment of berm ■ Provision of a convex mirror on the outside of the bend for drivers to see oncoming vehicles
OSOM Vehicles	The following measures will be implemented in relation to OSOM vehicles: At least two pilot vehicles will accompany each OSOM vehicle to guide the OSOM vehicle and manage traffic under the direction of police where required Police vehicles will provide traffic management at ‘pinch points’ as identified in the Route Assessment. The OSOM vehicles will leave at specific intervals and regroup at specific pinch points to allow police to implement the required traffic management
Other	The following other measures will be adopted to minimise the impact of construction traffic along the road network: ■ A pre-condition survey of the relevant sections of the existing road network be undertaken in consultation with Walcha Council. During construction the sections of the road network utilised by the Project will be monitored and maintained to ensure continued safe use by all road users, and any faults attributed to construction of the Project will be rectified ■ At the end of construction, a post-condition survey will be undertaken to ensure the road network is left in a consistent condition as at the start of construction ■ Delivery of larger plant will preferably occur outside of school bus service times to prevent larger vehicles interacting with the school bus ■ All vehicles will enter and exit the Project access locations (refer **Figure 3-25**) in a forward direction ■ Implementation of a proactive erosion and sediment control plan for on-site roads, hardstands, and laydown areas ■ All permits for working within the road reserve must be received from the relevant authority prior to works commencing ■ Include a map in the TMP of the primary haulage routes highlighting critical locations

Issue	Mitigation measures
	■ Establish an induction process for vehicle operators and regular toolbox meetings ■ Establish a complaint resolution and disciplinary procedure ■ Due to the location of the Project, there is an inherent risk that adverse conditions may impact on the movement of transportation vehicles and transport of staff. Consideration for driving in the rain, fog, frost, icy conditions, bright sunlight and within/near a bushfire is required, especially during the transportation of OSOM vehicles. The following mitigation measures are to be considered when travelling in adverse conditions: - Inspection of roads prior to using them to ensure that the road is safe. If there is black ice on the road, depending on the location, signage shall be installed and/or transportation movements will be stopped until it is safe to proceed - Ban or restrict vehicle movements during periods where adverse conditions may impact on the operation of the road and the safety of workers - Reduce the speed along the transportation route - Provide additional warning for drivers on the road network - Train and inform staff on how to drive in adverse conditions - Ensure that vehicles are fitted with equipment to assist them during adverse conditions and that drivers can communicate to one another to either warn each other or call for assistance - Chains will not be permitted to be used on local roads for the commencement of a journey, for emergency use only ■ The requirements of the TMP must be followed. The site manager will ensure that Project inductions occur on a regular basis or as deemed necessary and include a detailed program to monitor and report on the effectiveness of these measures and the code of conduct

6.5 Hazard

6.5.1 *Aviation Safety*

6.5.1.1 Introduction

Aviation Projects prepared an Aviation Impact Assessment (AIA) to inform the Project. The AIA assesses the potential aviation safety impacts associated with the Project, provides aviation safety advice in respect of relevant requirements of air safety regulations and procedures and documents the results of consultation with the relevant aviation agencies and stakeholders.

The AIA report also includes an Aviation Impact Statement that addresses the requirements of Airservices Australia (ASA), and a qualitative risk assessment to determine any requirement for obstacle lighting.

The AIA can be found in full at **Appendix K** (Aviation Projects, 2021).

6.5.1.2 Methodology

The AIA has been prepared to address the requirements specified in the SEARs for aircraft safety and having regard to the following:

- *Civil Aviation Safety Regulations 1998;*
- *NASF Guideline D Managing the Risk of Wind Turbine Farms as Physical Obstacles to Air Navigation*; and
- *ISO 31000:2018 Risk Management –Guidelines (for the risk assessment)*.

The AIA was prepared based on a:

- Review of relevant information provided by the Applicant and available within the public domain,
- Site visit to investigate aviation safety aspects of the Project;
- Review of relevant regulatory requirements and information sources;
- An assessment of project in relation air and aviation safety and the identification of appropriate risk mitigation strategies, particularly an acceptable alternative to night lighting;
- Consultation with Walcha Council, Uralla Shire Council, Part 173 procedure designers (Airservices Australia), and other stakeholders including Commonwealth Department of Defence and representatives of nearby aerodromes and aircraft operator; and
- Engagement with other stakeholders, including all owners/operators of airstrips within and in proximity to the project.

The associated height and coordinates of each turbine assessed are provided in Annexure 3 of **Appendix K**.

6.5.1.3 Existing Environment

The AIA identifies the following aviation facilities in proximity to the Project Area:

- Aviation Facilities:
  - The Project Area is located within 30 nm (55.56 km) of Armidale Airport (YARM). Armidale Airport is a certified, Code 3, non-precision approach runway, operated by Armidale Regional Council, with a published aerodrome elevation of 1,084 m AHD (3,556 ft AMSL); and
  - Tamworth Regional Airport (YSTW) is located outside of the 30 nm (55.56 km) radius of the Project Area.
- Nearby Aircraft Landing Areas (ALA):
  - As a guide, an area of interest within a 3 nm radius of an Aircraft Landing Area (ALA) is used to assess potential impacts of proposed developments on aircraft operations at or within the vicinity of the ALA. Published aeronautical navigation charts obtained via OzRunways

(https://www.ozrunways.com) identified six ALAs within proximity of the Project Area. A search of aerial imagery and consultation with local aerial agriculture contractors identified a further ten ALAs in close proximity and within the Project Area. These are shown on Figure 6-20 and include:

  - The six published ALA sites: YWCH (Walcha), OZKEV (Kelvin), (OZSGH) Strathleigh, (OZWSK) Wilsons Creek, YWMM (Wollomombi ALA) and OZJEO (Jeogla), are located more than 3 NM from any WTG and will not be impacted by the Project;
  - Two of the identified ALA sites: Europambela ALA and Lochaber ALA are located more than 3 NM from any WTG and will not be impacted by the Project;
  - Six of the identified ALA sites are owned by Associated landowners: Abbottsley ALA, Wayamba ALA, Alendale ALA, Kambala ALA, Roseville ALA, and The Retreat ALA;
  - Rowleys Creek ALA and Argyll ALA are located on private non-associated land approximately 2.2 km (1.2 NM) and 3.5 km (1.9 NM) north-east of WTG B127 respectively;

- Airspace: The Project Are is located outside of controlled airspace (wholly within Class G airspace) and is not located in any Prohibited, Restricted and Danger areas;
- Air routes and Lowest Safe Altitude (LSALT):
  - The Project is located in the area with two LSALT of:
    - 1,951 m AHD (6,400 ft AMSL) with a Minimum Obstacle Clearance (MOC) surface of 1,646 m AHD (5,400 ft AMSL);
    - 2,011 m AHD (6,600 ft AMSL) with a MOC surface of 1,707 m AHD (5,600 ft AMSL);
  - Seven air routes are in the vicinity of the Project Area. Route LSALT vary from 5,900 ft to 6,600 ft and route MOC vary from 4,900 ft to 5,600 ft;
- Radar: The closest aviation radar facility is the Round Mountain Route Surveillance Radar which is located approximately 60 km (32 nm) north-east of the Project Area;
- Bureau of Meteorology: The closest Bureau of Meteorology (BoM) weather radar is the Namoi Black Jack Mountain DWSR 8502S 2° S-band Doppler radar located at Black Jack Mountain near Gunnedah approximately 183 km (99 nm) north-west of the Project;
- Aerial firefighting: Aerial firefighting operations (firebombing in particular) are conducted in Day Visual Flight Rules (VFR), sometimes below 500 ft above ground level (AGL);
- Aerial application operations: Aerial application operations including such activities as fertiliser, pest and crop spraying are generally conducted under day VFR below 500 ft AGL; usually between 6.5 ft (2 m) and 100 ft (30.5 m) AGL;
- Other operations:

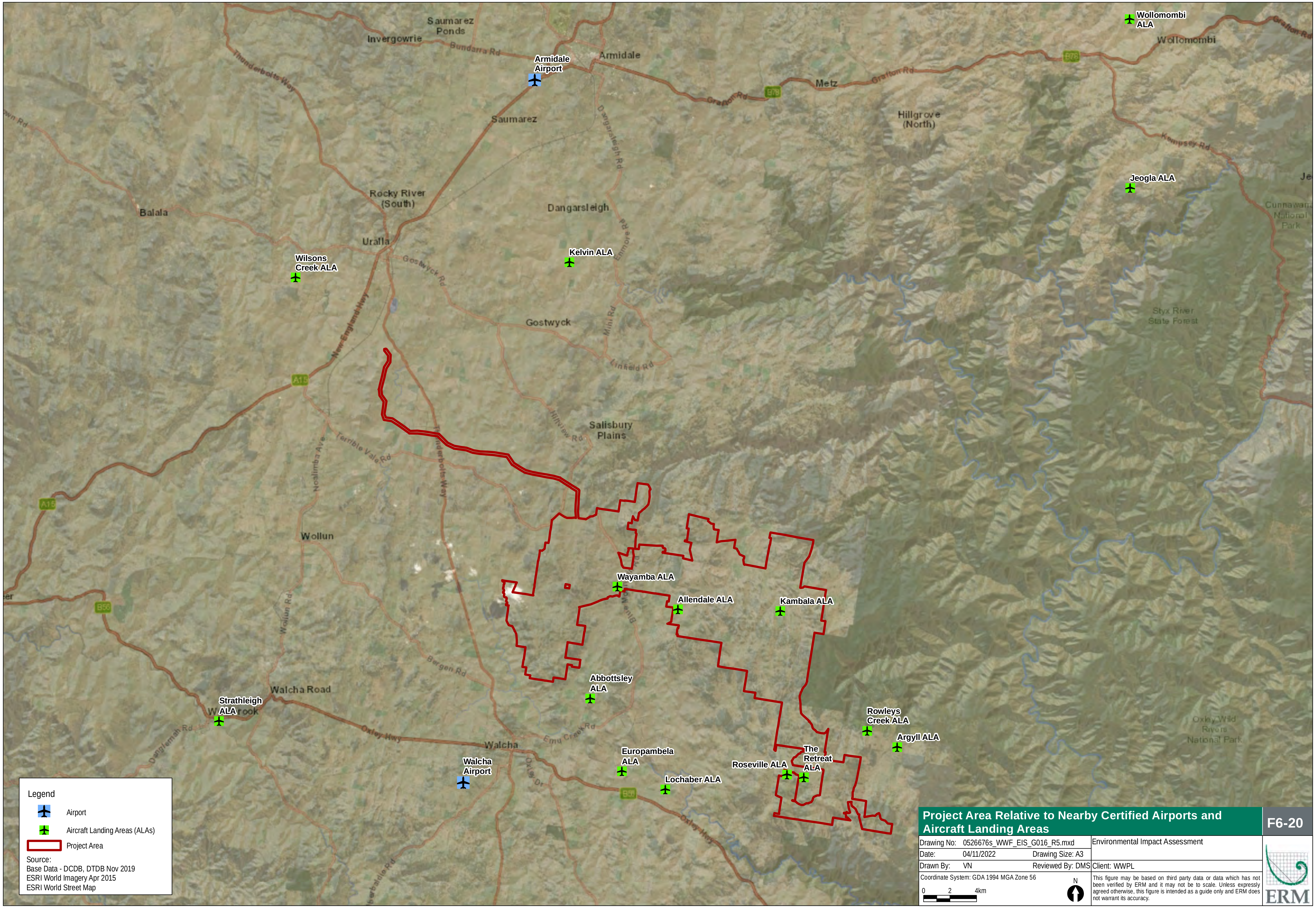
  - Passenger transport operations: Regular public transport and passenger carrying charter operations are generally operated under the Instrument Flight Rules (IFR);

  - Private operations: Private operations are generally conducted under day or night VFR, with some IFR. Flight under day VFR is conducted above 500 ft AGL;

  - Military operations: There may be some high-speed low-level military jet aircraft and helicopter operations conducted in the area. The Department of Defence advised during consultation that it has no objections to the Project; and

  - Emergency services: Royal Flying Doctor Service and other emergency services operations are generally conducted under the IFR, except when arriving / departing a destination that is not serviced by instrument approach aids or procedures.

Figure 6-20 shows the location of the Project Area relative to nearby certified aerodromes and ALAs.



Project Area Relative to Nearby Certified Airports and Aircraft Landing Areas — F6-20

Drawing No: 0526676s_WWF_EIS_G016_R5.mxd		Environmental Impact Assessment
Date: 04/11/2022	Drawing Size: A3	
Drawn By: VN	Reviewed By: DMS	Client: WWPL

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6.5.1.4 Assessment of Impacts

Certified Airports

The Project Area is located outside the 10 nm minimum safe altitude (MSA) of Armidale Airport but within the 25 nm MSA of Armidale Airport, with an MSA of 6,100 ft AMSL which has a minimum obstacle clearance (MOC) of 5,100 ft AMSL.

The highest WTG located inside of the horizontal extent of the 25 nm MSA of Armidale Airport (including 5 nm buffer area) is B007. The maximum overall height for WTG B007 is approximately 1,538 m AHD (5,046 ft AMSL) (including 5 m error budget). As a result, WTG B007 will be approximately 16 m (54 ft) below the 5,100 ft MOC. Therefore, the 25 MSA of 6,100 ft AMSL will not be impacted.

The Project will not impact instrument procedures of Armidale Airport, and the Project is located outside the horizontal extent of circling areas at Armidale Airport and will have no impact on its aviation activities.

Tamworth Regional Airport (YSTW) is located outside of the 30 nm (55.56 km) radius and will not be impacted by the Project in terms of issues associated with airspace protection.

Aircraft Landing Areas (ALAs)

The AIA considered the potential impacts to operations out of the uncertified ALAs in proximity to the Project Area. The AIA found that when the prevailing wind has a westerly component, WTGs located in the eastern side of the Project Area may impose possible wake turbulence into Rowleys Creek ALA circuit area, and to a lesser extent, Argyll ALA circuit area.

In strong westerly winds, the circuit direction to both ALAs could be kept to the eastern side of the ALA to avoid any potential wake turbulence impacts, noting that aerial spraying takes place when wind is calm. Turbulence would be negligible in light wind conditions when operations at these ALAs are likely to occur

Six ALAs are also located within the Project Area, as detailed in **Table 6-32.** Subject to their operational status, aircraft operations at these ALAs may be affected by the WTG obstacles and/or wake turbulence.

Table 6-32 ALAs within Project Area

ALA Name	ICAO Code	Registration Status	Nearest WTG	Impact on the OLS	Impact on Flight Circuit(s)
Wayamba	Nil	uncertified	B160	Nil	Minimal restriction by WTGs to the west, may be subject to wake turbulence impacts in westerly winds
Allendale	Nil	uncertified	B049	Nil	Restricted by WTGs to the north and east, may be subject to wake turbulence impacts in northerly and easterly winds
Kambala	Nil	uncertified	B092	Nil	Restricted by WTGs to the west, south and east, may be subject to wake turbulence impacts in easterly, southerly and westerly winds
Roseville	Nil	uncertified	B138	Nil	Restricted by WTGs to the south, may be subject to wake turbulence impacts in southerly winds
Abbottsley	Nil	uncertified	B039	Nil	Minimal restriction by WTGs to the west, may be subject to wake turbulence impacts in westerly winds
The Retreat	Nil	uncertified	B139	Nil	Minimal restriction by WTGs to the west, may be subject to wake turbulence impacts in westerly winds

Obstacle Limitation Surfaces

The maximum horizontal distance that an Obstacle Limitation Surface (OLS) may extend for an aerodrome in Australia is 15 km (8.1 nm) from the edge of a runway strip.

The closest proposed WTG B001 is located 33 km (18 nm) south-east from Armidale Airport's ARP. Therefore, the Project is located outside the horizontal extent of any OLS and will not impact the OLS of Armidale Airport.

Grid and Air Route LSALT

The Manual Standards 173 *Standards Applicable to Instrument Flight Procedure Design* (MOS 173) requires that a MOC of 1,000 ft below the published LSALT is maintained along each air route. Hence, MOC is the height above which obstacles would impact LSALTs or air routes.

The Project Area has two grid LSALTs. The highest WTG is B130, with a maximum overall height of 1,564 m AHD (5,132 ft AMSL) and is below the two LSALT MOCs of 5,400 ft AMSL and 5,600 ft AMSL. The Project will therefore not affect the grid LSALTs of 6,400 ft AMSL and 6,600 ft AMSL.

Table 9 of **Appendix K** provides an impact analysis of the seven air routes surrounding the Project Area. The Project will have an impact on the MOC of 146 ft and hence LSALT of air route W128. No further impacts to air routes were identified. The draft AIA was submitted to Airservices Australia, which assessed the Project as having no impacts to existing air routes (refer Section 5 of **Appendix K**).

Airspace

The Project is located outside of controlled airspace (wholly within Class G airspace) and is not located in any Prohibited, Restricted or Danger areas. The Project therefore will not impact controlled airspace.

Aviation Facilities

Aviation facilities including a non-directional radio beacon and distance measuring equipment are located approximately 33 km (18 nm) to the north west from the Project Area. The Project will not penetrate any protection areas associated with non-directional radio beacon and distance measuring equipment at Armidale Airport.

Radar

The closest aviation radar facility is the Round Mountain Route Surveillance Radar which is located approximately 60 km (32 nm) north east of the Project Area. As the Project is located in Zone 4 (accepted zone) and outside the radar line of sight of Round Mountain Route Surveillance Radar, it is therefore unlikely that the Project will interfere with the serviceability of this facility.

It is also unlikely that the Project will impact the Namoi Black Jack Mountain DWSR 8502S 2° S-band Doppler radar located at Black Jack Mountain near Gunnedah, as the Project is located more than 183 km from this meteorological radar.

Aerial Application Operations

Safe aerial application operations would be possible on properties within the Project Area and neighbouring areas, subject to final turbine locations and by implementing recommendations provided in the AIA (refer **Appendix K**). This is based on previous studies undertaken by Aviation Projects and is subject to further consultation with the Aerial Application Association of Australia (AAAA) and with local aerial application operators.

Risk Assessment

Five potential risk events associated with WTGs and meteorological masts were identified in relation to aviation safety:

- For an aircraft to collide with a WTG (controlled flight into terrain);
- For an aircraft to collide with a met mast (controlled flight into terrain);
- A pilot to initiate manoeuvring in order to avoid colliding with a WTG or met mast resulting in collision with terrain;
- Hazards associated with the Project to invoke operational limitations or procedures on operating crew; and
- Obstacle lighting on neighbours.

The concept of worst credible effect has been used for the assessment for the purpose of considering applicable consequences. A summary of the level of residual risk associated with the Project with the recommended treatments implemented, is provided in **Table 6-33**. The risk assessment is provided in full in Section 9 of the AIA (refer **Appendix K**).

Table 6-33 Summary of Risks

Risk Element	Consequence	Likelihood	Risk	Actions Required
Aircraft collision with WTG	Catastrophic	Unlikely	7	**Acceptable without obstacle lighting (ALARP)** Communicate details of the Proposal to local and regional operators and make arrangements to publish details in ERSA for surrounding aerodromes before, during and following construction
Aircraft collision with wind monitoring tower	Catastrophic	Unlikely	7	**Acceptable without obstacle lighting (ALARP)** Although there is no obligation to do so, consideration has been made for marking the wind monitoring towers according to the requirements set out in MOS 139 Chapter 8 Division 10 Obstacle Markings, specifically 8.110 (5), (7) and (8) Details of wind monitoring towers will be communicated to local and regional operators and to CASA and Airservices Australia following construction
Avoidance manoeuvring leads to ground collision	Catastrophic	Unlikely	7	**Acceptable without obstacle lighting (ALARP)** Communicate details of the Proposal to local and regional operators and make arrangements to publish details in ERSA for surrounding aerodromes before, during and following construction
Effect on crew	Minor	Possible	5	**Acceptable without obstacle lighting (ALARP)** Communicate details of the Proposal to local and regional operators and make arrangements to publish details in ERSA for surrounding aerodromes before, during and following construction
Visual impact from obstacle lights	Moderate	Likely	7	**Acceptable without obstacle lighting** (zero risk of visual impact from obstacle lighting). If lights are installed, design to minimise impact

Hazard Lighting and Marking

Based on the **Appendix K** risk assessment, it was concluded that aviation lighting is not required for WTGs and met masts to maintain an acceptable level of safety to aircraft. However, relevant lighting standards and guidelines should be followed.

The following conclusions apply to hazard lighting and marking:

- The proposed WTGs and met masts must be reported to CASA if they are considered a hazardous obstacle. WTGs and met masts must be marked in accordance with MOS 139 Chapter 8 Division 10.8.110;
- WTGs must be lit in accordance with MOS 139 Chapter 9 Division 4.9.3 and 9.31, unless an aeronautical study assesses they are of no operational significance, however the Project will not require obstacle lighting to maintain an acceptable level of safety to aircraft;
- CASA advised that it will only review assessments referred to it by a planning authority or agency; and
- WTGs in a white or light grey colour will provide sufficient contrast with the surrounding environment to maintain an acceptable level of safety while lowering visual impact to the neighbouring residents.

6.5.1.5 Mitigation Measures

Impacts to aviation and airspace (as described above) will be mitigated through the implementation of specific mitigation and management measures as described below. As part of the detailed design, the applicant will continue to investigate options to further avoid and minimise impacts to aviation and airspace.

A summary of mitigation measures which will be adopted by the Proponent are included in **Table 6-34**.

Table 6-34 Aviation Mitigation Measures

Issue	Measures
Designed air routes	■ To accommodate the WTGs at 230 m AGL, air route W128 LSALT should be increased by 200 ft from 5,900 ft to 6,100 ft AMSL
Notification and reporting	■ 'As constructed' details of WTGs including coordinates and elevations will be provided to Airservices Australia ■ Department of Defence will be consulted if there is any subsequent modification in the WTG height or scale of development ■ Any obstacles above 100 m AGL (including temporary construction equipment) will be reported to Airservices Australia NOTAM office until they are incorporated in published operational documents ■ Details of the Project should be provided to local and regional aircraft operators prior to construction in order for them to consider the potential impact of the wind farm on their operations. Specifically, details should be provided to the NSW Regional Airspace and Procedures Advisory Committee for consideration by its members in relation to VFR transit routes in the vicinity of the wind farm ■ To facilitate the flight planning of aerial application operators, upon request details of the Project (including location and height information of WTGs, met masts and overhead transmission lines) will be provided to landowners within Project Area so that, when asked for hazard information on their property, the landowner may provide the aerial application pilot with all relevant information
Aerial operations	■ Whilst not a statutory requirement, the Proponent will engage with local aerial agricultural operators and aerial firefighting operators in developing procedures for such aircraft operations in the vicinity of the Project ■ Engage with the operators of ALAs in close proximity to the wind farm to develop a mitigation plan. This may include suspending the relevant WTG's operation (dependent on wind direction and wind speed) for the period that the ALAs are in use for take-off and landing

Issue	Measures
Marking of turbines	■ The rotor blades, nacelle and the supporting tower of the WTGs should be painted white, typical of most WTGs operational in Australia. No additional marking measures are required for WTGs
Lighting of turbines	■ Aviation Projects has assessed that the Project will not require obstacle lighting to maintain an acceptable level of safety to aircraft
Micro-siting	■ Micro-siting of the WTGs and met masts within 100 m of assessed location, if required. ■ The micro-siting of the WTGs and met masts is not likely to result in a change in the maximum overall blade tip height of the Project ■ Providing the micro-siting is within 100 m no further assessment is likely to be required from micro-siting and the conclusions of this AIA would remain the same

6.5.2 Bushfire

6.5.2.1 Introduction

The SEARs require assessment of bushfire risk, and the *Rural Fires Act 1997* (NSW) imposes obligations on land occupiers to take practicable steps to prevent the occurrence of bushfires on or from land.

A Bushfire Risk Assessment was prepared by NGH to identify potential hazards and risks associated with bushfires / use of bushfire prone land and contains management and mitigation measures designed to address these obligations.

The Bushfire Risk Assessment (NGH, 2022) is included in **Appendix L**.

Consideration was also given to the application of bushfire protection measures prescribed by *Planning for Bushfire Protection* (PBP 2019) (NSW RFS, 2019) throughout the construction, operation, and decommissioning phases of the Project (refer Section 3.3 of **Appendix L**).

6.5.2.2 Existing Environment

The Walcha Council and the Uralla Shire Council Bushfire Prone Land mapping identifies the Project Area as bushfire prone land (refer **Figure 6-21**).

The typical / average climate in the New England region is temperate to cool, characterised by warm summers with uniform rainfall generally occurring in the summer. Patches of montane climate occur at higher elevations, and these are characterised by mild summers and no dry season. The bushfire season generally runs from August to March.

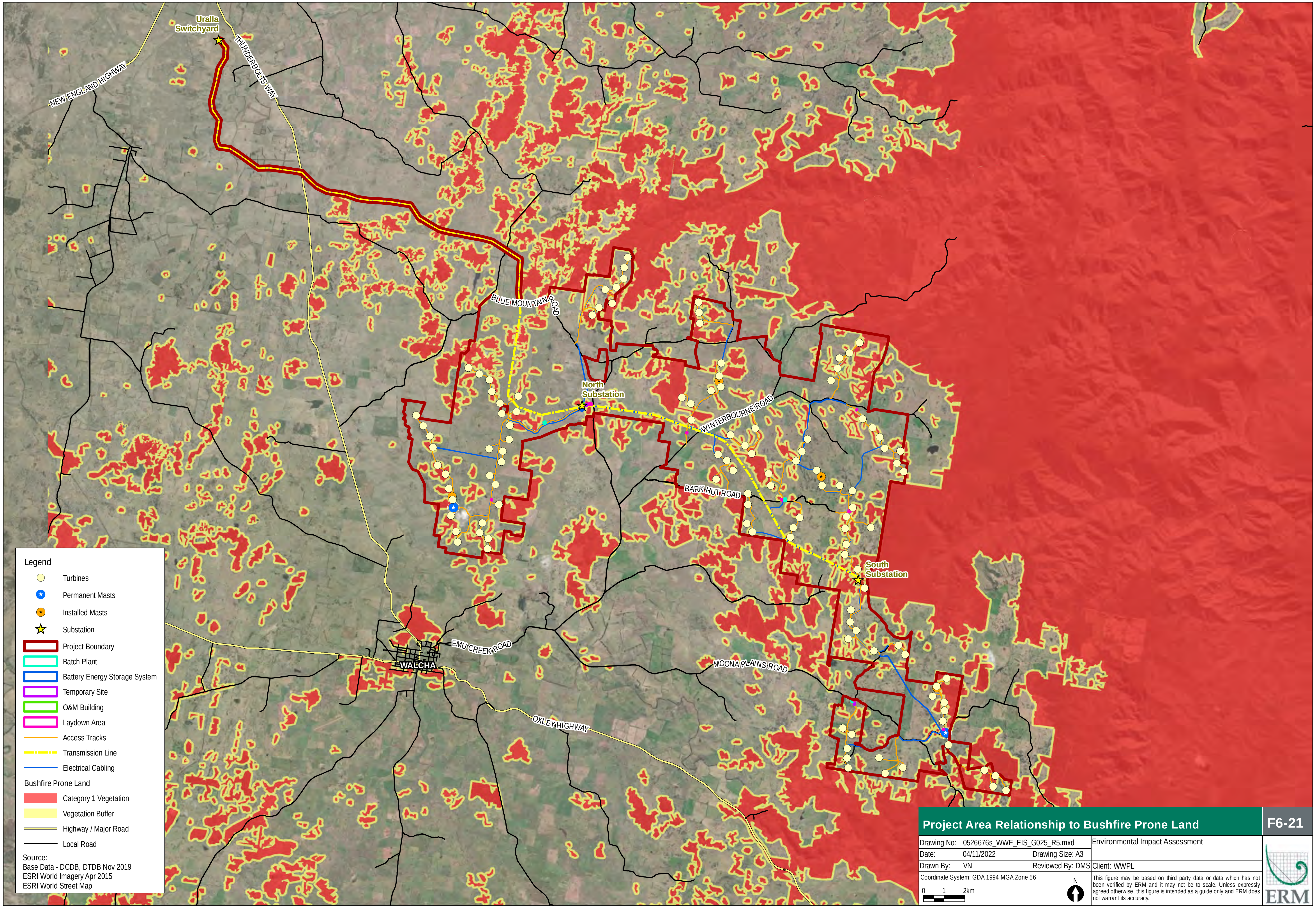
The Project Area is located along ridgelines that are exposed to prevailing wind directions. The prevailing weather conditions associated with the bushfire season in the New England region are west to north-westerly winds, moderate to high daytime temperatures and low relative humidity (NSW RFS, 2017b). Frosts in winter create low fuel moisture content and dry lightning storms can occur in the bushfire season.

The New England Bush Fire Management Committee (BFMC) area is in the northern tablelands of NSW and includes the LGAs of Armidale Regional, Uralla and Walcha. The New England Bush Fire Risk Management Plan identifies that the New England BFMC area has on average 95 bushfires per year, where 12 on average are considered to evolve into major fire events (NSW RFS, 2017b). The Bush Fire Risk Management Plan provides detailed fire frequency mapping, which includes large areas of the adjacent Oxley Wild Rivers National Park. The frequency of fire events that occur in vegetation immediately adjacent to the Project Area is identified as occurring at intervals of one to two years (NSW RFS, 2017b).

The Project Area is located wholly within the New England Tablelands Bioregion and wholly within the Walcha Plateau Sub-bioregion. It generally contains modified vegetation due to historical and ongoing agricultural practices. While dominated by grassland and pastures, remnant patches of forest and woodland vegetation exist within the Project Area (refer **Figure 6-22**). The isolated remnant areas of wooded vegetation do not provide a fire path to the National Park from Project infrastructure.

Grassland vegetation presents a fuel load that could enable the rapid spread of fire, particularly in times when pastures are cured. However, it is acknowledged that grassland does not always present a hazard in agricultural areas, as vegetation may be low or non-flammable due to being too green to burn (high moisture content) or may be recently planted (not of sufficient height or structure to facilitate growth and movement of a fire).

In terms of fire risk, PBP 2019 indicates that the effective slope is the slope under the vegetation which will most significantly influence the bushfire behaviour. Steeper slopes significantly increase the rate of spread of a fire throughout the landscape. A wildfire moves quickly up-slope, doubling in speed every 10 degrees of incline (SA DEW, n.d.). In extreme weather conditions, significant slope can generate an intense fire over a relatively short distance. Some wooded areas within 100 m of the Development Footprint are subject to significant slope (up to 15 degrees), representing potential for high fire intensity.

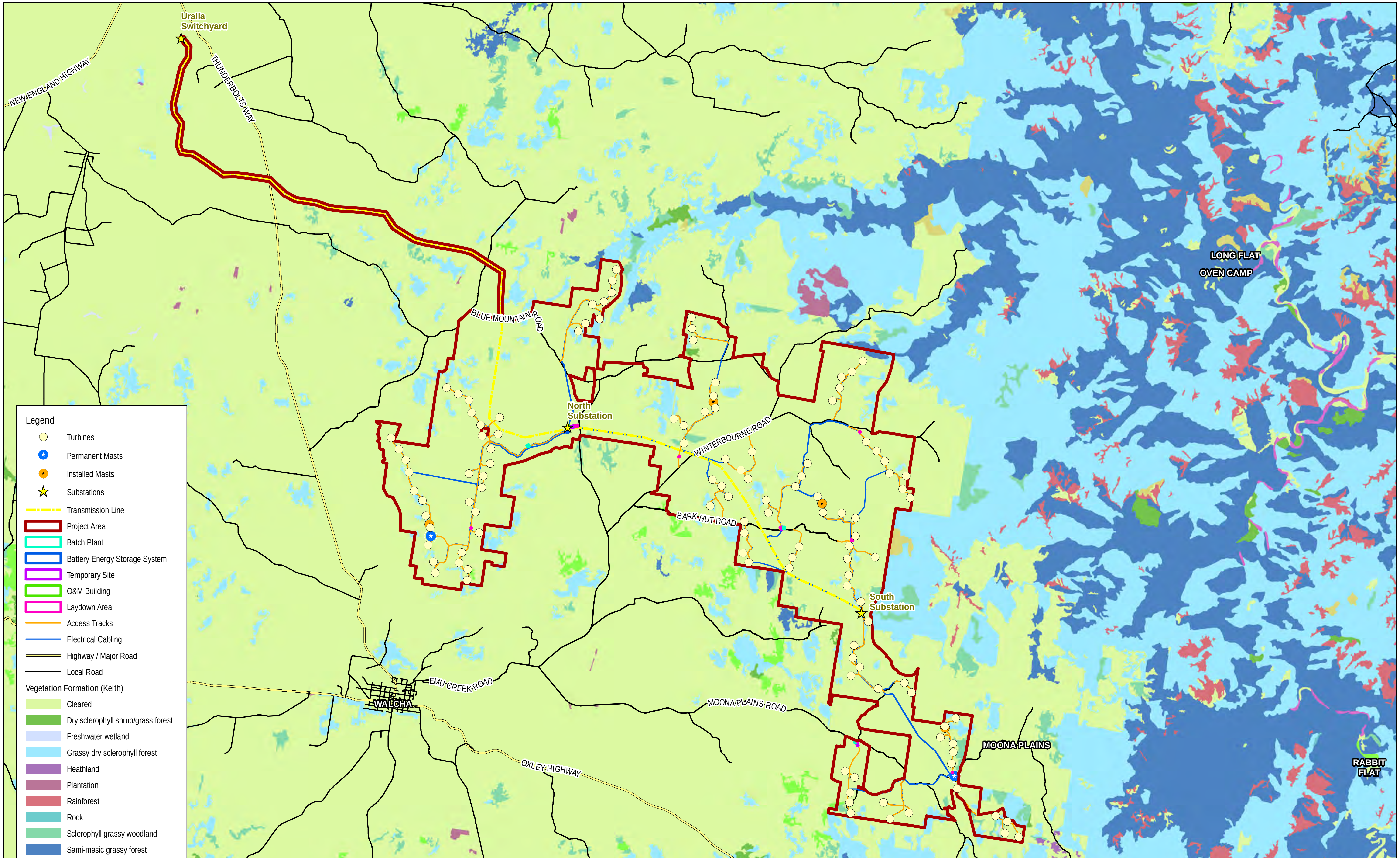


Project Area Relationship to Bushfire Prone Land

F6-21

Drawing No: 0526676s_WWF_EIS_G025_R5.mxd		Environmental Impact Assessment
Date: 04/11/2022	Drawing Size: A3	
Drawn By: VN	Reviewed By: DMS	Client: WWPL

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.



Vegetation within the Project Locality

F6-22

Drawing No: 0526676s_WWF_EIS_G026_R5.mxd	Environmental Impact Assessment
Date: 04/11/2022 Drawing Size: A3	
Drawn By: VN Reviewed By: DMS	Client: WWPL

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

6.5.2.3 Assessment of Impacts

Risk of Fire Ignition during Construction and Maintenance

In the New England region, bushfires mostly occur due to escaped controlled burns, machinery, hot works, lightning strikes and arson / fire setting (NSW RFS, 2017b).

Earth moving equipment, power tools (e.g. welders, grinders), mowers and slashers are known for starting bushfires under conditions of high temperature, low humidity, and high wind.

Construction activities will be a potential source of ignition, particularly from October to March. Management of activities across the Project Area is important to ensure fire risk is kept to a minimum throughout the construction and decommissioning stages of the Project.

Construction activities associated with the Project are described in **Section 3.4**.

Risk of Fire Ignition during Operation

The operational phase of the Project has the following associated bushfire risks:

- Transmission line failure or contact with vegetation within clearances;
- Overheating in the substation;
- Overheating in the BESS banks;
- Grass fire ignition from vehicles and maintenance machinery; and
- Poor groundcover management and associated increase in fuel loads.

The operational phase of the Project has a significantly reduced risk for ignition sources, as the WTGs, substations, BESS, and O&M facility will be located on hardstands (compact ground and gravel base) with APZs established around the perimeter.

The APZs will include gravel surfacing to minimise the risk of fire escaping from the Project infrastructure and the risk of external fire affecting the Project infrastructure.

The risk of bushfire ignition from electrical cabling will be minimised in consideration of the requirements described in Section 5.3.3 Table 5.3c, of the PBP 2019 guidelines.

In relation to the 330 kV transmission line, the project will comply with TransGrid requirements and guidelines in respect of vegetation management within the main transmission line easement. Regarding permanent or long-term buildings to be used for maintenance or site offices, these will be constructed of low-combustibility or non-combustible materials in accordance with the *National Construction Code* (ABCB, 2022) and will therefore be considered low risk during the operational phase.

Permanent buildings used as site offices or maintenance buildings will be constructed of low-combustibility or non-combustible materials in accordance with the National Construction Code (NCC) to reduce the risk of fire during the operational phase. In addition, engineering controls such as fire alarm, suppression systems and fire extinguishers will be used to reduce the risk of fire.

Potential Impacts to Aerial Fire Fighting Capabilities

Fire suppression aircraft would generally operate in areas where there is no smoke and during daylight hours. Aerial firefighting operations would treat turbine towers like other tall obstacles such as high voltage transmission lines or telecommunication towers which are commonly found throughout the landscape. Pilots and Air Operations Managers will assess these risks as part of routine procedures. Risks due to wake turbulence and the moving blades have been considered in the AIA, which found that WTGs are not expected to pose unacceptable risks (refer **Appendix K**).

As recommended by the AIA, the Proponent should engage with local aerial firefighting operators to develop procedures, as further described in **Section 6.5.1.5**.

If a fire does breach any containment lines and threatens the wind farm assets, it is possible that the Project infrastructure will sustain direct flame contact and that firefighting will require aerial support. While the construction of the WTGs may remove the ability for aerial firefighting support (i.e. aerial water-bombing) over the WTGs themselves, it is noted that the WTG towers are made from non-combustible material and do not present a significant fire risk. In the unlikely event that a fire did spread from the wind farm to surrounding properties, the WTGs would not limit aerial firefighting capabilities on other properties in the surrounding area.

Potential Impacts on National Park Fire Management

The Project requires construction of internal access tracks, including an upgrade of some existing public roads, which will facilitate better access to the western perimeter of Oxley Wild Rivers National Park for emergency services personnel. New roads will be all-weather access and of adequate width to enable firefighting vehicles to access and manoeuvre.

The Project would not require APZs that extend beyond the Project Area or rely on ongoing maintenance activities by adjacent landowners, including NPWS. Similarly, the Project would not encroach on, or impact the use of, the mapped Strategic Fire Advantage Zone.

6.5.2.4 Mitigation Measures

Bushfire risk (as described above) will be mitigated through the implementation of specific mitigation and management measures as described below. As part of the detailed design, the applicant will continue to investigate options to further minimise bushfire risk.

Bushfire Protection Measures

The following Bushfire Protection Measures are a series of controls that when combined, aim to provide an acceptable level of protection for bushfire risk and are committed for the Project.

- **Asset Protection Zones**: An APZ is a buffer zone between a bushfire hazard and buildings or infrastructure. The APZ is managed to minimise fuel loads and reduce potential radiant heat levels, flame, localised smoke, and ember attack.

  An APZ will be established at the respective location of work, at the appropriate time, prior to commencement of activities, and maintained for the life of that component. The APZs would be maintained to the standard of an IPA for the life of the development.

  An APZ no less than 10 m in width will be provided, thus providing a defendable space around key infrastructure and temporary construction facilities (as described in Table 5.1 of **Appendix L**). Where forest / wooded vegetation is present adjacent the infrastructure, an increased 20 m wide APZ is recommended.

  Table 5.1 of **Appendix L** further describes how the Project will comply with the APZ specifications contained in PBP 2019 (NSW RFS, 2019).
- **Landscaping**: Landscaping will be considered throughout the design process and further enforced throughout the construction and operational phases of the Project. If landscaping or revegetation of areas within the Project Area are required, they will be located and designed to reduce the risk of flame contact and radiant heat to both Project infrastructure and other key assets.
- **Access**: Property access and internal access arrangements will comply with the specifications of Table 7.4a of PBP 2019 (or otherwise, the NSW RFS Fire Trail Standards (NSW RFS, 2016), included in Appendix D of **Appendix L**, to ensure access to the Project Area is suitable for emergency response vehicles.
- **Water Supply and Utilities**: In accordance with Table 5.3d of PBP 2019, a water supply no less than 20,000 L will be provided to improve property protection measures and/or to act as a static water supply for emergency services in consultation with NSW RFS.
- **Building Construction and Design:** Regarding suitable storage of essential equipment, non-combustible structures will be installed onsite, or otherwise structures should incorporate basic ember protection measures.

Emergency Management Arrangements

Bushfire Emergency Management and Operational Plan

A Bushfire Emergency Management and Operational Plan (BFEMOP) will be prepared in consultation with relevant stakeholders. The BFEMOP will outline appropriate management bushfire protection measures for the life of the Project. The NSW RFS will be provided with coordinates of the final WTG layout and identification information for individual WTG sites, to facilitate internal fire response planning.

Remote Monitoring and Shutdown

In the event of a fire, the AC circuit breaker in the substation will be closed remotely by operational staff. TransGrid will also be able to shut off the supply from outside the Project Area if required. WTGs are fitted with a variety of control systems, which can be activated in the event of extreme weather conditions (such a high wind speeds or high temperatures), localised fire, or overheating. WTGs can also be shut down if they exceed the tolerance of their design specifications.

The Proponent will engage with FRNSW and NSW RFS to develop operational procedures for remote shutdown to allow for aerial firefighting over WTGs.

Other Protection Measures

Other protection measures for the Project are listed **Table 6-35**.

Table 6-35 Bushfire Mitigation Measures

Consideration	Mitigation Measure
Electrical components	■ Venting and containment requirements of the BESS manufacturer to be followed ■ Automatic shutdown control would be available to automate response protocols to any potential electrical, heating, or chemical safety and hazards incidents; ■ The battery and power conversion systems would be in cubicle design, manufactured of low combustible external materials; ■ A building room for switch room, operational, maintenance building would comprise a containerised infrastructure or concrete structure, a low or non-combustible material
SCADA system	■ Remote controls incorporated into the SCADA system. The signal and alarm would be received simultaneously
Cooling/heating ventilation shafts	■ Any critical infrastructure that may be proposed, including ventilation shafts, should be screened with perforated mesh (with a maximum aperture of 2 mm) to offer protection against ember attack
Storage of hazardous materials	■ Storage locations of hazardous materials will not be located adjacent the Project Area (i.e. adjacent hazard vegetation) within the APZ ■ Storage of hazardous materials will be fully enclosed in a bunded location, or otherwise located in a shielded location, such as masonry wall surroundings or prefabricated container, to reduce exposure to radiant heat and flames
Storage of fuels and flammable liquids	■ Fuels and flammable liquids will be stored safely to ensure these items do not contribute to a bushfire event ■ Storage of fuels should be fully enclosed in a bunded location, or otherwise located in a shielded location, such as masonry wall surroundings or prefabricated container, to reduce exposure to radiant heat and flames
Lightning Dispersal Technology	■ Turbine blades will be fitted with a built-in lightning dispersal system, which dissipates electricity from the blades or nacelle to the ground

6.5.3 Blade Throw

6.5.3.1 Introduction

This section assesses the Blade Throw risk of the Project as a result of the proposed WTG locations and specification in accordance with the SEARs and *Wind Energy Guideline* (DPE, 2016a).

6.5.3.2 Methodology

The Blade Throw Risk Assessment incorporated the following scope of work:

- Assessment of the likelihood of occurrence for a blade throw event;
- Assessment of theoretical distance radii for a blade throw event;
- Review of distances between turbines and nearby dwellings;
- Review of historical blade throw occurrences in Australian wind farms; and
- Provision of relevant mitigation measures for Project implementation.

6.5.3.3 Risk Assessment

Background

In order to investigate blade hazards, it is useful to first examine the structure of a WTG.

A WTG is constructed of around 25,000 components, which are grouped into several main systems, such as the foundation, tower, nacelle, hub and blades, as illustrated in **Figure 6-23**. Other components of the broader wind farm include electrical reticulation connecting turbines to each other and to the internal substations, and access roads linking turbine locations to each other and to existing local roads.

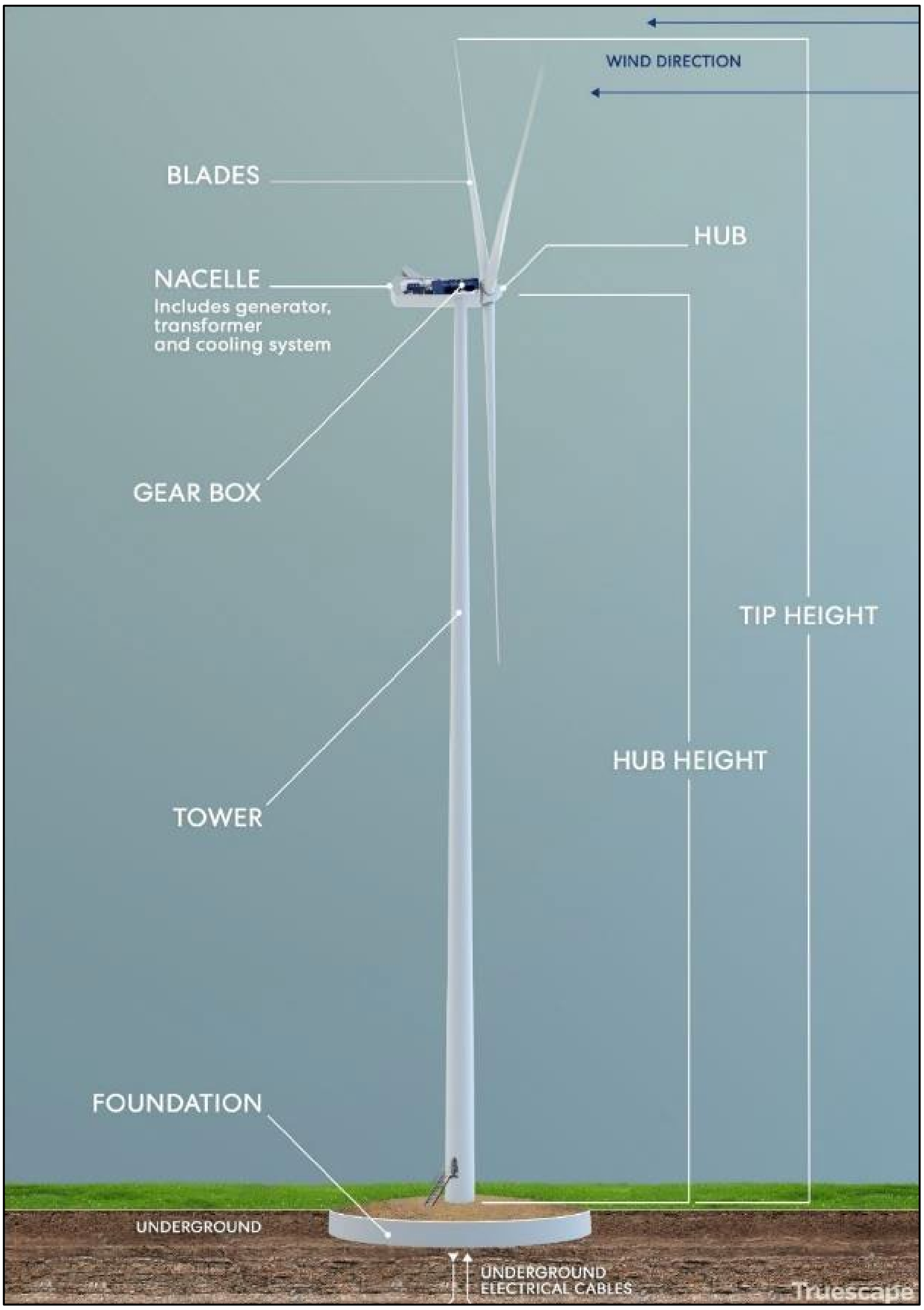
The nacelle contains the main electrical and mechanical components of the turbine, including the gearbox, main shaft, generator, transformer and control systems. **Figure 6-24** below shows the individual components of the nacelle module, which are described below:

- Gearbox: increases slow rotational speed of the rotor to a high speed motor to generate electricity. The gearbox is composed of cast iron and steel;
- Generator: mainly consists of steel, cast iron and copper;
- Nacelle foundation: the nacelle foundation is made from cast iron; and
- Nacelle cover: the nacelle cover is made from fibreglass, which consists of woven glass fibres, polyethylene and styrene.

In addition to the above-mentioned components, the nacelle also generally consists of a range of other components, including yaw system, coupling, cooler top, cables, and controls.

The hub and spinner are parts of the rotor system. The spinner consists of a cover constructed of glass fibre-reinforced polyester, and a blade hub made of cast iron and internals.

Figure 6-23 WTG Components



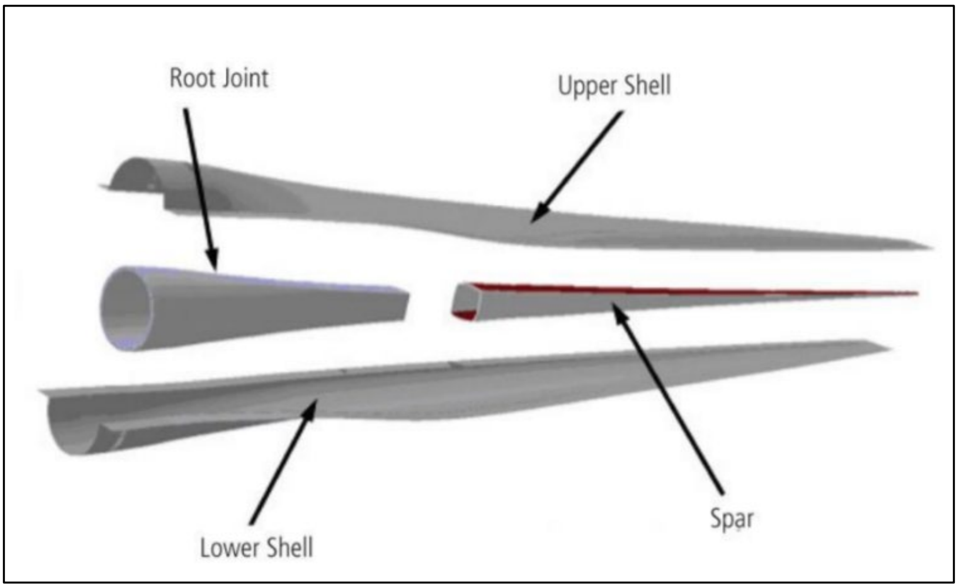
Source: Truescape (2021)

Figure 6-24 Illustration of Nacelle Module

Source: Vestas (2019)

The structure of a WTG blade is illustrated in **Figure 6-25**. Each blade will be up to 79.3 m long and consists of two structural shell sections and web design. The main materials used in the blades are carbon fibre and woven glass fibres infused with epoxy resin. Polyurethane glue is the primary material used to assemble blade shells and web. After the gluing process, the blades are ground and polished to ensure the correct finish. Given this construction technique, the scenario of a blade fragmenting is very unlikely and is not discussed further in this assessment.

Figure 6-25 Typical Structure of a WTG Blade



Source: Sarlak & Sørensen (2015)

Source of Blade Throw

A blade throw incident can occur when an entire WTG blade becomes separated from its hub at the metal to metal root joint. A possible cause which could lead to this event is the instantaneous failure of the bearing or hub flange fastening system (MMI Engineering Ltd, 2013). In this instance, it is possible a blade could be thrown from the hub if the control system fails to detect an abnormality (e.g. vibration, imbalance, under power). However, the progression of this failure is generally slow enough that the control system will detect an abnormality and the machine will fault and shut down, preventing a blade throw event (MMI Engineering Ltd, 2013).

Preventing structural failures such as fatigue resistance of WTG subassemblies can, in addition, prevent the possibility of a blade throw event (MMI Engineering Ltd, 2013). Data has indicated that subassembly failure frequencies are reducing with time, which has been correlated to improvements in design and manufacturing (Ribrant & Bertling, 2007). The causes for WTG blade failures may also include extreme environmental conditions, incorrect design for ultimate or fatigue loads, extremely low strength of the materials, failure of turbine control system, and human error (Carbone & Afferrante, 2013; Rastayesh, Long, Dalsgaard Sorensen, & Thons, 2019).

Likelihood of Blade Throw

In order to quantify the likelihood of a blade throw event, researchers have examined historical data sets of incidents on wind farms. Comprehensive and detailed blade throw data sets are not typically available to the public. Where databases have been compiled, the data is typically held in confidence by manufacturers or industrial bodies (Larwood & Simms, Analysis of blade fragment risk at a wind energy facility, 2018; MMI Engineering Ltd, 2013). The limited data available includes a database of over 200 severe WTG incidents which occurred in Germany and Denmark from 1980 until 2001. Using this database, researchers (Braam & Rademakers, 2002) were able to establish rates of incidents as depicted in **Table 6-36**.

Table 6-36 also includes blade throw probabilities as contained in the *Handbook Windturbines* (2019) (or translated as *Wind Turbines Handbook*) prepared by the Belgium Government (Department of Omgeving).

Table 6-36 Blade Throw Probabilities: Frequencies of Occurrences

Failure Case	Recommended Value (1 / year)	
	Braam & Rademakers (2002)	Handbook Windturbines (2019)
Collapse of an entire tower from base	3.2×10^{-4}	1.5×10^{-5}
Loss of entire blade	8.4×10^{-4}	6.2×10^{-4}
nominal operating rpm	4.2×10^{-4}	6.2 x 10-4
Mechanical braking (1.25 x nominal rpm)	4.2×10^{-4}	-
Emergency (2.0 x nominal rpm)	5.0×10^{-6}	5.0×10^{-6}

Using an extensive database compiled by Caithness Windfarm Information Forum entitled *Wind Turbine Accident and Incident Compilation (last updated 30 June 2021)* (http://www.caithnesswindfarms.co.uk/fullaccidents.pdf) and through using web search engines, it was identified that five incidents of blade throw are estimated to have occurred at the following Australian wind farms:

- Dundonnell Wind Farm, Victoria (October, 2020);
- Bald Hills Wind Farm, Victoria (June, 2020);
- Lal Lal Wind Farm, Victoria (September, 2019);
- Wonthaggi Wind Farm, Victoria (March, 2012); and
- Windy Hill Wind Farm, Queensland (July, 2005).

Limited information is publicly available on these occurrences; however, in all occurrences no damage to human life or property was reported. However, there is general agreement throughout the literature that the likelihood of damage to human life or property from a blade throw incident is extremely small and well within risk levels typically deemed acceptable by society.

Distance of Blade Throw

Extensive literature reviews on blade throw indicate that there are many approaches to modelling blade throw potential, whether theoretical or incident based. Documented blade failures and blade throw distances were also reported in the afrementioned incident database, in which the maximum throw distance for an entire blade was 150 m (Braam & Rademakers, 2002).

Sarlak & Sorensen (2015) consider 18 different ordinary differential equations derived from the equations of motion using Newton's second law, Euler's equations of motion and tabulated airfoil aerodynamic data. They have solved the ODEs to calculate maximum blade throw distances for four different turbine sizes, ranging from 2.3 MW to 20 MW. These calculations take into account initial factors such as blade length, wind speed and blade velocity. Of particular relevence to thes Project are the findings for a 5 MW and 10 MW turbine, which form an estimate of the maximum throw distance. For a full blade throw under normal operating conditions of 70 m/s blade tip speed, the maximum distance is less than 200 m. Under extreme conditions of 150 m/s blade tip speed, the maximum throw distance is less than 500 m.

At the time of separation, the blade or fragment has the same angular velocity (or spin) as the rotor (Larwood, 2005), as illustrated in **Figure** 6-26.

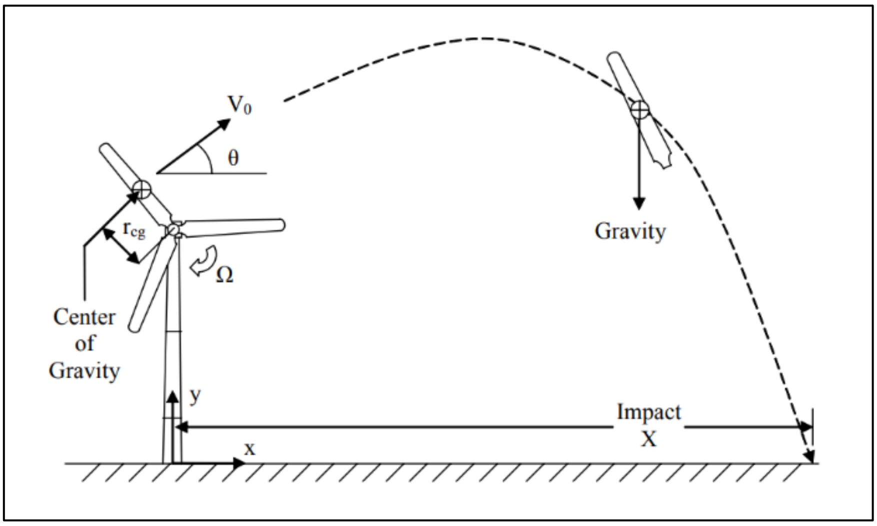


Figure 6-26 Diagram Illustrating Blade Throw

Source: (Larwood, 2005)

Comparatively, the maximum range of a projectile may be estimated using the following formula (Rogers, Slegers, & Costello, 2011):

$$D = \frac{v_T^2 s_{\theta_T} c_{\theta_T} \pm v_T^2 \sqrt{s_{\theta_T}^2 c_{\theta_T}^2 + 2\frac{g}{v_T^2}\left(h - Rc_{\theta_T}\right) c_{\theta_T}^2}}{g}$$

Where: D = Lateral distance (m)
v_T = Initial velocity (m/s)
θ_T = Initial angle
$c\theta_T = \sin\theta_T$
$c\theta_T = \cos\theta$
g = acceleration due to gravity (m/s^2)
h = Hub height (m)
R = Radial distance (m).

Arriscar (2021) used the above formula to map the probability vs. distance distribution for an entire blade (at nominal rpm speed) assuming a tip height of 230 m. Assuming an equal probability of failure at any angle of rotation, a < 10% chance of a blade throw at greater than approximately 380 to 390 m was found.

At nominal rpm an entire blade throws had nil chance of being thrown greater than 430 m. The length and width of the potential impact area was assumed to be equivalent to twice the fragment length and the direction of blade throw was assumed to be perpendicular to the wind direction.

Risk Statement

For a conservative approach this assessment assumes the theoretical distance radii for a blade throw event to be 500 m, which the research literature confirms has a very low risk of occurrence.

There is no risk of a blade throw impacting the BESS or the O&M facility as the closest WTG to this infrastructure is greater than 3 km away. All dwellings are greater than 500 m to a WTG. It is acknowledged that a number of WTGs are within 500 m of a property boundary. The southern substation is within proximity to two WTGs, being 426 m north east of B116, and 463 m south of B115.

There are also a number of public roads within vicinity of a WTG:

- B063 approximately 465 m south west of Bark Hut Road;
- B149 approximately 330 m south of Moona Plains Road;
- B168 approximately 130 m north of Bark Hut Road; and
- B169 approximately 375 south of Bark Hut Road.

Wind monitoring data from the BoM and data collected through met masts installed onsite, indicate that the predominant wind direction in the region is east-west. However, the failure of a WTG blade could be a result of many factors, and therefore, the blade orientation at failure is ‘hardly predictable’ (Sarlak & Sørensen, 2015).

Nonetheless, the studies discussed in this risk assessment all assign a very small likelihood of a blade throw event occurring and also a very small likelihood of it being a significant distance. Therefore, this risk assessment finds that that the risk associated with a blade throw event can be considered very low. It is acknowledged that in the unlikely event of a blade throw, the consequence could be significant (e.g. damage to human life or property).

6.5.3.4 Mitigation Measures

At present there is no Australian or New Zealand standard for the design of large WTGs (rotor swept area above 200 m^2). In the absence of such standards, the International Electrotechnical Commission (IEC) Standards are accepted as the default for the design of WTGs.

The IEC is a global organisation that prepares and publishes international standards for all electrical, electronic, and related technologies. Its membership consists of more than 60 participating countries, including all the world's major trading nations and a growing number of industrialising countries.

The following IEC Standards will be used for the design and construction of the Project which will reinforce the confidence that blade throw will represent a very low risk:

- *IEC WT 01:2001 System for conformity testing and certification of wind turbines* — rules and procedures: Defines a certification system for WTGs. It specifies rules for procedures and management to carry out conformity evaluation of WTGs, with respect to specific standards and other technical requirements, relating to safety, reliability, performance, testing and interaction with electrical power networks;
- *IEC 61400-1:2005 Wind turbines Part 1: design requirements*: This guidance specifies essential design requirements to ensure the engineering integrity of WTGs. It provides an appropriate level of protection against damage from all hazards during the planned lifetime and is concerned with all subsystems of WTGs such as control and protection mechanisms, internal electrical systems, mechanical systems and support structures;
- *IEC 61400-12-1:2005 Wind turbines Part 12-1: power performance measurements of electricity-producing wind turbines*: Specifies a procedure for measuring the power performance characteristics of a single WTGs and applies to the testing of WTGs of all types and sizes connected to the electrical power network;
- *IEC 61400-23 WTG systems – Part 23*: full-scale structural testing of rotor blades: Defines the requirements for full-scale structural testing of WTG blades and for the interpretation and evaluation of achieved test results. Static load tests and fatigue tests are considered in this standard;
- *IEC 62305-1/3/4 Protection against lightning*: Together, these parts describe how to design a Lightning Protection System and requirements to prevent injury to people and structure by means of a Lightning Protection System, and the protection of electrical and electronic systems; and
- *IEC 61400-4:2012 Wind turbines — Part 4*: design requirements for WTG gearboxes: Provides guidance on the analysis of the WTG loads in relation to the design of the gear and gearbox elements.

Inspection and Testing Procedures will be initiated and audited during the construction and commissioning phase. Once testing finds all WTG components including the blades are passed, the WTG will be commissioned for operation.

A high quality, comprehensive and robust operations and maintenance program will be implemented to ensure that WTG faults are prevented or detected and rectified quickly, minimising the risk of occurrence of a serious or dangerous problem. This will include inspecting blades for micro-cracks using current best practices. If any cracks above engineering thresholds are detected, the WTG will be immobilised until a replacement blade can be installed.

The industry is constantly developing measures to limit the cost of blade damages, such as sensors to identify blade weaknesses and enable early maintenance and management measures which will also assist in mitigating blade throw risks.

It is noted that the Proponent is one of the largest providers of wind farm operation and maintenance services, and currently services over 129,000 MW of WTGs around the world, including over 4,000 MW in Australia across 45 wind farms.

6.5.4 Preliminary Hazard Analysis

6.5.4.1 Introduction

Sherpa Consulting Pty Ltd (Sherpa) has prepared a PHA relating to the proposed BESS component of the Project.

The objective of the PHA is to identify potential hazards and assess the risks associated with the BESS to determine risk acceptability from a land use safety planning perspective. The PHA assesses the proposed location of the BESS and any potential offsite impacts.

The PHA addresses the 'Hazards and Risks' requirement of the SEARs and is included in **Appendix M** (Sherpa, 2021).

A BESS will be occupying an area of approximately 100 m x 100 m. Adequate asset protection zones will be included around the BESS. The model and design specification of the BESS will be determined during detailed design. However, the final model and design specifications will remain within the specifications assessed in the PHA report. The indicative BESS design and typical layout of a 100 MW/200 MWh BESS is further discussed in **Section 3.3.6**.

6.5.4.2 Methodology

This study was carried out in accordance with the requirements of the 'Hazardous Industry Planning Advisory Paper' (HIPAP) No. 6 *Hazard Analysis*, and included the following steps:

1. Establish the study context;
2. Identify hazards resulting from the operations of the BESS and events with the potential for offsite impact (Hazard Identification);
3. Analyse the severity of the consequences for the identified events with offsite impact (e.g. fires and explosions (Consequence Analysis));
4. Determine the level of analysis and risk assessment criteria;
5. Analyse the risk of the identified events with offsite impact (Risk Analysis); and
6. Assess the estimated risks from identified events against risk criteria to determine acceptability (Risk Assessment).

The PHA assessed the events associated with proposed operation of the BESS.

The Multi-Level Risk Assessment (MLRA) sets out three levels of risk analysis that may be appropriate for a PHA as shown in **Table 6-37**. The outcomes of the Hazard Identification and Consequence Analysis were used to determine the level of analysis appropriate for the PHA.

The HIPAP No. 4 Risk Criteria for Land Use Safety Planning guideline (HIPAP 4) suggest risk assessment criteria to be considered when assessing the land use safety implications of industrial development of a potentially hazardous nature. The risk criteria used for assessment followed the guidance provided in HIPAP No. 4 and are appropriate for the level of analysis determined.

Table 6-37 Level of Analysis

Level	Analysis type	Appropriate / can be justified if:
1	Qualitative	There are no potential events with significant offsite consequences and societal risk is negligible
2	Partially Quantitative	The frequency of occurrence of risk contributors having offsite consequences is low
3	Quantitative	There are significant offsite risk contributors and a Level 2 analysis is unable to demonstrate that the risk criteria will be met.

6.5.4.3 Assessment of Impacts

Hazard identification

The following factors were considered to identify hazards:

- BESS component and type of equipment;
- Hazardous materials present;
- Proposed operation and maintenance activities; and
- External factors (e.g. unauthorised access, lightning storm).

Events with the potential to result in significant impacts to people (i.e. injury and/or fatality) were identified. The study excluded hazards related with Occupational Health & Safety (OH&S), such as slips, trips and falls.

In this study, bushfire was considered as a cause of fire resulting from encroachment of an offsite bushfire impacting the BESS. Bushfire as a potential threat to Project infrastructure is considered in a separate Bushfire Risk Assessment (refer **Section 6.5.2, Appendix L**).

The Hazard Identification Register is provided in full in Section 4, Table 4.3 of the PHA. The findings are summarised as follows:

- A total of 15 potentially hazardous events were identified.
- Some hazardous events (i.e. fires) may extend beyond the Project Area boundary (i.e. offsite impact in the context of HIPAP No. 6).
- However, as the BESS will be situated in a rural area and the nearest residential dwelling will be approximately 2.6 km away, no events with potential for significant offsite impact (i.e. serious injury and/or fatality to the public or offsite population) were identified.

The Hazard Identification found that for all identified events the resulting consequences are not expected to have significant offsite impacts. This assessment was determined based on the following:

- The distance between the proposed BESS location and the nearest residential dwelling is approximately 2.6 km (ID SR 031). Hazardous events (e.g. thermal runaway) resulting in potential fire and explosion are expected to be localised with no potential for significant offsite consequences; and
- Provision of controls under the Battery Management System (BMS) provides protection against overheating, overcharging and thermal runaway. Design of the battery system may also contain fires within the modular units and prevent escalation.

Additionally, the identified events are expected to present negligible societal risk impact as:

- The proposed BESS will be located at the North Substation, which is situated in a rural area with only scattered residential dwellings. The nearest dwelling is approximately 2.6 km away (ID SR 031); and
- The nearest township (Walcha) is about 15 km away.

The battery can safely be accommodated within the area designated for the battery, accounting for adequate separation distances between units to prevent fire propagation.

Risk analysis

A fully qualitative approach (i.e. Level 1 analysis) was determined appropriate for this study based on the Hazard Identification findings and the MLRA guidance. For each identified event, risk was qualitatively determined from the resulting severity and likelihood rating pair using the Proponent’s company risk matrix, which is designed to assess the risk for employees.

The acceptance criteria used to assess the risk for offsite population is as follows:

- Very High risk – Unlikely to be tolerable (review if activity should proceed);
- High risk – Tolerable, if as low as reasonably practicable;
- Medium risk – Broadly acceptable; and
- Low risk – Acceptable.

For each event, the severity rating was qualitatively assigned based on the consequence description identified in the Hazard Identification Register. The severity rating was assigned based on consequence to people (safety) with respect to offsite impacts to the offsite population though the use of a category scale. Refer to Figure 6-1 of Appendix L for an explanation of the consequence categories.

The likelihood of an event was estimated using the category scale shown in **Figure 6-27**. The likelihood ratings were assigned based on knowledge of historical incidents in the industry and in consultation with the Proponent, by accounting for the initiating causes and resulting consequences with controls (prevention and mitigation) in place.

			INCREASING LIKELIHOOD				
			1	2	3	4	5
			<20%	20-40%	40-60%	60-80%	>80%
			Remote	Unlikely	Possible	Likely	Almost Certain
INCREASING CONSEQUENCE	5	Very High	High	High	Very High	Very High	Very High
	4	High	Medium	High	High	Very High	Very High
	3	Medium	Medium	Medium	High	High	Very High
	2	Low	Low	Medium	Medium	High	High
	1	Very Low	Low	Low	Medium	High	High

Figure 6-27 Qualitative Risk Matrix

The qualitative risk results for the identified events and the offsite and public impact are shown in Table 6.1 of the PHA (refer **Appendix M**). The findings of the risk analysis are summarised as follows:

- **Consequence:** The worst-case consequence for the identified events, when considering potential for offsite impact, is a fire and/or explosion event which may result from a variety of causes (e.g. battery thermal runaway, encroachment from offsite bushfire, substation fire). The study found that for all events the impacts are not expected to have offsite impacts. This was assessed based on the proposed controls and separation distance between the proposed BESS and sensitive receivers. The assessment found that for all events the impacts will be localised and not expected to have offsite impacts;
- **Likelihood:** The highest likelihood rating for the identified events is Remote;
- **Risk Analysis**: A total of 15 hazardous events were identified. The breakdown of these events according to their risk ratings is as follows:
  - 1 High risk event: Relating to unauthorised personnel access to the proposed BESS area, resulting in vandalism/asset damage to the infrastructure and no significant offsite impact expected. A severity rating of 'Very High' was assigned to account for the trespasser potentially injuring themselves in the act. The likelihood was rated as Remote; and
  - 14 Low risk events: Most events relate to fire and/or explosion events, with no significant offsite impact expected. The highest likelihood for these events were rated as Remote.

Risk Assessment against HIPAP 4 Criteria

Assessment against the HIPAP 4 qualitative land use planning risk criteria is provided in **Table 6-38**.

Table 6-38 Assessment against HIPAP Qualitative Risk Criteria

HIPAP 4 qualitative criteria	Remarks	Complies?
All 'avoidable' risks should be avoided. This necessitates the investigation of alternative locations and alternative technologies, wherever applicable, to ensure that risks are not introduced in an area where feasible alternatives are possible and justified.	The PHA has identified hazardous events and assessed the inherent risks associated with the proposed operations of the BESS The BESS location is suited for the proposed operation, situated in rural area with considerable separation distance to sensitive receiver to avoid off-site risks	Yes
The risk from a major hazard should be reduced wherever practicable, irrespective of the numerical value of the cumulative risk level from the whole installation. In all cases, if the consequences (effects) of an identified hazardous incident are significant to people and the environment, then all feasible measures (including alternative locations) should be adopted so that the likelihood of such an incident occurring is made very low. *This necessitates the identification of all contributors to the resultant risk and the consequences of each potentially hazardous incident. The assessment process should address the adequacy and relevancy of safeguards (both technical and locational) as they relate to each risk contributor.*	Based on the separation distance to sensitive receivers, consequence impacts from the identified hazardous events are not expected to have significant offsite impacts	Yes
The consequences (effects) of the more likely hazardous events (i.e. those of high probability of occurrence) should, wherever possible, be contained within the boundaries of the installation.	This study found that for all events the impacts are expected to be localised and contained within the boundaries of the installation with no significant offsite impacts	Yes
Where there is an existing high risk from a hazardous installation, additional hazardous developments should not be allowed if they add significantly to that existing risk.	There are no other additional hazardous developments in the vicinity	Yes

6.5.4.4 Mitigation Measures

The following recommendations are identified from the PHA and will be applied to the Project:

- Consult with FRNSW during detailed design of the facility to ensure that the relevant aspects of fire protection measures have been included. These may include:
  - (i) type of firefighting or control medium; and
  - (ii) demand, storage and containment measures for the medium. The above aspects will form an input to the Fire Safety Study if required as part of the development consent conditions; and
- Review the investigation reports on the Victorian Big Battery Fire (occurred on 31 July 2021) and implement relevant findings for the Project.

Further, a range of mitigation and management measures for each of the identified hazards and events will be implemented as detailed in Table 4.3 of the PHA (refer **Appendix M**).

6.5.5 Electromagnetic Interference

6.5.5.1 Introduction

An Electromagnetic Interference (EMI) Assessment was prepared by DNV Energy Systems (DNV) and is provided in **Appendix N**.

Wind farms have the potential to interfere with radiocommunication services. Two services that are most likely to be affected are television broadcast signals and fixed point-to-point signals. Terrestrial broadcast signals are commonly used to transmit domestic television; while point-to-point links are used for line-of-sight connections for data, voice, and video.

Other services with the potential to experience interference from the Project have also been identified, and the potential for interference to those services assessed, including: meteorological radars, trigonometrical stations, CB radio and mobile phones, wireless internet, broadcast radio, satellite television and internet, and broadcast television.

6.5.5.2 Methodology

The potential EMI-related impacts for the Project were assessed in accordance with the SEARs, NSW Wind Energy Guideline, and the Draft National Wind Farm Development Guideline (Draft National Guidelines). The methodology used in this study has been informed by these guidelines and various standard industry practices.

Information regarding radiocommunications licences in the vicinity of the Project was obtained from the Australia Communication and Media Authority (ACMA) Register of Radiocommunications Licences (RRL) database on 27 April 2022.

Consultation with operating services that may be impacted by the Project was also undertaken to understand potential EMI-related impacts to operations and services. The outcomes of this engagement is discussed below and are detailed in Table 16 of **Appendix N**.

Engagement to determine EMI-related impacts for the Project is still ongoing, and the outcomes of future consultation will be incorporated into the detailed design of the Project. This approach will ensure that any technological “fixes” to existing services are progressed in preference to Project changes to ensure that EMI-related impacts from the Project will be minimal.

6.5.5.3 Existing Environment

Radiocommunication Services

WTGs located close to radiocommunication sites have the potential to cause interference through near-field effects, reflection or scattering of the signals. The Draft National Guidelines conservatively recommend that:

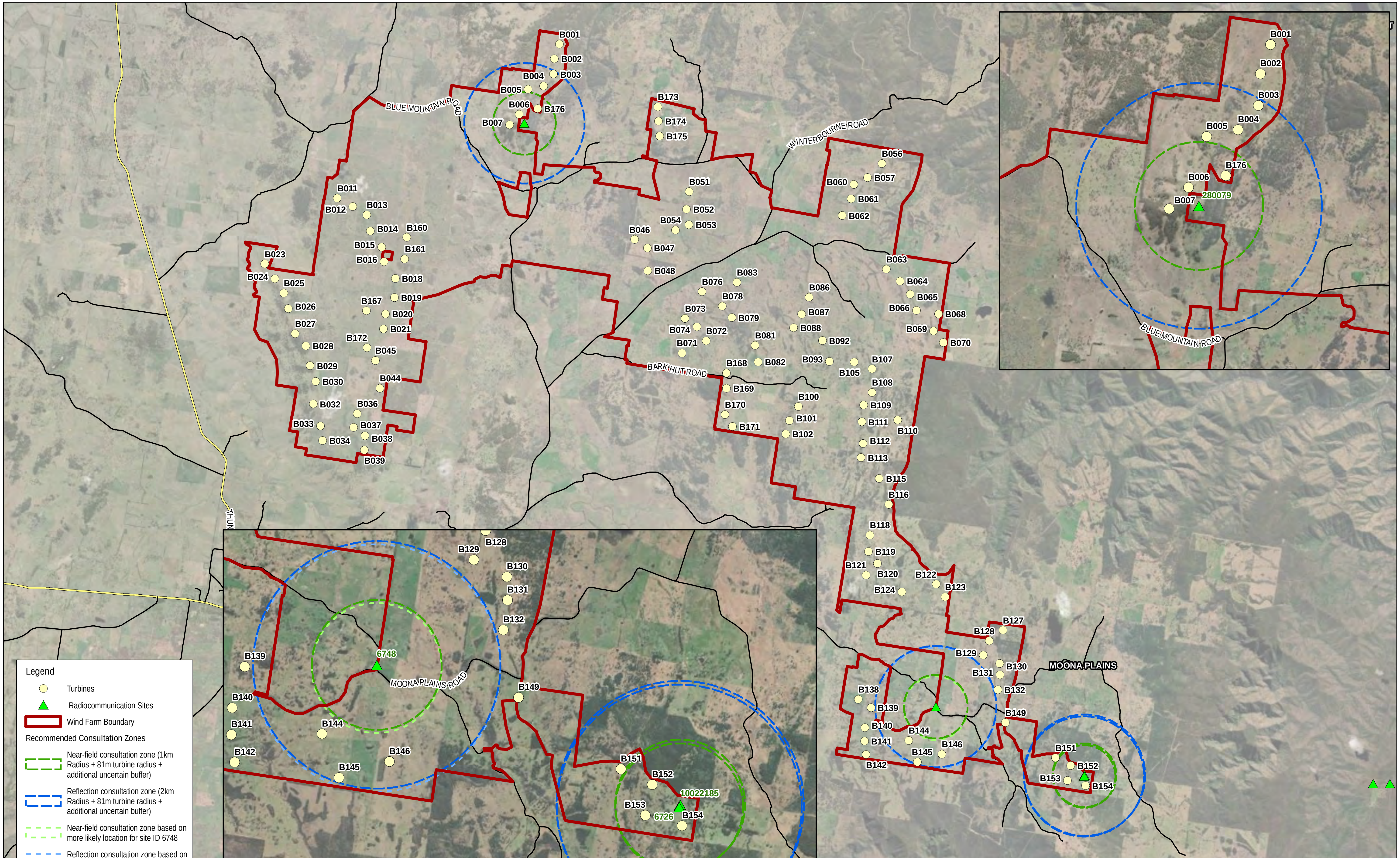
- Any radiocommunication site within 1 km of a proposed WTG be considered as having the potential to be impacted by near-field effects; and
- Consultation with service operators occur if any WTG is to be located within 2 km of a radiocommunication site.

From the ACMA RRL database, there are 423 radiocommunication sites with 75 km of the Project Area. Four of these radiocommunication sites are located within 2 km of a WTG location, as shown in **Figure 6-28** and as detailed in **Table 6-39**.

DNV has contacted the operators of the services associated with the radiocommunication sites shown in **Table 6-39.** Responses have been received as discussed below and summarised in Table 16 of **Appendix N**.

Table 6-39 Proximal Radiocommunication Sites

Site ID	Operator	License / Service Types	Distance to Nearest WTG (m)
6726	Edwin Scott Dening (Coffs Harbour and District Amateur Radio Club)	Point-to-area (amateur repeater)	325
	Goodcom Communications Pty Ltd	Point-to-area (CB radio repeater)	
	Telco Authority	Point-to-point links Point-to-area (land mobile)	
	NSW RFS	Point-to-point links	
	Walcha Council	Point-to-point links Point-to-area (land mobile)	
	Walcha Radio Group	Point-to-area (amateur repeater)	
6748	Telstra	Point-to-point links	1,505 (based on coordinates recorded in ACMA RRL database) 1,462 (based on coordinates determined from satellite imagery)
280079	Brian Smith Timber Transport Pty Ltd	Point-to-area (land mobile)	356
10022185	Telco Authority	Point-to-point links Point-to-area (land mobile)	366



Identified radiocommunication sites within 2km of the WTG | **F6-28**

Drawing No: 0526676s_WWF_EIS_G056_R3.mxd		Environmental Impact Assessment
Date: 04/11/2022	Drawing Size: A3	
Drawn By: VN	Reviewed By: DMS	Client: WWPL
Coordinate System: GDA 1994 MGA Zone 56		This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

0 1 2km

N

Fixed Licence of Point-to-Point Type

An analysis of the registered licences for each radiocommunication tower was undertaken according to the ACMA RRL database to determine the transmission paths of the licensed links. For this analysis, a wider and more conservative frequency range of 0 GHz to 50 GHz was used.

It was found that 11 point-to-point links pass through the Project Area which are operated by BoM, Telco Authority, NSW RFS, NPWS, Telstra, and Walcha Council. The details of the links are provided in Table 9 of **Appendix N** and the links' paths illustrated in Figure 6 and Figure 7 of **Appendix N**.

Consultation with the operators of the point-to-point links crossing the Project Area was undertaken to further understand the potential EMI impacts of the Project. Responses have been received from the BoM, Telco Authority, NSW RFS, Walcha Council, NPWS which is discussed below and summarised in Table 16 of **Appendix N**. Engagement with Telstra is ongoing; however, preliminary advice is that they do not believe there will be any impacts to their links.

Locations of Point-to-Multipoint Licences and Potential for Interference

From the ACMA RRL database, three point-to-multipoint base stations were identified within 20 km of the Project Area which are operated by Walcha Council (Site ID 41044, 402425, 9013090).

Operators of all potentially affected base stations within 60 km of the Project were contacted to determine the likelihood that the Project will cause interference to services. Responses were received from the BoM with no concerns raised, and Walcha Council with no concerns raised.

Other Licence Types

Other licence types recorded in the ACMA RRL database include spectrum licences that permit a range of radiocommunications in a specific geographic area and frequency band, private mobile radio and public telecommunications service licences, television and radio broadcasting licences, amateur apparatus licences, and aeronautical licences for ground to aircraft communications.

These are described in further detail of in Section 4.4 of **Appendix N**.

6.5.5.4 Assessment of Impact

Radiocommunication Services

Four towers are located within 2 km of WTG locations which host point-to-point links and point-to-area style communications. The potential for a WTG to cause reflection or scattering of signals depends on various factors, including: the service type, the required signal-to-noise radio for the service, and the distances between the user, transmission tower and WTG.

The potential for the Project to interfere with point-to-point links through reflection or scattering of signals or near-field effects is discussed further below.

Point-to-Point Link

Point-to-point links are often used for line-of-sight connections for data, voice, and video. WTGs can potentially cause interference to point-to-point microwaves links, and in some cases, point-to-point ultra-high frequency links through three mechanisms: diffraction of the signal, reflection or scattering of the signal, and near-field effects.

Table 6-40 summarises the WTGs located within the interference zones for point-to-point links crossing the Project Area (refer Section 4.2 of **Appendix N**), where:

- There are 14 WTGs located within the exclusion zones;
- There are eight WTGs located within the potential reflection/scattering interference zone; and
- There are no WTGs located within the near-field interference zone.

Table 6-40 Point-to-Point EMI Potential Interference Summary

Link no.	Operator	WTGs within potential interference zone			
		Horizontal plane	Vertical plane	Reflection / scattering	Near-field
1	BoM	None	Note assessed	Not assessed	Not assessed
2	Telco Authority	2 WTGs (B138, B139)	2 WTGs (B138, B139)	4 WTGs (B151, B152, B153, B154)	None
3	Telco Authority	1 WTG (B154)	1 WTG (B154)	3 WTGs (B152, B153, B154)	None
4	Telco Authority	None	Not assessed	3 WTGs (B152, B153, B154)	None
5	NSW RFS	5 WTGs (B013, B014, B038, B167, B172)	4 WTGs (B013, B014, B167, B172)	None	None
6	NSW RFS	2 WTGs (B160, B161)	2 WTGs (B160, B161)	Not assessed	Not assessed
7	NSW RFS	None	Not assessed	4 WTGs (B030, B032, B033, B034)	None
8	NSW RFS	None	Not assessed	3 WTGs (B152, B153, B154)	None
9	NPWS	2 WTGs (B071, B073)	2 WTGs (B071, B073)	Not assessed	Not assessed
10	Telstra	1 WTG (B149)	None	None	None
11	Walcha Council	3 WTGs (B141, B144, B146)	3 WTGs (B141, B144, B146)	4 WTGs (B151, B152, B153, B154)	None

Concerns were raised by the Telco Authority regarding the potential for WTGs at the Project to cause interference to two of their point-to-point links crossing the Project Area (link no. 2 (licence no. 10330342/1) and link no. 3 (licence no. 10956325/2) detailed in Table 9 and Figure 7 of **Appendix N**). To mitigate the potential for interference to their links, the NSW Telco Authority have proposed changes to the WTG layout, comprising movement of WTGs B138, B139 and B154.

Turbine movements proposed by the NSW Telco Authority were greater than the movements suggested by the diffraction exclusion zones established during the assessment. As such, further clarification was sought from the NSW Telco Authority regarding the required clearances from the point-to-point links. It is generally possible to design around these issues as the link paths and potential interference zones for these signals can be determined (see **Section 6.5.5.5**).

A response has been received from NSW RFS indicating that it expects the required clearance zone for at least one of their point-to-point links to pass under the WTGs rotors. Previous advice received by the Proponent from NSW RFS indicated that impacts to their point-to-point links are considered unlikely.

Outcomes of engagement with BoM indicates it does not expect the Project to cause interference to their point-to-point link crossing the Project.

Other Licence Types

A summary of impact on other licence types recorded in the ACMA RRL database (see section 4.4 of **Appendix N** for further detail) include:

- Emergency Services:
  - Point-to-point links: high likelihood of interference to links via diffraction effects operated by NSW RFS and low likelihood of interference to links via reflection and scattering effects to links operated by NSW RFS;
  - High likelihood of interference with mobile telephony systems within 2 km of WTGs;
  - Unlikely to cause interference with other services.
- Meteorological radar: Potential for interference if WTGs at the Project are visible to radars;
- Television broadcasting:
  - Armidale (Dumaresq) transmitter: High likelihood of interference;
  - Upper Namoi (Mount Dowe) transmitter: Low likelihood of interference;
  - Walcha transmitter: Low likelihood of interference;
- Wireless internet: Low likelihood of interference with mobile broadband services, and no impact on NBN;
- Radio broadcasting: Low likelihood of interference with AM and FM signals and no impact on digital radio signals;
- Satellite television and internet: Low likelihood of interference;
- Mobile phones: Low likelihood of interference;
- Trigonometrical stations: Unlikely to cause interference; and
- Citizen’s band radio: Unlikely to cause interference.

6.5.5.5 Mitigation Measures

Table 6-41 provides an overview of potential options to mitigate potential EMI-related impacts of the Project on licences and services in the vicinity of the Project.

Table 6-41 EMI Mitigation Measures

License or Service Type	Potential Mitigation Options
Radiocommunication towers	The following mitigation hierarchy will be followed in consultation with the operators: ■ Technological “fix” (e.g. increasing the signal strength from the affected tower or alternative towers, or installing a signal repeater or additional tower on the opposite side of the Project Area.) to existing services will be progressed in preference to Project changes to minimise potential impacts ■ If this does not result in minimal impacts, project changes may be employed including relocating WTGs to be further from the affected tower or removing WTGs from the Project
Fixed point-to-point links	During detailed design, consultation with the operators will occur. If there is a potential for interference from the WTGs, the following mitigation hierarchy will be followed in consultation with the operators: ■ Technological fix: Upgrading the equipment for the affected link, rerouting the link via an existing or new tower, or replacing the link with an alternative communication technology ■ Slightly relocate WTGs B138, B139, and B154 as proposed by the NSW Telco Authority and outlined in Section 4.2.2 of **Appendix N**

License or Service Type	Potential Mitigation Options
	■ Avoid interference to the point-to-point links operated by the NPWS and Walcha Council by moving WTGs outside of the diffraction exclusion zones established by DNV and shown in Figure 6 and Figure 7 of **Appendix N** In consultation with NSW RFS, identify and rectify interference of NSW RFS point-to-point links after construction of the Project, if required. No WTGs will be located within 600 m of BoMs point-to-point link which crosses the Project Area
Fixed point-to-multipoint type	If interference is experienced after the Project is operational, mitigation options will be employed in consultation with the operator to resolve the issue including rerouting the links, installing additional towers, or replacing the affected links with alternative communications infrastructure.
Emergency services	Point-to-point links: As per mitigation for point-to-point links above. Mobile telephony systems: If interference is experienced after the Project is operational, the Proponent will engage with the operator to: increase signal strength from affected tower or alternative towers, install signal repeater, and/or install additional tower
Meteorological radar	The BoM will be notified prior to any planning shutdown of the Project to allow calibration of systems. The Proponent will collaborate with BoM in the event of severe weather conditions.
Trigonometrical stations	None required
Citizen's band radio	None required
Wireless internet	Mobile broadband services: Refer mitigation measures for mobile phones in 'emergency services' above NBN: None required
Satellite television and internet	If interference is experienced after the Project is operational, in consultation with the operator: redirect satellite dish to alternative satellite, install larger or higher quality satellite dish, change location or height of satellite dish.
Radio broadcasting	If interference is experienced after the Project is operational, in consultation with the operator: ■ AM signals: install a higher quality antenna at affected location ■ FM signals: install higher quality antenna at affected location, increase signal strength from affected tower, move tower to a new location, install signal repeater, install additional tower
Television broadcasting	If interference is experienced after the Project is operational, in consultation with the operator: ■ Realign the antenna at affected dwelling to existing tower ■ Redirect antenna to alternative tower ■ Install more directional or higher gain antenna ■ Change location of antenna ■ Install cable or satellite television ■ Install relay transmitter

6.5.6 Health and Electric and Magnetic Fields (EMF)

This section considers the potential for adverse impacts from Electric and Magnetic Fields (EMFs) associated with the Project to people within close vicinity of the Project Area and the wider community.

6.5.6.1 NHMRC Statement: Evidence on Wind Farms and Human Health

The National Health Medical Research Council (NHMRC) *NHMRC Statement: Evidence on Wind Farms and Human Health* was released on 11 February 2015. The document provides advice to the community and to policy makers regarding the potential impact of wind farms to human health. While it is acknowledged that there are limitations to the existing evidence, NHMRC has concluded that there is currently no consistent evidence that wind farms cause adverse health effects in humans.

6.5.6.2 Commissioner's Observations and Recommendations on Health Matters

The Commissioner is an independent role established in October 2015 by the Federal Minister for the Environment. The Commissioner's role is to facilitate the referral and resolution of complaints received from concerned residents about proposed or operating wind farms, solar plants, energy storage facilities, and transmission projects. Further, the Commissioner promotes best practices related to the planning, development and operation of renewable energy projects, including standards and compliance.

The *National Wind Farm Commissioner 2020 Annual Report* covers the Office's activities for the period of 1 January 2020 through to 31 December 2020.

The 2020 report cites that several complaints about wind farms received by the Commissioner's Office include reference to health impacts attributed to wind farm operations. The complainants generally state that such conditions are caused by audible noise and low frequency noise. In some cases, complainants have stated that some health conditions persist even when the turbines are not operating.

Numerous invitations have been extended by the Commissioner to complainants to provide evidence of their medical conditions. Complaints regarding health concerns received by the Office have, in the main, provided only anecdotal evidence regarding stated health issues and perceived causality. The Commissioner therefore concludes:

> *'It has therefore been difficult to form an opinion on whether or not the stated health conditions reported by complainants are valid and, if valid, whether or not the health conditions are possibly a result of the wind farm's operations or from some other known cause.'*

The Office has stated that it will continue to monitor relevant decisions that explore evidence about wind farms and health in consultation with the *Independent Scientific Committee on Wind Turbines*, such as Guidelines issued by the World Health Organization (WHO) in 2018, as well as hearing outcomes.

The full statement on health can be found via the following link: https://www.aeic.gov.au/observations-and-recommendations/health-matters.

6.5.6.3 Overview of Electric and Magnetic Fields

EMFs are associated with all electrical wiring and equipment. The electric field is caused by the voltage of the equipment and the magnetic field is caused by the current flowing (amperage). Electric fields and magnetic fields are essentially independent of one another and, in combination, cause energy to be transferred along electric wires.

Electric Fields

Electric fields are the result of an electric charge on an object. The strength of this force is related to the voltage, or pressure, which forces electricity along wires. Electric fields are strongest close to their source, and their strength diminishes rapidly with distance from the source, in much the same way as the warmth of a fire decreases with distance. Many common materials (such as brickwork or metal) block electric fields, and, for all practical purposes, electric fields do not penetrate buildings. Electric fields are also shielded by human skin, such that the electric field inside a human body will be at least 100,000 times less than the external field. The units commonly used to describe electric field strength are volts per metre (V/m) or kilovolts (1,000 Volts) per metre (kV/m).

To demonstrate the range of electric fields that exist day-to-day, electric fields at normal user distance from appliances are generally of the order of tens of volts per metre. On the other hand, electric fields produced by electric blankets have been reported ranging from a few hundred to more than a thousand volts per metre.

Magnetic Fields

Magnetic fields result from the movement of electric charges, that is, an electric current. The strength of a magnetic field depends on the size of the current (measured in amps) and decreases with distance from the source. Because magnetic fields are related to the current rather than the voltage, high voltage equipment is not the only source of magnetic fields encountered in everyday life. In fact, modern life involves frequent contact with magnetic fields from a variety of sources such as appliances and electrical machinery. While electric fields are blocked by many common materials, this is not the case with magnetic fields. This is one reason why power lines may contribute to the overall magnetic fields in the environment and why burying power lines will not necessarily eliminate these fields.

Magnetic fields are often described in terms of their flux density which is commonly measured in units of Tesla (T) or the older unit of Gauss (G) where:

- 1 Tesla (T) = 1,000 milliT (mT) = 1,000,000 microT (μT);
- 1 μT = 10 milliGauss (mG); and
- 1 Gauss (G) = 1,000 mG.

Typical Values of Magnetic Fields

Dwellings usually have negligible background electric fields, while magnetic fields are usually in the order of 2 mG. Magnetic fields may reach into the tens of milligauss within dwellings, depending on the location of electrical wiring. The magnetic fields in the vicinity of a selection of appliances are indicated in **Table 6-42**.

Table 6-42 Typical Magnetic Fields of Household Appliances

Appliance	Typical Range at Normal User Distance	
	Microtesla (μT)	Miligauss (mG)
Electric Stove	0.2 - 3	2 - 30
Computer	0.2 - 2	2 - 20
Television	0.002 - 0.2	0.2 - 2
Electric Blanket	0.5 - 3	5 - 30
Hair Dryer	1 - 7	10 - 70
Refrigerator	0.2 - 0.5	2 - 5
Toaster	0.2 - 1	2 - 10
Electric Kettle	0.2 - 1	2 - 10
Pedestal Fan	0.002 - 0.2	0.2 - 2

Source: Australian Radiation Protection and Nuclear Safety Agency (ARPANSA 2020c)

Magnetic field measurements associated with overhead power lines and substations are shown in **Table 6-43**. The magnetic field from power lines will vary with configuration, phasing and load.

Table 6-43 Typical Values of Magnetic Fields*

Source	Location of Measurement (1 m above the ground)	Range of Measurements**	
		Microtesla (µT)	Milligauss (mG)
Distribution Line (street power lines)	Directly underneath	0.2 - 3	2 - 30
Distribution Line (street power lines)	10 m away	0.05 - 1	0.5 - 10
Substation	At substation fence	0.1 - 0.8	1 - 8
Transmission Line (high voltage power lines)	Directly underneath	1 - 20	10 - 200
Transmission Line (high voltage power lines)	At edge of easement	0.2 - 5	2 - 50

Notes:

** Measured Near Overhead Power Lines and Substations*

***Levels of magnetic fields may vary from the range of measurements shown.*

Switching stations typically do not have power transformers and thus would have lower magnetic fields than substations.

Source: ARPANSA 2020c

Standards and Guidelines

The ARPANSA is the Australian Government's primary authority on radiation protection and nuclear safety. ARPANSA regulates Commonwealth entities using radiation with the objective of protecting people and the environment from radiation. Established by the *Australian Radiation Protection and Nuclear Safety Act 1998*, ARPANSA commenced operation on 5 February 1999.

ARPANSA considers the publications produced by the International Commission on Non-Ionizing Radiation Protection (ICNIRP), which is a body of independent scientific experts who provide information and advice on the potential health hazards from exposure to non-ionising radiation. ARPANSA is also a contributor to the work of ICNIRP.

ICNIRP has issued *Guidelines for Limiting Exposure to Time-Varying Electric and Magnetic Fields (1 Hz -100 kHz)* (2010) which are aimed at preventing the established health effects resulting from exposure to Extremely Low Frequency (ELF) EMF. Exposure to high levels of ELF EMF is extremely rare and does not occur in people during their day-to-day living (ARPANSA, 2020a).

In Australia, EMFs associated with the use of electricity are generated at a frequency of 50 hertz (Hz). This frequency falls within the ELF range. **Table 6-44** below summarises reference levels for exposure to external magnetic fields and electric fields respectively at 50 Hz as contained in ICNIRP (2010).

Table 6-44 Reference Levels for Exposure to Magnetic Fields and Electric Fields

	Magnetic Fields Reference Levels at 50 HZ	Electric Field Reference Levels at 50 HZ
General Public (general exposure)	200 µT	5 kV/m
Occupational (general exposure)	1,000 µT	10 kV/m

6.5.6.4 Risk Assessment

Extremely Low Frequency EMF

The process in which an electron is given enough energy to break away from an atom is called ionisation (ARPANSA, 2020c).

ELF EMF occupy the lower part of the electromagnetic spectrum and is non-ionising radiation, or in other terms, there is insufficient energy to cause ionisation and there is not enough energy to damage DNA (ARPANSA, 2020a).

Exposure to high levels of ELF EMF is extremely rare apart from medical exposures to patients and some specialised occupational exposures (ARPANSA, 2020a). Therefore, exposure to high levels of ELF EMF will not occur in people during their day-to-day living.

EMF and Human Health

Over the past 50 years, concerns have been expressed that the EMFs associated with electrical equipment might have adverse health effects. The issue has been the subject of extensive research throughout the world, which includes more than 2,900 studies at a cost of more than $490 million (Energy Networks Association, 2016). There are known health effects from very high levels of EMFs and health standards have been established to protect against these effects.

The WHO (2020) recognise that to date, no adverse health effects from ELF, long-term exposure to radiofrequency or power frequency fields have been confirmed.

While some researchers believe there is a need for further scientific research, the WHO considers the existing body of research on EMF to be extensive. This assessment however recognises that while adverse health effects from exposure to ELF EMFs have not been established, the possibility remains that such effects may exist.

EMF and Wind Farms

There has been some research conducted on WTG emissions of EMF from both the turbines themselves or from the power lines required for distribution of the generated electricity. Researchers (McCallum, et al., 2014) have associated fears about exposure to EMF from WTG to internet sources and misunderstanding of science, as opposed to actual measurements of EMF exposure surrounding existing WTG. The available evidence at large does not find EMF from WTGs to be a likely causative agent for negative health effects in the community (Knopper, et al., 2014).

EMF and Transmission Lines, Substations and Switching Stations

Energy Networks Association (2016) note that large substations such as zone and transmission substations vary greatly in size, configuration and loading. Key sources of magnetic fields within the substation include the transformer secondary terminations, cable runs to the switch room, capacitors, reactors, busbars, and incoming and outgoing feeders. Energy Networks Association (2016) continue that in most cases the highest magnetic fields at the boundary come from the incoming and outgoing transmission lines, and the magnetic field decrease to background levels within a few metres of the substation. For this reason, Energy Networks Association (2016) conclude that distribution substations are not a significant source of exposure. Switching stations contain fewer sources of magnetic fields than substations (such as power transformers) and thus would likely be an even lower source of exposure than substations.

Table 6-43 presents data showing that the typical magnetic field of a transmission line at the edge of an easement and a substation at the substation fence measures 0.2 - 5 μT (or 2 - 50mG) and 0.1 - 0.8 μT (or 1 - 8mG), respectively (ARPANSA, 2020b). **Table 6-44** provides reference levels for exposure to magnetic fields at 50 Hz, which is the frequency at which electricity is generated in Australia**.** Based on this data, the reference level for magnetic field exposure to the general public and occupational exposure is 200 μT and 1,000 μT respectively (ICNIRP, 2010).

Based on the available data, the EMF from transmission lines and substations, based on likely exposure scenarios, are well within acceptable levels. Furthermore, the locations of Project infrastructure (e.g. substations, switching station, transmission line) are generally a significant distance from dwellings or publicly-accessible locations, indicating that potential EMF exposure from project infrastructure will be negligible.

EMF and BESS

BESS typically comprise batteries, inverters, transformers, heating ventilation, air conditioning and fire protection. There is limited information on typical measurement of magnetic fields around BESS. The magnetic field associated with a BESS will vary depending on a number of factors including configuration, capacity and type of housing.

The BESS for the Project is located adjacent to the substation, with the BESS to be housed in enclosures or buildings. The specific details of the BESS housing are subject to detailed design, however they are likely to be either modified shipping containers, pre-fabricated structures, buildings or smaller cabinets, mounted on concrete slabs / footings. It is assumed that the typical magnetic field associated with a BESS will be not too dissimilar to that of a substation based on material components of the infrastructure. The BESS for the Project will be designed in accordance with relevant electrical safety standards and codes, thus excluding general public exposure from BESS EMF sources.

6.5.6.5 Mitigation Measures

The Project has been designed to implement prudent avoidance by ensuring appropriate setbacks consistent with setbacks as detailed below.

Prudent Avoidance

While compliance with standards and guidelines is important, because they are based on established effects only, such compliance does not imply absolute safety. Therefore, it is generally considered that the prudent avoidance approach is the most appropriate response in these circumstances. Under this approach, facilities should be designed to reduce the intensity of fields they generate, and should be located to minimise the fields that people encounter over prolonged periods. Provision of setbacks and easements are discussed below.

The practice of ‘prudent avoidance’ has been adopted by the Energy Networks Association and most Australian power utilities. The Energy Networks Association is the national industry body representing Australia’s electricity transmission and distribution and gas distribution network.

The WHO (WHO, 2007) also advocates this response while addressing prudent avoidance in these terms:

> *…it is not recommended that the limit values in exposure guidelines be reduced to some arbitrary level in the name of precaution. Such practice undermines the scientific foundation on which the limits are based and is likely to be an expensive and not necessarily effective way of providing protection;*
>
> *Electric power brings obvious health, social and economic benefits, and precautionary approaches should not compromise these benefits; and*
>
> *Provided that the health, social and economic benefits of electric power are not compromised, implementing very low-cost precautionary procedures to reduce exposure is reasonable and warranted.*

Provision of Setbacks and Easements

In line with the above approach of prudent avoidance, the Project incorporates significant setbacks between residential dwellings and Project components which will generate ELF EMF. The current setbacks based on the indicative Project layout are outlined in **Table 6-45** and provide further assurance for the community in relation to all ELF EMF generated from the Project:

Table 6-45 Distance Between Dwellings and Project Components

Project Component	Approximate Distance to Nearest Dwelling (m)	Approximate Distance to O&M Facility(m)
Substation (North)	2,475	15
Substation (South)	1,500	-
BESS	2,640	200
Switchyard (Uralla)	935	-
Transmission Line	370	120

6.6 Aboriginal Heritage

6.6.1 Introduction

OzArk Environment & Heritage (OzArk) prepared an ACHAR to assess the potential impacts of the Project on Aboriginal cultural heritage, and identify mitigation and risk management measures during construction and operation. The ACHAR was prepared to address the requirements of the SEARs, including the following government policies:

- 'Code of Practice for the Investigation of Aboriginal Objects in NSW' (Code of Practice; DECCW 2010);
- 'Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW' (The Guide; OEH 2011); and
- 'Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010' (ACHCRs; DECCW 2010b).

The ACHAR can be found at **Appendix O** (OzArk, 2021).

6.6.2 Methodology

The ACHAR incorporated the following scope of works:

- Consultation with Aboriginal communities in relation to the Project;
- Review of the landscape and natural resources of the Project Area in order to establish background parameters;
- Research of local and regional context of Aboriginal cultural heritage literature and archaeological records;
- Review of the Aboriginal Heritage Information Management System (AHIMS) database and other relevant database; and
- Archaeological surveys within the Project Area.

6.6.2.1 Archaeological Surveys

Archaeological surveys were undertaken across the Project Area at the following times:

- Stage 1: Monday 20 July 2020 to Friday 31 July 2020;
- Stage 2: Monday 2 November 2020 to Friday 6 November 2020; and
- Stage 3: Tuesday 23 February 2021 to Wednesday 24 February 2021.

In total, there were 27 days of archaeological surveying conducted by independent teams with a combined survey effort of 79 "person days" (including both OzArk archaeologists and RAPs).

The construction and operation of the wind farm does not impact all areas within the Project Area. Therefore, a "Survey Boundary" was mapped for this study. The Survey Boundary comprised of approximately 1,300 ha including the Development Footprint (581.41 ha) and a buffer around all Project components. The Survey Boundary includes the transmission line alignment to the proposed Switchyard. It does not include the transport route to the Project Area as the Aboriginal cultural heritage assessment included a desktop assessment of the locations along the transport route where modifications to the road network are proposed.

6.6.2.2 Aboriginal Community Consultation

Aboriginal community consultation was conducted in accordance with ACHCRs (DECCW 2010b). A log and copies of correspondence with Aboriginal community stakeholders is presented in Appendix 1 Figure 1 of the ACHAR (refer **Appendix O**). The ACHCRs include four main stages:

- Stage 1: Identify RAPs who wish to be consulted about the project;
- Stage 2 & 3: Provide information about the project to the RAPs and acquire information regarding Aboriginal cultural values associated with the Project either through consultation and / or fieldwork; and
- Stage 4: Produce a draft ACHAR to be issued to all RAPs for their consideration.

Consultation undertaken for each stage above is summarised in **Table 6-46**.

Table 6-46 Aboriginal Community Consultation Process

ACHCR Stage	Actions	Outcome
1	An advertisement was placed in the 'Daily Leader' on 28 April 2020 to request expressions of interest for consultation Relevant agencies were contacted to identify potential stakeholders Letters were sent to all potential stakeholders asking if they wished to be consulted about the Project	The following individuals / groups registered to be consulted, and constitute the RAPs for the Project: ■ Amaroo Local Aboriginal Land Council ■ Armidale Local Aboriginal Land Council ■ Nunawanna Aboriginal Corporation ■ Larissa Ahoy ■ Iwatta Aboriginal Corporation The above RAPs or representatives of RAPs also participated in fieldwork
2 & 3	The assessment methodology was issued to all RAPs on 18 June 2020 for their consideration, with a closing period of 17 July 2020. The cover letter attached to the assessment methodology invited RAPs to identify whether any Aboriginal cultural values which exist within the Project Area should be incorporated into the assessment methodology. RAPs that registered later were also sent the assessment methodology	No amendments or comments concerning the assessment methodology were provided by the RAPs from their review of the documentation On 4 February 2021, a Project update letter was sent to all RAPs to inform them of the progress of the assessment
4	The draft ACHAR was sent to RAPs on 19 November 2021 with a closing period of 17 December 2021. The letter attached to the draft ACHAR invited RAPs to review the ACHAR and provide any comments on the cultural values of the sites and the broader Project Area	No comments were received from the RAPs on the draft ACHAR

6.6.2.3 Survey Constraints

The main constraint during all three stages of the fieldwork was poor ground surface visibility. The dense ground cover may be explained by the large amount of rainfall that occurred throughout 2020 in the New England Tableland. Landforms with archaeological potential were extensively assessed as a compensation for the low ground surface visibility in some areas of the Survey Boundary.

Further, particular areas of the Survey Boundary contained certain topographies that were deemed either inaccessible or too dangerous to walk or drive. Some portions of the Survey Boundary also contained extremely dense weed and grass cover, where access was not possible.

6.6.3 Existing Environment

6.6.3.1 Previously Recorded Sites

The search of the AHIMS database revealed 106 Aboriginal sites recorded in or within the vicinity of the Project Area. No Aboriginal places have been declared in or near the Project Area. The location of the AHIMS sites that were recorded near the Project Area are shown in **Figure 6-29**. In addition to searches of the AHIMS database, searches were undertaken on the statutory heritage registers for Aboriginal heritage items summarised in **Table 6-47**.

Table 6-47 Aboriginal Heritage Desktop Search Results

Name of Database Searched	Date of Search	Type of Search	Findings
Commonwealth Heritage Listings	03/06/2020	Walcha and Uralla LGA	No places listed on either the National or Commonwealth heritage lists are located within the Project Area
National Native Title Claims Search	03/06/2020	NSW	No Native Title Claims cover the Project Area
Heritage AHIMS	03/06/2020	10 x 10 km centred on the boundary of the Project Area	106 sites returned. AHIMS site 21-4-0041 is within the search area (refer **Table 6-48**)
Local Environmental Plan	03/06/2020	Walcha LEP of 2011 and Uralla LEP of 2012	None of the Aboriginal places noted occur near the Project Area

The AHIMS data revealed artefact sites as the dominant site category near the Project Area (**Table 6-48**). Artefact sites are a relatively stable indicator of past Aboriginal occupation. Grinding grooves are another site type recorded in the area, and are also a relatively stable indicator of past Aboriginal occupation. The distribution of sites near the Project Area conforms to some expected patterns which are outlined below:

- Most sites are associated with watercourses; and
- The highest densities of sites are located along Apsley River, the closest major waterway.

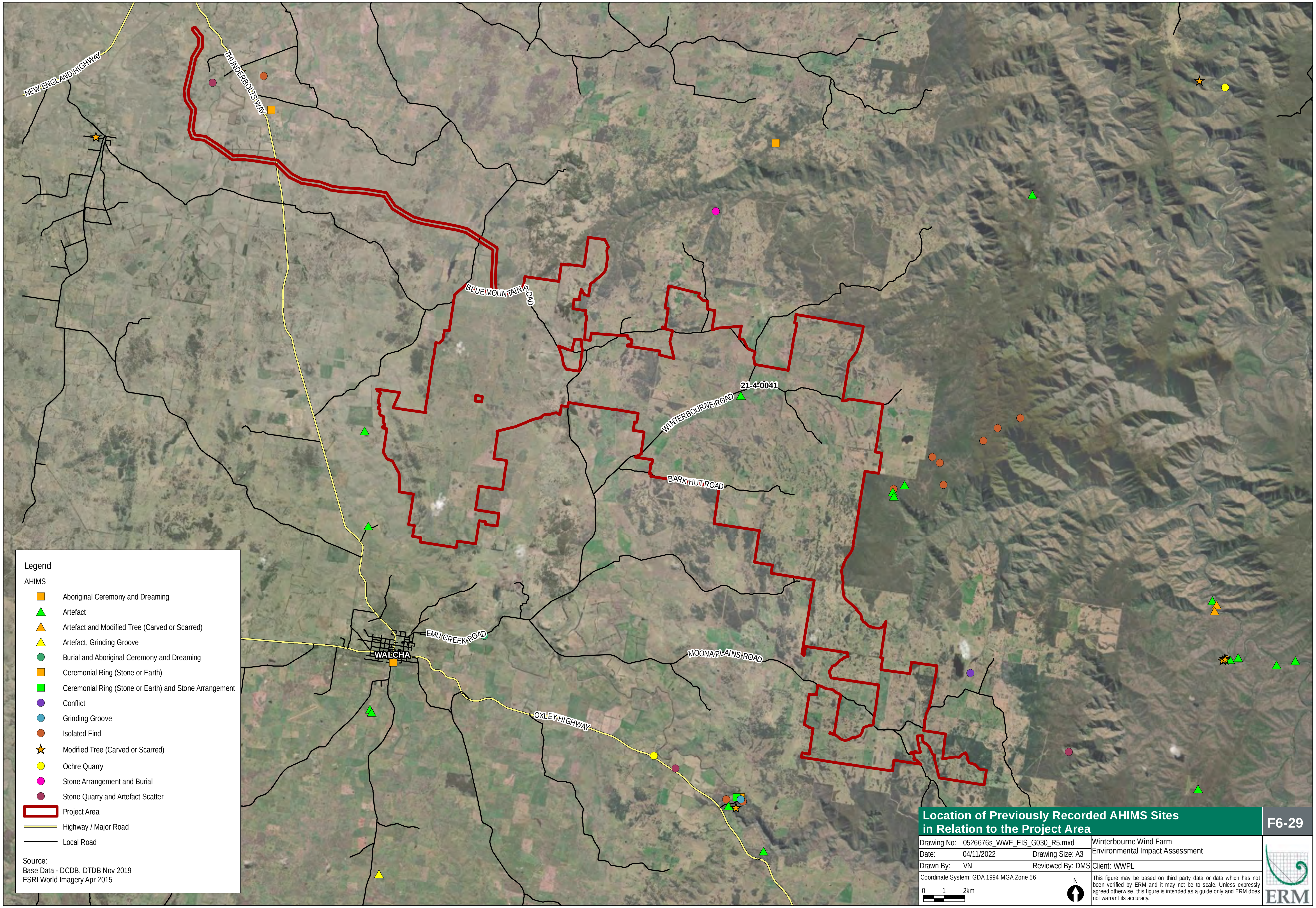
AHIMS site 21-4-0041 is an open artefact scatter within a creek flat landform (refer **Figure 6-30**). The site consists of four artefacts.

AHIMS site 21-4-0041 is located within the Project Area, although it is outside the Survey Boundary and will not be impacted by the Project. The site is located adjacent to the proposed transport route between Walcha and the eastern site entry; however, the assessment of the transport route does not indicate that works will be required near the probable location of the site. Although not within the Survey Boundary, the location of the site in the AHIMS register was visited during the archaeological survey, and no artefacts were visible at the AHIMS location.

All other previously recorded AHIMS sites are not within the Project Area and are therefore not at risk of impact from the Project.

Table 6-48 Known AHIMS Site within the Project Area

Site ID	Site Name	GDA Zone 55 Easting	GDA Zone 55 Northing	Site Features	Site Types
21-4-0041	Lambine Flat - (note: this is the name as it appears on the AHIMS register but it is a typographical error for Lambing Flat)	382400	6583683	Artefact Scatter	Open Camp Site


NEW ENGLAND HIGHWAY
THUNDERBOLTS WAY
BLUE MOUNTAIN ROAD
21-4-0041
WINTERBOURNE ROAD
BARK HUT ROAD
EMU CREEK ROAD
WALCHA
MOONA PLAINS ROAD
OXLEY HIGHWAY
Legend
AHIMS
Aboriginal Ceremony and Dreaming
Artefact
Artefact and Modified Tree (Carved or Scarred)
Artefact, Grinding Groove
Burial and Aboriginal Ceremony and Dreaming
Ceremonial Ring (Stone or Earth)
Ceremonial Ring (Stone or Earth) and Stone Arrangement
Conflict
Grinding Groove
Isolated Find
Modified Tree (Carved or Scarred)
Ochre Quarry
Stone Arrangement and Burial
Stone Quarry and Artefact Scatter
Project Area
Highway / Major Road
Local Road
Source:
Base Data - DCDB, DTDB Nov 2019
ESRI World Imagery Apr 2015
Location of Previously Recorded AHIMS Sites
in Relation to the Project Area
F6-29
Drawing No: 0526676s_WWF_EIS_G030_R5.mxd
Date: 04/11/2022
Drawing Size: A3
Drawn By: VN
Reviewed By: DMS
Winterbourne Wind Farm
Environmental Impact Assessment
Client: WWPL
Coordinate System: GDA 1994 MGA Zone 56
0 1 2km
N
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM

Probable Location of AHIMS Site 21-4-0041

F6-30

Drawing No: 0526676s_WWF_EIS_G031_R4.mxd
Date: 06/10/2022 Drawing Size: A3
Drawn By: VN Reviewed By: DMS
Coordinate System: GDA 1994 MGA Zone 56

Winterbourne Wind Farm
Environmental Impact Assessment
Client: WWPL

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM

6.6.4 Assessment of Impacts

6.6.4.1 Aboriginal Sites Recorded

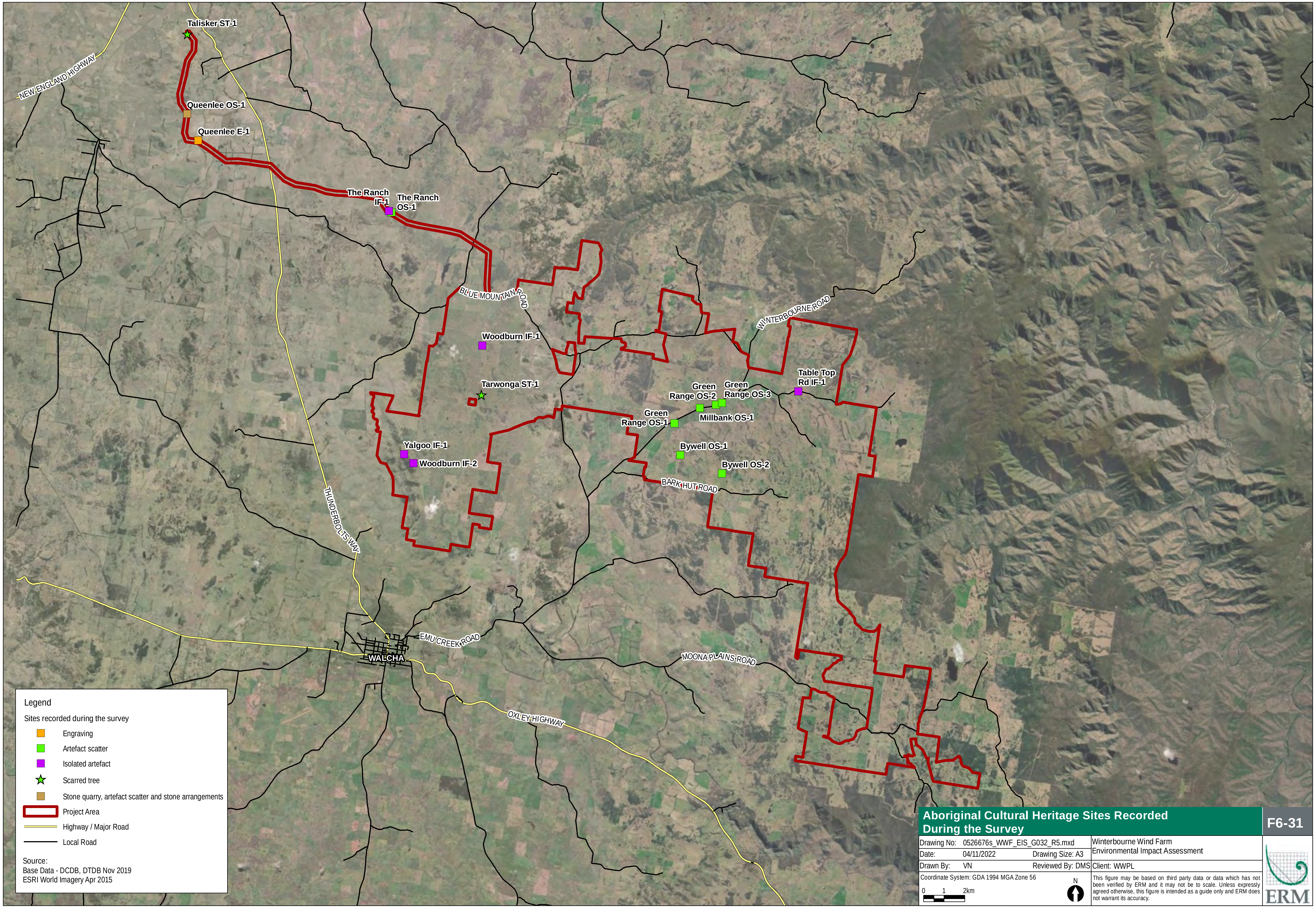
The location of the Aboriginal cultural heritage sites that were recorded during the archaeological survey is illustrated in **Figure 6-31**. A summary of these sites is provided in **Table 6-49**, or further detailed in section 6.4 of the ACHAR (refer **Appendix O**).

In total, 16 sites were recorded during the assessment, representing a range of site types. 12 artefact sites (seven artefact scatters and five isolated finds), two culturally modified trees, and single incidences of a quarry site (also incorporating an artefact scatter), and an engraving site were recorded. No evidence of human burials or skeletal material were recorded, and no test excavation was undertaken for the assessment.

With only two exceptions, all sites were recorded either in low gradient undulating landforms or flat landforms (transmission line alignment). Two isolated finds were recorded either in sloping landforms or crest / ridgeline landforms.

Only five sites are located within 200 m of waterways. Additionally, these five sites are low density artefact scatters or isolated finds (The Ranch OS-1, Table Top Rd IF-1, Tarwonga ST-1, and Woodburn IF-1), and low-moderate artefact density (Millbank OS-1).

Green Range OS-3 with PAD recorded the highest artefact density, and is in close proximity to the waterway buffer. The only recorded sites that are distant to waterways are Bywell OS-2 (six artefacts recorded), and two isolated finds, Yalgoo IF-1 and Woodburn IF-2.



Talisker ST-1
NEW ENGLAND HIGHWAY
Queenlee OS-1
Queenlee E-1
The Ranch IF-1
The Ranch OS-1
BLUE MOUNTAIN ROAD
WINTERBOURNE ROAD
Woodburn IF-1
Tarwonga ST-1
Table Top Rd IF-1
Green Range OS-2
Green Range OS-3
Green Range OS-1
Millbank OS-1
Bywell OS-1
Bywell OS-2
Yalgoo IF-1
Woodburn IF-2
BARK HUT ROAD
THUNDERBOLTS WAY
EMU CREEK ROAD
WALCHA
MOONA PLAINS ROAD
OXLEY HIGHWAY
Legend
Sites recorded during the survey
Engraving
Artefact scatter
Isolated artefact
Scarred tree
Stone quarry, artefact scatter and stone arrangements
Project Area
Highway / Major Road
Local Road
Source:
Base Data - DCDB, DTDB Nov 2019
ESRI World Imagery Apr 2015
Aboriginal Cultural Heritage Sites Recorded During the Survey
F6-31
Drawing No: 0526676s_WWF_EIS_G032_R5.mxd
Date: 04/11/2022
Drawing Size: A3
Drawn By: VN
Reviewed By: DMS
Winterbourne Wind Farm
Environmental Impact Assessment
Client: WWPL
Coordinate System: GDA 1994 MGA Zone 56
0 1 2km
N
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM

Table 6-49 Summary of Aboriginal Sites Recorded

Site	Site type	Description of Site	Photograph of Artefact or PAD
Woodburn IF-2	Isolated find	Single quartz artefact located on a flat crest at the top of a ridgeline.	
Yalgoo IF-1	Isolated find	Single quartz artefact located on an undulating ridgeline with mature trees in the immediate area.	
Bywell OS-1	Open artefact scatter	Open artefact scatter consisting of multiple broken flakes and one complete flake, dispersed across a relatively large area. The artefact raw materials included greywhacke and silcrete.	
Bywell OS-2	Open artefact scatter	Open artefact scatter containing several complete flakes and two broken flakes, dispersed across a distance of 20 m. The artefact raw materials included silcrete, greywhacke, and chert.	
Green Range OS-1	Open artefact scatter	Five artefacts located in an exposure within an agricultural paddock. Recorded artefacts include complete and fragmented flakes made of greywhacke, silcrete, mudstone, and quartz.	

Site	Site type	Description of Site	Photograph of Artefact or PAD
Green Range OS-2 with PAD	Open artefact scatter	Open artefact scatter consisting of complete and broken flakes. Materials include silcrete and greywhacke.	
Green Range OS-3 with PAD	Open artefact scatter with PAD	Extensive open artefact scatter consisting of over 100 recorded artefacts, though it is highly likely that there are more present. The assemblage comprises primarily flakes, both complete and broken. Materials include greywhacke, silcrete, mudstone, quartzite, chalcedony, chert, and other siliceous material.	
Millbank OS-1	Artefact scatter	Low-density artefact scatter located on a generally flat, raised landform overlooking Lambing Flat Creek and an associated swampy area. The site consists of 17 unmodified flakes and one backed blade. Most artefacts were manufactured from greywacke. Additional materials present include quartz, silcrete, and mudstone.	
Table Top Rd IF-1	Isolated find	Isolated crystal quartz flake located on a gentle slope descending west towards Winterbourne Creek.	
Woodburn IF-1	Isolated find	Isolated silcrete artefact located in an area of erosion at the base of a tree above a valley floor with an associated wetland. The recorded artefact which is possibly a core fragment, and a manuport, as silcrete does not occur around this area naturally.	

Site	Site type	Description of Site	Photograph of Artefact or PAD
Tarwonga ST-1	Scarred tree	Dead tree with single scar located within 100 m of Mihi Creek, a minor waterway, and at the base of a low lying hill. The tree is 12 m tall with a 1.88 m trunk circumference. The southward facing scar is 61 cm long and 16 cm wide. The base of the scar is 1.1 m above the ground.	
The Ranch OS-1 with PAD	Open artefact scatter	Dispersed artefact scatter consisting of flakes, a core, and a blade. Materials include silcrete of several colours, basalt, and quartzite.	
The Ranch IF-1	Isolated find	Single axe blank, or scraper blank, located within a rocky crevice of an unnamed creek bed. The artefact is manufactured from greywhacke.	
Queenlee OS-1 with PAD	Stone quarry and stone arrangements	Extensive area of rock outcrop, where there is significant evidence of Aboriginal stone quarrying. A range of stone artefacts were recorded including axe blanks, blades, flakes, cores, hammerstones and anvils, all of the same grey fine-grained material. Other site features included locations, recorded as activity areas, where there was clear evidence of stone quarrying, often in the form of clear Hertzian cones. At least one, and possibly more, stone arrangements were also recorded.	 **View of a selection of artefacts**  **View of a stone arrangement**

Site	Site type	Description of Site	Photograph of Artefact or PAD
			 View of an activity area
Queenlee E-1	Rock engraving	Rock engraving on a large flat rock bedded horizontally within the ground. It is unclear what this rock type is although it is likely to be volcanic.	
Talisker ST-1	Scarred tree	Single scarred tree located in an area where there is no nearby natural water source. The tree is currently dying, with the bottom half of the tree already dead. The tree stands approximately 15 m tall with a circumference of 3.2 m. The northeast facing scar is 1.6 m long and 92 cm wide (outer width). The scar has approximately 60 cm of regrowth and its base is 62 cm from the ground surface. OzArk notes that the team were not completely positive of the tree being listed as a culturally scarred tree, though using the criteria for scarred tree identification, five of the nine criteria are evident.	

6.6.4.2 Significance Assessment

The ACHAR provides an assessment of significance for the cultural heritage sites located within the Project Area. The assessment of significance is a key step in the process of impact assessment for a proposed activity as the significance or value of an object, site or place will be reflected in resultant recommendations for conservation, management or mitigation.

The *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW, 2010) requires significance assessment according to criteria established in the Australia ICOMOS Burra Charter (Australia ICOMOS, 2013). The Burra Charter and its accompanying guidelines are considered best practice standard for cultural heritage management, specifically conservation, in Australia. Guidelines to the Burra Charter set out four criteria for the assessment of cultural significance:

- Aesthetic value;
- Historic value;
- Scientific value; and
- Social value.

The significance assessment of Aboriginal cultural heritage sites recorded during the assessment is presented below and summarised in **Table 6-50**. The significance assessment for each of the identified Aboriginal archaeological sites is provided in full in Chapter 7 of the ACHAR (refer **Appendix O**).

Social or Cultural Value

The Aboriginal community who accompanied the survey noted the cultural significance of all sites as being reminders of the traditional use of the area by Aboriginal people and as a tangible link to their ancestors. Sites such as Green Range OS-3 with PAD, Queenlee OS-1 with PAD, and Queenlee E-1 were assessed as highly significant due to their ability to inform the Aboriginal community about their ancestors' use of the region.

Archaeological / Scientific Value

- The sites recorded during the survey range from having low scientific significance (isolated finds, low density artefact scatters) through to moderate scientific significance (Green Range OS-3 with PAD), and high archaeological significance (Queenlee OS-1 with PAD and Queenlee E-1);
- Green Range OS-3 with PAD is an exemplar of an occupation site located on an elevated landform near a waterway; However, the past land use has disturbed the site's integrity and lowers its significance to moderate rather than high; and
- Queenlee OS-1 with PAD and Queenlee E-1 are rare site types in good current condition. Both sites have the ability to inform further about the region's ceremonial and 'industrial' uses. The recordings at Queenlee OS-1 with PAD suggests further research at this site would be of benefit in understanding procurement of stone for Aboriginal stone tool manufacture.

Aesthetic Value

- Apart from Queenlee OS-1 with PAD and Queenlee E-1, all other sites do not manifest themselves obviously in the landscape. The exception to this is the two recordings of culturally modified trees (Tarwonga ST-1 and Talisker ST-1);
- Queenlee OS-1 with PAD and Queenlee E-1 are both sites with high aesthetic significance because they can be easily interpreted. Their position in the landscape adds to their overall significance; and
- Aboriginal representatives on the survey remarked on general aesthetic characteristics of the Survey Boundary including the landforms, the weather, and wildlife sounds.

Historic Value

- No site recorded during the survey has specific historical significance as there are no known associations to specific people or events; and
- A knapped glass artefact was recorded at Green Range OS-3 with PAD, which indicates that the site was used into the colonial period and affords the site low historic significance.

Table 6-50 Significance Assessment Summary

Site Name	Social or Cultural Value	Archaeological / Scientific Value	Aesthetic Value	Historic Value
Woodburn IF-2	High	Low	Low	Nil
Yalgoo IF-1	High	Low	Low	Nil
Bywell OS-1	High	Low	Low	Nil
Bywell OS-2	High	Low	Low	Nil
Green Range OS-1	High	Low	Low	Nil
Green Range OS-2 with PAD	High	Low	Low	Nil
Green Range OS-3 with PAD	High	Moderate	Low	Low
Millbank OS-1	High	Low	Low	Nil

Site Name	Social or Cultural Value	Archaeological / Scientific Value	Aesthetic Value	Historic Value
Table Top Rd IF-1	High	Low	Low	Nil
Woodburn IF-1	High	Low	Low	Nil
Tarwonga ST-1	High	Low	Low-Moderate	Nil
The Ranch OS-1 with PAD	High	Low	Low	Nil
The Ranch IF-1	High	Low	Low	Nil
Queenlee OS-1 with PAD	High	High	High	Nil
Queenlee E-1	High	High	High	Nil
Talisker ST-1	High	Low	Low–Moderate	Nil

6.6.4.3 Likely Impacts to Aboriginal Heritage

Assuming the precautionary principle, it is assumed that all sites within the Survey Boundary, including 30 m either side of the transmission line alignment, will be impacted by the Project. Of the 16 sites recorded in the Survey Boundary, six will be directly impacted, including five totally, and one partially. These sites consist of four isolated finds, a low-density artefact scatter, and a scarred tree. A total of 10 sites are outside of any Project impact and will not be harmed. The only previously recorded site in the Project Area (AHIMS site 21-4-0041) is outside of the Survey Boundary and will not be harmed.

The most significant Aboriginal sites, Queenlee OS-1 with PAD and Queenlee E-1, are within or near the transmission line alignment of the Survey Boundary. The final positioning of the transmission line and associated access tracks will be designed to avoid both sites.

The Project design was altered to avoid the artefact scatter Green Range OS-3 with PAD. However, for several reasons, recommendations have been made to manage this site to reduce non-Project related impacts.

Tarwonga ST-1, Woodburn IF-1, The Ranch OS-1, and The Ranch IF-1 are within areas potentially impacted by the transmission line alignment. The Project design will ensure that the proposed works will avoid all, or most, of these sites. Talisker ST-1 is located within the area for the proposed grid connection point and Project design will ensure that this site is avoided.

6.6.4.4 Transport Route Assessment

An assessment was undertaken on a number of locations associated with the transport route where modifications are required to allow Project components, such as WTG blades to be transported to the Project Area.

An AHIMS search was undertaken for each location with a significant impact to the ground surface. One previously recorded site was identified near one of the locations. The site, AHIMS #37-2-0881 (Village 2) is an isolated find located approximately 67 m south west of the transport route at the intersection of Invermein Street and Stair Street, Muswellbrook. The site is not within the immediate Development Footprint, and therefore will not be harmed by the proposed works.

All other locations proposed for impacts associated with the transport route are within modified landforms, and no archaeological sites have been previously identified. The likelihood that these areas contain Aboriginal objects is extremely low.

6.6.5 Mitigation Measures

Impacts to Aboriginal cultural heritage (as described above) that will be mitigated through the implementation of specific mitigation and management measures as described below. As part of the detailed design, the applicant will continue to investigate options to further avoid and minimise impacts to Aboriginal cultural heritage.

6.6.5.1 Aboriginal Cultural Heritage Management Plan

An ACHMP will be prepared prior to the commencement of construction. The ACHMP will detail measures to protect Aboriginal heritage sites outside the area of disturbance, minimisation and management measures, including test excavations and salvage (if required), a strategy for the long-term management of any Aboriginal heritage items collected from the test excavations or salvage works, an unexpected finds procedure and other contingency and reporting procedures.

The fate of the artefacts salvaged under an approved ACHMP will be determined in consultation with the RAPs and the details provided in the ACHMP.

General Management Principles

The following management options are general principles, in terms of best practice and desired outcomes, rather than mitigation measures against individual site disturbance:

- Avoid impact by altering the Project, or in this case, by avoiding impact to a recorded Aboriginal site. If this can be done, then a suitable curtilage around the site must be provided to ensure its protection both during the short-term construction phase of development and in the long-term use of the area. If plans are altered, care must be taken to ensure that impacts do not occur to areas not previously assessed; and
- If impact is unavoidable then approval to disturb sites under the authority of an ACHMP must be sought from the relevant regulator. The recommendations for site management in this ACHAR will normally be carried over into the ACHMP. The Aboriginal community can assess the management recommendations within this ACHAR and the ACHMP when it is developed and offer their comments. The ACHMP procedures will often stipulate that the Aboriginal community should be involved in any salvage activities and will dictate the fate of any salvaged Aboriginal objects.

No further management is required for the following four sites which are located at a distance to the proposed works and are unlikely to be inadvertently harmed: Woodburn IF-1, Bywell OS-1, Green Range OS-2 and Millbank OS-1.

Management and Mitigation of Recorded Aboriginal Sites

Table 6-51 summarises the management and mitigation for the Project for all sites recorded during the survey.

Table 6-51 Summary of Management and Mitigation Recommendations

Site Name	Type of Harm	Potential for Avoidance	Recommendation
Woodburn IF-2	None	N/A	The site is distant to proposed works and no further management is required
Yalgoo IF-1	Total	Low	The site is likely to be harmed through the construction of an access road and an underground electrical reticulation line. The site will be salvaged through a collection of the surface artefacts
Bywell OS-1	None	N/A	The site is distant to proposed works and no further management is required

Site Name	Type of Harm	Potential for Avoidance	Recommendation
Bywell OS-2	None	Requires management	The site is out of impact but within 6 m of the transmission line easement. The site will be protected from inadvertent harm through the installation of temporary fencing
Green Range OS-1	None	Requires management	The site is out of impact but within 36 m of the proposed works. The site will be protected from inadvertent harm through the installation of temporary fencing.
Green Range OS-2 with PAD	None	N/A	The site is distant to proposed works and no further management is required
Green Range OS-3 with PAD	None	Requires management	The site is out of impact but within 16 m of the proposed works. The site will be protected from inadvertent harm through the installation of temporary fencing. To protect visible Aboriginal objects from non-project harm, a collection of surface artefacts will take place from within the Winterbourne Road corridor and from within the ploughed paddock to the south.
Millbank OS-1	None	N/A	The site is distant to proposed works and no further management is required. Although the site is located outside of Project impacts, its location is in an area of on-going harm from the use of Winterbourne Road and the property access gate around which the site was recorded. Surface artefacts at the site will be collected to remove them from ongoing, non-Project impacts
Table Top Rd IF-1	Total	Low	The site is likely to be harmed through the road construction and an underground electrical reticulation line. The site will be salvaged through a collection of the surface artefacts
Woodburn IF-1	Total	High	The site is located within the middle of the transmission line easement. All efforts will be made to avoid the site by locating any impacts including electricity poles and access tracks away from the site by providing at least a 5 m buffer. If it is not possible to avoid the site will be salvaged through a collection of the surface artefacts
Tarwonga ST-1	Total	Moderate	The design of the overhead transmission line should ensure that the site is spanned and that any associated access tracks avoid the site. If this is possible, the site should be temporarily fenced with hi-visibility fencing during the construction phase of the project to avoid inadvertent harm to the site. If there are clearance issues for the transmission line, the Proponent will consult with the Aboriginal community to determine if the tree can be trimmed to preserve the scarred portion of the tree or moved entirely to a place of safe-keeping
The Ranch OS-1 with PAD	Partial	High	The design of the overhead transmission line should ensure that the site is spanned and that any associated access tracks avoid the site. If this is possible, the site will be temporarily fenced with hi-visibility fencing during the construction phase of the Project to avoid inadvertent harm to the site. If the site cannot be avoided, the portion of the site in the transmission line easement will be salvaged through a collection of the surface artefacts
The Ranch IF-1	Total	High	The design of the overhead transmission line should ensure that the site is spanned and that any associated access tracks avoid the site. If this is possible, the site will be temporarily fenced with high visibility fencing during the construction phase of the Project to avoid inadvertent harm to the site. If the site cannot be avoided, the site will be salvaged through a collection of the surface artefacts
Queenlee OS-1 with PAD	None	Requires management	This site has high cultural and scientific values and will be avoided by the Project. This will involve designing the

Site Name	Type of Harm	Potential for Avoidance	Recommendation
			overhead transmission line to ensure that the site is spanned and that any associated access tracks avoid the site. If this is possible, the site will be temporarily fenced with high visibility fencing during the construction phase of the Project to avoid inadvertent harm to the site. With landowner's permission, the Proponent will consider funding a non-invasive study of the site including mapping and photography. The Proponent will consult with the landowner about the possibility of permanently fencing the site. Managed crash grazing of the site area will be permissible to keep grass and weed growth under control
Queenlee E-1	None	Requires management	This site has high cultural and scientific values and will be avoided by the Project. However, the site will be temporarily fenced with high visibility fencing during the construction phase of the Project to avoid inadvertent harm to the site. With the landowner's permission, the Proponent will fund a non-invasive study of the site including mapping and photography. The Proponent will consult with the landowner about the possibility of permanently fencing the site. Managed crash grazing of the site area will be permissible to keep grass and weed growth under control
Talisker ST-1	None	Requires management	The design of the connection switchyard will ensure that the site is avoided. If this is possible, the site will be temporarily fenced with high visibility fencing during the construction phase of the Project to avoid inadvertent harm to the site. If the site is likely to be harmed, the Proponent will consult with the Aboriginal community to determine if the scarred portion of the tree should be moved to a place of safe-keeping

6.7 Historic Heritage

6.7.1 Introduction

OzArk prepared a Historic Heritage Assessment (HHA) to assess the potential impacts of the Project on historic heritage, and identify mitigation and risk management measures during construction and operation. The HHA was prepared to address the requirements of the SEARs, including the following government policies:

- *NSW Heritage Manual* (Heritage Office, 2002);
- Heritage Council's *Historical Archaeology Code of Practice* (Heritage Council 2006); and
- NSW Heritage Office's *Assessing Heritage Significance* (Heritage Office 2001).

The objectives of the assessment were as follows:

- To identify whether historical heritage items or areas are, or are likely to be, present within the Survey Boundary;
- To assess the significance of any recorded historical heritage items or areas;
- Determine whether the Project is likely to cause harm to recorded historical heritage items or areas; and
- Provide management recommendations and options for mitigating impacts.

6.7.2 Methodology

The assessment methodology involved conducting desktop research and undertaking archaeological fieldwork concurrent with the Aboriginal heritage assessment. It is in this regard that the methodology for the heritage assessment is consistent with that described in **Section 6.6.2**.

6.7.2.1 Archaeological Surveys

The fieldwork was undertaken in three stages:

- Stage 1: Monday 20 July 2020 to Friday 31 July 2020;
- Stage 2: Monday 2 November 2020 to Friday 6 November 2020; and
- Stage 3: Tuesday 23 February 2021 to Wednesday 24 February 2021.

Fieldwork Stage 1 consisted of two teams of two archaeologists in each team. Fieldwork for Stage 2 and Stage 3 consisted of one team of two archaeologists.

Survey Boundary

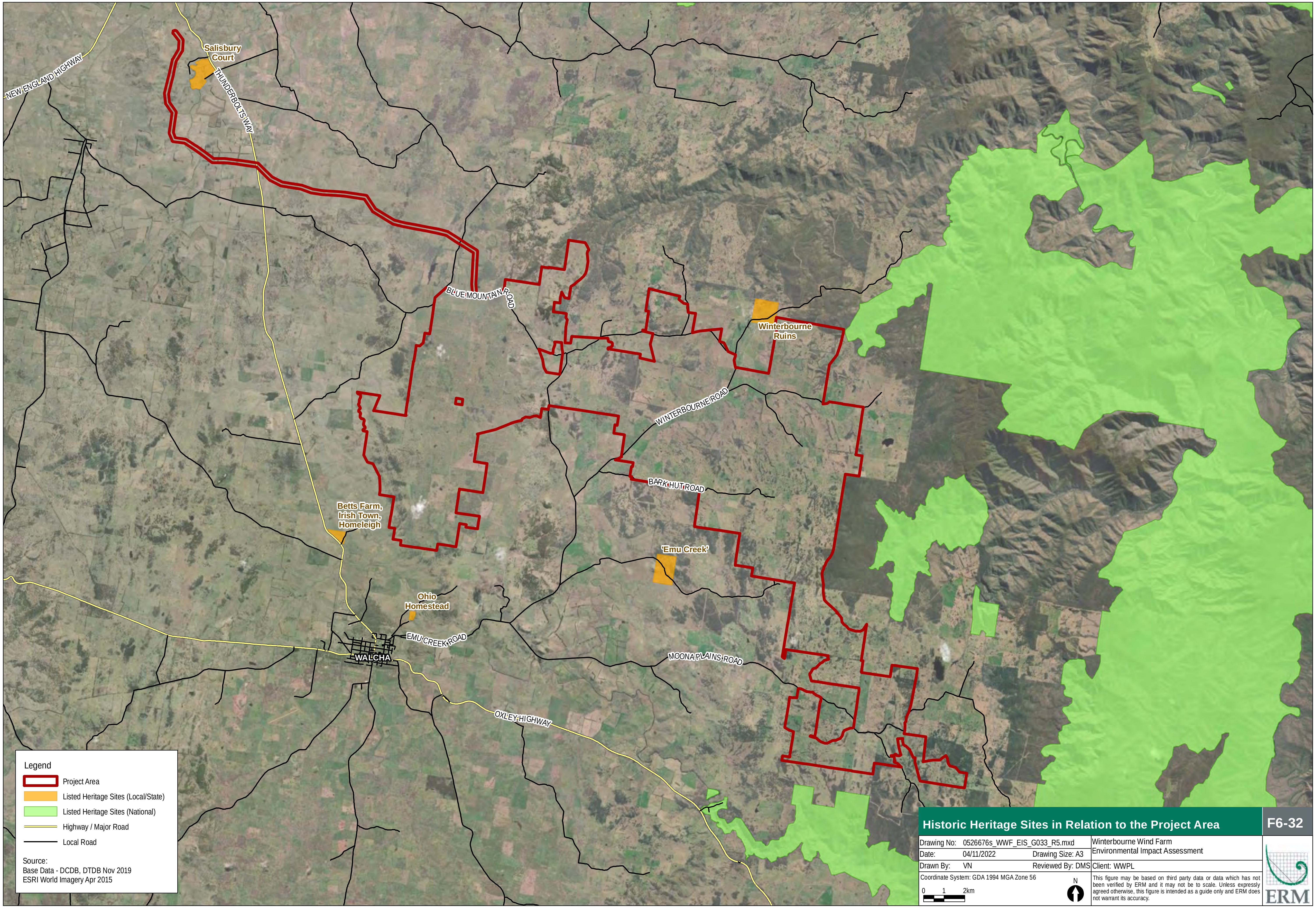
The Survey Boundary is consistent with **Section 6.6**.

Survey Constraints

The same constraints of low ground surface visibility found in the Aboriginal heritage survey (refer **Section 6.6**) also affected the historic heritage survey, but not to the extent as was noted with Aboriginal heritage, as historic heritage items tend to be more manifest in the landscape.

6.7.3 Previously Recorded Sites

A desktop search was conducted on the following databases to identify any previously recorded items of historic heritage within or near the Project Area. The results of this search are summarised in **Table 6-52** and the location of sites in relation to the Project Area is shown in **Figure 6-32**.


Salisbury Court
NEW ENGLAND HIGHWAY
THUNDERBOLTS WAY
BLUE MOUNTAIN ROAD
Winterbourne Ruins
WINTERBOURNE ROAD
BARK HUT ROAD
Betts Farm, Irish Town, Homeleigh
'Emu Creek'
Ohio Homestead
EMU CREEK ROAD
WALCHA
MOONA PLAINS ROAD
OXLEY HIGHWAY
Legend
Project Area
Listed Heritage Sites (Local/State)
Listed Heritage Sites (National)
Highway / Major Road
Local Road
Source:
Base Data - DCDB, DTDB Nov 2019
ESRI World Imagery Apr 2015
Historic Heritage Sites in Relation to the Project Area
F6-32
Drawing No: 0526676s_WWF_EIS_G033_R5.mxd
Date: 04/11/2022
Drawing Size: A3
Drawn By: VN
Reviewed By: DMS
Winterbourne Wind Farm
Environmental Impact Assessment
Client: WWPL
Coordinate System: GDA 1994 MGA Zone 56
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This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
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Table 6-52 Historic Heritage: Desktop Database Search Results

Name of Database Searched	Date of Search	Type of Search	Comment
National and Commonwealth Heritage Listings	19/03/21	Walcha, Uralla and Clarence Valley LGA	The Gondwana Rainforest heritage curtilage is at its closest 85 m from the Project Area
State Heritage Listings	19/03/21	Walcha, Uralla and Clarence Valley LGA	Search returned no state heritage listings within the Project Area; however, two items are directly adjacent to the Survey Boundary
Local Environmental Plan (LEP)	19/03/21	Walcha LEP 2011 & Uralla LEP 2012	Search returned no LEP listed sites within the Project Area, however, there are three items relatively close to the Project Area

A search of the Heritage Council of NSW administered heritage databases, the Walcha LEP 2011, and the Uralla LEP 2012 returned 113 records for historical heritage sites within the two LGAs. While no listed sites are located within the Project Area, nearby sites can provide context for the historic heritage in the area.

The Gondwana Rainforests of Australia are located directly east of the Project Area (National Heritage listing S99, State Heritage listing SHR 01002). At its closest, the state heritage curtilage is approximately 85 m east of the Project Area. While the heritage curtilage of the site is located relatively close to the Project Area, the proposed impacts of the Project will not extend beyond the Development Footprint, and any cultural heritage values associated with the listing will not be impacted.

At a State heritage level, Ohio Homestead (SHR 00463, I019 on Walcha LEP 2011) is located approximately 3 km from the Project Area. The homestead is Walcha's oldest surviving house in northern NSW, and with 'Salisbury Court' in Uralla, is one of the few New England homes surviving from the 1840s. There will be no impacts to the cultural heritage values of this item.

Three sites listed on the Walcha LEP 2011 are listed relatively close to the Project Area. The closest LEP listed site, located directly adjacent to the Project Area, is the Winterbourne Ruins (A001). The homestead was constructed in 1845 and has a historical, cultural and research significance. While the site is located close to the Project Area, the proposed impacts of the Project will not impact this item.

Also located relatively near the Project Area is “Emu Creek” homestead (I005), located approximately 1.6 km away. Emu Creek has historical significance as a squatting run in the 1830s. As the item is over 1 km from the Project Area, there will be no loss of cultural heritage values associated with this item.

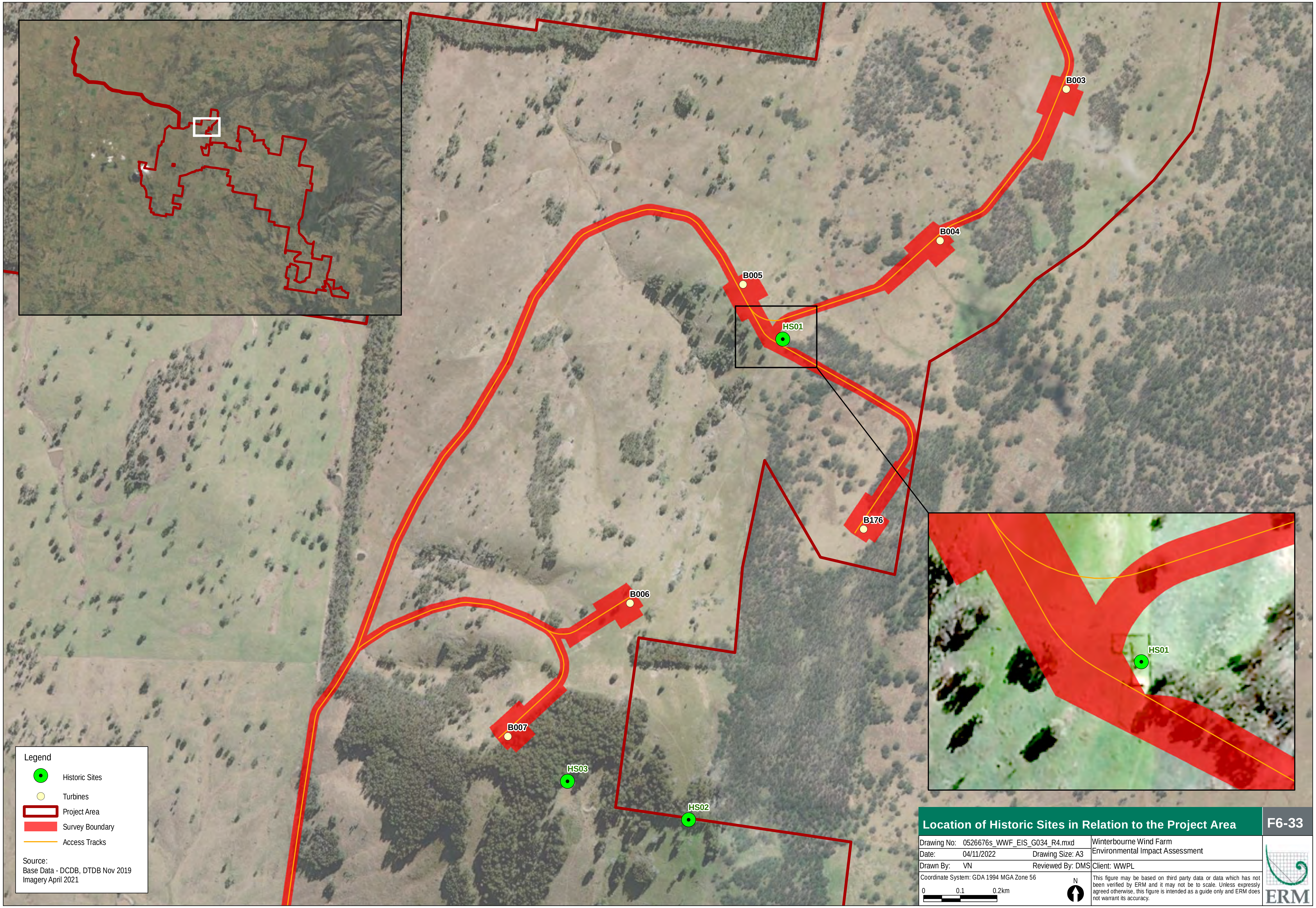
“Betts Farm – Irish Town, Homeleigh” (I023) is also located approximately 2.1 km west of the Project Area. Betts Farm is historically and culturally significant as it is a rare and substantially intact survivor of an Irish enclave, known colloquially in the district as 'Irishtown'. There will be no loss of cultural heritage values associated with this item.

6.7.4 Assessment of Impacts

6.7.4.1 Historic Heritage Sites Recorded

Three historic sites were identified during the field survey. The location of these sites in relation to the Project are shown in **Figure 6-33** and the features of these sites are detailed in **Table 6-53.**

For the transport route modifications outside the Project Area, only one location, Stair Street, Kayuga, is near a listed heritage curtilage. This listing on the Muswellbrook LEP (I43) is for Kayuga Cemetery within Lot 1, DP835733. It has been assessed as having State heritage values due to his historical importance.



B003
B004
B005
HS01
B176
B006
B007
HS03
HS02
HS01
Legend
Historic Sites
Turbines
Project Area
Survey Boundary
Access Tracks
Source:
Base Data - DCDB, DTDB Nov 2019
Imagery April 2021
Location of Historic Sites in Relation to the Project Area
F6-33
Drawing No: 0526676s_WWF_EIS_G034_R4.mxd
Date: 04/11/2022
Drawing Size: A3
Drawn By: VN
Reviewed By: DMS
Winterbourne Wind Farm
Environmental Impact Assessment
Client: WWPL
Coordinate System: GDA 1994 MGA Zone 56
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Table 6-53 Summary of Historic Heritage Sites Recorded

Site	Site type	Description of Site	Image
HS01	Cattle years and hut	The site consists of cattle yards and a loading ramp with stone and brick used as foundation courses. It is adjacent to a shed. These were most likely constructed by the previous landowner Billie Hamel. Located on a sloping landform approximately 1.4 km west of Blue Mountain Creek.	Photo 
HS02	Memorial marker	The site consists of a memorial marker for Rhonda Holstein (died 1998) whose ashes were scattered at this location. Located on a sloping landform approximately 1.4 km west of Blue Mountain Creek. The site is on the Blue Mountain property	
HS03	Potential Burial	The site consists of wooden fencing around shrubbery. It appears to be a potential location marker of a grave. Located on a sloping landform approximately 2 km west of Blue Mountain Creek. The site is on the Blue Mountain property	

6.7.4.2 Assessment of Significance

The assessment evaluated the heritage significance of the identified historic heritage sites in accordance with the NSW Heritage Office's publication 'Assessing Heritage Significance' (OEH, 2001).

Table 6-54 details the assessed significance of recorded historic heritage items in accordance with the NSW Heritage Office guidelines and the Burra Charter, which recognises four categories of heritage value: historic, aesthetic, scientific, and social significance.

Items are categorised as having local or State level, or no significance. The level of significance is assessed in accordance with the geographical extent of the item's value. An item of State significance is one that is important to the people of NSW whilst an item of local significance is one that is principally important to the people of a specific LGA.

Table 6-54 Historic Heritage Assessment of Significance

Site Name	Description and Assessment	Level of significance
HS01	HS01 is a common rural feature that is assessed as having no heritage significance.	Nil
HS02	HS02 is also noted as having no heritage significance, however, due to its role as a memorial marker it will hold importance to the landowner (should the current landowner be related to Rhonda Holstein).	Nil
HS03	HS03 has no heritage significance, although, like HS02, it may hold significance to the landowner if the item is a grave site.	Nil

6.7.5 Likely Impacts to Historic Heritage

The anticipated impacts to historic heritage from the Project are detailed in **Table 6-55**.

In addition, ground disturbing modifications associated with the transport route are located near to an item listed on the Muswellbrook LEP (I43, Kayuga Cemetery). However, the Project will not impact the heritage values of the listed item as the works are minor and confined to the road corridor.

Table 6-55 Historic Heritage Impact Assessment

Site Name	Assessment	Will the site be impacted?
HS01	Item HS01 will be partially impacted by the proposed works but will be avoided by the proposed access track and underground reticulation line that will be located slightly further south to avoid the item.	Yes
HS02	Item HS02 is located at a distance to any proposed works and will not be harmed by the Project.	No
HS03	Item HS03 is located at a distance to any proposed works and will not be harmed by the Project.	No

6.7.6 Mitigation Measures

Impacts to historic heritage (as described above) will be mitigated through the implementation of specific mitigation and management measures as described below. As part of the detailed design, the applicant will continue to investigate options to further avoid and minimise impacts to historic heritage values.

6.7.6.1 Historic Heritage Management Plan

A Historic Heritage Management Plan (HHMP) will be prepared prior to the commencement of construction. The HHMP will detail measures to protect historic heritage sites outside the area of disturbance, minimisation and management measures, and an unexpected finds procedure and other contingency and reporting procedures.

6.7.6.2 Management and Mitigation of Recorded Heritage Items

All historic heritage items have been assessed as having no heritage significance and they are not protected by the Heritage Act.

However, HS01 is located near the alignment for an access track and an underground reticulation line. The access track and reticulation alignment be deviated slightly to the south to avoid impact to this item.

HS02 and HS03 are distant to any proposed works and there are no further management recommendations with regard to these items.

In summary, the following management recommendations are made:

- HS01: if it is possible to conserve the item in the landscape this would be an acceptable heritage outcome. However, if it is not possible to conserve the site, it may be harmed as it represents a common rural feature without heritage values;
- HS02: The item is located away from any potential impacts and there are no further management recommendations; and
- HS03: The item is located away from any potential impacts and there are no further management recommendations.

As noted in **Table 6-56**, the location of the Kayuga Cemetery should be noted and all works will be confined to the road corridor to avoid impacted to the listed heritage item.

Table 6-56 Listed Historic Items Requiring Management

Item Number	Site Name	Level of Significance	Lot and DP	Potential Management Options
I43	Kayuga Cemetery	State	Lot 1 DP835733	The heritage curtilage of this item is outside of proposed works; however, care needs to be taken in the design of the transport route that all impacts remain outside of the identified heritage curtilage

6.8 Soil and Water

6.8.1 Introduction

ERM prepared a Soils and Water Assessment for the Project to assess the potential impacts of the Project on soil and water and to identify appropriate mitigation and risk management measures for implementation during construction and operation. The Soils and Water Assessment was prepared to address the requirements of the project-specific SEARs, which include:

- Quantify water demand, identify water sources (surface and groundwater), including any licensing requirements, and determine whether an adequate and secure water supply is available for the development;
- Assess potential impacts on the quantity and quality of surface and groundwater resources, including impacts on other water users and watercourses;
- Where the Project involves works within 40 m of the high bank of any river, lake or wetlands (collectively waterfront land), identify likely impacts to the waterfront land, and how the activities are to be designed and implemented in accordance with the *DPI Guidelines for Controlled Activities on Waterfront Land* (2018) and (if necessary) *Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings* (DPI 2003); and *Policy & Guidelines for Fish Habitat Conservation & Management* (DPI, 2013); and
- Describe the measures to minimise surface and groundwater impacts, including how works on steep gradient land or erodible soil types would be managed and any contingency requirements to address residual impacts.

The assessment considered (at least) the following government policies:

- *DPI Water Guidelines for Controlled Activities on Waterfront Land* (DPI, 2012);
- *Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterways Crossings* (DPI, 2003); and
- *Policy and guidelines for Fish Habitat Conservation and Management* (DPI, 2013).

The Soils and Water Assessment can be found in full at **Appendix P** (ERM, 2022).

6.8.2 Methodology

The Soils and Water Assessment incorporated the following scope of works:

- A desktop investigation of soil profile, soil mapping and available water data;
- Review of available WaterNSW data for registered groundwater bores and river flows;
- Review of climatic background data research from the Bureau of Meteorology;
- Quantification of expected water demands and identify available water supply options;
- Identification of statutory licensing requirements and consultation with relevant NSW government stakeholder and Councils;
- Identification of the key potential soil and water impacts and assess associated risks; and
- Identification of appropriate management and mitigation measures to ensure that construction, operation and decommissioning of the proposed wind farm would result in an acceptable level of environmental impact, pursuant to the EP&A Act and other relevant legalisation. A Conceptual SWMP has been provided to support this assessment.

6.8.3 Existing Environment

6.8.3.1 Topography and Bioregions

Landform and Elevation

The Project is situated within the New England Tablelands Bioregion which has a general gradient incline from west to east associated with the topography of the Great Dividing Range. Elevation across the tablelands ranges between 600 and 1,585 m AHD. The geology of the region consists of Permian sedimentary rocks, intrusive granites, and extensive Tertiary basalts, which strongly influence the topography of the region.

The landform adjacent the Project Area is characterised by large basalt plateaus to the west associated with the Walcha Plateau, and steeper granite country to the east associated with the adjacent Oxley Wild Rivers National Park (DPIE, 2016). The topography of the Project Area comprises an exposed, elevated plateau of rolling hills at an elevation between 1,100 m to 1,300 m AHD. A slope analysis conducted to inform the project design confirmed that most of the Project Area consists of slopes of less than 10% (refer **Figure 6-34**). The Development Footprint (including turbine locations) tends to follow higher areas of the site which have steeper sided slopes. WTG B130 is the highest of the Project's infrastructure with a ground elevation of 1,329 m AHD and an overall elevation of 1,559 metres AHD. Elevation of the Project Area is shown in **Figure 6-35**.

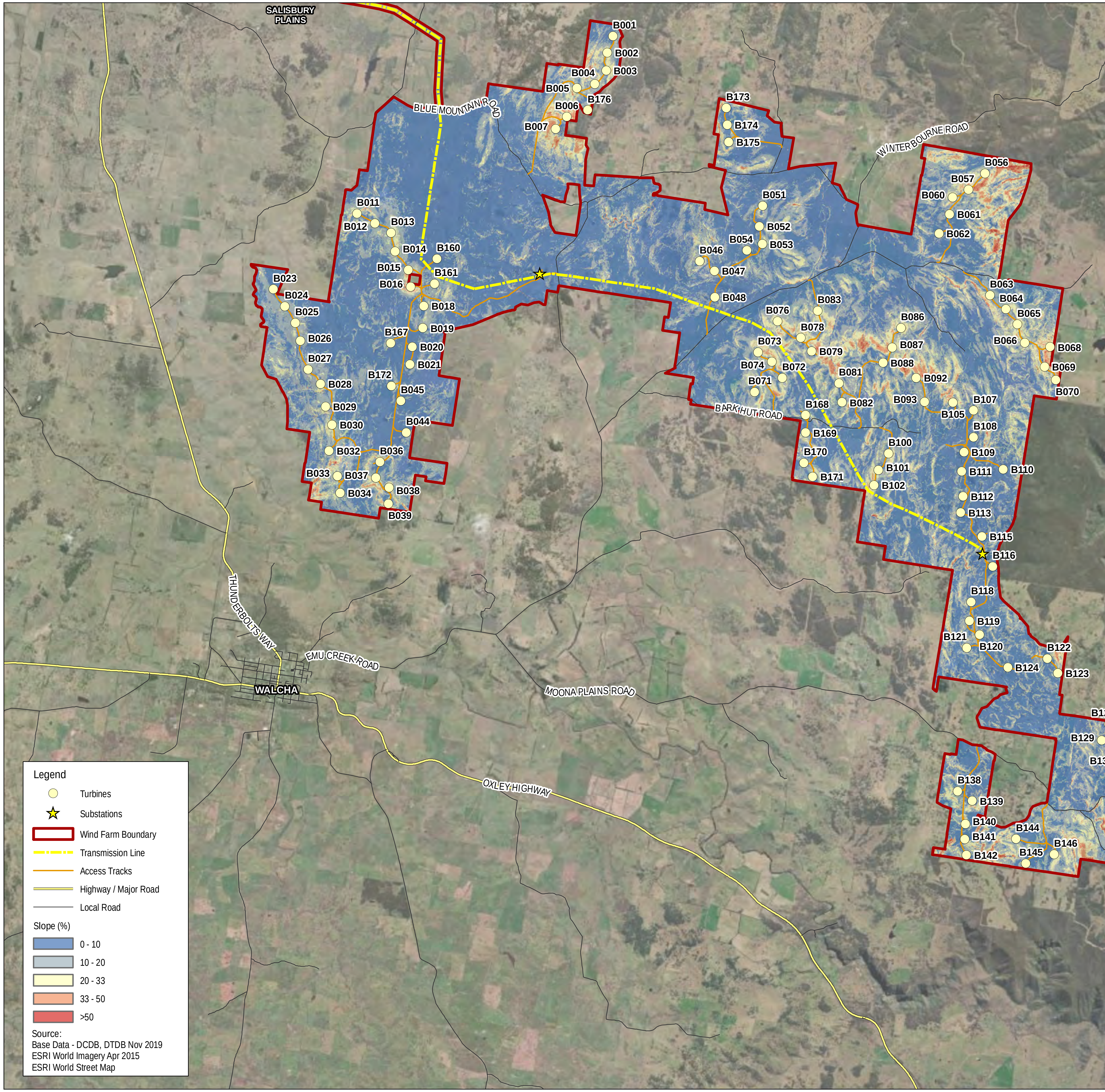
Bioregions

The Interim IBRA mapping provides a national and regional framework for understanding bioregions. Bioregions are relatively large land areas characterised by broad, landscape-scale natural features and environmental processes that influence the functions of entire ecosystems. Sub-regions are based on finer differences in geology, vegetation and other biophysical attributes and are the basis for determining the major regional ecosystems (Morgan & Terrey, 1992).

The Project Area is within the Walcha Plateau IRBA Sub-region of the New England Tableland Bioregion (refer **Figure 6-35**). The Walcha Plateau consists of faulted inliers of Devonian and Carboniferous sandstone, conglomerate, minor limestone, slate, schist, amphibolite and small volcanics. Small stock of granodiorite and central peak and ridge top fingers of Tertiary Basalt. The characteristics of the Walcha Plateau IBRA Sub-region of the New England Tableland Bioregion are described in **Table 6-57**.

Table 6-57 Walcha Plateau IBRA Sub-region of the New England Tableland Bioregion

Feature	Description
Geology	Faulted inliers of Devonian and Carboniferous sandstone, conglomerate, minor limestone, slate, schist, amphibolite and volcanics. Small stock of granodiorite and central peak and ridge top fingers of Tertiary basalt.
Characteristic Landforms	Eastern and southern margin is the Great Escarpment. High central plateau capped by basalts. General topography undulating with small, rugged areas often related to geology.
Typical Soils	Mellow and harsh texture contrast soils on sediments and granite. Red brown to black structured loams on basalt, thin in places and often stony.
Vegetation	Snow gum and black sallee on coldest wet ridges. Ribbon gum, mountain gum, silvertop stringybark, New England blackbutt, narrow-leaved peppermint, in moist high areas. New England Stringybark, ribbon gum, and cool temperate rainforest elements in moist sheltered gullies.



Slope Analysis Across the Wind Farm Boundary Area

F6-34

Drawing No:	0526676s_WWF_SW_G001_R6.mxd		Environmental Impact Assessment
Date:	04/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: DMS	Client: WWPL

Coordinate System: GDA 1994 MGA Zone 56

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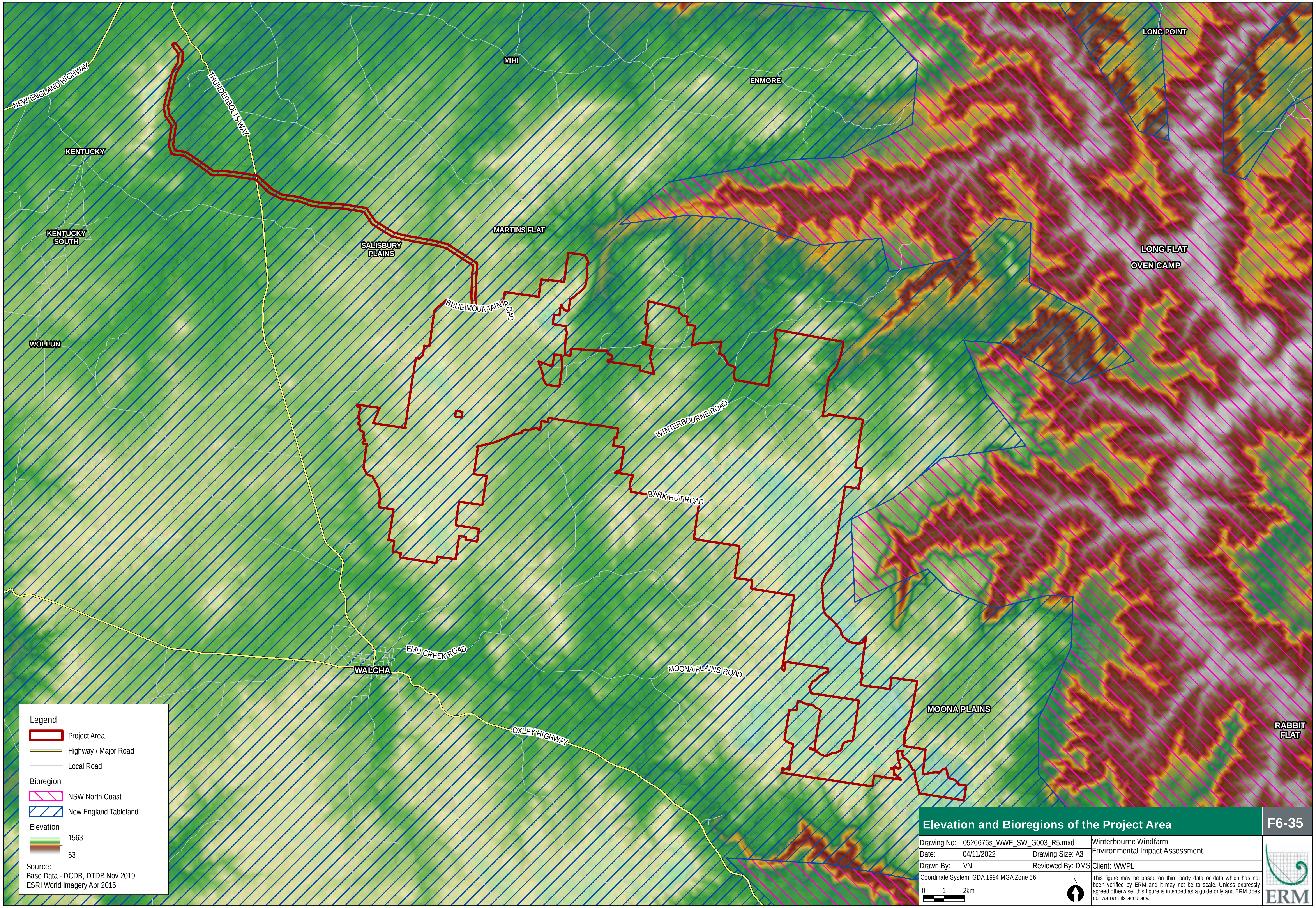


Elevation and Bioregions of the Project Area

F6-35

Drawing No: 0526676s_WWF_SW_G003_R5.mxd	Winterbourne Windfarm Environmental Impact Assessment
Date: 04/11/2022 Drawing Size: A3	
Drawn By: VN Reviewed By: DMS	Client: WWPL

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

6.8.3.2 Soils

Land and Soil Capability

The NSW land and soil capability assessment scheme describes and maps land and soil capability classes. The mapping is based on an eight-class system with values ranging between 1 and 8 which represents a decreasing capability of the land to sustain productive agricultural land use. Class 1 represents land capable of sustaining most land uses including those that have a high impact on soil (e.g. regular cultivation), whilst Class 8 represents land that can only sustain very low impact land uses (e.g. nature conservation) (OEH, 2012) (refer Table 4-2 of **Appendix P**).

The land and soil capability mapping provided on **Figure 6-36** shows the land and soil capability mapping and biophysical strategic agricultural land within and adjacent the Project Area. Note that the Project Area (or broader region) contains no class 1 or 2 land and, therefore, these are not represented in the **Figure 6-36** legend.

Broadly, the majority of land within the Project Area has been classified as either class 4 or class 5. Several small patches of Class 3 and Class 6 land are also scattered across the Project Area. A larger patch of Class 3 land is located in the south west corner, and a larger section of land along the eastern and southern boundary of the Project Area is mapped as Class 6. An area of Class 7 land is mapped in the northern extremity of the Project Area.

Biophysical Strategic Agricultural Land

The NSW Government introduced a range of measures designed to deliver greater protection to agricultural land from the impacts of developments. These measures included the safeguarding of 2.8 million hectares of Biophysical Strategic Agricultural Land (BSAL) across the state, as well as designating Critical Industry Clusters. BSAL is land identified with high quality soil and water resources capable of sustaining high levels of productivity, which is critical to sustaining the state’s agricultural industry. Critical Industry Clusters (CIC) are concentrations of highly productive industries within a region that are related to each other, contribute to the identity of that region, and provide significant employment opportunities.

There is approximately 1,525,462 ha of mapped BSAL within the New England North West Region (NSW Government 2012). Only two locations within the Project Area totalling approximately 327.7 ha are mapped as BSAL, coinciding with larger patches of soil and land capability Class 3 land (refer **Figure 6-36**). Of this, the Development Footprint covers approximately 22.5 ha. None of the Project Area is mapped as CIC.

Australian Soil Classification

A search of the Australian Soil Classification Soil Type Map of NSW (OEH, 2019) reveals that the Kurosols soil type dominates the Project Area along with Kurosols Natric, a Great Group of Kurosols in which a major part of the upper 0.2 m of the B2t horizon is sodic. They have strong texture contrast between A horizons and strongly acidic B horizons, and with low water holding capacity Kurosols are often sodic. Kurosols generally have low fertility and land use is generally restricted to grazing pastures.

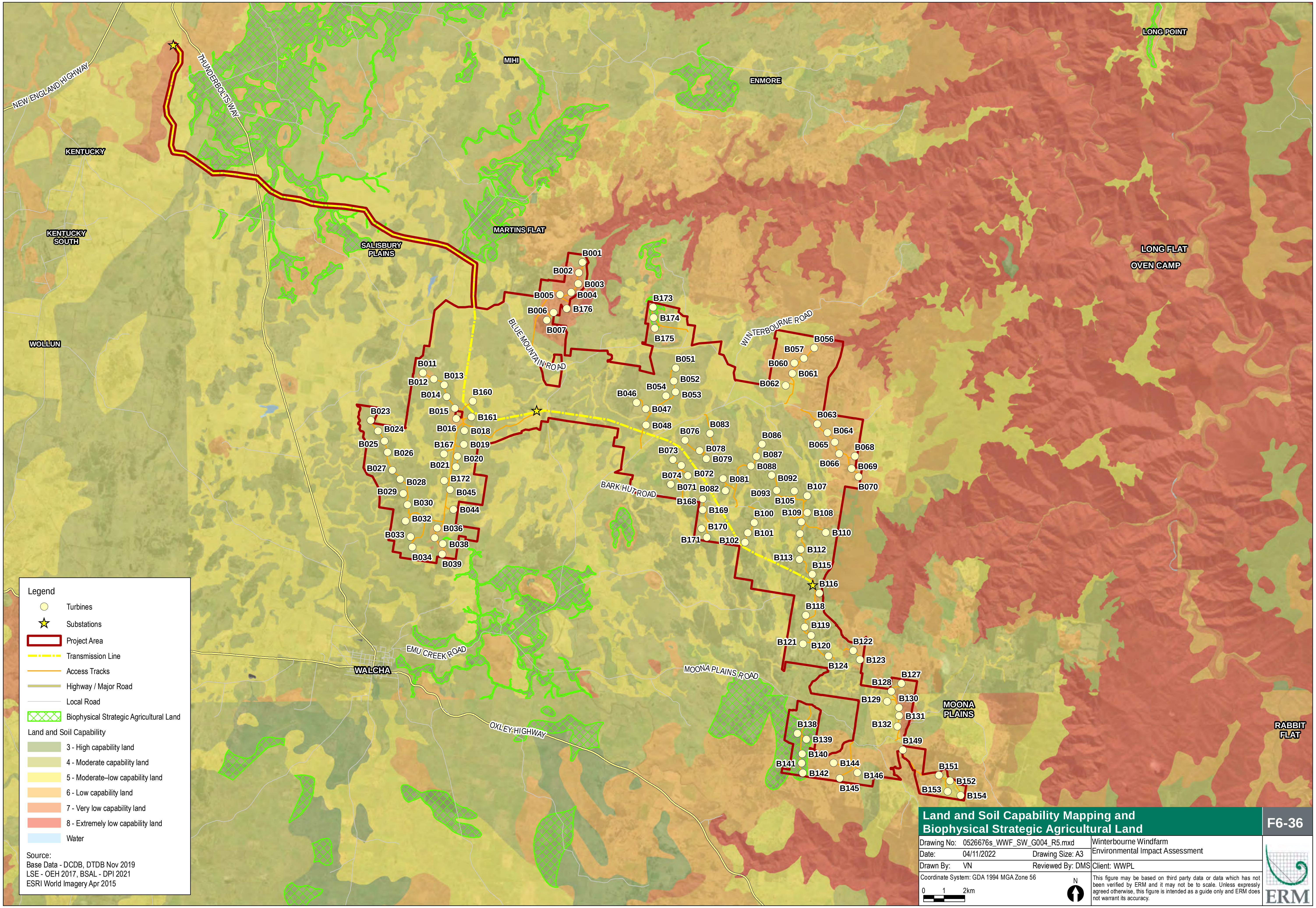
The mapping also showed, to a lesser extent, the presence of Ferrosols, Dermosols and Kandosols across the Project Area, and Rudosols on ridge lines surrounding the Project Area to the east and north. The Australian Soil Classification mapping is presented in **Figure 6-37**.

Acid Sulphate Soils

A review of acid sulphate soil risk mapping has identified that no potential acid sulphate soils are expected to occur across the Project Area (Naylor, et al., 1998).

Soils Summary

The soil character of the Project Area is identified as having moderate to high erodibility and generally lower permeable soils, which increases runoff potential. The primary concern for soil management is the disturbance of steep sloped areas. The proposed design has avoided disturbance of steep sloped areas, with the primary ground excavation works associated with access tracks which are mainly on flat plateaus, or along low to moderate sloped areas that lead to small ridges (where most turbine hardstands would be located).



Land and Soil Capability Mapping and Biophysical Strategic Agricultural Land

F6-36

Drawing No: 0526676s_WWF_SW_G004_R5.mxd
Date: 04/11/2022 Drawing Size: A3
Drawn By: VN Reviewed By: DMS

Winterbourne Windfarm
Environmental Impact Assessment
Client: WWPL

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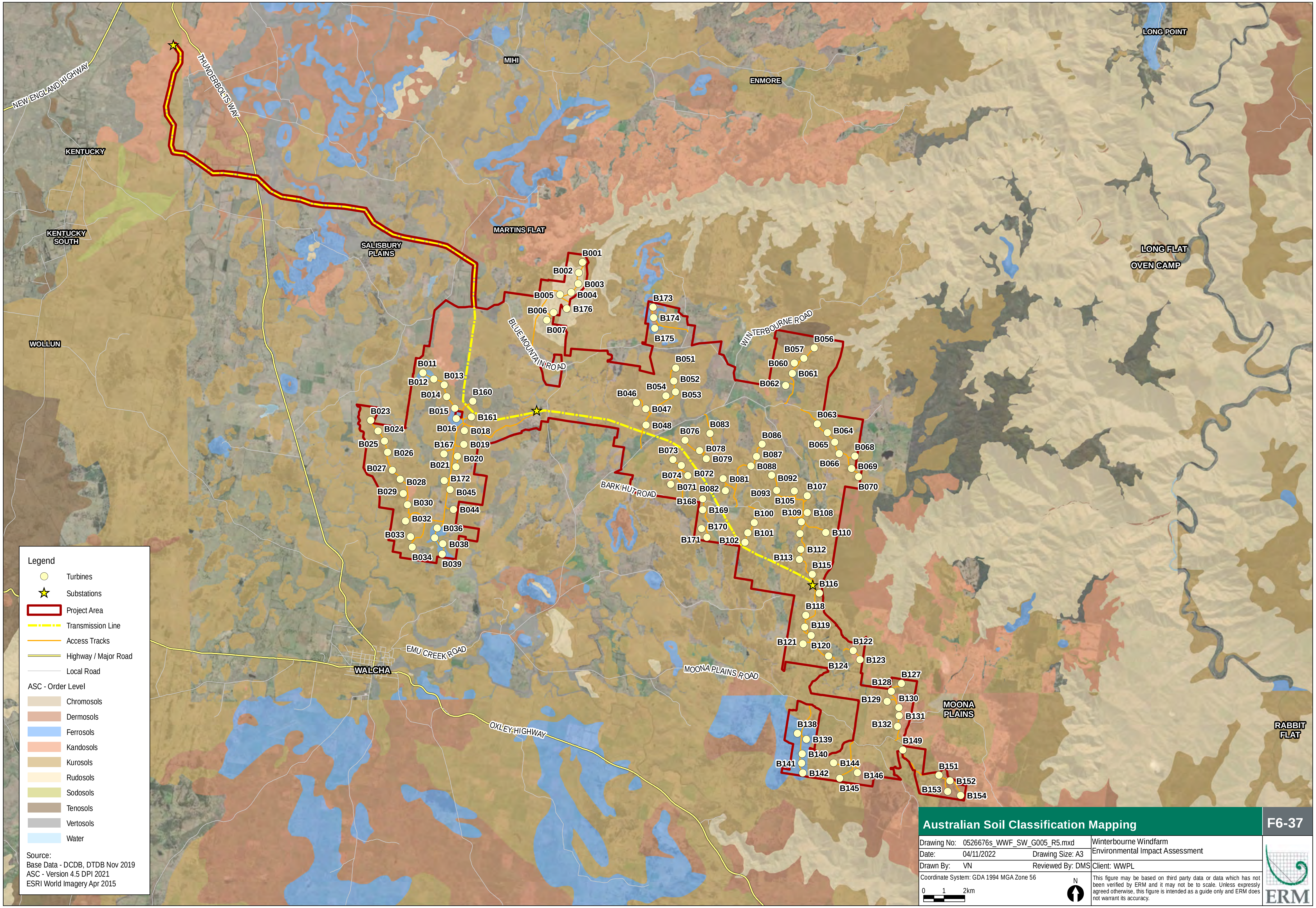

Australian Soil Classification Mapping

F6-37

Drawing No: 0526676s_WWF_SW_G005_R5.mxd	Winterbourne Windfarm Environmental Impact Assessment
Date: 04/11/2022 Drawing Size: A3	
Drawn By: VN Reviewed By: DMS	Client: WWPL

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6.8.3.3 Hydrology

Surface Water and Watercourses

The Project Area is located within the Macleay River catchment. The Macleay River catchment covers an area of about 11,452 km^2 and stretches about 405 km from the headwaters of the Gara River in the west, to the tributary of the mouth of the Macleay River at South West Rocks. Average annual rainfall across the catchment varies considerably from west to east, from about 800 mm at Armidale, to 1200 mm at Kempsey, and 1500 mm at South West Rocks (BoM, 2022a). All rivers within the catchment are unregulated, although there are numerous control structures within waterways.

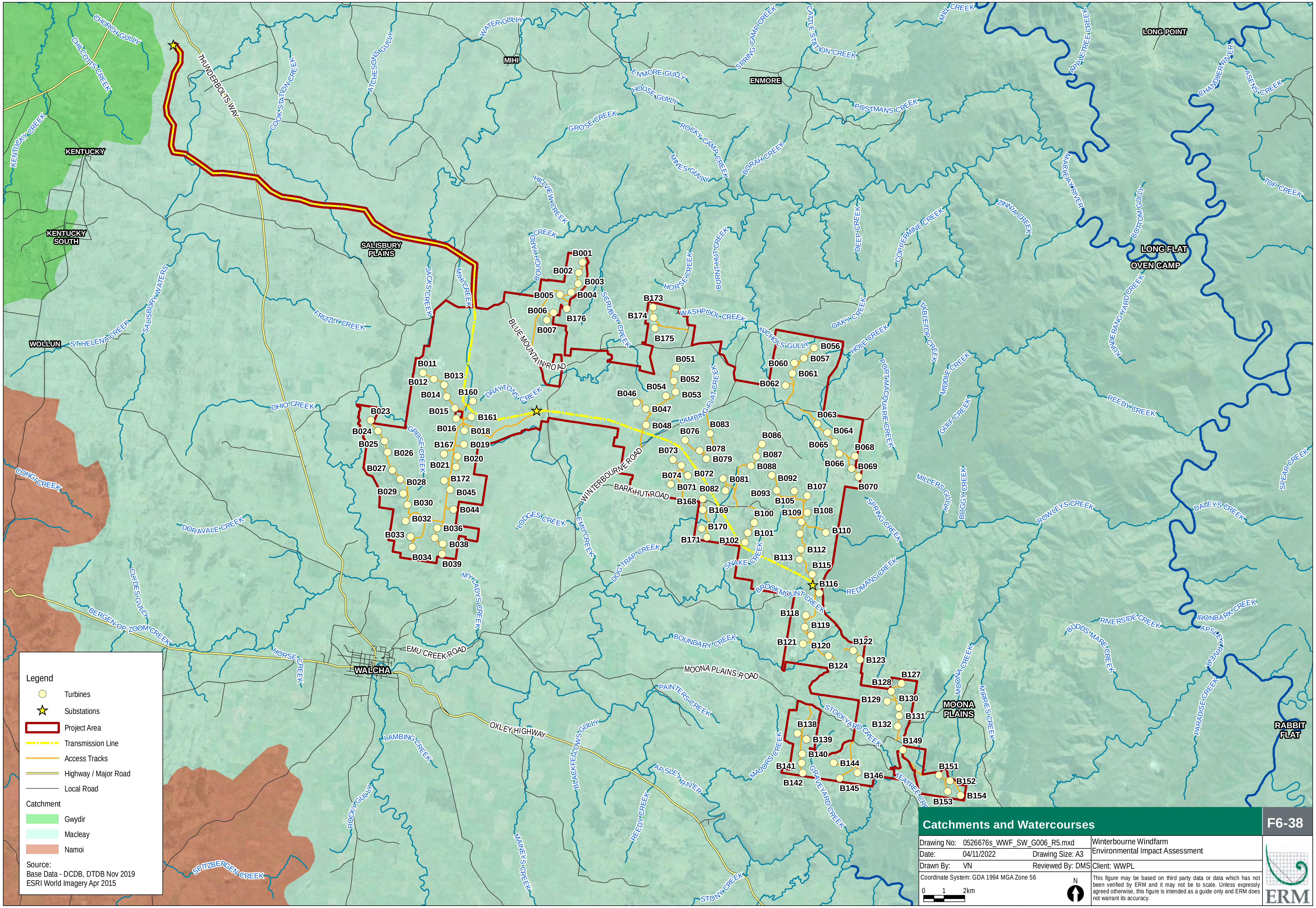
The Project Area overlaps the Apsley River, Blue Mountain Creek and Salisbury Water sub-catchments of the Macleay River catchment. The Apsley River is a perennial stream of the Macleay River catchment. Its main tributary flows to the south and east of the Project Area. Both Blue Mountain Creek and Salisbury Waters are intermittently flowing creeks within the Macleay River catchment. The main tributary of Blue Mountains Creek flows to the north of the Project Area, while the main tributary of Salisbury Waters flows to the west of the Project Area. Several small creeks traverse the site including Grose Creek, Draytons Creek, and Winterbourne Creek. For much of the year these smaller creeks may have no running water. Small farm dams occur across the Project Area. There are no wetland areas or lakes (other than small farm dams) within the Project Area.

The Strahler stream order classification is used in NSW to describe the hierarchy of streams within a catchment. The Strahler system is based on the confluence of streams of the same order. First order streams have no other streams flowing into them. Where two streams of the same order meet, the stream below the confluence becomes the next highest order stream. When two streams of different orders join, the resulting stream retains the highest order of the streams that created it.

Many regulations provision conservation measures, access licencing and other regulatory requirements according to stream order. For example, one of the objectives of the *Fisheries Management Act 1994* is to preserve key fish habitats, which is typically applied to 3rd order streams and above (refer Section 4.2.3 of **Appendix P**).

Across the Project Area there are numerous first order and second order tributaries that are generally ephemeral gullies and are characteristic of the ridgeline topography. Fourteen 3rd and 4th order tributaries occur within the Project Area. These would meet the definition of key fish habitat (refer **Figure 6-38**). However, these waterways would not meet the definition of rivers that constitute 'waterfront land' under the Water Management Act 2000. As such, the Project does not involve works within 40 metres of the high bank of any river, lake, or wetlands (collectively waterfront land).

There are no wetlands of international importance nor nationally important wetlands located within the Project Area (refer Section 2.6 of **Appendix G**).



Catchments and Watercourses

F6-38

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Date:	04/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: DMS	Client: WWPL

Coordinate System: GDA 1994 MGA Zone 56

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Groundwater

The Project Area is predominantly free of groundwater aquifers. Small upper aquifers exist in locations in the south and north of the Project Area. Surface dependent groundwater aquifers are mainly associated with perennial 3rd order streams and above.

There are currently 11 registered bores across the Project Area. These range in depth from about 16 m to 104 m. The bores are used for irrigation, water supply, stock and domestic use. The majority of these bores were installed prior to 2002 and their current operating status is unknown. The two most recently (2014) installed bores are listed as functioning.

Water Quality Objectives

The NSW Water Quality Objectives (WQOs) are the agreed environmental values and long-term goals to achieve healthy waterways in surface water catchments across the State. The WQOs include a range of water quality indicators to help assess the current conditions of waterways and their ability to support its respective uses and values.

The Macleay River catchment contains the towns of Armidale, Walcha, Guyra and Kempsey and supports a diverse range of water uses. Key users include local councils, water utilities, conservation, livestock grazing including dairying, dryland agriculture, some forestry and tourism. Water sharing plans have been developed in the Macleay River catchment to address environmental requirements and to ensure sustainable use of water by all water users.

The Macleay River Catchment WQO have been developed to provide guideline levels to assist water quality planning and management. Considering the Project Area is situated across tributaries that are 3rd order streams and above, meeting the WQO is vital for protecting the local ecosystem, environmental values, and uses people have for the water downstream of the Project. The corresponding WQO for the Macleay River Catchment are detailed in Table 4-6 of **Appendix P**. In Australia, waterway health is assessed against the National Water Quality Management Framework (Australian Government, 2018; formerly ANZECC, 2000). The Water Guideline establishes values for various water quality measures which support the WQO’s.

An ecosystem health assessment of the broader Macleay River catchment (Kempsey Shire Council, 2016) reported that water quality across the catchment had been impacted by pollution from land-based activities, and extensive clearing resulting sediment runoff. As an example, the Apsley River flows through Walcha and then eastward to the Apsley Gorge. The Walcha sewage treatment plant is located adjacent to the Apsley River downstream of Walcha. The plant is licensed under the provisions of the POEO Act by NSW EPA (EPL 2613) to discharge 219 ML of treated effluent annually into the river. The licence allows for the treated effluent to contain certain pollutants that must not exceed the concentration limits specified in the licence.

Sensitive Locations

The Oxley Wild Rivers National Park is located adjacent to the eastern boundary of the Project Area. The World and National Heritage listed Gondwana Rainforests of Australia is mapped as a subset of the National Park. The Gondwana Rainforests of Australia primarily follow the deep gorge country of the Apsley River and its major tributaries from Apsley Gorge downstream to its confluence with the Macleay River, and upstream and downstream along the Macleay River and key tributaries.

Potential impacts relating to the World Heritage area are discussed in **Section 6.1.3**.

Water Supply Options

Preferred water supply options for use during the development of the Project have not been determined. It is anticipated that these will be identified on the design has been finalised and prior to the construction phase of the Project.

The project has identified four secure options for supply water during the Project's construction period have been identified and include:

- Surface water collection from existing (or new) dams;
- Groundwater pumping from bores;
- Water abstraction from a nearby permanent water source; and
- Tanking water to site from Council supply (including treated wastewater) or other local Water Access Licence (WAL) owners.

Water extraction for the purposes of development of the Project from either unregulated water sources, existing or new groundwater sources would be subject the provisions of the *Water Management Act 2000* (WM Act). Extraction from unregulated water sources would require a WAL, as would the installation of, and extraction of water from, new groundwater bores. Water may be sourced from existing licenced groundwater bores within the Project Area, subject to agreements with the WAL licensee, and provisions of the specific WAL.

The Project may store and use water from the numerous dams that are scattered throughout the Project Area. Water within these dams could be supplemented with water imported from offsite, allowing the construction contractor to store the required water closer to construction activities. The main construction activities that would require water are concrete batching, soil conditioning, and dust suppression. Potable water would also be required for use within the site compounds.

Should additional groundwater bores or water from other sources covered under the relevant water sharing plan be required, the Proponent would seek to obtain a WAL and other relevant approvals, subject to availability.

6.8.4 Assessment of Impacts

6.8.4.1 Construction Impacts

Soils will be subject to disturbance during construction activities associated with site establishment, installation of infrastructure and replacement of soils for revegetation. Construction activities that have the potential to impact soils and therefore may result in impacts to downstream watercourse are outlined in **Table 6-58**.

Table 6-58 Potential Construction Impacts to Soils and Water

Construction Activities	Potential Impacts
All-weather Unsealed Road Network	■ Creation of fugitive dust due to vehicle movements ■ Erosion of unsealed roadways and resultant sediment runoff ■ Erosion of roads and roadside drainage in areas of steep terrain or in inappropriately 'finished' locations ■ Insufficient compacting of the road surface which could lead to erosion or batter slips in areas of steep terrain ■ Mud tracking at the confluence of internal access roads with the public road network
Watercourse Crossings	■ Erosion of drainage lines and subsequent sediment runoff ■ Removal of vegetation and subsequent increased erosion potential ■ Vehicle movements across unaltered watercourses during construction phase leaving wheel tracks and causing damage to creek beds ■ Potential for unstable steep banks collapsing under weight of vehicles/machinery ■ Bank erosion at creek crossings from culvert installations
Water Supply	■ Over-extraction of surface water or groundwater resulting in reduced environmental flows, reduced water availability for existing licensed users and impacts on water dependent ecosystems

Construction Activities	Potential Impacts
Establishment of hardstands (e.g. crane pads, access roads laydown areas etc)	■ Erosion of disturbed areas and resultant sediment runoff
Turbine and Transmission Tower Foundations	■ Erosion of soils around turbine/tower foundations ■ Potential increase to water filtration and subsequent impacts to groundwater ■ Erosion from soil stockpiles and subsequent sediment runoff
Dewatering of Site	■ Potential interception of subsurface water during construction of turbine foundation, requiring dewatering
Ancillary Infrastructure (e.g. substation, operations, and maintenance facility)	■ Erosion of disturbed areas and subsequent sediment runoff ■ Erosion from spoil stockpiles and subsequent sediment runoff
Stockpile Management	■ Erosion from soil stockpiles and subsequent sediment runoff
General Construction Activities (e.g. Machinery Operations)	■ Erosion from soil stockpiles and subsequent sediment runoff ■ Hydrocarbon spills from machinery (e.g. burst hoses, mechanical failures, leaking machinery) ■ Contamination of soils from poor refuelling practices ■ Disturbance of unknown contaminated sites

Impacts to groundwater are not expected as construction activities (i.e. excavation) will not likely be to a depth that will interfere with groundwater aquifers. Based on data from bores across the Project Area, groundwater is anticipated to occur at a depth of about 12 m and below. The maximum required excavation depth is likely to be 5 m.

6.8.4.2 Operational Impacts

Operational and maintenance activities may lead to impacts on soils and water resources of the Project Area. Specific operational activities that may impact soils and watercourse are outlined in **Table 6-59**.

Table 6-59 Potential Operational Impacts to Soils and Water

Operational Activities	Potential Impacts
Driving on All-weather Unsealed Road Network	■ Creation of fugitive dust due to vehicle movements ■ Erosion of roads and roadside drainage in areas of steep terrain ■ Mud tracking at the confluence of internal access roads with the public road network
Watercourse Crossings	■ Vehicle movements across unaltered watercourses leaving wheel tracks and causing damage to creek beds; ■ Bank erosion at culvert crossings
Pad Sites	■ Potential for erosion and subsequent sediment runoff during heavy rainfall
General Operational Activities (e.g. Machinery Operations)	■ Hydrocarbon spills from machinery (e.g. burst hoses, mechanical failures, leaking machinery) ■ Contamination of soils from poor refuelling practices ■ Soil erosion following heavy rainfall and subsequent sediment runoff

The Project will increase the area of impervious surfaces. This will affect the infiltration of rainfall and velocity of runoff from these areas compared to existing conditions. Changes to the catchment runoff characteristics due to project activities primarily relate to upgrading existing access tracks and replacing open vegetated ground cover with hardstand (all weather) access tracks, crane pads and turbine footings as well as construction of sealed areas for the O&M facility and a mix of sealed and gravel areas within the BESS and substation.

6.8.4.3 Project Water Demands

Water will be required during construction for the following activities:

- Concrete production (batching plant);
- Construction of roads and hardstands;
- Dust suppression; and
- Potable water for site amenities etc.

Water demand during operations is anticipated to be negligible.

Water volumes required during construction have been estimated based on an understanding of the construction requirements and the construction schedule. The estimated total construction water demand is summarised in **Table 6-60** and is based on the construction of 119 WTGs.

Table 6-60 Indicative Water Demand by Activity (ML)

Project Stage	Activity	Water Requirement
Construction	**Non-Potable Supply**	
	Foundation concrete volume for WTGs	6 ML
	General Use including roads and earthworks compaction	26 ML
	Dust Suppression – up to 30 months of construction	81 ML
	Total (Non-Potable)	*113 ML*
	Potable Supply	
	Potable (drinking) supply for site amenities	3 ML
	TOTAL	**116 ML**

As the Project is designated SSD, section 4.41 of the EP&A Act negates the requirements for relevant approvals otherwise obtained through the WM Act, including a water use approval under section 89, a water management work approval under section 90, or an activity approval under section 91 of the WM Act.

The Project has four viable options available to obtain an adequate and source water supply, being:

- Council water supply (or treated wastewater), in agreement with the relevant Council(s);
- Extraction of water collected from existing (or new) dams using landowner harvestable rights or from an existing nearby landowner bore, in agreement to use their allocation;
- Extraction from one or more new groundwater bores, which will require WAL(s) in consultation with WaterNSW; and
- Extraction from a large private dam located approximately 20 km to the north of the Project Area, which will require a WAL in consultation with WaterNSW and the licence holder.

6.8.5 Mitigation Measures

Impacts to soil and water resources (as described above) will be mitigated through the implementation of specific mitigation and management measures as described below. As part of the detailed design, the applicant will continue to investigate options to further avoid and minimise impacts to soil and water resources.

6.8.5.1 Project Mitigation and Management

The following measures will be implemented to address potential soil and water impacts associated with the whole Project:

- Prepare a Soil and Water Management Plan (SWMP) prior to construction commencing. The SWMP should be prepared by a suitably qualified person and be accompanied by Progressive Erosion and Sediment Control Plans (ESCP) to address management requirements at individual work sites;
- Design and construct the Project to minimise land disturbance and therefore reduce the erosion hazard;
- Stage construction activities to minimise the duration and extent of land disturbance;
- Manage topsoil resources to minimise the risk of erosion and sediment runoff, and maximise reuse of topsoil during rehabilitation;
- Divert upslope (clean) stormwater around the disturbed sites and capture sediment-laden runoff from within the disturbed site for diversion to sediment control devices;
- Rehabilitate the site promptly and progressively with works;
- Inspect and maintain erosion and sediment control devices for the duration of the Project construction stage;
- Avoid land disturbance beyond that identified in the assessment within 20 m of minor streams (first and second order watercourses) and 40 m of third order or higher watercourses;
- Ensure appropriate procedures are in place for the transport, storage and handling of fuels, oils, and other hazardous substances, including availability of spill clean-up kits;
- Construct access tracks early to minimise ongoing disturbance during construction;
- Obtain necessary water access licences; and
- Ensure appropriate stormwater, collection, treatment, and recycling at the concrete batch plants, in accordance with good practice and any requirements of the NSW EPA.

6.8.5.2 Construction

Mitigation measures specific to construction of the Project, and in addition to those outlined in **Section 6.8.5.1**, include:

- Design drainage for hardstand and access track infrastructure that directs runoff to appropriate sediment control facilities such as sediment basins, grassed filter strips or swales to trap sediments and filter water prior to discharge (to appropriate vegetated areas or drainage lines);
- Install geotextile silt fences (with sediment basins where appropriate) at drainage lines within the Project Area that are likely to receive runoff from disturbed areas;
- Install appropriate sediment traps or sediment ponds near waterways to minimise surface water that may be contaminated with sediment entering waterways;
- Implement appropriate measures to treat steep batters to minimise sediment loss;
- Implement overland flow management procedures to minimise the flow of water onto steep or erosion prone areas;

- Implement a program of visual inspections at work sits following significant rain events with to identify and immediately remediation any localised erosion (within response times specified in the SWMP); and
- Where possible, 'dirty' runoff from disturbed areas will be graded away from waterways, and directed to collection drains that convey flows via outlet water quality controls. Where this is not possible, runoff that directs toward waterways should be buffered using vegetated filter strips or concentrated in collection drains that divert to join the site construction drainage network or to enhanced sediment controls prior to release.

The separation of 'clean' and 'dirty' runoff is the first principle of best management practices in erosion and sediment control. This minimises flows to water quality controls and will be implemented throughout the Project.

Mitigation measures will be included in the Project SWMP and ESCP.

6.8.5.3 Operation

Mitigation measures specific to the operation of the Project, and in addition to those outlined in **Section 6.8.5.1**, include:

- Include design features that allow the capture of runoff in rainwater tanks at the operations and maintenance building to provide potable water supply for amenities;
- Install controls such as grass swales with regular rock checks in access track and other constructed drainage lines, and level spreaders onto naturally vegetated areas at flow outlets to reduce velocities and encourage infiltration; and
- Design hardstand areas that are graded to the perimeter of drains and have minimal available fine materials on surfaces and limited potential to erode and hence the potential to generate sediment.

The erosion risk for the Project is primarily associated with construction when working on disturbed surfaces and constructing cut and fill batters prior to completion of permanent stabilising works. However, the erosion risk remains in concentrated flow paths such as access track drainage lines. These can be managed using appropriate controls as noted above.

6.8.5.4 Sensitive Areas Mitigation Measures

The Oxley Wild Rivers National Park is located adjacent to the Project Area, immediately to the east. Additional considerations to ensure activities associated with the Project do not impact on the integrity of the National Park are required. The primary risk to impact upon this "sensitive location" is associated with runoff and sediment deposits.

Suitable measures can be implemented to mitigate potential impacts to the adjacent National Park. Measures will be included in the progressive SWMP to either:

- Direct disturbed runoff away from the catchment areas that flow directly to the National Park; or
- Process runoff through additional sediment controls (e.g. sumps and/or sediment basins) and discharge at a low, non-erosive velocity.

6.9 Hydrology and Flooding

6.9.1 Introduction

BMT Commercial Australia Pty Ltd (BMT) prepared a Rapid Flood Assessment in response to environmental assessment requirements by the Biodiversity, Conservation and Science Directorate in the BCD in a letter dated 22 April 2021 (refer Annex A of **Appendix Q**).

Due to the limited footprint and positioning of the Project infrastructure primarily along catchment ridge lines, BMT considered the completion of a typical flood impact assessment not warranted, as the potential flood impacts are likely to be minimal. Instead, a Rapid Flood Assessment was undertaken to determine indicative flood risks for the Project infrastructure including proposed WTG sites and waterway crossings. Another objective of the assessment was to determine the intersection of predicted flood extents and the Development Footprint.

The Rapid Flood Assessment can be found in full at **Appendix Q** (BMT, 2021).

6.9.2 Methodology

The assessment was prepared using new flood models developed based on the Australian Rainfall and Runoff 2019 (Australian Rainfall and Runoff (ARR) 2019) data and methodology, to ascertain indicative flood risks for the Project infrastructure.

The following datasets were utilised in the assessment:

- Aerial imagery of the Project Area;
- Digital Elevation Model in 2 m and 5 m resolution tiles based on LiDAR aerial survey obtained from 2011 to 2018 by the NSW Government, available from the ELVIS webpage (https://elevation.fsdf.org.au/);
- Cadastral information and hydrolines (watercourses) from SIX Maps (https://maps.six.nsw.gov.au/clipnship.html);
- Bureau of Meteorology (BoM) 2016 design rainfalls (http://www.bom.gov.au/water/designRainfalls/revised-ifd/);
- Storm losses and temporal patterns for design rainfalls from ARR Data Hub (https://data.arrsoftware.org); and
- 2017 land use information from DPE (https://data.gov.au/dataset/ds-nsw-9b6781fe-279d-49c4-ae45-23907fa8bd8b/details?q=NSW%20Landuse%202017%20v1.2).

The following flood studies and guidelines were also utilised in the assessment:

- 'Walcha Flood Study' (2004) prepared by WBM Oceanics Australia for Walcha Council;
- 'Bendemeer Flood Study' (2012) prepared by SMEC for Tamworth Regional Council;
- 'Australian Rainfall and Runoff' 2019 (ARR 2019); and
- 'Review of ARR Design Inputs for NSW' (2019) prepared by WMA Water for NSW Office of Environment Heritage (OEH).

Hydraulic models were developed to simulate the 1% Annual Exceedance Probability (AEP) design flood event for a range of storm durations across three catchments in the vicinity of the Project. The 1% AEP (or 1 in 100 AEP) event is generally a critical event used to assess flood risk, and to reduce flood exposure and damage (NSW Floodplain Development Manual, 2005). The hydraulic models for the assessment were developed to simulate the dynamic interactions between watercourses and floodplains, as well as overland flow paths within the Project Area, using TUFLOW modelling software developed by BMT.

A detailed description of the hydraulic model and its application to the assessment can be found in Section 3.2 of the Rapid Flood Assessment (BMT, 2021).

Flood mapping produced as part of the assessment provides indicative flood extents across the Project Area. Further details on flood parameters such as flows, velocities and levels will require further detailed and more robust analysis in future stages of the Project based on ground and watercourse bathymetry survey information once it becomes available. Nevertheless, the indicative flood extents presented are sufficient to inform the appropriate siting of the Project infrastructure and to avoid areas subject to high flood risks where necessary.

6.9.3 Assessment of Impacts

Using the TUFLOW models, the 1% AEP design flood event was simulated for the Project Area to establish the peak flood depths and indicative flood extents that can be used to assess the flood risks for the proposed development footprint.

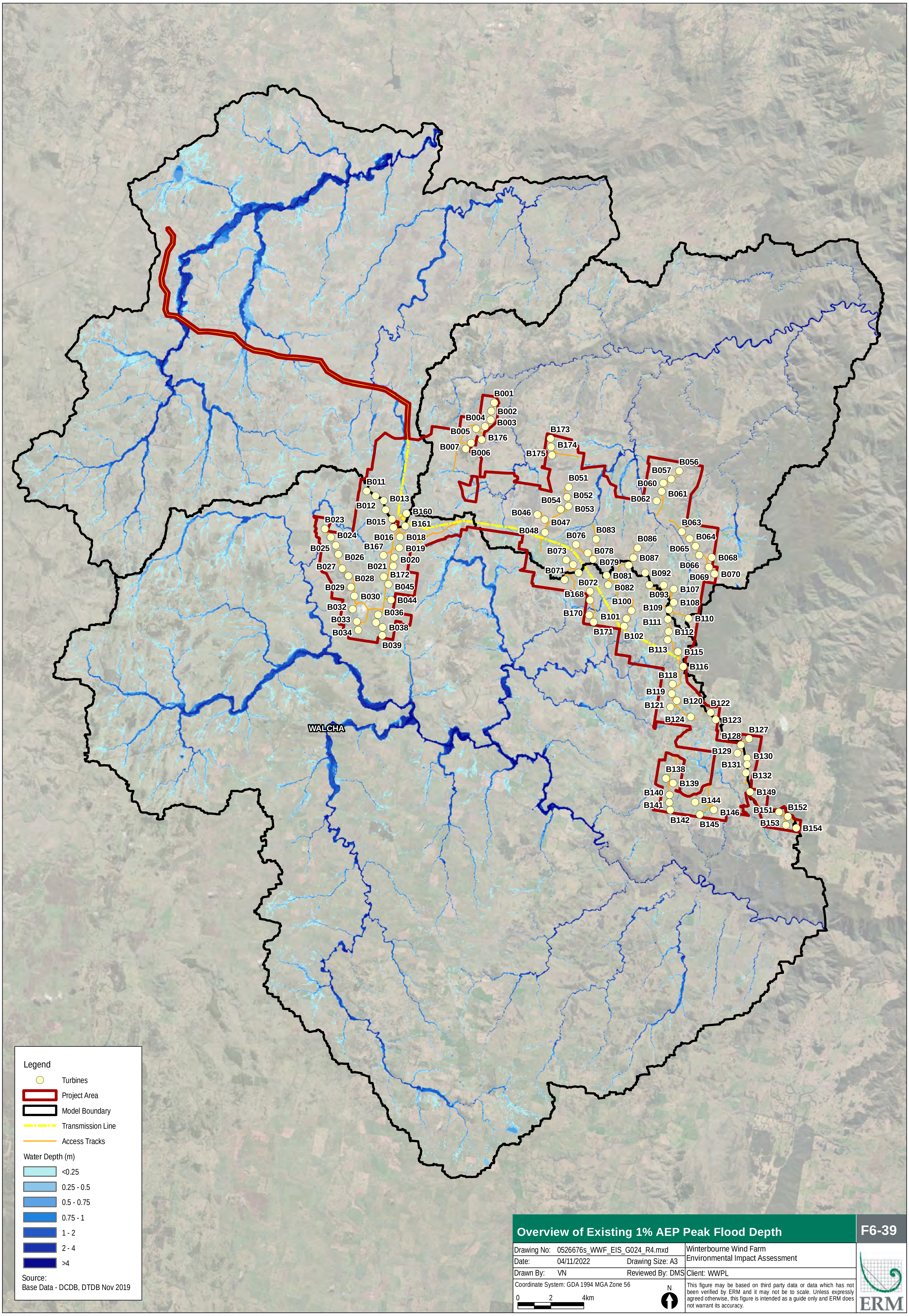
An overview of the 1% AEP design flood results is presented in **Figure 6-39**. A more detailed representation of the model results is presented in a series of figures in Annex C of **Appendix Q**.

The results presented are based on a maximum envelope grid using the mean peak flood depth grid for each duration modelled which therefore yields the highest peak flood depths across the Project Area. Due to the limited footprint and positioning of the proposed development footprint primarily along catchment ridge lines, the completion of a typical flood impact assessment was not considered warranted by BMT, as the potential flood impacts are likely to be minimal. Therefore, a Rapid Flood Assessment was undertaken to determine indicative flood risks for the Project, including proposed WTG sites and waterway crossings. Another objective of the assessment was to provide indicative flood extents to enable the intersection of predicted flood extent and the Project to be determined.

With the exception of transmission lines, internal access tracks and medium voltage reticulation, the majority of the Project components are situated away from watercourses and high flood risk areas. The WTGs are generally located on catchment ridge lines or high ground some distance away from the major watercourses.

There may be presence of local overland flow paths at some sites such as the Uralla switchyard, North Substation, Crane Pad, O&M facility, Laydown Areas, Joint Box and Batch Plant which should be suitably managed or avoided. There is no apparent flood risk from the closest watercourses.

A detailed SWMP will be developed to manage additional runoff from the surface of the Project components (e.g. hardstands and access roads).



Overview of Existing 1% AEP Peak Flood Depth

F6-39

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Date:	04/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: DMS	Client: WWPL

Coordinate System: GDA 1994 MGA Zone 56

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6.10 Air Quality

This section discusses the potential air quality related impacts associated with the Project and summarises the mitigation measures to manage impacts to air quality predominantly associated with the construction stage of the Project. Due to the lack of significant point and fugitive sources of air pollutants from the Project, a quantitative assessment is not necessary.

6.10.1 Methodology

The following methodology was undertaken to assess the impact of the Project to air quality:

- Description of local climate, including rainfall and wind speed and direction;
- Description of existing air quality based on background monitoring data;
- Identification of sensitive receivers;
- Qualitative assessment of Project emissions; and
- Development of mitigation and management measures to control impacts.

6.10.2 Existing Environment

6.10.2.1 Locality Overview

The Project Area is located in a rural setting in which agricultural primary production is the predominant land use. Agricultural operations are unlikely to have a significant influence on local and regional air quality.

Figure 3-8 identifies dwellings within and surrounding the Project Area. Dwellings in the Project Area are generally located along Blue Mountain Road, Winterbourne Road, Moona Plains Road, Bark Hut Road and Table Top Road. The township of Walcha is located 6.5 km south-west of the Project Area and has a population of 3,092 according to the ABS 2016 Census. The region has relatively isolated and low population density.

6.10.2.2 Local Climate

The Project is located within the Walcha Plateau subregion of the New England Tableland Bioregion. The bioregion is characterised by warm summers with steady rainfall. Areas of higher elevation are characterised by mountainous climates, experiencing mild summers and no dry seasons.

The closest operating BOM weather station is Woolbrook (055136), located approximately 23 km south-west of the Project Area.

Rainfall

Figure 6-40 and **Table 6-61** depict the mean rainfall (mm) for years 1991 to 2020 measured at Woolbrook weather station. The mean rainfall experienced per year was 753.2 mm with the highest average monthly rainfall in December (109 mm).

Figure 6-40 Mean Rainfall (mm) Measured at Woolbrook Weather Station

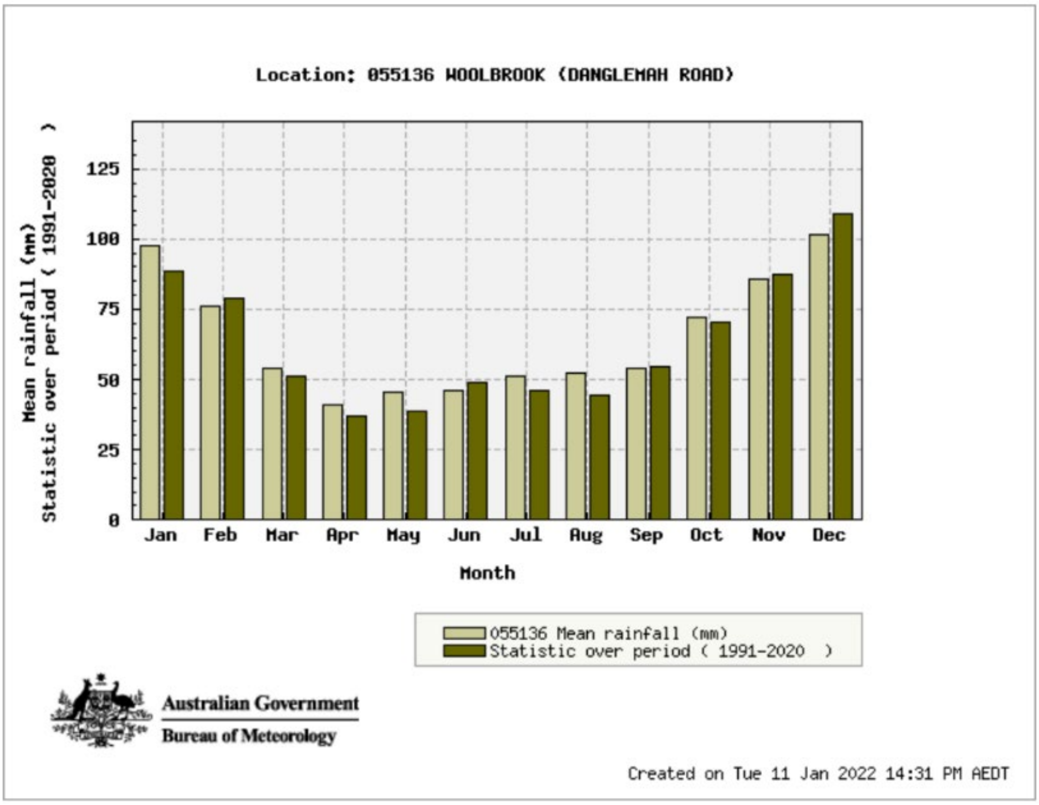


Table 6-61 Mean Rainfall (mm) for Years 1991 to 2020 Measured at Woolbrook Station

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean rainfall (mm)	88.4	78.8	51.2	37.2	38.5	48.8	45.9	44.2	54.3	70.3	87.4	109.0	753.2

Wind Conditions

The Walcha region primarily consists of cool, dry, west to south-westerly air supplied from the continental interior or from the southern oceans during winter, whereas summer months are predominantly easterly flows originating from the Tasman Sea. These airflows significantly influence the temperature and rainfall that is experienced in the region (Walcha Council, 2013).

Across Australia, wind speed and wind direction measurements are made at various times of the day. Historically, these measurements tended to occur at 9.00 am and 3.00 pm. Wind roses summarise the occurrence of winds at a location, showing their strength, direction and frequency, noting that:

- The percentage of calm conditions is represented by the size of the centre circle - the bigger the circle, the higher is the frequency of calm conditions;
- Each branch of the rose represents wind coming from that direction, with north to the top of the diagram; and
- The branches are divided into segments of different thickness and colour, which represent wind speed ranges from that direction.

Figure 6-41 illustrates how to interpret a wind rose. **Figure 6-42** illustrates local wind speed and direction based on 1970 to 2021 records measured at 9.00 am and 3.00 pm at the Woolbrook weather station (BoM, 2022b).

Figure 6-41 Guide to Interpreting the Wind Rose

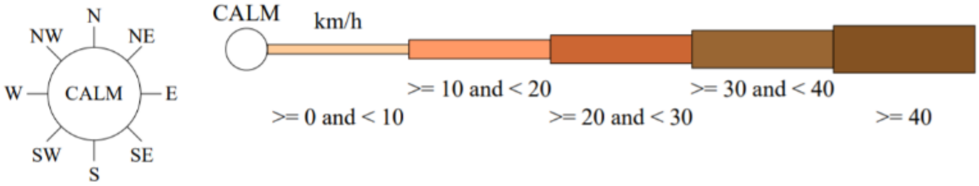
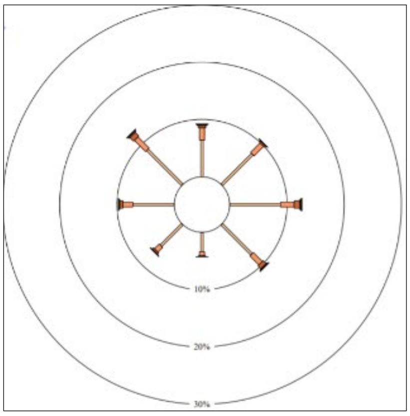
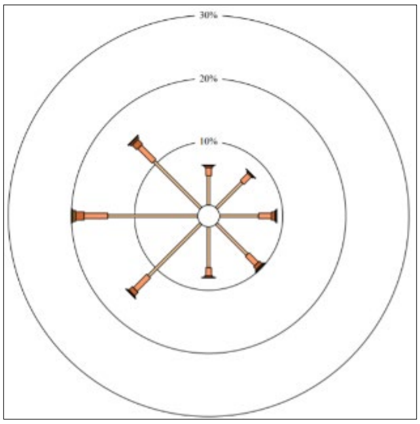


Figure 6-42 Local Wind Speed and Direction

9.00 am Annual I 18,652 total observations I Calm 24%



3.00 pm Annual I 16,455 total observations I Calm 9%



6.10.2.3 Local Air Quality

The Walcha LGA generally experiences a high level of air quality and relatively low occurrences of atmospheric pollution, due mainly to limited urban development and the presence of few polluting industries, as noted in the *2013 State of the Environment Report* (Walcha Council, 2013).

Potential causes of air pollution in the locality include:

- Particulate matter (e.g. wood smoke, bushfires, dust (unsealed roads and dust storms));
- Agricultural farming activities and earthworks creating dust and odours; and
- Greenhouse gas (GHG) emissions (industry, plant and equipment, petrol /diesel engine motor vehicle use).

Air quality monitoring stations located in Armidale and Tamworth, provide hourly pollutant concentration data, 24-hour summaries and Air Quality Category ratings.

Particulate matter PM_{10} and $PM_{2.5}$ are air pollutants measured at Armidale and Tamworth. The data is published by DPE (DPE, 2021), and is reported in the *NSW Ambient Air Quality Annual Compliance Report*.

The National Environment Protection (Ambient Air Quality) Measure (NEPM) sets national standards and goals for air quality. This measure is implemented in NSW under the POEO Act, *the Protection of the Environment Operations (Clean Air) Regulation* 2021 and the *Protection of the Environment Operations (General) Regulation 2021*. In the NSW Annual Compliance Report 2020 (DPIE, 2021d), the monitoring data from 2020 are assessed against the NEPM standards. **Table 6-62** provides the NEPM standards (DPIE, 2021c) for fine particles as PM_{10} and $PM_{2.5}$ which are consistent with the impact assessment criteria specified in Table 7.1 of *Approved Methods* (NSW EPA, 2005).

Table 6-62 Relevant NEPM Standards

Pollutant	Averaging Period	Concentration (µg/m^3)
PM_{10}	24 hours	50
	Annual	25
$PM_{2.5}$	24 hours	25
	Annual	8

The compliance status for Armidale and Tamworth with respect to NEPM goals for particulate matter in 2020 is summarised in **Table 6-63.** Armidale was non-compliant versus $PM_{2.5}$ goals; however, annual mean concentrations of PM_{10} remained below the NEPM criteria. Tamworth was compliant with the NEPM goals and incurred no exceedance days for either $PM_{2.5}$ or PM_{10}.

According to the 2020 compliance report, the major cause of elevated particle pollution was smoke from the Black Summer bushfires during the 2019–20 summer season. Widespread dust storms also significantly impacted air quality during early 2020. Drought and low rainfall resulted in poor groundcover in central and western parts of the State, significantly contributing to increased dust levels under high winds. Other influences which led to elevated particle concentrations during the year were hazard reduction burning, wood smoke from domestic wood heating and site-specific local dust.

Table 6-63 Ambient Air Quality NEPM Goals for Particles

Station	PM_{10}				$PM_{2.5}$			
	Number of exceedance days	Annual Mean (µg/m3	Performance against standards and goals		Number of exceedance days	Annual Mean (µg/m3	Performance against standards and goals	
			24- hour	1-year			24- hour	1-year
Armidale	1	13.7	non-compliant	compliant	23	9.2	non-compliant	non-compliant
Tamworth	Nil	16.8	compliant	compliant	Nil	6.8	compliant	compliant

6.10.3 Assessment of Impacts

6.10.3.1 Air Quality

Emissions to the atmosphere from the Project are predominantly associated with construction phase activities which will be temporary and limited to:

- Localised dust emissions generated by land disturbance; and
- Exhaust emissions of civil construction and vehicle, plant and machinery.

The anticipated construction timeframe for the Project is over a period of approximately 30 months, with peak construction activities to occur over approximately 10 months.

During the temporary construction phase, dust particles and other air quality emissions could potentially be released from activities including:

- Construction of new / upgraded access tracks and roads;
- Vegetation clearing and creation of open exposed areas;
- Excavation works and stockpile management;
- Mobile concrete batching plants;
- Rock crushing;
- Transport of material and equipment;
- Processing and handling of material;

- Construction activities and associated earthmoving and construction equipment;
- Transfer points;
- Loading and unloading of material; and
- Haulage activities along unsealed roads.

Vehicular access within the Project Area will be provided via a number of new and upgraded access tracks that will connect directly with sealed and unsealed local rural roads. All unsealed roads within the vicinity of the Project are rated to accommodate B-double vehicles. The implementation of recommended mitigation measures in **Section 6.10.4** will ensure that the Project can be constructed without any significant impact to local and regional air quality.

6.10.3.2 GHG

During the operation phase, the Project will generate electricity without directly emitting air pollutants that are known to affect the climate and human health. The Project will contribute the improvement of air quality through the displacement of emissions that would otherwise be generated through the burning of fossil fuels used to generate electricity from traditional coal fired power stations. The Project would thus abate the production of up to 1.8 Mt CO_2e per annum which is a substantial contribution towards a cleaner atmosphere. A key environmental benefit of the Project relates to these GHG emission reductions.

The Project does not include any point or fugitive source of offensive odours and hence will not cause or permit the emission of any offensive odour from the Project Area pursuant to section 129 of the POEO Act.

6.10.4 Mitigation Measures

Impacts to air quality (as described above) will be mitigated through the implementation of specific mitigation and management measures as described below. As part of the detailed design, the applicant will continue to investigate options to further avoid and minimise impacts.

The Environmental Management Strategy will include consideration of the management and mitigation of offsite dust emissions, and provide guidance on how those environmental management measures will be implemented. Such measures may include, where appropriate:

- Watering roadways or preparing roadways with coarse gravel or other road coverings where required to minimise wheel-generated offsite dust emissions;
- Covering and/or stabilising material loads which may generate dust, such as aggregates, during transport into and within the construction site where practicable;
- Managing soil stockpiles through stabilisation, light watering or the use of covers;
- Minimising vegetation clearance, including clearing vegetation in stages, and stabilisation of cleared areas where practicable;
- Managing vehicle speed when travelling on unsealed roads;
- Controlling the speed of dumping from tip trucks;
- Minimising vehicle movements, where practicable;
- Cleaning and washing of vehicles, plant and equipment;
- Progressive revegetation and stabilisation of disturbance areas no longer required for construction;
- Regular inspection and maintenance of all vehicles, plant and equipment to ensure operational efficiency; and
- Regular monitoring of environmental conditions during construction, such as wind, that may result in dust generation and implementation of control measures as specified above.

6.11 Waste Management

6.11.1 Introduction

This waste assessment has been prepared to characterise and quantity the waste streams likely to be generated as a result of construction, operation and decommissioning of the Project, and to describe measures to manage these waste streams. The assessment has been undertaken to address the SEARs.

Further, this waste assessment addresses environmental assessment requirements from the NSW EPA letter dated 7 July 2020 (refer **Appendix A**).

Regulatory guidelines and instruments referred to in the preparation of this assessment include:

- *Waste Classification Guidelines* (NSW EPA, 2014a); and
- *Resource Recovery Orders and Exemptions* issued by the NSW EPA.

The requirements of the following legislation will also be considered during construction and operation of the Project, to ensure the effective management of wastes on-site:

- POEO Act;
- *Protection of the Environment Operations (Waste) Regulation 2014*; and
- *Waste Avoidance and Resource Recovery Act 2001* (NSW) (WARR Act).

Best practice for waste management is to implement the resource management hierarchy principles, in accordance with the WARR Act and the principles of ecologically sustainable development:

- Avoidance of unnecessary resource consumption;
- Resource recovery (including reuse, reprocessing, recycling and energy recovery); and
- Disposal.

6.11.2 Existing Waste Management Facilities

Existing waste management facilities located in both Uralla Shire Council and Walcha Council LGAs are listed below in **Table 6-64**. Two facilities are licensed under the POEO Act and are further described in **Table 6-65** and **Table 6-66**.

Table 6-64 Existing Waste Management Facilities

Waste Management Facility	Responsible Local Council, Location and Hours of Operation	Waste Streams Accepted
	Uralla Shire Council	
Uralla Waste Management Facility and Community Recycling Centre (Uralla Landfill)	Tip Road off Rowan Avenue ■ Monday, Tuesday, Thursday and Friday from 8:00 am – 4:00 pm and on Saturday and Sunday from 9:00 am – 2:00 pm	Refer **Table 6-65**
Bundarra Waste Management Facility	Bingara Road, Bundarra ■ Monday, Thursday and Friday from 8.00 am – 4.00 pm and on Sunday from 9.00 am – 3.00 pm	Sorted recyclables accepted at all times
Kingstown Waste Management Facility	Bendemeer Road, Kingstown ■ Wednesdays 8:30 am - 3:30 pm and Saturdays 10.00 am – 2.00 pm	Accepts domestic recyclables only
Kentucky Recycling Station	Dorlie Lane, Kentucky ■ 24 hours a day, 7 days a week	Accepts domestic recyclables only

Waste Management Facility	Responsible Local Council, Location and Hours of Operation	Waste Streams Accepted
	Walcha Council	
Walcha Waste Depot	49 Aerodrome Road, Walcha ■ Tuesday to Friday from 8.30 am – 4.30 pm, Sunday: 12.00 pm – 4.00 pm	Refer **Table 6-66**

Table 6-65 Licensed Facility: EPL 5899 Uralla Landfill

Premises	Uralla Landfill		
EPL number	5899		
Scheduled Activity	Waste disposal (application to land)		
Fee Based Activity	Waste disposal by application to land		
Scale	Any capacity		
Waste Streams Accepted	**Description**	**Activity**	**Other Limits**
Waste tyres	As defined in Schedule 1 of the POEO Act, in force from time to time	Waste disposal (application to land)	N/A
Waste	Any waste received on site that is below licensing thresholds in Schedule 1 of the POEO Act, in force from time to time	-	N/A
General solid waste (putrescible)	As defined in Schedule 1 of the POEO Act, in force from time to time	Waste disposal (application to land)	N/A
General solid waste (non-putrescible)	As defined in Schedule 1 of the POEO Act, in force from time to time	Waste disposal (application to land)	N/A
Asbestos waste	As defined in Schedule 1 of the POEO Act, in force from time to time	Waste disposal (application to land)	N/A

Table 6-66 Licensed Facility: EPL 6120 Walcha Waste Depot

Premises	Walcha Waste Depot		
EPL number	6120		
Scheduled Activity	Waste disposal (application to land)		
Fee Based Activity	Waste disposal by application to land		
Scale	Any capacity		
Waste Streams Accepted	**Description**	**Activity**	**Other Limits**
General solid waste (putrescible)	As defined in Schedule 1 of the POEO Act, in force from time to time	Waste disposal (application to land)	The total quantity of waste disposed of at the premises must not exceed 1,500 tonnes per year

Waste Streams Accepted	Description	Activity	Other Limits
General solid waste (non-putrescible)	As defined in Schedule 1 of the POEO Act, in force from time to time	Waste disposal (application to land)	The total quantity of waste disposed of at the premises must not exceed 1,500 tonnes per year
Asbestos waste	As defined in Schedule 1 of the POEO Act, in force from time to time	Waste disposal (application to land)	The total quantity of waste disposed of at the premises must not exceed 1,500 tonnes per year
Waste tyres	As defined in Schedule 1 of the POEO Act, in force from time to time	Waste disposal (application to land)	The total quantity of waste disposed of at the premises must not exceed 1,500 tonnes per year
Waste	Any waste received on site that is below licensing thresholds in Schedule 1 of the POEO Act, as in force from time to time	-	N/A

6.11.3 Assessment of Impacts

6.11.3.1 Overview

The anticipated waste types generated by the Project during the construction, operation and decommissioning phases are detailed in **Table 6-67**.

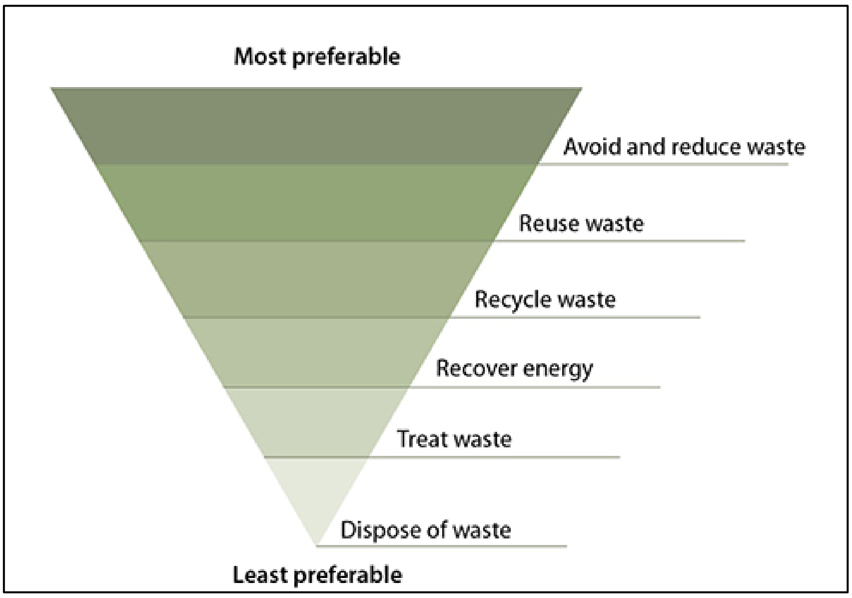
Table 6-67 Identification of Project Waste Streams and Classifications

Waste Type	Indicative Quantities	Waste Stream	Source	Classification
Green waste	N/A (reuse)	Reuse	Site establishment and clearing of development footprint	General solid waste (non-putrescible)
Spoil	N/A (reuse)	Reuse	Site earthworks	General solid waste (non-putrescible)
Concrete	24 tonnes	Recyclable	Construction waste, footings and laydown construction, decommissioned turbine footings and laydown areas	General solid waste (non-putrescible)
Timber (incl. pallets)	208 m^3	Reuse / General Waste	Construction and packaging waste, store, workshop	General solid waste (non-putrescible)
Plastic packaging	85 kg	Recyclable	Construction and packaging waste, store, workshop, O&M office	General solid waste (non-putrescible)
Plastics (PET)	170 kg	Recyclable	Construction waste, store, workshop, O&M office	General solid waste (non-putrescible)
Cardboard packaging / paper waste	702 m^3	Recyclable	Construction waste, store, workshop, O&M office	General solid waste (non-putrescible)
Glass	425 kg	Recyclable	Construction waste, store, workshop, O&M office	General solid waste (non-putrescible)

Waste Type	Indicative Quantities	Waste Stream	Source	Classification
Empty chemical drums	340 drums	Reuse or Recycling	Construction waste, store, workshop, site maintenance	General solid waste (non-putrescible)
Paint	170 L	General waste	Construction waste, store, workshop, site maintenance	General solid waste (non-putrescible)
Oil spill clean-up material	30 kL	Hazardous waste	Construction waste, store, workshop, site maintenance	General solid waste (non-putrescible)
Waste oils, lubricants and liquids	2,550 L	Hazardous waste	Construction waste, store, workshop, site maintenance, decommissioned turbines and substation transformers	Liquid waste
Metals (ferrous and non-ferrous)	700 – 2000 kg per turbine	Recyclable	Offcuts, damaged items, site maintenance, decommissioned turbines, O&M facility, substation and switching station	General solid waste (non-putrescible)
Electronics and electrical infrastructure	85 kg	Reuse, Recyclable, General solid waste	Offcuts, damaged items, site maintenance, decommissioned turbines, transformers, conductors, switches.	General solid waste (non-putrescible)
Recyclable domestic waste	5 tonnes	Recyclable	Construction offices, O&M office	General solid waste (non-putrescible)
PPE	1,190 kg	Recyclable	Construction and operational offices	General solid waste (non-putrescible)
Septic tank waste	595 kL	Sewage	Ablutions during construction, operations and decommissioning	Liquid waste
Domestic wastes	5,950 m^3	General solid waste	Construction, operational and decommissioning offices.	General solid waste (putrescible)

Waste streams generated across all Project phases will be managed using the waste hierarchy, as illustrated in **Figure 6-43**. Further detailed breakdown of the waste types and quantities will be included in a Waste Management Plan (WMP). As an overarching principle, the waste minimisation hierarchy of avoid / reduce / reuse / recycle / dispose will be applied wherever possible to all decommissioning wastes. Any waste that is unable to be reused, reprocessed or recycled will be disposed of at a facility approved to receive that type of waste.

Figure 6-43 Waste Hierarchy



6.11.3.2 Construction Phase

Waste generated during the construction would mainly be from works associated with site establishment and earthworks, including construction of access tracks and landscaping. Some types of waste, such as hazardous chemicals, cannot be safely recycled and direct treatment or disposal is the most appropriate management option.

Should waste be found to be unsuitable for reuse or recycling, disposal methods would be selected based on the classification of the waste material in accordance with the 'Waste Classification Guidelines: Part 1 Classifying Waste' (NSW EPA, 2014a). The Waste Classification Guidelines provide direction on the appropriate classification of waste, specifying requirements for management, transportation and disposal of each waste category.

The predominant types and classification of waste streams generated by the Project are listed in **Table 6-67**.

Under the waste definitions in the POEO Act, most of the waste generated during the construction phase would be classified as general solid waste, either putrescible or non-putrescible. Staff facilities such as transportable amenities buildings at the site would also produce sanitary wastes defined as general solid wastes (putrescible) is accordance with the relevant waste definitions under the POEO Act.

6.11.3.3 Operation Phase

During the operational phase of the Project, the waste streams will be limited to minor quantities of putrescible waste associated with site maintenance activities and domestic and sewerage waste from the O&M facility.

Materials such as fuels and lubricants, redundant equipment and metals may require replacement over the operational life of the Project. No waste streams would be associated with the generation of electricity using WTGs. In general, the potential impacts associated with waste generation and management during the operational phase would be similar to those for construction, albeit at a much smaller scale.

6.11.3.4 Decommissioning Phase

On behalf of the Proponent, Aurecon Australasia Pty Ltd (Aurecon) has prepared a preliminary Decommissioning and Rehabilitation Assessment for the Project which can be found at **Appendix S**. The Decommissioning and Rehabilitation Assessment includes a waste minimisation strategy, as well as the handling of waste from Project decommissioning. Ultimately, the waste minimisation strategy commits that all waste management will be undertaken in accordance with the NSW EPA's Waste Classification Guidelines, or any other guidelines relevant at the time of decommissioning.

The decommissioning and site rehabilitation process shall generally include:

- Obtaining all necessary consents for decommissioning, demolition, remediation and rehabilitation;
- Consultation with stakeholders prior to and during the process;
- Preparation and implementation of a Decommissioning and Rehabilitation Environmental Management Plan;
- Deactivation, securing, making safe, isolation, and closure of the wind turbines, substations, and ancillary infrastructure;
- Installation of erosion and sediment controls as necessary;
- Removal of all liquids and other consumables from turbines, plant and electrical equipment;
- Removal and safe disposal of waste and hazardous materials;
- Dismantling or demolition and removal of turbines, buildings, structures, plant, equipment, services and other objects, excluding subsurface foundations, and services 200 mm below ground surface level, using best management practices for demolition and rehabilitation;
- Recycling the majority of the wind farm and substation components for scrap and materials, salvage and reuse with minimal disposal to landfill;
- Rehabilitation of the impacts of construction and decommissioning the wind farm and its components;
- Rehabilitation of the wind farm civil infrastructure components, including top soiling where necessary and seeding with local and indigenous vegetation;
- Maintaining the site in context of sediment and erosion control and weed management;
- Compliance with all laws applicable to the decommissioning, demolition or rehabilitation processes; and
- Monitoring of residual risks.

At Project retirement, the facility would be decommissioned with the various structures, plant, equipment and buildings de-energised, disconnected, dismantled, demolished and removed. The approach to decommissioning and rehabilitation of the sites detailed within **Appendix S** is based on current practices and general requirements for decommissioning and rehabilitation of industrial facilities including extent of recycling and clean-up requirements. The decommissioning and rehabilitation of the Project will be undertaken in accordance with the requirements and objectives of the Development Consent determined by the Minister for Planning and the requirements of the Landowner Agreements for the Project.

It is anticipated all major onsite decommissioning activities would be completed within a period of two years, with ongoing site monitoring and rehabilitation activities continuing for up to a further two years beyond this time.

The preliminary rehabilitation process is detailed in **Appendix S**. This will be refined at the time of decommissioning and rehabilitation.

At this stage, the BESS is not included in the Decommissioning and Rehabilitation Assessment as the operating life of a BESS unit will be much shorter than the wind farm, and a BESS system if installed at the Project would be decommissioned much earlier than the wind farm.

Should the BESS be installed the Decommissioning and Rehabilitation Assessment will be updated during its scheduled review to cover the decommissioning and disposal of the BESS units.

6.11.4 Mitigation Measures

In order to mitigate the potential impacts of poorly managed waste, a WMP will be prepared and will describe the measures to be implemented to manage, reuse, recycle and safely dispose of waste. Specific measures to be included in the WMP will include the following:

- Removal of packaging waste;
- Separation of recyclable and non-recyclable materials where possible;
- Separation of materials that meet Resource Recovery Orders for reuse at locations with appropriate planning approvals and managed under the relevant Resource Recovery Exemptions;
- Waste receptacles will be collected on a regular basis by licensed contractors or Council collection service and transported for offsite disposal at an appropriately licensed landfill or recycling facility;
- All waste disposal will be in accordance with the POEO Act and Waste Classification Guidelines (NSW EPA, 2014a);
- Waste tracking will occur for any types and quantities of waste that trigger the requirement for tracking;
- An objective of ensuring that any use of local waste management facilities does not exhaust available capacity, nor disadvantage the local community;
- Installation and operation of a septic system according to the Uralla Shire Council and/or Walcha Council regulations;
- All fuels, oils and hazardous substances used onsite will be stored in appropriately bunded locations to prevent release to the environment. Bulk storage areas for fuels, oils and chemicals used during construction will be contained within an impervious bund to retain any spills of more than 110% of the volume of the largest container in the bunded area. Any spillage will be immediately contained and absorbed with a suitable absorbent material. Storage will comply with *AS 1940- 2004 The Storage and Handling of Flammable and Combustible Liquids*; and
- In the event water is polluted by chemicals and/or firefighting materials (e.g. foams), the water will be collected, and disposed at an approved Liquid Waste Treatment Facility. A designated refuelling area should be established with drip trays installed and spill kits on stand-by. Should refuelling in the field be required, absorptive mats and drip trays are to be used in the refuelling process.

A preliminary Decommissioning and Rehabilitation Assessment has been prepared for the Project and will be updated in accordance with any project approval requirements.

Targeted management strategies have been identified for each waste type, as detailed in **Table 6-68**.

Table 6-68 Indicative Waste Generation and Management Strategies

Waste Type	Management Strategies
Green waste	Onsite reuse where possible or reused offsite in accordance with the Mulch Resource Recovery Order and Exemption (NSW EPA, 2016)
Spoil	Onsite reuse; or reused offsite as Virgin Excavated Natural Material or the Excavated Natural Material Resource Recovery Order and Exemption (NSW EPA, 2014b) (as applicable)
Concrete	Source separated and stored in separate receptacles / storage areas. Reused onsite where feasible; reused offsite in accordance with the Recovered Aggregate Resource Recovery Order and Exemption (NSW EPA, 2014c); or transported off site for recycling
Timber	Pallets will be reused where possible. Stored in separate receptacles / storage areas. Reused onsite where feasible or offsite transport for recycling. Unused pallets returned to source
Plastic packaging	Source separated and stored in separate receptacles / storage areas. Offsite transport for recycling
PET	Source separated and stored in separate receptacles / storage areas. Offsite transport for recycling
Cardboard packaging / paper waste	Source separated and stored in separate receptacles / storage areas. Offsite transport for recycling
Glass	Source separated and stored in separate receptacles / storage areas. Offsite transport for recycling
Empty chemical drums	Reused onsite, recycled via contractor or returned to supplier
Paint	Transported from site and disposed of in accordance with the Waste Classification Guidelines (NSW EPA, 2014a)
Oil spill clean-up material	Collected oily rags and spill clean-up material will be collected in regulated waste bins and transported by a licenced regulated waste contractor to a licenced regulated waste receiver for disposal
Waste oils, lubricants and liquids	Stored separately and transported by a licensed regulated waste contractor to a licenced regulated waste receiver for disposal
Metals (ferrous and non-ferrous)	Scrap metal will be stored in for periodic transportation offsite to applicable recycling facilities
Turbine blades	Some members of the community have expressed concerns regarding the disposal of turbine blades. No turbine blades will be disposed in the Walcha Waste Depot (refer **Appendix S**).
Electronics and electrical infrastructure	Stored in dedicated areas prior to offsite transport. As far as possible, all materials and components will be reused, sold as scrap, recycled or re-purposed to the maximum amount economically practicable. Where not practicable, transported from site and disposed of in accordance with the Waste Classification Guidelines (NSW EPA, 2014a)
Recyclable domestic waste	Stored in dedicated recyclable bins for periodic transportation offsite to applicable recycling facilities
PPE	Recyclable PPE will be stored in large industrial bins for periodic transportation offsite to applicable recycling facilities
Septic tank waste	Collected waste will be transported by a licenced regulated waste contractor to a licenced regulated waste receiver for disposal
Domestic wastes	Transported from site and disposed of in accordance with the Waste Classification Guidelines (NSW EPA, 2014a)

6.12 Social and Economic

6.12.1 Introduction

The NSW DPE's environmental assessment requirements for the Project include a requirement to assess social and economic impacts in accordance with the SIA Guideline (DPE, 2021a) and *Technical Supplement: Social Impact Assessment Guideline for State Significant Projects* ('Technical Supplement') (DPE, 2021b). This section discusses the potential social and economic impacts associated with the Project and summarises the mitigation and management measures designed to address impacts arising from the Project's planning, construction, and operation phases.

6.12.2 Authorship

The SIA Report was completed on 10 October 2022 by Dr Rene Provis, lead author, and contains all relevant information. The lead author holds a PhD in development anthropology from the University of New South Wales, and is a member of the International Association for Impact Assessment (IAIA) and the Australian Anthropological Society (AAS). The Report was completed in good faith in accordance with the relevant ethical frameworks, and to the lead author's knowledge does not contain any false or misleading information.

6.12.3 Methodology

The 'Guideline and Technical Supplement' (DPE 2021a, 2021b) aims to enhance the rigour applied to SIAs with a view to minimising impacts and enhancing benefits in line with good international industry practice. The assessment has been undertaken in accordance with the SIA Guidelines and the Project SEARs (outlined in Section 1.3.1 of **Appendix R**). **Figure 6-44** outlines the steps taken to complete the SIA, which are described in the following sections.

Figure 6-44 SIA Process

The phases adopted by the SIA are as follows:

- Scoping aimed to capture and characterise the likely social impacts to inform Project planning and ensuring level of assessment is proportionate to the scale and nature of the likely social impacts;
- The social baseline describes the social context in the absence of the Project. It documents the existing social environment, conditions and trends relevant to the impacts identified. The social baseline is the benchmark against which direct, indirect and cumulative impacts are predicted and analysed;
- The impact assessment undertaken in the SIA places people at the centre and considers the impacts from their perspective. The primary and secondary data collected and compiled for the social baseline, including community voices, is then assessed with the rigorous impact significance methodology, as outlined in the 'Technical Supplement' (2021b). In this approach, *impact significance* is understood as the *likelihood* of an impact occurring combined with the *magnitude* of impacts, both positive and negative, and prior to the application of any mitigation or management measures;

- Following the assessment of impacts, measures to avoid and/or minimise negative impacts are considered, including those implemented in earlier stages of Project planning and development. Where avoidance or minimisation is not possible, management strategies are identified. Where an impact is predicted to be positive, measures to enhance positive impacts are identified to ensure the maximum benefit to the community across all impact significance ratings; and
- The accuracy of the impact assessment, progress towards implementation of mitigation and management measures, and their effectiveness is understood through implementation of a monitoring and management framework. The framework includes a program for monitoring the predicted social impacts against actual impacts that arise as a result of the Project.

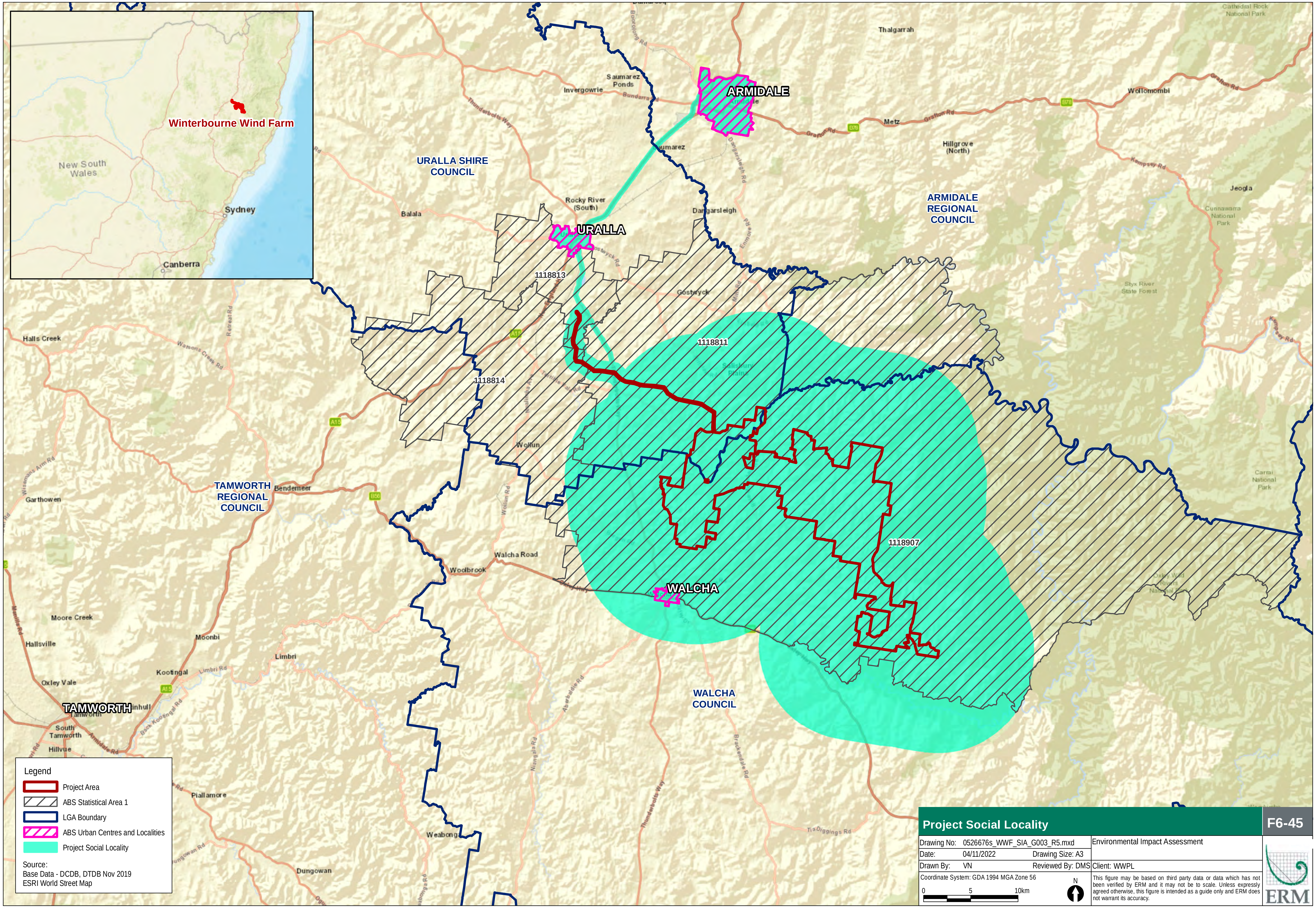
6.12.4 Existing Environment

6.12.4.1 Social Locality

The first step in a SIA is the scoping process, which helps to define the social area of influence, or Social Locality (**Figure 6-45**), as well as the potential interactions between the Project and people surrounding the Project who may experience impacts. For the purposes of the SIA, this includes individuals, households, groups, communities, businesses, and other types of organisations.

The Project's Social Locality is comprised of the Project Area, the area surrounding the Project Area wherein noise, visual and other amenity impacts may occur, the haulage routes where similar amenity impacts may be experienced, and the communities in larger centres that may provide workers or goods and services to the Project:

- The Project Area and immediate surrounding areas, located within the Walcha and Uralla LGAs. State level data for NSW and national level data for Australia are used to provide an understanding of the broader and comparative social context within which the Project sits;
- The transportation and haulage routes: It is anticipated that major turbine components will be delivered to the Port of Newcastle and transported to the Project Area via the New England Highway. This route will exit the New England Highway near Bendemeer onto the Oxley Highway (B56) to the west of Walcha, then follow Saleyard Road and Darjeeling Road bypassing central Walcha to Thunderbolts Way, and subsequently south to Jamieson Street and onto Ohio Road and Emu Creek Road to access the Project Area; and
- The nearby regional centres of Armidale and Tamworth, which may provide goods and services to support the construction phase of the Project. ABS Urban Centres and Localities (UCLs) provide baseline data for these regional centres.



Winterbourne Wind Farm
New South Wales
Sydney
Canberra
ARMIDALE
URALLA
WALCHA
TAMWORTH
URALLA SHIRE COUNCIL
ARMIDALE REGIONAL COUNCIL
TAMWORTH REGIONAL COUNCIL
WALCHA COUNCIL
1118813
1118811
1118814
1118907
Thalgarrah
Saumarez Ponds
Invergowrie
Metz
Wollomombi
Hillgrove (North)
Jeogla
Rocky River (South)
Dangarsleigh
Balala
Gostwyck
Salisbury Plains
Halls Creek
Garthowen
Bendemeer
Woolbrook
Walcha Road
Wollun
Moore Creek
Hallsville
Moonbi
Limbri
Kootingal
Oxley Vale
South Tamworth
Hillvue
Piallamore
Weabonga
Dungowan
Cathedral Rock National Park
Cunnawarra National Park
Styx River State Forest
Carrai National Park
Oxley Wild Rivers National Park
Legend
Project Area
ABS Statistical Area 1
LGA Boundary
ABS Urban Centres and Localities
Project Social Locality
Source:
Base Data - DCDB, DTDB Nov 2019
ESRI World Street Map
Project Social Locality
F6-45
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Date: 04/11/2022
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Client: WWPL
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6.12.4.2 Social Baseline

Land Use Context

The Project Area's immediate surroundings comprise sparsely populated rural farm properties. The Project Area contains little to no social infrastructure and commerce with the closest such services available at Walcha, approximately 20 km away from the approximate centre of the Project Area.

The main employment industry (41.1%) within the locality is primary production comprised of agriculture and forestry. The locality is also suited to grazing operations where wool and prime lamb production together with cattle breeding and fattening are the main activities. The Project Area is generally used for grazing operations. The locality is further known as a producer of high-quality native hardwoods and softwood production is increasing (Walcha Council, 2019). The Project Area and ancillary infrastructure including the transmission line are spread over rural properties zoned RU1: Primary Production under the Walcha LEP and Uralla LEP. Much of the eastern boundary of the Project Area is adjacent to the Oxley Wild Rivers National Park, zoned C1: National Parks and Nature Reserves.

Population Demographics

The Social Locality is generally characterised by aging populations in the town centres and above average aged populations in the ABS SA1 areas within which the Project is located. Section 5.2 of the SIA (refer **Appendix R**) further summarises the primary ABS datasets used to provide key demographic data across the Project's Social Locality, drawing on select ABS datasets.

Housing and Accommodation

Rental affordability and availability are the most likely features of the housing market to respond to change in population prompted by large projects and is a key component for economic vitality of communities and the wellbeing of individuals (Lawrie et al., 2011). Generally, housing stress can occur when rent exceeds 30% of a low-income household gross income. A review of rental properties within the SA1s of the Project Area identifies that a large proportion (89% and above) of the population who pay rent are paying less than 30% of household income for that rent. Additionally, SGS in partnership with National Shelter, Beyond Bank, and Brotherhood of St Laurence have published the Rental Affordability Index since 2015 (SGS, 2021b).

The findings identify that in Quarter 2, 2021 Walcha was considered 'Very Affordable' (despite low vacancy rates described below), Uralla and Armidale were considered 'Affordable', while the Tamworth region ranges from 'Acceptable' to 'Affordable' (SGS, 2021a). Overall, housing vacancy for Walcha and Uralla is low (between 0.66% and 0.06%) in comparison to New England and North West Region (between 2.4% and 3.9%) (REINSW, 2021).

Short-term tourist accommodation such as hotels/motels/cabins and caravan parks are important in regional areas to provide accommodation for visitors and to support regional tourism and economic activity. The LGA's of the Social Locality are included in the New England North West tourism region which had an occupancy rate of 55.1% in 2018/19.

Economic Profile

The key occupations in the Walcha LGA (defined by the ABS statistical area 17850 (LGA)) were Managers (34.6%), Labourers (14.9%), Professionals (11.0%), Technicians and Trades Workers (10.4%), and Clerical and Administrative Workers (9.1%). Of the employed people in Walcha LGA, 20.7% worked in Beef Cattle Farming (Specialised). Other major industries of employment included Sheep-Beef Cattle Farming (7.4%), Sheep Farming (Specialised) (6.0%), Local Government Administration (3.5%) and Supermarket and Grocery Stores (3.2%).

The key occupations in the Uralla LGA (defined by the ABS statistical area 17650 (LGA)) were Managers (19.0%), Professionals (16.1%), Technicians and Trades Workers (14.2%), Labourers (14.0%), and Clerical and Administrative Workers (12.5%). Of the employed people in Uralla LGA, 5.4% worked in Beef Cattle Farming (Specialised). Other major industries of employment included Higher Education (5.0%), Sheep-Beef Cattle Farming (4.5%), Local Government Administration (3.9%) and Sheep Farming (Specialised) (2.9%).

Access and Connectivity

Walcha is located at a natural crossroad between the New England Tableland areas and the coast, connecting the regional centres of Tamworth and Armidale with Port Macquarie and the Pacific Highway via the Oxley Highway. This route makes Walcha a popular stop for tourists, transport workers and other travellers bringing economic activity into the town. According to information obtained during stakeholder interviews, Walcha has faced a significant challenge since the floods of early 2021 which caused the closure of the Oxley Highway. This has likely had a greater local negative impact than Covid-19 on limiting traffic through the town and local economic activity.

Walcha is serviced by Tamworth and Armidale regional airports for aviation services. In addition, Walcha is also serviced by the Walcha Road Train Station, located around 20 km west of the town, and the NSW Trainlink coach services connect Walcha to Tamworth and Port Macquarie.

The Walcha Council Community Care Transport Service provides additional coach services to Armidale and Tamworth, while the Walcha Access Bus provides wheelchair accessible public transportation within Walcha. A taxi service is also available.

Social Infrastructure and Community Wellbeing

Social infrastructure comprises schools and other education institutions, medical services, emergency services, recreational facilities and community organisations. Some commercial services are also listed under social infrastructure, such as childcare facilities.

There is no social infrastructure located in the immediate vicinity of the Project Area. The nearest town is Walcha (population: 3,092) which is located 6.5 km south-west from the Project Area. Walcha has a multipurpose hospital opened Monday-Friday from 11.00 am to 8.00 pm, as well as general practice clinic. The town hosts public and private primary schools and a preschool, as well as other social infrastructure such as an Australia Post office, Rural Fire Service, churches and a museum. Walcha also has a range of retail businesses, grocery stores, service stations, accommodation and a veterinary agricultural supplies business.

Uralla (population: 6,048) is a region centre located approximately 25 km north west of the Project Area. Services in Uralla include the Uralla Medical Centre and Uralla Clinic which both offer general practice, and both opened for five days a week. Uralla also has a pharmacy and a range of emergency services such as Police, Ambulance and Rural Fire Services. The town hosts three primary schools (a mix of public and private), a preschool and a childcare centre. Uralla also has a range of social infrastructure such as a recycling centre, veterinary clinic, post office, churches, McCrossins Mill Museum, a golf course, grocery stores, service stations and a motel.

Armidale and Tamworth as larger regional centres have a strong presence of social services and a wide variety of community organisations and recreational facilities that service the wider area.

Community Values

The Walcha LSPS (Walcha Council, 2019) describes the strong sense of community pride that exists among residents. A significant proportion of the LGA, approximately 32%, comprises national parks, wilderness and state forests, including the Macleay Gorges, Werrikimbe National Park, and the Oxley Wild Rivers National Park. Outdoor pursuits including camping and fishing are popular for locals and tourists, while the installation of an open air art gallery featuring numerous sculptures has become a popular tourist attraction.

During stakeholder interviews conducted for the SIA a variety of locals' perspectives on community values were obtained. Many respondents commented on the older and conservative but close-knit nature of the local community, as is commonly expressed in rural and regional communities in NSW and elsewhere in Australia. This was described as manifesting in everyone 'pitching in' to help others in need, even strangers. Several respondents also described the region as featuring widespread concerns around the impacts of climate change and pride that via the renewable energy projects in the region they can make some small contributions to mitigating it.

6.12.5 Assessment of Impacts

The key drivers of social change that may affect communities in the Social Locality resulting from the Project relate to:

- Procurement opportunities for local businesses and employment opportunities for the local workforce;
- Opportunities for diversification of income streams for host landowners and additional financial benefits for Project neighbours through the Neighbour Benefit Program and the wider community through the Public Benefit Fund;
- Disruptions due to construction related activities (noise, dust, transportation of materials and workers, etc.);
- Accommodation arrangements for construction workforce; and
- Amenity (e.g. noise, visual) and other land use and landscape changes due to altered landscapes.

Technology to support renewable energy projects is continuously evolving and improving. Accordingly, following the 30-year operational timeframe, components of the wind farm may be upgraded to prolong the life of operation, or decommissioned and the land returned to the original land use. For the purposes of this SIA, therefore, the decommissioning phase has not been assessed. The potential social impacts associated with the decommissioning of the Project will be considered as part of a future Decommissioning Plan (or similar).

In assessing the potential impacts, ERM has considered the:

- Characteristics of the Project, including the timing, duration and intensity of activities (where known);
- Issues raised by stakeholders during the engagement process; and
- Outcomes from technical studies undertaken by the Proponent (noise, visual, cultural heritage, etc.).

The impacts have been assessed based on the likelihood of the impact occurring, the magnitude of the impact (degree of change caused by the impact) if it occurs, and the vulnerability of the impacted receiver.

Table 6-69 provides an overview of predicted impacts likely to be experienced by different stakeholder groups.

Table 6-69 Impact Issues

Impact Issue	Host Landowners	Project Neighbours	Wider Community	Local Workforce	Local Businesses	Regional Visitors	Traditional Owners	Emergency Services
Stakeholder and Community								
Adequacy and transparency of stakeholder engagement		✓	✓					
Establishment of the Public Benefit Fund			✓	✓	✓			✓
Community wellbeing enhanced by perceived environmental benefits of renewable energy development	✓	✓	✓			✓	✓	
Impacts to community cohesion through divided opinions about the desirability of the Project in the community	✓	✓	✓					
Employment and Procurement								
Increased employment opportunities			✓	✓				
Increased business opportunities			✓		✓			
Diversification of income streams for rural businesses (host landowners)	✓							
Establishment of the Neighbour Benefit Program		✓						
Local Disruptions								
Disruptions to farming practices	✓	✓						
Road safety impacts	✓	✓	✓	✓		✓		
Interruptions to daily life	✓	✓	✓					
Construction amenity impacts	✓	✓						
Accommodation and Worker Influx								
Increased demand for accommodation					✓	✓		
Increased demand for local services			✓					
Antisocial behaviour of non-local workforce			✓					
Land Use and Landscape								
Impacts on land use and values	✓	✓						
Perceived health impacts	✓	✓						
Visual amenity impacts	✓	✓	✓			✓		
Improved vehicular access for fire-fighting in the vicinity of Project	✓	✓						✓
Impacts to tangible and intangible Aboriginal heritage							✓	
Cumulative impacts associated with an additional project in the New England REZ	✓	✓	✓	✓	✓	✓	✓	✓

6.12.6 Mitigation Measures

The preliminary Social Impact Management Plan (SIMP) contained in Section 7 of the SIA (refer **Appendix R**) provides a summary of the management and mitigation measures relevant to the identified Project impacts across all phases of the Project lifecycle. Management and mitigation measures may include:

- Development of a Procurement Policy to maximise local employment, and regional business opportunities;
- Development of hiring preferences with priority given to applicants from within the Walcha Region who have suitable skills to undertake the jobs required for the Project;
- Collaboration with local trade/training organisations (such as TAFE) to promote job and apprenticeship opportunities with the Project well ahead of construction to give local people enough notice to get training in Project related skill sets, if desired;
- Regular engagement with key stakeholders such as business chambers and regional businesses to inform them of goods and services required for the Project and outlining requirements for businesses to secure contracts;
- Implementation of the TMP informed by the traffic impact assessment in the EIS;
- Implementation of the Construction Environmental Management Plan (CEMP) informed by the EIS to manage construction environmental impacts, consistent with component studies included in the EIS;
- Implementation of a Workforce Accommodation Strategy that manages impacts to local short and long-term accommodation arrangements in surrounding towns;
- Engagement with local health care, social and emergency service providers to monitor the Project's use (if any) of these facilities;
- Establishing and implementing the Neighbour Benefit Program and Public Benefit Fund; and
- Continuing engagement with emergency services for access requirements for bushfire fighting.

6.13 World Heritage

An assessment of potential impacts on the portion of the Gondwana Rainforests of Australia World Heritage Area that is contained within Oxley Wild Rivers National Park is provided in **Appendix T**. The Project Area is on rural land to the west of the Oxley Wild Rivers National Park. Part of the National Park is a component part of the Gondwana Rainforests of Australia, which is on the World Heritage List established under the World Heritage Convention. The World Heritage property is protected under the EPBC Act. The Project is outside both the National Park and World Heritage Area. The closest proposed turbine is approximately 1.2 km to the north of the World Heritage boundary in the southern part of the Project Area.

Potential Impacts to the portion of the Gondawana Rainforests of Australia World Heritage Area that is within the Oxley Wild Rivers National Park were primarily assessed in based on the:

- BDAR (NGH 2022; **Appendix G**); and
- LVIA (Moir Landscape Architecture 2022; **Appendix I**).

Broadly, two categories of potential impact were considered which relate to geomorphology, ecological and biological processes, and biodiversity:

- Actions arising from the project area but which have the potential to impact on World Heritage values and attributes inside the World Heritage area (e.g. bushfires), or the appreciation of these values (e.g. through visual impacts); and
- Actions arising from the project area which have the potential to impact on World Heritage values and attributes which extend outside the World Heritage area (e.g. wildlife which are part of the World Heritage biodiversity and whose home range may extend into the project area, or which may disperse or traverse across the project area). (adapted from NGH Pty Ltd 2022, Section 7.5.3).

With respect to the potential impacts to biodiversity values within the World Heritage area, the BDAR concludes that significant impacts within the are unlikely. Potential impacts within the World Heritage area relate primarily to pollution, and spear of weeds and pest species. These will be managed within the Project Area boundary to ensure that they have minimal effect on World Heritage values. In the case of bushfire, there may be a net positive benefit to the World Heritage Area through improved access and facilities for fire-fighting.

Potential impacts relating to biodiversity values outside of, but that may have an impact on the World Heritage area were also considered unlikely to be significant. Such potential impacts may include habitat loss for species relevant to the World Heritage values, and the potential for mortality (due to turbine strike) of aerial species that may use the World Heritage area. Proposed mitigation and management measures (Section 6.1) will address such impacts.

With respect to potential landscape and visual impacts on the World Heritage area, the LVIA concluded that from the main publicly accessible locations within the Gondwana Rainforest area - the Green Gully Track and 'Rocks' Lookout - the WTGs are located more than 20 km from accessible viewpoints. The majority of these trails generally feature dense vegetation with limited views of the surrounding regional landscape. The LVIA determined that due to a combination of distance and existing vegetation visitors to these areas of the World Heritage area would be unlikely to be able to view the Project.

It is noted that there will be minor views of a few turbine blades from the Apsley Gorge Bridge, and it may be possible to sight the Project at the edge of the World Heritage area; however, this area is not publicly accessible.

Based on these studies, it is concluded that the Project is unlikely to result in significant impacts on the World Heritage area. Any potential impacts will be minimised through the implementation of management and mitigation measures (**Appendix E**).

6.14 Cumulative Impacts

6.14.1 Introduction

The *Cumulative Impact Assessment Guidelines for State Significant Projects* (CIA Guidelines) (DPIE, 2021d) requires the consideration of impacts from a proposed project in combination with other past, present and reasonably foreseeable future projects.

The CIA Guidelines state that the assessment should focus on the key matters that are within the immediate geographical area of influence of the project (i.e. within proximity to the project site) and within the relevant strategic context.

This section draws on the relevant aspect-specific assessments undertaken as part of the preparation of this EIS, which have identified and addressed potential cumulative impacts related to that aspect.

The CIA Guidelines state that the CIA is to focus on the key matters that could be materially affected by the cumulative impacts of the Project and other relevant future projects. As such, an assessment of the potential cumulative impacts to aspects including cultural heritage, shadow flicker and blade glint, soil and water, and EMI has not been undertaken as it is considered that these potential impacts are primarily confined to the Project Area and are negligible in a broader context.

6.14.2 Existing Environment

There are in excess of 30 renewable energy developments within or in the vicinity of the New England REZ (extending up to 160 km from the Project Area). Roughly half of these are operational, under construction, or approved. The remainder are in various stages of the EP&A Act assessment process.

In accordance with the CIA Guidelines, the Project has considered relevant future projects, and only included the types of development specified in Section 3.4 of the CIA Guidelines. Given the distance between the projects, discussion of impacts associated with the operation phase were limited as it was considered that the majority of potential cumulative impacts were associated with the construction phase, and relate primarily to transport and traffic, and social and economic impacts.

Table 6-70 and **Figure 6-46** presents the future developments in proximity to the Project. The majority of these are renewable energy developments. Table 6-69 states which of these were considered relevant future developments.

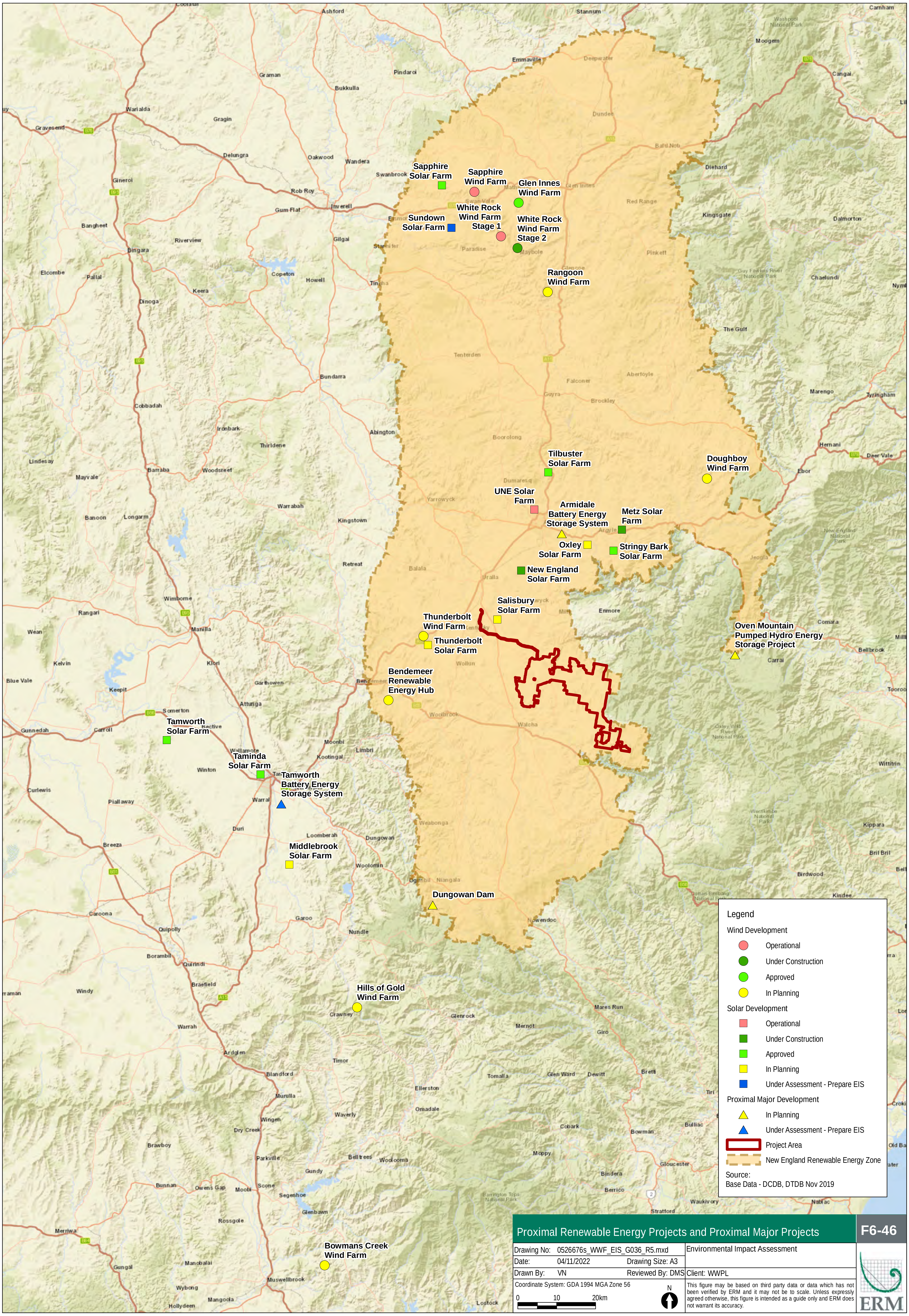
Table 6-70 Developments in Proximity to the Project

Project	Description / Status	Approx. distance (km) from the Project	Relevant Future Development	Potential Cumulative Impacts
Wind Energy Developments				
Thunderbolt Wind Farm (Tamworth Regional & Uralla Shire LGAs)	■ Nominal generating capacity 192 MW ■ Up to 32 WTGs ■ Battery energy storage and ancillary infrastructure. ■ In Panning (Response to Submissions).	26	Yes	Traffic & Transport Social & Economic
Doughboy Wind Farm (Armidale Regional LGA)	■ Nominal generating capacity 312 MW ■ Up to 52 WTGs ■ Battery energy storage and ancillary infrastructure ■ In Planning (Prepare EIS).	55	Yes	Traffic & Transport Social & Economic
Hills of Gold Wind Farm (Tamworth Regional, Liverpool Plains Shire, Upper Hunter Shire LGAs)	■ Nominal generating capacity 390 MW ■ Up to 65 WTGs ■ Battery energy storage and ancillary infrastructure ■ In Planning (Assessment)	88	Yes	Traffic & Transport Social & Economic
Rangoon Wind Farm (Glen Innes Severn Shire & Armidale Regional LGAs)	■ Nominal generating capacity 130 MW ■ Up to 25 WTGs ■ Battery energy storage and ancillary infrastructure ■ In Planning (Prepare EIS)	92	No	N/A
White Rock Wind Farm Stage 2 (Glen Innes Severn Shire & Inverell Shire LGAs)	■ Increase in generating capacity by up to 216 MW ■ Up to 48 additional turbines ■ Under construction	104	No	N/A
White Rock Wind Farm Stage 1 (Glen Innes Severn Shire & Inverell Shire LGAs)	■ Nominal generating capacity 175 MW ■ Up to 70 WTGs ■ Operational.	107	No	N/A
Glen Innes Wind Farm (Glen Innes Severn Shire LGA)	■ Nominal generating capacity 162 MW ■ Up to 27 WTG ■ Ancillary infrastructure ■ Approved.	115	No	N/A

Project	Description / Status	Approx. distance (km) from the Project	Relevant Future Development	Potential Cumulative Impacts
Sapphire Wind Farm (Glen Innes Severn Shire & Inverell Shire LGAs)	■ Nominal generating capacity 270 MW ■ Up to 75 WTGs ■ Operating.	119	No	N/A
Bowmans Creek Wind Farm (Muswellbrook Shire, Singleton Shire, Upper Hunter Shire LGAs)	■ Nominal generating capacity 360 MW ■ Up to 60 WTGs ■ Ancillary infrastructure ■ In Planning (Assessment).	150	No	N/A
Solar Energy Developments				
Salisbury Solar Farm (Uralla Shire LGA)	■ Approx. 600 MW solar farm ■ Battery energy storage and ancillary infrastructure ■ In Planning (Prepare EIS).	13	Yes	Traffic & Transport Social & Economic
New England Solar Farm (Uralla Shire LGA)	■ Approx. 720 MW solar farm ■ Battery energy storage and ancillary infrastructure ■ Under construction.	22	Yes	Traffic & Transport Social & Economic
Thunderbolt Solar Farm (Uralla Shire LGA)	■ Approx. 120 MW solar farm ■ Battery energy storage and ancillary infrastructure ■ In Planning (Prepare EIS).	24	Yes	Traffic & Transport Social & Economic
Oxley Solar Farm (Armidale Regional LGA)	■ Approx. 225 MW solar farm ■ Battery energy storage and ancillary infrastructure ■ In Planning (Response to Submissions).	28	Yes	Traffic & Transport Social & Economic
Bendemeer Solar Farm (Tamworth Regional LGA)	■ Approx. 210 MW solar farm ■ Battery energy storage and ancillary infrastructure ■ In Planning (Prepare EIS).	33	Yes	Traffic & Transport Social & Economic
Metz Solar Farm (Armidale Regional LGA)	■ Approx. 100 MW solar farm ■ Ancillary infrastructure ■ Under construction.	35	Yes	Traffic & Transport Social & Economic

Project	Description / Status	Approx. distance (km) from the Project	Relevant Future Development	Potential Cumulative Impacts
Tilbuster Solar Farm (Armidale Regional LGA)	■ Approx. 150 MW solar farm ■ Battery energy storage and ancillary infrastructure ■ Approved.	45	Yes	Traffic & Transport Social & Economic
Middlebrook Solar Farm (Tamworth Regional LGA)	■ Approx. 500 MW solar farm ■ Battery energy storage and ancillary infrastructure ■ In Planning (Prepare EIS).	73	No	N/A
Sundown Solar Farm (Inverell Shire LGA)	■ Approx. 600 MW solar farm ■ Battery energy storage and ancillary infrastructure ■ In Planning (Prepare EIS).	112	No	N/A
Sapphire Solar Farm (Inverell Shire LGA)	■ Approx. 180 MW solar farm ■ Ancillary infrastructure ■ Approved.	123	No	N/A
Other Development				
Armidale BESS (Armidale Regional LGA)	■ 150 MW BESS ■ Ancillary infrastructure ■ In Planning (prepare EIS)	30	Yes	Social & Economic
Oven Mountain Pumped Hydro Energy Storage Project (Armidale Regional LGA)	■ 600 MW pumped hydro energy storage and generation ■ Ancillary infrastructure ■ In Planning (Prepare EIS)	33	Yes	Social & Economic
Dungowan Dam (Tamworth Regional LGA)	■ New Approx. 22.5 gigalitres capacity dam ■ 33 km pipeline and ancillary infrastructure ■ In Planning (Prepare EIS).	56	No	N/A
Tamworth BESS (Tamworth Regional LGA)	■ 200 MW BESS ■ Ancillary infrastructure ■ In Planning (Prepare EIS)	67	No	N/A

[1] *Project status as of 25 May 2022 based on DPE's Major Projects website.*



Proximal Renewable Energy Projects and Proximal Major Projects

F6-46

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Date:	04/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: DMS	Client: WWPL

Coordinate System: GDA 1994 MGA Zone 56

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6.14.3 Strategic Planning Framework

Section 2 of this EIS discusses the strategic context of this Project with reference to relevant strategic planning publications. In consideration of the Project and relevant future developments, most of those detailed in **Table 6-70** align with the relevant objectives of the:

- United Nations Sustainable Development Goals;
- Federal Government's Renewable Energy target;
- *Climate Change Bill 2022*; and
- NSW Government Commitments.

The majority of relevant future developments identified are renewable energy developments that will provide affordable, reliable, sustainable modern energy. These developments will assist Australia and NSW in meeting their respective emissions reduction targets. They will also assist NSW in the development of affordable, reliable and sustainable renewable energy generation, transmission and storage. The New England REZ will connect multiple generators and storage in the same area, to capitalise on economies of scale to deliver cheap, reliable and clean electricity for homes and businesses in NSW.

The Project, as well as the relevant future developments have or are all progressing assessments required under their relevant planning approvals pathways, which will minimise impacts on the environment and their respective social localities. For example, most of the wind and solar farms would have had to undertake a visual impact assessment, and implement either design modifications or management measures to avoid or minimise impacts. This process assists in preserving the rural landscape, which is a key objective of relevant local strategic planning statements and community strategic plans.

More broadly these projects will provide social and economic benefits to the region. They will encourage economic development within the region, by supporting both employment and economic growth. While all projects would endeavour to hire locally, it is inevitable that skilled labour from outside of the region would be also required; however, this will also benefit local business and the community through an increased in demand for local services, and diversification of communities.

6.14.4 Cumulative Impact Summary

Potential cumulative impacts associated with the Project have been addressed in relevant technical assessments and the relevant findings summarised in this EIS. A summary of the potential cumulative impact of key environmental aspects is provided in the below sections.

6.14.4.1 Biodiversity Impacts

Cumulative impacts on biodiversity associated with wind farm developments are commonly associated with the increased risk of avifauna strikes and the alteration of flight paths for migratory species as more wind turbine generators are constructed across the landscape, as well as clearing of native vegetation associated with the project construction. An assessment of potential cumulative biodiversity impacts associated with the Project with respect to relevant future developments (**Table 6-70**) was undertaken.

Of the relevant future developments in Table 6-69, Thunderbolt Wind Farm, Thunderbolt Solar Farm, Salisbury Solar Farm, New England Solar Farm, and Bendemeer Solar Farm were considered relevant with respect to potential cumulative biodiversity impacts. These future developments are within 35 km of the Project.

Relevant impacts to biodiversity values of these developments are presented in **Table 6-71**.

Table 6-71 Cumulative Biodiversity Impact Assessment

Project	Impacts Relevant to the Project
Thunderbolt Wind Farm	■ Up to 7 ha White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland ■ Up to 69 ha of Bluegrass ■ Up to 80 ha of potential foraging and breeding habitat for the koala ■ Up to 215 ha of potential habitat for the spotted-tai quoll ■ Up to 215 ha of potential habitat for the white-throated needletail.
Thunderbolt Solar Farm[1]	■ 80 ha of White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland within Project Area ■ New England Peppermint (Eucalyptus nova-anglica) Grassy Woodlands within the Project Area.
Salisbury Solar Farm	■ New England Peppermint (Eucalyptus nova-anglica) Grassy Woodlands within the Project Area
New England Solar Farm	■ Up to 15.26 ha of White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland.
Bendemeer Solar Farm	■ White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland within project Area.

The impacts for other future developments presented in **Table 6-71** demonstrate commonality with species or habitat that may be potentially impacted by the Project.

6.14.4.2 Noise Impacts

All relevant future developments are more than 20 km from the Project Area. The Noise Impact Assessment determined that potential impacts relating to noise generation would be restricted to within 3 km from the Project Area. As such, no cumulative noise impacts are expected.

6.14.4.3 Landscape and Visual Impacts

Cumulative landscape and visual effects result from additional changes to the landscape or visual amenity caused by the proposed development in conjunction with other developments (associated with or separate to it) or actions that occurred in the past, present or are likely to occur in the foreseeable future. Cumulative visual effects may also affect the way a landscape is experienced and can be positive or negative. Where they comprise benefits, they may be considered to form part of the mitigation measures.

The nearest constructed and operating wind farm to the Project is the White Rock Wind Farm, which is located in excess of 115 km northeast from the Project Area. The nearest approved wind farm to the Project is the Liverpool Range Wind Farm which is located over 150 km south east of the Project. The nearest proposed wind farm currently under assessment by DPE is the Thunderbolt Wind Farm which is located approximately 26 km to the north west of the Project. It is noted that one other wind farm has been proposed in the vicinity of Walcha (Ruby Hills Wind Farm) but no information about the layout of this project was publicly available at the time of this assessment.

Due to distance there are no opportunities to view any additional wind farms simultaneously from a static viewpoint in the foreseeable future.

The potential cumulative visual impact must also be assessed in relation to the potential visual impact when viewed sequentially. If a number of wind farms are viewed in succession as a traveller moves through the landscape (e.g. motorist travel routes or walking tracks) this may result in a change in the overall perception of the landscape character. The viewer may only see one wind farm at a time, but if each successive stretch of the road is dominated by views of a wind farm, then that can be argued to be a cumulative visual impact (EPHC, 2010).

Due to the relatively isolated location, the Project is set back from major travel routes which prevents any opportunities to view wind farms in succession along travel routes.

6.14.4.4 Agricultural Production and Land Use Impacts

Impacts of the Project on agricultural production and land use were assessed in Section 6.1, Section 6.3, Section 6.8 and Section 6.12. The Project and all relevant future developments are proposed in land that is appropriately zoned for the respective development. The Project and other proposed energy development can coexist with existing agricultural practices, and in fact may augment these through the provision of host-landowner economic benefits.

Regarding high quality agricultural land, the NSW Government has identified approximately 2.8 million hectares of BSAL across the state, including over 1.74 million ha within the New England North West Region and Upper Hunter regions, which include the Walcha and Uralla LGAs. BSAL is defined as land with high quality soil and water resources capable of sustaining high levels of productivity, and plays a critical role sustaining the State’s $12 billion agricultural industry.

As discussed in Section 6.8.3, approximately 327.7 ha of the Project Area is mapped within a broad, regional area of BSAL, of which the Development Footprint encompasses approximately 22.5 ha. A site verification process has been developed under the Resources and Energy SEPP, to determine the existence of BSAL at the site of a potential development.

Many of the relevant future developments included in this CIA either did not assess BSAL as their primary assessments were undertaken prior to BSAL being introduced, or they provide no information on impacts to BSAL as they are still in the assessment phase. Of those that do state potential impacts to BSAL, these impacts are typically in the 10’s of ha.

Solar farms typically present a greater potential impact to BSAL because solar farms require relatively flat land, which in many regions is land that is highly suitable for agriculture. For example, the New England Solar Farm EIS states that up to 670 ha of BSAL may be impacted. However, Oxley Solar Farm EIS states that no BLSA will be impacted.

With the number of relevant future developments within vicinity to the Project, cumulative impacts to BSAL may occur. However, given context, this impact is anticipated to be negligible. Agricultural production and grazing can coexist with both wind and solar farms, particularly with management to avoid or minimise potential indirect impacts to soil and water resources. It is important also to note that the BSAL scheme was primarily aimed at delivering greater protection to agricultural land from the impacts of mining and coal seam gas activity. Considering potential impacts to BSAL from the relevant future developments with respect to the total area of BSAL across the state, even if impacts were materialised, these would represent less than 0.05% of the total mapped BSAL area in NSW.

Once the Project and other relevant future developments reach the end of their operational life, the infrastructure would be decommissioned and the development footprint returned, as far as practicable, to its pre-existing land use.

Any cumulative impact to agricultural production and land use would be managed and mitigated by:

- Site selection and refinement processes which has reduced the total area of BSAL to be impacted by the Development Footprint;
- Not preventing ongoing use of the land for other purposes, such as ongoing grazing activities during operation of the wind farm;
- Rehabilitating the development footprint – the development footprint can be returned to agricultural land use at the completion of the Project’s operations; and
- Implementation of land management practises to avoid or minimise potential impacts to neighbouring agricultural operations. Management measures have been identified in the Soils and Water Assessment (refer **Appendix P**).

6.14.4.5 Traffic and Transport Impacts

The primary traffic impact of the Project is generated during construction which is anticipated to start in mid-late 2023 and be completed by late 2025. The TIA (refer **Appendix J**) demonstrates that the road network will continue to operate with ample spare capacity even during the peak construction period of the Project. An assessment of the cumulative impacts of major projects that are proposed in the surrounding area is provided below, which provides a description of each project to determine the potential overlap of construction traffic:

- Salisbury Solar Farm: The construction period for both projects may partially overlap which is when the projects will generate the peak traffic on the road network. Staff for both projects are anticipated to be located in similar locations given the sites proximity to each other. Therefore, the state road network in the vicinity of Armidale, Uralla, Walcha and Tamworth will be utilised by both projects. During operation the projects are both expected to generate a minimal level of traffic;
- Thunderbolt Wind and Solar Farm: The construction periods for the projects could potentially overlap. Both projects are anticipated to have staff located in Armidale, Uralla, and Tamworth and will utilise the same transport route to deliver plant from the Port of Newcastle;
- Oxley Solar Farm: There is potential for construction of both projects to overlap. Construction traffic generated by the projects may interact within the township of Armidale where staff for both projects are proposed to be located. During operation the projects are both expected to generate a minimal level of traffic;
- Tilbuster Solar Farm: There is potential for construction of both projects to overlap. The traffic generated by the projects may interact within the township of Armidale where staff for both projects are proposed to be located;
- New England Solar Farm: There is potential for construction of both projects to overlap, although it is noted that this project is currently under construction so overlap is considered unlikely. The traffic generated by the projects may interact within the township of Uralla and Armidale where staff for both projects are proposed to be located;
- Middlebrook Solar Farm: There is potential for construction of both projects to overlap. The traffic generated by the projects may interact within the township of Tamworth where staff for both projects are proposed to be located. Upgrades are proposed to the intersection of Middlebrook Road / New England Highway to allow vehicle to turn safely from the state road;
- Tamworth Solar Farm: There is potential for construction of both projects to overlap. The traffic generated by the projects may interact within the township of Tamworth where staff for both projects are proposed to be located;
- Hills of Gold Wind Farm: The construction periods for the projects could potentially overlap. Both projects are anticipated to have staff located in Tamworth and will utilise the same transport route to deliver plant for the Port of Newcastle;
- Bowmans Creek Wind Farm: The transport route for heavy plant from the Port of Newcastle will be used for both projects and there is potential for the construction periods to overlap;
- Doughboy Wind Farm: The construction periods for the projects could potentially overlap. Both projects are anticipated to have staff located in Armidale and will utilise the same transport route to deliver plant from the Port of Newcastle; and
- Rangoon Wind Farm: The construction periods for the projects could potentially overlap. Both projects are anticipated to have staff located in Armidale and will utilise the same transport route to deliver plant from the Port of Newcastle.

The TIA reviews whether the cumulative additional traffic of the other projects, particularly from staff vehicles during peak periods, resulted in increased congestion on the road network that would result in the unacceptable delays or queue lengths, and whether there was potential conflict for OSOM vehicles. Based on the assessment, the surrounding major projects have the potential to generate a number of staff vehicle movements during peak construction. In particular, a number of staff will be located in Tamworth, Uralla, and Armidale. Key projects that are expected to generate traffic on the surrounding road network include the Salisbury and New England Solar Farms and the Thunderbolt Energy Hub and Wind Farm.

6.14.4.6 Aviation Impacts

The AIA identifies the Project is located within 30 nm (55.56 km) of Armidale Airport (YARM). The Thunderbolt Wind Farm is located within 30 nm of Armidale Airport; however, was not predicted to impact on the operation of any certified airports (Umwelt, 2022). The Doughboy Farm is also located within 30 nm of Armidale Airport and further assessment of aviation impacts will be undertaken as part of the development application for this project.

The Aviation Impact Assessment assessed the density of WTGs in the surrounding area and how this may potentially impact on low flying aircraft and other aviation related activities and services. As detailed in the AIA, the Project will maintain an acceptable level of safety to aircraft.

6.14.4.7 Socio-Economic Impacts

Wind farms can provide a significant economic boost to local communities, both during the construction and operational phases. The economic benefits provide flow-on social benefits, particularly in the provision of a range of employment opportunities for the region, upgrades to local infrastructure and increasing value to agricultural land.

At a broader social level, the development of additional wind farms reduces the community’s reliance on energy derived from fossil fuels and supports the community’s growing desire for renewable energy sources and a reduction in greenhouse emissions.

The Project is expected to have a positive socio-economic benefit by facilitating the economic growth of the region that is occurring through the development of the wind industry, while at the same time contributing to local, State, National and international objectives to reduce greenhouse emissions. The socio-economic impacts of the Project are discussed in **Section 6.12**.

In relation to workforce and accommodation requirements of the Project, the potential cumulative impacts associated with the Project will be manageable through the Proponent’s commitment to the development and implementation of a Workforce Accommodation Strategy. This strategy will be developed prior to the commencement to reflect and respond to actual regional demand conditions at that time, especially in relation to concurrent projects which will be serviced out of Tamworth and Armidale.

6.14.5 Mitigation Measures

Mitigation measures specific for each of the aspects above that were included in the individual aspects assessments, will also minimise cumulative impacts. No specific mitigation measures to minimise cumulative impacts were identified.

7. JUSTIFICATION OF THE PROJECT

7.1 Environmental, Social and Economic Impacts

Australia and the world are in the process of transitioning from traditional fossil fuel generation. Wind energy is a clean and inexhaustible resource that generates zero pollution or carbon emissions during operation (U.S. Energy Information Administration, 2021). Wind energy is now cheaper than new generation from coal and natural gas, and together with solar and other renewable energy projects, wind energy is helping to drive down the cost of wholesale electricity (CSIRO, 2021).

Compared to traditional energy sources such as coal and gas, wind farms:

- Require no invasive mining, extraction or burning of fossil fuels during operations;
- Emit no greenhouse gas during operations;
- Emit no fine particle pollution, sulphur dioxide, or oxides of nitrogen during operations;
- Require no water during operations;
- Have limited environmental impacts from construction; and
- Typically offset all emissions generated across the turbine lifecycle in the first year of plant operation (Vestas, 2021).

The Project is expected to generate around 2,100,000 megawatt hours (MWh) per year of clean, renewable energy — enough to power more than 375,000 NSW homes on average. The wind farm will deliver renewable, low-cost energy to the national grid and contribute to the NSW Government's net-zero emissions target by 2050. The Project will further provide a significant amount of the new generation capacity required as coal-fired power stations are retired over the next decade, including the 1,680 MW Liddell Power Station (scheduled to close in 2023) and the 2,880 MW Eraring Power Station (scheduled to close in 2025).

The Project will primarily be developed on agricultural land which has been previously disturbed and/or historically cleared. Wind farms are very much compatible with existing farming operations as the turbines occupy only a small amount of land, and landowners are able to continue normal grazing or cropping activities. Livestock has often been seen using turbine towers for shade and shelter from wind and rain.

The Project layout has been designed to maximise the use of existing disturbed areas and to avoid or minimise impact to identified biodiversity and Aboriginal cultural heritage values. Progressive design iterations for the turbines, ancillary infrastructure, and the transmission line corridor have continued with key drivers being measures to minimise and avoid environmental and social impacts in line with the Avoid-Minimise-Mitigate-Offset design hierarchy.

The Project will create a range of social and economic benefits which will create substantial capital investment in Walcha and the broader New England region. The Project is anticipated to generate up to 400 FTE construction jobs, in turn creating approximately $150 million in direct wages and profits, and more than $160 million in indirect wages and profits, per year of construction. The construction workforce will generate more economic activity at local restaurants, shops and businesses, and will possibly lead to higher occupancy rates in temporary accommodation.

During Project operations, the Project will generate 33-39 FTE jobs and $25 million per year in direct and indirect economic benefit for the local region. The Proponent will operate and maintain the WTGs and other infrastructure to ensure safe and efficient facilities that optimise energy generation. The Proponent's service team will include around 16 skilled staff permanently based in Walcha or surrounding towns, who will become part of the local community.

There will be opportunities for local contractors and businesses to supply services during Project construction and operation. The Project will offer training and development to upskill the regional workforce to support the growing renewable energy industry.

The Project will further provide a diversified income stream for rural landholders and neighbours through payments to host landholders and the Neighbour Benefit Fund. The income provided to landowners hosting wind farm infrastructure can help make farms more resilient to the impacts of droughts, fires and commodity price fluctuations.

A Public Benefit Fund is proposed to be managed by Walcha Council under a VPA, which will support local community initiatives and programs, non-profits and charities, and services and infrastructure in the Walcha and Uralla communities. The employment and economic opportunities created by the Project have been supported by the community during engagement and consultation activities.

During construction, WinterbourneWind will work closely with contractors, local communities, neighbours and local councils, to plan and manage construction to minimise disturbance. Construction management will include:

- Regular and ongoing communication with the community;
- Working during standard construction hours as much as possible;
- Communicating with affected stakeholders where it may be necessary to work outside standard hours, or where work is expected to be disruptive;
- A rigorous safety culture; and
- Environmental monitoring.

Through the implementation of best practice management, the potential environmental impacts associated with the Project can be appropriately managed, which will also address the community concerns and associated social impacts identified during the stakeholder engagement process.

Given the net benefit and commitment from WinterbourneWind to appropriately manage the potential environmental impacts associated with the Project, it is considered the Project would result in a net benefit to the Walcha locality, New England region and broader NSW community.

7.2 Action Taken to Avoid / Minimise Impacts

The layout of the Project and siting of WTGs and other key infrastructure components has been subject to an ongoing iterative design and siting process, considering environmental, civil engineering and wind generation constraints and opportunities, as well as consideration of issues raised during ongoing community engagement. **Section 1.6** describes the design approach of the Project.

WinterbourneWind has engaged with landowners, Project neighbours, the broader community, local government, State and Federal Agencies, and business and stakeholder groups since acquisition of the Project in 2019.

Throughout the planning phase of the Project, a range of alternative Project designs have been considered in the context of technical, environmental, social, and commercial constraints, as discussed in **Section 2.2**. This has included:

- Reducing number of WTGs from up to 130 WTGs (refer Scoping Report Addendum (ERM, 2021)) to up to 119 WTGs to avoid highly sensitive ecological areas and reduce visual impacts from the Oxley Highway and Apsley Falls;
- Reducing blade tip height from 250 m to 230 m to further reduce visual and construction impacts;
- Realignment of transmission line corridor to minimise biodiversity impact; and
- Careful selection and assessment of the OSOM Transport Route from the Port of Newcastle, which includes a bypass of the Walcha township.

The Proponent has conducted a rigorous environmental assessment of the Project in accordance with the SEARs. This has included 2,633 hours of field survey effort by ecologists across 12 field investigations between August 2020 and January 2022. To assess the impact on Aboriginal and historic cultural heritage, archaeologists and RAPs completed 600 hours of field survey effort.

Background noise monitoring has further been conducted at a number of dwellings in the vicinity of the Project between November 2020 and February 2021. These results have been used to predict the expected levels of noise and vibration during wind farm construction (including construction traffic, heavy machinery, rock-crushing, etc.) and wind farm operation (including WTGs and ancillary infrastructure such as substations).

Further, a total of 17 viewpoints were selected for the preparation of photomontages, to best illustrate the potential appearance of the proposed wind farm from varying distances and locations with differing views. This included nine public viewpoints and eight private viewpoint locations based on feedback received from the community. Exact photomontage locations were selected on site to represent a worst-case scenario for the viewpoint location. Localised screening factors such as vegetation were avoided (where possible) to ensure maximum exposure to the Project.

Wire frame diagrams indicate the 3D shape of the landscape in combination

Section 6.1 to **Section 6.14** presents a range of design and management and mitigation measures that would be implemented to avoid or minimise Project-related impacts.

Figure 7-1 Project Ecologist Surveying for Amphibians

Figure 7-2 Project Ecologist Undertaking BUS

Figure 7-3 Noise Logger Installed to Monitor Background Noise

Figure 7-4 Archaeologists / RAPs Surveying Proposed Transmission Line Corridor

7.2.1 Consistency with Strategic Context

Section 2.1 presents an overview of the key International, Federal Government, and State Government commitments and strategic goals relevant to the Project. In summary, the Project would be consistent with each of the documents reviewed for the following reasons:

- Increased adoption of renewable energy generation sources will assist Australia to transition from traditional fossil fuel energy production, which is linked to atmospheric pollution, water pollution, land pollution and human health impacts;
- Reducing carbon emissions through replacement of traditional energy sources with renewable energy will assist to slow the effects of climate change, benefitting current and future generations in line with the principles of ESD;
- The Project Area is situated within a State declared REZ due to its excellent renewable energy resources; and
- The Project will have a generation capacity of approximately 700 MW and will generate sufficient energy on an annual basis to supply over 375,000 average NSW homes.

7.3 Consistency with Community Views

The Project is well supported by a significant number of the local community in Walcha and surrounds. In December 2021, the community were invited to participate in a survey at two Community Open Days, as discussed in **Section 5**.

When asked about concerns with the Project, 48% of the community respondents elected that they did not have any concerns about the Project. Most respondents (85%) expressed ‘local economic benefits such as jobs, tourism, and economic stimulus’ as the most significant benefit of the proposed wind farm. This was followed by ‘clean energy for future generations’ and ‘funding of local projects’.

The Proponent is committed to ongoing and thorough community engagement with stakeholders. A community consultation program has been implemented including Community Open Days, phone calls to Project neighbours, individual meetings with stakeholders, the distribution of Project updates, and a Project website.

Community engagement will continue throughout the exhibition of the EIS, post approval, and during construction and operation of the Project. Throughout this time the CCC will assist in raising and addressing community concerns and will provide ongoing information and support to the community.

Figure 7-5 Engaging with the Community at the Walcha Show 2022

7.4 Ecologically Sustainable Development

7.4.1 Introduction

The importance of ecologically sustainable development has been acknowledged across all levels of government in Australia for almost three decades. Ecologically sustainable development is designed to meet the needs of society today in a manner that does not compromise the ecosystems on which life depends so that future generations are also able to meet their needs. Such development integrates economic and social factors with environmental protection in decision making to balance the interests of current and future generations.

Section 193 of the EP&A Regulation identifies the principles of ecologically sustainable development as follows:

> *(2) The* ***precautionary principle*** *is that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.*
>
> *(4) The principle of* ***inter-generational equity*** *is that the present generation should ensure the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.*

> *(5) The principle of the* ***conservation of biological diversity and ecological integrity*** *is that the conservation of biological diversity and ecological integrity should be a fundamental consideration.*
>
> *(6) The principle of* ***improved valuation, pricing and incentive mechanisms*** *is that environmental factors should be included in the valuation of assets and services, such as—*
>
> > *(a) polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement, and*
> >
> > *(b) the users of goods and services should pay prices based on the full life cycle of the costs of providing the goods and services, including the use of natural resources and assets and the ultimate disposal of waste, and*
> >
> > *(c) established environmental goals should be pursued in the most cost effective way by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.*

7.4.2 Application to the Project

7.4.2.1 The Precautionary Principle

The environmental impacts of the Project have been carefully evaluated in this EIS and where practicable been avoided, mitigated, managed or offset. Various options have been considered for the WTGs, ancillary infrastructure and the transmission line corridor having regard to environmental risks and, ultimately, options with lower environmental impacts and risks have been selected to avoid and minimise potential biodiversity and heritage impacts.

The site suitability and project alternatives selection process, as detailed in **Section 2** of this EIS, have thoroughly considered and sought to minimise the likely impacts to the local environment. Where uncertainty exists, measures have been suggested to address the uncertainty.

During operations, management plans incorporating adaptive management principles will be implemented to ensure that necessary care is taken where there are threats of serious or irreversible environmental harm.

7.4.2.2 Inter-generational Equity

The *State of the Climate* reports prepared by BoM and CSIRO draw on the latest monitoring, science and projection information to describe variability and changes in Australia's climate. The 2020 report emphasises the following statement on climate change:

> *'Observations, reconstructions and climate modelling paint a consistent picture of ongoing, long-term climate change interacting with underlying natural variability. Associated changes in weather and climate extremes—such as extreme heat, heavy rainfall and coastal inundation, fire weather and drought—have a large impact on the health and wellbeing of our communities and ecosystems ... Reducing global greenhouse gas emissions will lead to less warming and fewer impacts in the future'.*

At the local context, the *Walcha Local Strategic Planning Statement 2036* (Walcha Council, 2019) has made the following warning about climate change:

> *'These climate changes have the potential to affect not only our environment (through drought, changing rainfall patterns, heatwaves and storm events) but our community's economy, health and wellbeing, infrastructure and overall water security*'.

The Project is consistent with the principle of inter-generational equity because it involves a new renewable energy resource which will result in estimated savings of approximately 1.8 Mt CO_2e of GHGs per annum, which is an action against climate change which will benefit future generations.

Other environmental benefits associated with the Project include reductions in air quality emissions and water use from wind power generation when compared to traditional coal fired power stations.

During decommissioning, the Project Area will be made suitable for continued agricultural or other uses by future generations.

7.4.2.3 Conservation of Biological Diversity and Ecological Integrity

Conservation of biodiversity has been a fundamental consideration throughout project development. Extensive desktop and field assessment has been undertaken to understand the anticipated biodiversity impacts. The findings of the biodiversity assessment have informed an ongoing iterative design for the layout of the Project and siting of WTGs and other key infrastructure.

Impacts to biodiversity will be avoided, mitigated and offset where necessary to ensure that there is no net loss in biological diversity and that ecological integrity is maintained (refer **Section 6.1** and/or BDAR in **Appendix G**).

7.4.2.4 Improved Valuation, Pricing and Incentive Mechanisms

The Project enables the utilisation of a valuable resource, wind energy, which is otherwise lost if the Project does not proceed. The Project further contributes to the transition from fossil fuel generation sources, which reduces air, water and land pollution from coal-fired power stations, which currently bear none of the external costs of such pollution.

An EPL will be required for the Project in accordance with the POEO Act, which will include fees to regulate pollution control and waste disposal associated with the Project.

The Project will establish a new Community Benefit Fund to provide tangible and durable financial benefits to the Walcha and Uralla communities as described in **Section 3.12**.

7.5 Key Environmental and Social Outcomes

Detailed technical environmental assessments support the EIS. The key assessments and impacts include:

- **Biodiversity:** The impacts to biodiversity as a result of the Project have been avoided and minimised as much as practicable through design phase refinements. Further mitigation measures are outlined and proposed to be adopted to minimise biodiversity impacts during the construction and operational phases and include provisions for biodiversity offsets, management measures and monitoring and adaptive management measures.

  The BDAR confirms that there are no serious and irreversible impacts to biodiversity values from the Project. This is due to:

  - Sufficient habitat availability in the wider landscape and Project Area to continue to support threatened species known to occur within the Development Footprint;
  - The Project design has been refined so that the majority of vegetation impacts occur on areas that contain exotic grassland;
  - The Project design avoids areas of breeding habitat for threatened microbats, by locating all infrastructure outside of the mapped cliffs and steep areas;
  - Impacts to high quality vegetation communities containing higher quality fauna habitat have been minimised through the location of infrastructure; and
  - Residual impacts associated with the Project will be offset in accordance with the NSW Biodiversity Offset Scheme and the EPBC Act Offsets Policy. Once these offsets are applied, there should be no net loss to biodiversity.

- **Noise:** Some construction activities will create localised noise and vibration including road construction, turbine foundation excavation and construction, concrete batching, rock crushing and heavy vehicle movements. Construction noise and vibration criteria will be specified in the conditions of consent for the Project and will be based on guidelines published by the NSW Government. The Proponent commits to undertaking all feasible and reasonable control strategies to minimise noise and vibration impacts during construction, and advance notice will be provided when noise levels are expected to exceed the criteria. The noise assessment for the Project predicts the operational noise at all non-associated neighbouring dwellings will be lower than relevant noise criteria specified in the 'Wind Energy: Noise Assessment Bulletin' (DPE, 2016) (Noise Bulletin).
- **Visual**: The Project Area was selected in part due to the limited number of residences in close proximity and the Project has been designed to avoid visual impacts as far as practicable. However, the development of the Project will result in changes to the landscape and visual impacts will occur during the construction and operational phases of the development. A range of mitigation measures including supplementary planting and screen planting is proposed at various non-associated dwellings to minimise impact. Landscaping will reduce the visibility of Project infrastructure.
- **Traffic**: traffic generation analysis shows that there would be adequate capacity in the road network to accommodate the Project. The Project will include the delivery to site of the components of the WTGs and electrical equipment using restricted access vehicles including blades, tower sections, nacelles, substation, switching station components and cabling. A detailed Traffic Management Plan will be prepared prior to project construction, and individual transport permits will be required for all OSOM loads.
- **Aboriginal Cultural Heritage**: Eleven (11) sites were identified during archaeological survey effort as part of the Aboriginal cultural heritage assessment which may be impacted as a result of the Project. Following development consent of the Project, the Proponent will develop an ACHMP in consultation with the RAPs and DPE. The ACHMP will also include an unanticipated finds protocol, unanticipated skeletal remains protocol and long-term management of any artefacts.
- **Historic Heritage**: The Project Area does not include any historic heritage sites with heritage value. One item listed on the Muswellbrook Local Environmental Plan is located near potential ground disturbing works associated with the transport corridor. Although not at risk of harm, all efforts should be made to ensure that the item is not inadvertently harmed. Following development consent of the Project, a HHMP will be developed and used during the construction and operation of the Project. If items of historic heritage significance are uncovered during the Project, then the unanticipated finds protocols in the HHMP will be enacted.
- **Hazards and Risks**:
  - Aviation: Based on the Project layout and overall turbine blade tip height of 230 m AGL, the blade tip elevation of the highest WTGs (WTG B130) will not exceed 1,564 m AHD (5,132 ft AMSL). The Project is predicted to have an impact on a designated air route (W128), for which mitigation measures have been developed as detailed in Section 10.1.2. A Procedure will be developed in consultation with relevant aerial agricultural and firefighting operators which shall detail operational management to reduce impacts. The Project will maintain an acceptable level of safety to aircraft. Therefore, no obstacle lighting is required.
  - Telecommunications: Telco Authority raised the potential for WTGs at the Project to cause interference to two of their point-to-point links crossing the Project Area; however, further clarification will be sought from the Telco Authority regarding the required clearances from the point-to-point links. It is generally possible to design around these issues as the link paths and potential interference zones for these signals can be determined. Other conflicts can be readily resolved by application of standard management and mitigation measures.

  - Bushfire: The risk that the wind farm itself will cause a fire is minimal although the proposed development is located within a bushfire prone landscape. Construction activities are a potential source of ignition, with the greatest risk occurring during the bushfire season from October to March. Both construction and decommissioning activities will be managed in accordance with mitigation measures to ensure bushfire risk is kept to a minimum. A Bushfire Emergency Management and Operations Plan will be prepared in conjunction with relevant stakeholders. The improved access will be an advantage to both the local RFS and the NPWS.
  - Blade throw: The Blade Throw Risk Assessment has demonstrated that there is a very small likelihood of a blade being thrown a significant distance. The assessment therefore establishes that the risk associated with a blade throw event can be considered very low. Although the predictions for blade throw likelihoods and maximum throw distances vary, studies place the theoretical distance radii of blade fragment throw at a distance of 500 m under normal operating conditions, and there is general agreement throughout the literature that the likelihood of damage to human life or property from a blade throw incident is extremely small and well within risk levels typically deemed acceptable by society.
  - Preliminary Hazard Analysis: A PHA was completed for the BESS facility component of the Project, in accordance with the DPIE HIPAP No. 6 and Multi Level Risk Assessment guidance. The PHA concluded that there are no events with the potential for significant offsite impact associated with the operation of the proposed BESS and the BESS meets the HIPAP No.4 qualitative risk criteria. Further, the BESS is suitably located within the Project Area and minimises the risk to neighbouring land uses and onsite substations.

- **Soils and Water**: Two locations (approximately 327.7 ha) within the Project Area are mapped as BSAL, coinciding with larger patches of soil and land capability Class 3 land. The Project Area predominantly consists of Kurosols soil type with the presence of Ferrosols, Dermsols and Kandosols across the Project Area, and Rudosols on ridge lines surrounding the Project Area. Though the Project Area is predominantly free of groundwater aquifers, it overlaps the Apsley River, Blue Mountain Creek and Salisbury Water sub-catchments of the Macleay River catchment. Project design and staged construction will be applied to minimise land disturbance and therefore reduce the erosion hazard. A SWMP will be prepared prior to the commencement of construction works and it will be accompanied by Progressive ESCP to mitigate potential soil and water impacts arising from the Project. All necessary mitigation measures will be implemented to manage potential impacts to the adjacent Oxley Wild Rivers National Park.
- **Hydrology and Flooding:** The majority of the Project components are situated away from watercourses and high flood risk areas. The WTGs are generally located on catchment ridge lines or high ground some distance away from the major watercourses. There may be local overland flow paths at some sites which should be suitably managed or avoided. There is no apparent flood risk from the closest watercourses. Prior to the commencement of construction activities, a detailed Soil and Water Management Plan will be developed as part of the Environmental Management Strategy, to manage additional runoff from the surface of the Project components (e.g. hardstands and access roads).
- **Social**: A wide variety of consultation activities have been utilised to inform the social and economic impacts of the Project. Regular and ongoing stakeholder engagement activities, including targeted stakeholder interviews, provided feedback and sentiment from Project neighbours, the wider community, and the CCC. The Project may facilitate some social change that may affect communities within proximity to the Project, both positively and negatively. Among the range of mitigation and management measures proposed, the Proponent commits to developing and implementing a Procurement Policy and a Workforce Accommodation Strategy prior to construction, and implementing a Public Benefit Fund for the life of the Project.

- **Air Quality:** Air quality impacts associated with the Project will be temporary and low during the construction phase of the Project. It is anticipated that the Project will not generate significant air quality impacts and appropriate measures will be implemented to minimise the potential for offsite dust impacts resulting from construction. During the operation phase, the Project will generate electricity without directly emitting air pollutants that are known to affect the climate and human health. The Project will contribute to the improvement of air quality through the displacement of emissions that would otherwise be generated through the burning of fossil fuels used to generate electricity from traditional coal fired power stations. The Project would thus abate the production of up to 1.8 Mt CO_2e per annum which is a substantial contribution towards the reduction of anthropogenic generated GHGs emitted to the atmosphere.
- **Waste Management:** The Project will produce various waste streams during the construction, operations, and decommissioning stages. A Waste Management Plan (WMP) will be prepared prior to construction. The WMP will detail all appropriate measures to be incorporated to avoid potential contamination to land and water, and human and wildlife health impacts. The Project will separate waste streams to maximise recycling and emphasise reuse of any excess spoil and vegetative matter in accordance with resource recovery orders and exemptions. A key objective of the WMP will be to ensure that any use of local waste management facilities does not disadvantage local businesses and, more generally, the local community, by exhausting any available capacity at these facilities. A Decommissioning and Rehabilitation Assessment has been prepared for the Project and will be updated in accordance with relevant project approval requirements.

7.6 Environmental Management Strategy

An Environmental Management Strategy (EMS) will be developed to provide the overall framework for environmental management during the construction, operation, decommissioning and rehabilitation of the Project to ensure that appropriate measures and processes are in place to manage identified environmental risks and provide for ongoing continual improvement. The EMS will incorporate mitigation measures that have been identified throughout this EIS and associated technical assessments and will include relevant management plans.

Appendix E provides a summary of the environmental management commitments of the Project which will be implemented to avoid, minimise and where necessary, offset the potential environmental impacts associated with the Project.

Prior to the commencement of construction, final detailed design and layout plans will be submitted to DPE. Environmental mitigation and management measures outlined in the EMS and the associated environmental management plans will be prepared prior to each stage of the Project and submitted to DPE for approval.

7.7 Summary

The Project involves the operation of up to 119 WTG, together with associated and ancillary infrastructure, which will have an approximate energy generating capacity of 700 MW. The Project will contribute significantly to reducing carbon emissions and human induced climate change as part of the necessary and ongoing clean energy transition.

The Project has been carefully designed and sited to minimise environmental impacts in consultation with the local community and relevant landholders. While there will be some inevitable impacts associated with the Project, including biodiversity, visual and noise impacts as outlined above, these impacts will be significantly outweighed by the strong public and environmental benefits which the Project will deliver.

The Project will:

- Assist the Federal and NSW Governments to fulfil their targets and policies to increase renewable energy supply and reduce carbon emissions;
- Assist in meeting energy demand as part of the market transition from traditional energy sources; and
- Deliver economic benefits to regional and local communities.

The Project represents a positive addition to the local and wider NSW economy and the NEM. Through the implementation of proposed mitigation and management measures, it is considered that this Project is consistent with the objects of the EP&A Act and is in the public interest.

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ERM's Sydney Office
Level 15 309 Kent Street
Sydney NSW 2000

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