VOLUME 1

Biala Wind Farm

ENVIRONMENTAL IMPACT STATEMENT

July 2015

ERM REFERENCE
0178462RP01 ENVIRONMENTAL IMPACT STATEMENT

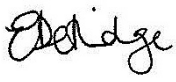
ERM

Newtricity
THE POWER OF WIND

ERM Document Control Record

0178462RP01_F02 – Environmental Impact Statement

Version	Revision	Author	Reviewed by	ERM Approval to Issue		Comments
				Name	Date	
DRAFT	D01	CP and ED	MC	Murray Curtis	23 March 2015	Draft report prepared by ERM.
FINAL	F01	ED	MC	Murray Curtis	22 July 2015	Final report prepared by ERM.
FINAL	F02	ED	MC	Murray Curtis	31 July 2015	Final report revised to address adequacy comments from DP&E.

Prepared by:	*Erin Dethridge*
Position	*Project Manager*
Signed:	
Date:	*31 July 2015*
Approved by:	*Murray Curtis*
Position:	*Partner*
Signed:	
Date:	*31 July 2015*

Biala Wind Farm

Environmental Impact Statement

Report prepared for Newtricity

ERM Reference: 0178462RP01

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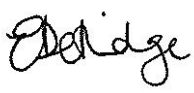
CERTIFICATION OF ENVIRONMENTAL IMPACT STATEMENT FOR THE BIALA WIND FARM prepared under Part 4 of the *Environmental Planning and Assessment Act 1979.*		
This Environmental Impact Statement (EIS) was prepared by Environmental Resources Management Pty Ltd (ERM) supports an application by Newtricity for the proposed Biala Wind Farm under Part 4 of the Environmental Assessment and Planning Act 1979.		
PROPONENT:	Newtricity	
Applicant's Address:	C/o Environmental Resources Management Australia Pty Ltd Locked Bag 3012, Australia Square NSW 1215	
Proposed Development:	Newtricity seeks approval to establish a wind farm consisting of up to 31 wind turbine generators and associated infrastructure near Biala, NSW.	
EIS COMPILATION BY:	Erin Dethridge	Murray Curtis
Qualifications:	Bachelor of Urban Planning and Development (Hons) University of Melbourne	Bachelor of Engineering (Hons Class 1) (Natural Resource Engineering) University of New England
Address:	Environmental Resources Management Pty Ltd Locked Bag 3012, Australia Square NSW 1215	
CERTIFICATION	We certify that we have prepared the contents of this EIS to the best of our knowledge. The EIS draws on the work undertaken by a number of technical specialists engaged as part of the Project Team with the information contained in the EIS neither false nor misleading.	
Signature:		
Name:	**Erin Dethridge** Project Manager	**Murray Curtis** Partner
Date:	31 July 2015	

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ABBREVIATIONS

Abbreviation	Description
AAAA	Aerial Agriculture Association of Australia
ABS	Australian Bureau of Statistics
ACMA	Australian Communications and Media Authority
AGL	Above Ground Level
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
ALA	Aircraft Landing Area
ALARP	As Low As Reasonably Practicable
AM	Amplitude Modulation
ANZECC	Australian and New Zealand Environment Conservation Council
APZ	Asset Protection Zone
ASA	Airservices Australia
ASS	Acid Sulfate Soil
ATC	Air Traffic Control
BCA	Building Code of Australia
BFMC	Bushfire Management Committee
BGS	Below Ground Surface
BoM	Bureau of Meteorology
CAR	Civil Aviation Regulation
CASA	Civil Aviation Safety Authority
CB	Citizens' Band Radio
CCC	Community Consultative Committee
CEMP	Construction Environmental Management Plan
CEP	Community Enhancement Program
CHA	Cultural Heritage Assessment
CLM Act	*Contaminated Land Management Act 1997*
CNMP	Construction Noise Management Plan
CO_2 –e	Carbon dioxide equivalent
CoRTN	*United Kingdom (UK) – Calculation of Road Traffic Noise*
Council	Upper Lachlan Shire Council
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CTMP	Construction Traffic Management Plan
dB	decibel
DCP 2010	*Upper Lachlan Development Control Plan 2010*
DECC	Department of Environment and Climate Change
DGRs	Director General's Requirements
DNG	Derived Native Grassland
DoD	Commonwealth Department of Defence
DoE	Commonwealth Department of Environment
DP&E	NSW Department of Planning and Environment
DP&I	NSW Department of Planning & Infrastructure
Draft Wind Farm Guidelines	The Department of Planning and Infrastructure's *Draft NSW Planning Guidelines: wind Farms, December 2011*
DTI	NSW Department of Trade and Investment
DUAP	Department of Urban Affairs and Planning
EEC	Endangered Ecological Community

EIS	Environmental Impact Statement
EMF	Electromagnetic Field
EMI	Electromagnetic Interference
EMP	Environmental Management Plan
EMR	Electromagnetic Radiation
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPA	NSW Environment Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPI	Environmental Planning Instrument
EPL	Environmental Protection Licence
ERA	Environmental Risk Assessment
ERM	Environmental Resources Management Australia Pty Ltd
ESD	Ecologically Sustainable Development
EVC	Ecological Vegetation Class
FDI	Fire Danger Index
FM	Frequency Modulation
FM Act	*Fisheries Management Act 1994*
FTE	Full time equivalent
GHG	Greenhouse Gas
GIS	Geographic Information System
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GWh	Gigawatt hours
ha	hectares
Hz	Hertz
IEC	International Electro technical Commission
INP	*NSW Environmental Noise Management – Industrial Noise Policy*
ISEPP	*State Environmental Planning Policy (Infrastructure) 2007*
ISO	International Standards Organisation
ISP	Internet Service Providers
km	kilometre
kV	Kilovolt
LEP 2010	*Upper Lachlan Local Environment Plan 2010*
LGA	local government area
LSALT	Lowest Safe Altitudes
LCVIA	Landscape Character and Visual Impact Assessment
LRET	Large-scale Renewable Energy Target
m	metres
Minister	NSW Minister for Planning and Environment
MNES	Matters of National Environmental Significance
MOS	Manual of Standards
Mt	Million tonnes
MW	Megawatt
NEM	National Electricity Market
NHMRC	National Health Medical Research Council
nm	Nautical Miles
NP&W Act	*National Parks and Wildlife Act 1974*
NSW	New South Wales
NSW WFG	DPI Planning Guidelines Appendix B NSW Wind Farm Noise Guidelines 2011

NW Act	*Noxious Weeds Act 1993*
OECD	Organisation for Economic Cooperation and Development
OEH	NSW Office of Environment and Heritage
OH&S	Occupational Health and Safety
OLS	Obstacle Limitation Surface
ONMP	Operational Noise Management Plan
PA	Project Area
PAC	NSW Planning and Assessment Commission
PAD	Potential Archaeological Deposit
PANS-OPS	Procedures for Air Navigation Services – Operations Surfaces
PBP	Planning for Bushfire Protection
PCT	Plant Community types
PEA	Preliminary Environmental Assessment
PEA Act	*Protection of the Environment Administration Act 1991*
PoEO Act	*Protection of the Environment Operation Act 1997*
PSR	Primary Surveillance Radar
RAP	Registered Aboriginal Party
RAV	Restricted Access Vehicles
RBL	Rating Background Level
REAP	Renewable Energy Action Plan
RECs	Renewable Energy Certificates
REF	Review of Environmental Factors
RET	Renewable Energy Target
RFS	NSW Rural Fire Service
RMS	Roads and Maritime Services (formerly the Roads and Transport Authority)
RNP	Road Noise Policy
Roads Act	*Roads Act 1993*
RSA	Rotor Swept Area
SA WFG	South Australia EPA Environment Noise Guidelines for Wind Farms
SA EPA	South Australian Environmental Protection Authority
SCADA	Supervisory control and data acquisition
SEARs	Secretary's Environmental Assessment and Requirements
SEPP	State Environmental Planning Policy
SIS	Species Impact Statement
SRD SEPP	*State Environmental Planning Policy (State and Regional Development) 2011*
SRES	Small-scale Renewable Energy Scheme
SSD	State Significant Development
SSR	Secondary Surveillance Radar
SWL	Standing Water Level
SWMP	Soil and Water Management Plan
The Proponent	Newtricity
TSC Act	*Threatened Species Conservation Act 1995*
vpd	Vehicles per day
WFGGT	Wind Farm Greenhouse Gas Savings Tool
WHO	World Health Organisation
WM Act	*Water Management Act 2000*
WTG	Wind Turbine Generator
ZVI	Zone of Visual Influence

GLOSSARY OF TERMS

Development Footprint	proposed for the development of the Project, including the Permanent Development Footprint and Temporary Development Footprint.
Direct Employment	Direct employment includes the employees who are directly employed in developing, constructing and/or operating the wind farms and those directly employed in manufacturing wind farm plant and equipment and supporting these activities.
Endangered Ecological Community (EEC)	An ecological community listed as protected by the NSW *Threatened Species Conservation Act 1995*.
native	Flora or fauna species that existed in NSW before European settlement.
negligible	Small and unimportant, such as to be not worth considering.
Obstacle Limitation Surface	These are a series of surfaces that set the height limits of objects around an aerodrome. Objects that project through the OLS become obstacles.
offset (biodiversity)	One or more appropriate actions put in place in an appropriate location to counterbalance a development's impact on biodiversity values.
PCT ID	An abbreviation meaning Plant Community Type Identification Number as according to the NSW Vegetation Information System.
perennial stream	Stream with a well-defined channel that flows continuously all year during a year of normal rainfall with the aquatic bed located below the water table for most of the year.
Permanent Development Footprint	This is the area of land that will be subject to permanent alteration as a result of installation and operation of Project infrastructure.
Plant Community Type (PCT)	From BBAM (2014): A NSW plant community type identified using the PCT classification system.
population	A group of animals or plants of the same species, potentially capable of interbreeding and sharing the same habitat in a particular area at a particular time.
Procedures for Air Navigation Services – Operations surfaces	This refers to the rules for designing aircraft instrument approach and departure procedures. The procedures are used to allow aircraft to land and take off when instrumental meteorological conditions impose instrument flight rules.
Project Area (PA)	The term Project Area (PA) refers to the area in which Newtricity has applied to develop the Project. The PA encompasses the parcels of land associated with the Development Footprint, as shown in *Figure 1-2*.
Prudent Avoidance	The avoidance without undue inconvenience and monetary expense to avert the possible human health risks associated with exposure to new high voltage transmission lines.
regeneration	Where native vegetation is allowed to return naturally to an area generally by removing existing impacts such as grazing or slashing.
regrowth vegetation	Defined in the *Native Vegetation Act 2003* as any native vegetation that has regrown since 1 January 1990 (or 1 January 1983 Western Division). Excluding regrowth after illegal clearing or natural events such as bushfire, floods and drought.
remnant vegetation	Any native vegetation that is not regrowth.
riparian	Associated with drainage lines.
Temporary Development Footprint	This is the area of land which will be temporarily disturbed during construction of the Project, and rehabilitated following construction, in order to minimise permanent impacts to biodiversity. Mitigation measures in these areas are to include revegetation, spreading mulched or cleared vegetation and spreading native grass seed with local species in accordance with an approved Construction and Environmental Management Plan (CEMP).
the Project	In this report, the Project refers to the proposal by the proponent (Newtricity) to construct and operate the Biala Wind Farm. The Project will involve the construction of up to 31 wind turbine generators.
the Project Team	The Project Team consists of Newtricity (the Proponent), Environmental Resources Management Pty Ltd (ERM) and their in-house and external technical specialists.

Threatened Ecological Community (TEC)	An ecological community listed as protected by the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.
threatened flora	A species of plant listed as protected by the EPBC Act or the TSC Act
threatened species	A species listed as protected by the EPBC Act or the TSC Act
Total Economic Impact	The direct effect of the initial increase in demand and the associated flow-on effects throughout the economy. For example, the direct manufacture of WTGs requires the purchase of steel and other materials from suppliers, these suppliers would then need to restock to meet commitments to other customers creating a production induced flow-on effect in the economy.
Vegetation Information System	A resource held and administered by OEH that contains information on the vegetation types of NSW, mapping products and previous vegetation survey details.
vegetation type	A general term used to describe an association of flora species that are recognisable as a unit or grouping based on observed co-occurrence. Includes both native and non-native vegetation.
vegetation zone	From BBAM (2014): a relatively homogenous area of native vegetation on a development or BioBank site that is the same PCT and broad condition state.

EXECUTIVE SUMMARY

E1. Overview

Newtricity (the Proponent) is seeking approval for the construction and operation of the Biala Wind Farm, situated near the locality of Biala in the Southern Tablelands region of New South Wales (NSW) (the Project). The Project is located approximately 14.5 km south-west of Crookwell and 8.5 km east of Biala, and is wholly contained within the Upper Lachlan local government area (LGA). The location of the Project is shown in *Figure E-1.*

The Project will involve the construction of 31 wind turbine generators (WTGs) at a maximum tip height of 185 metres (m) above ground level (AGL) and an indicative generation capacity of 77.5 Megawatts (MW). Support infrastructure includes an electrical reticulation network and substation, internal access roads and permanent operations and maintenance facilities together with a temporary concrete batching plant, site offices and equipment storage area that will be utilised during the construction period.

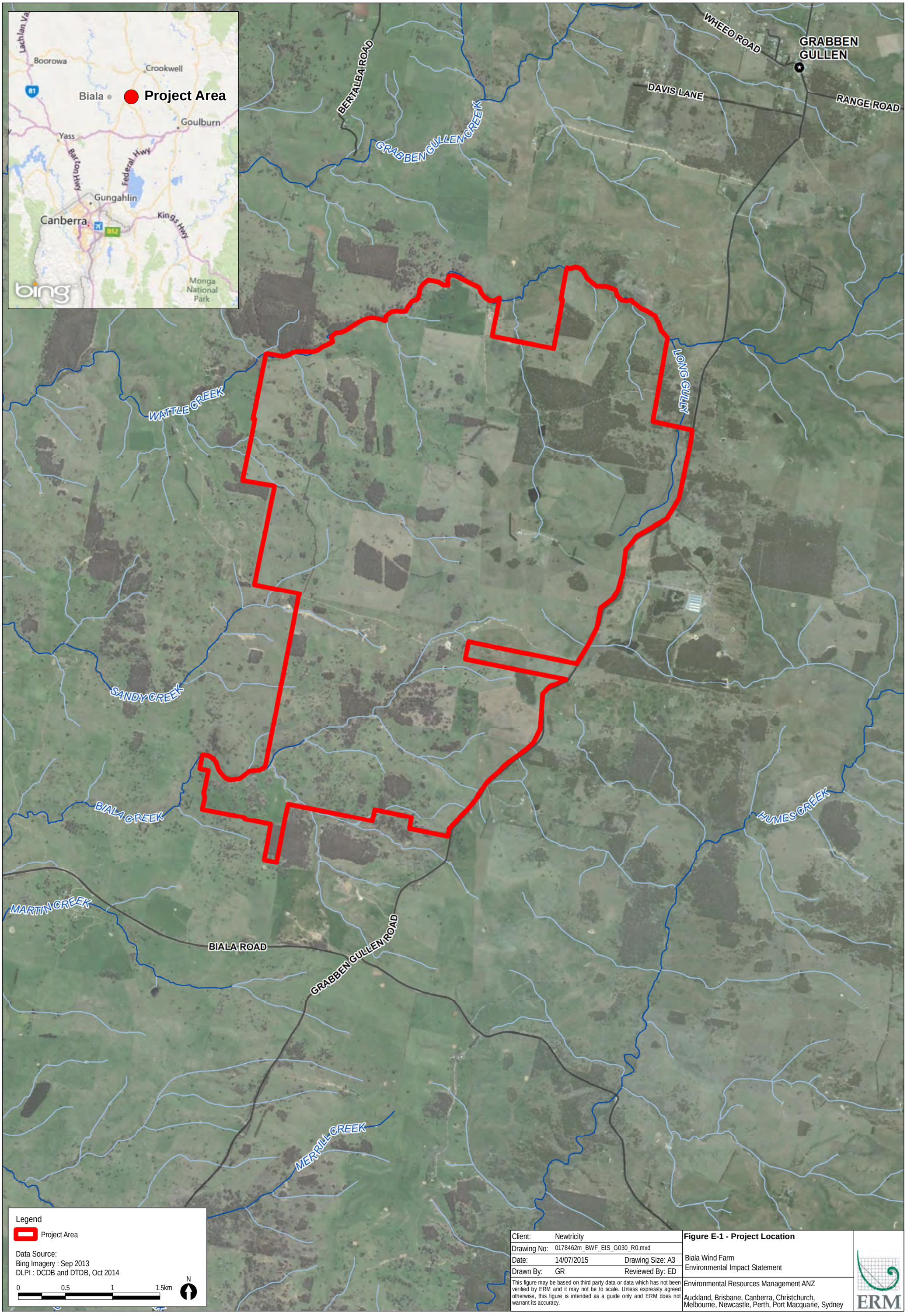
The Project Area (PA) covers approximately 1,936 hectares (ha), on which the WTGs, electrical reticulation network, access roads and ancillary structures will be located. Newtricity has entered into commercial lease agreements with four landholders hosting Project infrastructure, which encompasses 37 individual land parcels.

A 132 kilovolt (kV) overhead transmission line is proposed to connect the on-site substation within the PA to the existing 132 kV Yass to Goulburn transmission line located approximately 22 kilometres (km) south of the wind farm site. Approval for the transmission line will be sought separately to the wind farm and is therefore not assessed in detail in this Environmental Impact Statement (EIS).

The Project was declared as State Significant Development (SSD) in accordance with clause 20, Schedule 1 of the *State Environmental Planning Policy (State and Regional Development) 2011* and will be assessed under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The Project was referred to the Commonwealth Department of Environment (DoE), and a Delegate for the Minister for the Environment determined under section 75 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) that the Project is not a controlled action.

Environmental Resources Management Australia Pty Ltd (ERM) has been commissioned by Newtricity to coordinate the technical environmental assessments and prepare this EIS to support the SSD Application for submission to the NSW Department of Planning and Environment (DP&E) for assessment.

Photograph E-1 View of the Typical Landscape within the Project Area (ERM 2014)



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Date:	14/07/2015	Drawing Size: A3	
Drawn By:	GR	Reviewed By: ED	

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Figure E-1 - Project Location

Biala Wind Farm
Environmental Impact Statement

Environmental Resources Management ANZ

Auckland, Brisbane, Canberra, Christchurch, Melbourne, Newcastle, Perth, Port Macquarie, Sydney

ERM

The Proponent

Newtricity is an Australian owned business with investors based in Ireland. The investors were previously involved in a company called Airtricity prior to its sale in 2008. During the period of their involvement, Airtricity was an Irish based wind farm developer, owner and operator and developed multiple wind farms throughout Ireland, Scotland and the United States of America (USA).

Project Benefits

The Project will make a substantial contribution to renewable energy generation in NSW and to the achievement of Federal and State policy objectives. In addition to delivering clean energy, the Project will deliver significant economic benefits at the broader State, regional and local level, particularly through the creation of construction employment opportunities and increased demand and support for local goods and services. As a result, the Project is expected to contribute approximately $70 million in direct investment into the local and regional economy over the estimated two year construction period. The Project will also diversify existing income streams for involved landholders, provide employment opportunities, improve the local road network surrounding the PA and contribute financially to local community facilities and infrastructure through the Community Enhancement Program.

Need for the Project

The global emission of greenhouse gases (GHG) is a key environmental challenge facing the world today. It is well regarded that GHG emissions, particularly carbon dioxide (CO_2) generated from human activities has increased at an accelerated rate since the industrial revolution. The CSIRO (2011) has stated that:

"Greenhouse gas emissions from human activities are more than 90 per cent likely to have caused most of the global warming since the mid-20th century."

Australia's per capita GHG emissions are the highest of any Organisation for Economic Cooperation and Development (OECD) country and are among the highest in the world. In 2012-2013, per capita emissions (including emissions from land use, land-use change and forestry) were 249 tonnes carbon dioxide equivalent (CO_2-e). Australia's per capita emissions are nearly twice the OECD average and more than four times the world average (Garnaut 2011). NSW currently generates in the order of 155 million tonnes (Mt) of CO_2 emissions per year with the stationary energy sector, which includes emissions from fuel consumption for electrical generation accounting for approximately 47 percent (%) of total GHG emissions across the State.

Coal and natural gas will continue to play an important role in Australia's energy future in the short-to-medium term however; there is a need for a significant investment in renewable energy technologies, such as wind energy, to help meet growing energy demand in a manner that does not contribute to increasing GHG emissions. The key benefits of the Project are summarised in the following table.

Biala Wind Farm - Key Benefits	
Maximum number of wind turbines	31
Rated capacity of each turbine	2.5 MW to 3.5 MW
Indicative electrical generation capacity	77.5 MW (based on 2.5 MW capacity)
Equivalent household consumption (NSW homes)	33,200
GHG emissions displaced per annum	Approximately 200,000 tonnes

E2. Project Description

The Project will have an expected operational life of 25 years and an indicative installed capacity of 77.5 MW (based on a rated capacity of 2.5 MW per WTG).

At the end the Project's operational life, the Project will be decommissioned in accordance with the Preliminary Decommissioning and Rehabilitation Plan prepared as part of this EIS.

The Project will consist of the following permanent components:

- 31 WTGs with a maximum height of 185 m AGL (to the blade tip) and adjacent hardstands for use as crane pads and assembly areas;
- a central electrical substation including transformers, switchgear, insulators and other ancillary equipment;
- operations and maintenance facilities;
- up to three meteorological monitoring masts across the PA;
- underground 33 kV electrical reticulation and fibre optic cabling connecting the WTGs to the on-site substation; and
- an internal private access road network (up to a combined total length of approximately 27 km) connecting the WTGs and other proposed infrastructure to the public road network.

Electricity produced from the Project will be distributed to the existing Yass to Goulburn 132 kV transmission network, which is owned and operated by Essential Energy. As mentioned previously, approval for the transmission line connection will be sought separately from the wind farm.

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

- site offices, storage and car parking facilities;
- temporary concrete batching plant;
- earthworks for access roads, WTG platforms and foundations;
- cleared hardstand areas for construction equipment and storage (construction laydown areas);
- temporary site buildings and facilities for construction contractors; and
- the use and storage of hazardous substances.

The proposed layout of the Project including the WTGs, access roads and supporting infrastructure is shown *Figure E-2*.

E3. Site Analysis

The PA covers approximately 1,936 ha. Project infrastructure including WTGs and access roads will cover an area of approximately 42.37 ha (including permanent and temporary infrastructure), which constitutes approximately 2% of the PA. The length of the PA north to south is approximately 7 km and east to west is approximately 4.6 km. The nearest major township is Goulburn, located approximately 37 km to the south-east.

The PA and broader region consists of large and extensively cleared rural land parcels for the purpose of agricultural grazing. The landscape is characterised by rolling hills and gentle ridgelines with pockets of remnant vegetation. The PA ranges in height from approximately 780 m to 940 m Australian Height Datum (AHD) with the cleared elevated gentle ridgelines providing favourable terrain for the construction and operation of WTGs and exposure to wind resources. The predominant vegetation within the PA is characterised by a mixture of Red Stringy Bark, Broad-leaved Peppermint and Brittle Gum open woodland.

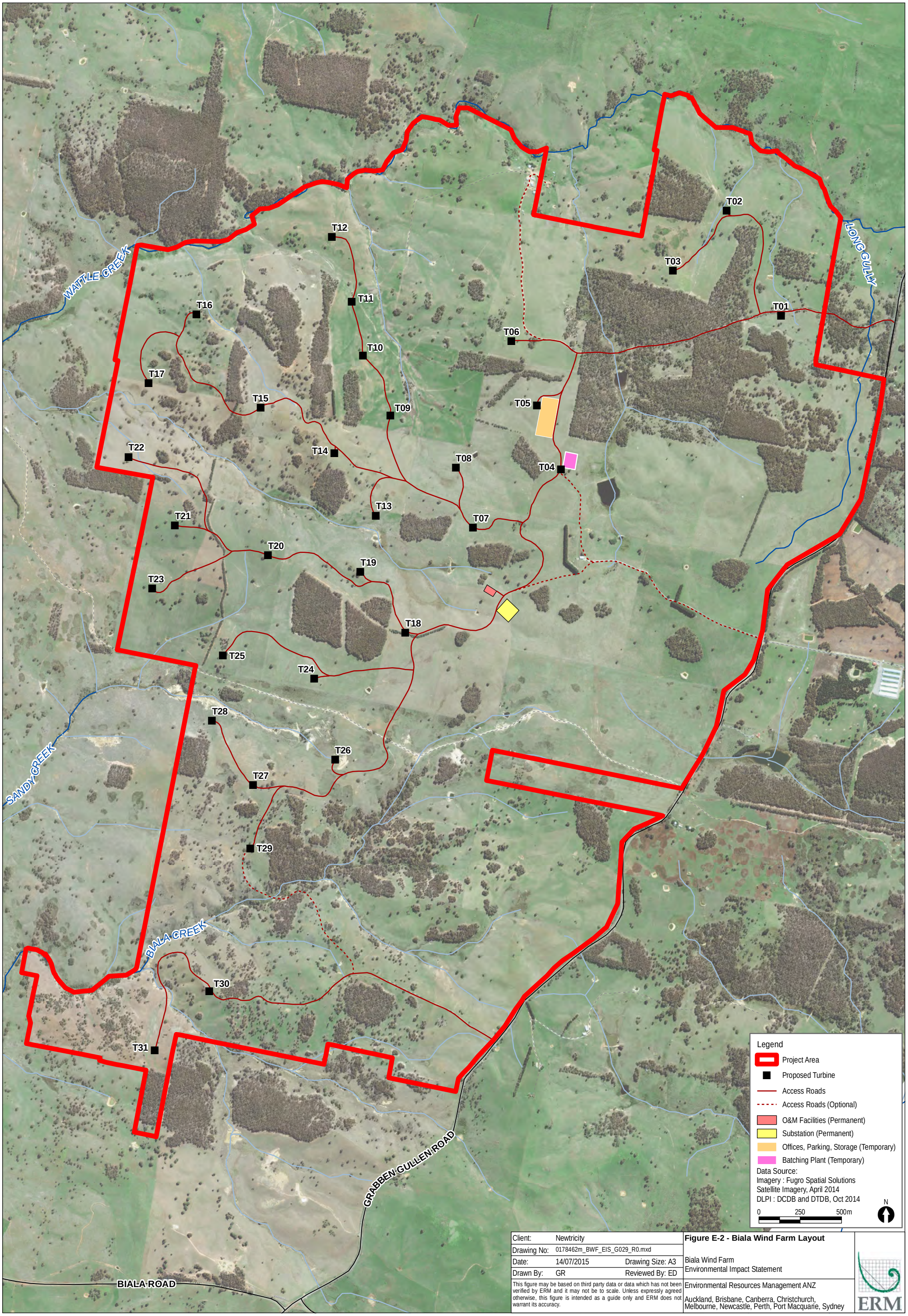

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Figure E-2 - Biala Wind Farm Layout

Biala Wind Farm
Environmental Impact Statement

Environmental Resources Management ANZ

Auckland, Brisbane, Canberra, Christchurch, Melbourne, Newcastle, Perth, Port Macquarie, Sydney

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E4. Statutory Framework and Approvals Process

Approval for the Project is sought under the SSD provisions (Division 4.1) of Part 4 of the EP&A Act in accordance with clause 20, Schedule 1 of the *State Environmental Planning Policy (State and Regional Development) 2011*. An overview of the SSD Application process is outlined below.

- **Secretary's Environmental Assessment Requirements (SEARs) -** a preliminary environmental assessment (PEA) report was prepared and submitted to the NSW Department of Planning and Infrastructure (now Department of Planning and Environment (DP&E)) in July 2013. Director General's Requirements (DGRs) were initially issued for the Project on 12 August 2013. Following changes to the scope of the Project including the removal of the transmission line from the PA, revised assessment requirements, now referred to as SEARs, were issued for the Project on 19 May 2015. The SEARs form the basis of the assessment criteria for the Project.

    - **Preparation of the EIS** - the scope of the impact assessment was derived from the environmental scoping stage and risk assessment undertaken in the initial stages of the Project to identify potential impacts. Potential impacts identified during the environmental risk assessment, together with the DGRs, formed the overarching scope of the EIS.
    - **Submission of the EIS** - the EIS was submitted to DP&E for their review and comment to determine its adequacy for public exhibition.
    - **Public Exhibition** - the EIS will be placed on public exhibition by DP&E for a period of up to 60 days. Submissions can be submitted on the DP&E website: www.planning.nsw.gov.au**.** During the exhibition period, submissions from the Upper Lachlan Shire Council and relevant State agencies will also be sought.
    - **Response to Public Submissions** - if required, responses to submissions received will be submitted to DP&E within 21 days, unless otherwise agreed by the Secretary of DP&E.
    - **Approvals Stage** - DP&E will consult further with Council and the relevant State agencies on draft conditions of consent. The assessment report will then be finalised and determined by either a delegated officer of DP&E, the Minister, or forwarded to the Planning and Assessment Commission (PAC) for determination. If approved, a list of consent conditions will be provided with the letter of determination.

E5. Community and Stakeholder Engagement

Newtricity recognise that community and stakeholder engagement is an integral part of any major development. The broader Project Team have undertaken an extensive consultation and engagement programme throughout the environmental assessment phase to seek feedback from key stakeholders to help inform the Project design.

The first and critical step in the consultation process was the briefing to Upper Lachlan Shire Council, which was undertaken on 20 June 2013. Council is often the point of contact for residents and the community in respect to concerns or questions about developments in the local area, therefore establishing a positive relationship with Council early in the process was important.

Consultation undertaken to date has taken the form of direct face-to-face engagement, phone and email correspondence, website information and the distribution of newsletters. Should the Project be approved, consultation with the local community and key stakeholders will continue throughout the construction and operational phases of the Project.

In accordance with the *Draft NSW Planning Guidelines: Wind Farms, 2011* (DP&I 2011) (Draft Wind Farm Guidelines) and the methods set out by the DP&E, a Community Consultative Committee (CCC) has been established for the Project, with the first meeting scheduled to occur in July 2015. The purpose of the CCC is to provide an open forum for discussion between representatives of Newtricity, the community, Council and other stakeholders on issues directly relating to the assessment and, if approved, the environmental performance, and operation of the Project. Ongoing community relations are also an important function of the Committee.

Key agencies consulted as part of the environmental assessment process and preparation of the specialist assessments included (among others):

- NSW Department of Planning and Environment;
- Upper Lachlan Shire Council;
- Office of Environment and Heritage;
- Roads and Maritime Services;
- NSW Department of Primary Industries;
- Department of Trade and Investment;
- Civil Aviation Safety Authority; and
- Local Aboriginal Land Councils and Aboriginal stakeholder groups.

Should the Project be approved, consultation and engagement with the local community will occur throughout the construction and operational phases of the Project and will involve:

- continued presence of the dedicated Project website to provide direct information and formal feedback options to stakeholders and the community;
- newsletters providing regular updates on the progress of the Project and important dates and events;
- regular community information sessions at key stages of the Project;
- media releases in local print media;
- briefings with key stakeholder groups including the DP&E and Council; and
- continuation of CCC meetings.

E6. Biodiversity

An *Ecology Impact Assessment* was undertaken by ERM (2015b) to address issues of State and Commonwealth ecological significance.

The vegetation of the PA is typical of the rural landscape of the Southern Tablelands region of NSW. Generally, the vegetation is a combination of grasslands (both native and non-native pastures) with isolated, scattered patches (or 'islands') of woodland. The PA is comprised of 26.30% native vegetation types and 73.70% non-native vegetation types and other land covers (including dams and non-native windbreaks.

A patch of Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland Endangered Ecological Community (EEC), listed under the Threatened Species Conservation Act 1995 (TSC Act) was identified within the PA. Infrastructure has been sited to avoid the EEC where possible, however trimming of trees or clearing of a small area of the EEC may be required to upgrade the existing northern access road. Spatial analysis has indicated the extent of clearing of EEC is 0.002 hectares (ha), equivalent to less than 0.01% of the EEC within the PA. Unavoidable impacts will be offset in accordance with the NSW Biodiversity Offsets Policy for Major Projects and based on advice from Department of Planning and Environment (DP&E).

The residual impacts to biodiversity from the Project are not significant. Project infrastructure has been sited to avoid disturbance to native vegetation where possible and in total, 3.57 ha of native vegetation, equivalent to less than 1% of the native vegetation in the PA, will be cleared. Habitat fragmentation will be limited to clearing for access roads at two already disturbed locations.

The results of the Assessments of Significance completed for the threatened ecological values listed under the TSC Act concluded:

- no significant impact on any of the threatened flora species assessed;
- no significant impact to the listed EEC; and
- no significant impact for threatened fauna species.

The results of the Assessments of Significance completed for the threatened matters listed under the EPBC Act concluded there was no significant impact to threatened or migratory species. The Project was referred to the DoE, and a Delegate for the Minister for the Environment determined under section 75 of the EPBC Act that the Project is not a controlled action.

E7. Noise and Vibration

To assess noise and vibration associated with the Project two separate specialist assessments were completed:

- *Wind Farm Noise Impact Assessment* prepared by DNV GL (2015a) assessed potential impacts associated with WTG noise; and
- *Supplementary Acoustics Assessment* prepared by ERM (2015c) considered construction noise and vibration, road traffic noise during construction and operation, and substation noise during operation.

A total of 16 residential dwellings and one approved but not yet constructed dwelling were included in the assessments. The specialist assessments indicated that predicted operational noise (noise generated from WTGs and on-site substation) will comply with the relevant noise assessment criteria at all surrounding residential locations (involved and non-involved landholders).

Predicted noise generated during construction activities and traffic movement was at or below the relevant noise assessment and is unlikely to impact on the noise amenity of the surrounding area. Construction and operational vibration levels that could impact the surrounding community and environment were determined unlikely to occur. Any impacts associated with these factors were deemed negligible, if any at all.

E8. Landscape and Visual

A *Landscape Character and Visual Impact Assessment* was undertaken by Clouston Associates (2015) to assess the visual and landscape character impacts of the Project.

The assessment concluded that the Project has a relatively limited visual catchment and will result in an overall moderate to moderate/low visual impact given:

- the limited number of sensitive residential dwellings in proximity to the PA;
- the limited number of public viewers on roads and limited quantity of public open space;
- topography that limits views of the PA, blocking many views of the WTGs from distances of over 3 km; and
- dense stands of tree planting, windbreaks and garden plantings (associated with individual properties) that block or filter views towards the Project.

The low density of residential receptors within the 12 km viewshed for the Project ensures that moderate/high visual impacts are limited to dwellings within 2-3 km of the WTGs. The private viewpoints assessed as having the highest potential visual impact are either located on elevated ground with panoramic views over the surrounding rural landscape or in a position when many WTGs are visually accessible.

Public viewpoints are mostly limited to the minor local road network and two main thoroughfares that traverse the study area. These view locations are dynamic with motorists travelling along the roads relatively quickly, reducing the duration of the view and hence the severity of the visual impact.

E9. Cultural Heritage

An *Aboriginal and Historic Cultural Heritage Assessment* was undertaken by ERM (2015d) to assess the potential impacts on items of cultural heritage significance. No items or places of historic heritage were identified within the PA. A total of 21 Aboriginal cultural heritage objects and areas of sensitivity were identified within the PA as part of the assessment. The development footprint largely avoids areas of Aboriginal heritage significance, however some recorded sites will need to be salvaged or re-located in line with the recommendations outlined in the *Aboriginal and Historic Cultural Heritage Assessment*. In addition, subsurface testing prior to ground disturbing works will be undertaken at specific locations.

Potential impacts to the previously recorded items of Aboriginal significance along with management procedures associated with potentially disturbing previously unrecorded items of significance will be addressed through the implementation of an *Aboriginal Cultural Heritage Management Plan* during construction.

E10. Traffic and Transport

A *Transport Impact Assessment* was undertaken by GTA Consultants (2015) to assess the potential traffic related impacts associated with the Project.

Subject to obtaining relevant approvals and permits from the Roads and Maritime Services (RMS) and Upper Lachlan Shire Council, and undertaking identified road upgrades, it is expected that Restricted Access Vehicles (RAV) (over-dimensional and over-mass vehicles) carrying oversized WTG components from Port Kembla to the PA will utilise Crookwell-Goulburn Road via the township of Goulburn and bypass the Crookwell township using Grange Road, Kialla Road, Range Road and Grabben Gullen Road. This haulage route was used to provide access for RAVs as part of the Gullen Range Wind Farm and at this stage, is the only haulage route for RAVs being considered for approval as part of the SSD Application. The section of Range Road between the Gullen Range Wind Farm site access and Grabben Gullen Road is proposed to be upgraded to support the use of the road by RAVs.

It is anticipated that general construction vehicles will access the PA from the south using Grabben Gullen Road via the township of Gunning or from the north using the RAV route via Goulburn.

Based on the estimated traffic generation associated with the Project and the existing spare capacity in the road network surrounding the PA, no significant impacts on the capacity of the road network or road users are anticipated.

E11. Water Supply, Water Quality and Hydrology

A *Water Supply, Water Quality and Hydrology Assessment* was undertaken by ERM (2015e) to assess the potential water and soil related risks of the Project. The development footprint is

located largely in areas of low erosion potential, whereby a standard suite of erosion and sediment control measures can be adopted in most areas.

A review of groundwater wells adjacent to the PA identifies that the groundwater aquifer occurs at depths significantly greater than would be intercepted by earthworks associated with Project construction.

Water supply options are available to meet the demands of the Project during construction, with the most convenient and cost effective being the use of surface water from existing dams within the PA. In the event that existing surface waterbodies are not utilised during construction, water may be sourced externally and delivered to the PA via water tanker. In addition, groundwater pumping via a new bore and extraction from the Lachlan River also present viable water supply options, however licensing, economic and logistical requirements would need to be determined, following approval.

E12. Socio-Economic

The Project is expected to deliver significant benefits to the local and broader region through employment opportunities and an increase in the demand for local goods and services, especially during the construction phase. The Project is anticipated to assist in the funding of local infrastructure and other projects via the establishment of the Community Enhancement Program. The structure and administration of these funds will be finalised prior to the commencement of operation.

Concerns have been raised during the preliminary stages of the Project with regards to the physical presence of the Project on visual and noise amenity as well as impacts on property values. As mentioned previously, elevated noise levels at surrounding residential properties is not expected to occur during the operation of the Project and predicted noise level during construction were at or below the relevant noise assessment criteria. In addition, the Project is expected to cause a moderate/high visual impact to non-involved residential dwellings located within 2-3 km from proposed WTG locations; however the level of impact was noted to decrease with distance from the PA. It is expected that the level of impact can be further reduced through the implementation of mitigation measures such planting of vegetation screens at affected properties in consultation with the respective landholders.

A review of available literature did not find a correlation between declining property values in proximity to wind farm developments. This is supported by the Secretary's Environmental Assessment Report for the State Significant Development: Yass Valley Wind Farm (SSD08_0246) (DP&E 2015), which states on page 40:

"The Department acknowledges that, in relation to impacts on land values, the NSW Valuer-General commissioned a report on the impacts of wind farms on land values in Australia. The report states as its principal finding, based on analysis of previous studies and its own investigations, that the majority of wind farms erected in Australia appear to have had no quantifiable effect on land values."

E13. Hazards and Risks

The EIS examined the potential hazards and risks associated with the Project, which included an assessment of aviation safety, electromagnetic interference, shadow flicker, blade throw, health impacts and bushfire risk.

Aviation Safety

An *Aeronautical Impact Assessment* was undertaken by Aviation Projects Pty Ltd (2015) to assess the potential impact the Project may impose on the safe operation of aircraft within proximity to the PA. The assessment concluded that the Project is not expected to result in any significant risk to normal flying operations provided aircraft are operated in compliance with applicable

regulatory and operational control requirements and with the application of good airmanship. Furthermore, the Project is not expected to impact on radar surveillance facilities in proximity to the PA. Whilst the Project is likely to prevent fixed wing agricultural operations within the PA, it is expected that safe aerial application operations would be possible on properties neighbouring the PA with some operational or cost impacts, subject to final WTG locations, and subject to a case by case assessment.

Electromagnetic Interference

An assessment of the potential electromagnetic interference issues was undertaken by DNV GL (2015b) and documented in the *EMI and EMF Assessment*. The assessment concluded that a total of six residential dwellings may be subject to television reception interference. Subject to approval, an assessment of the potentially affected dwellings and at the request of any other affected landholders, will be undertaken at the completion of construction to rectify any observed impacts relating to television reception.

Other communications services including radio broadcasting, mobile phones, internet and Citizens' Band radio are unlikely to be affected by the Project.

Shadow Flicker

A shadow flicker assessment was undertaken by DNV GL (2015c) and documented in the *Shadow Flicker and Blade Glint Assessment*. Shadow flicker may occur under certain combinations of geographical position and time of day, when the sun passes behind the rotating blades of a WTG and casts a moving shadow over neighbouring areas. When viewed from a stationary position, the moving shadows appear as a flicker giving rise to the phenomenon of 'shadow flicker'.

The shadow flicker assessment determined that potential shadow flicker impacts, which exceed the recommended limit of 30 hours per year, are confined to four dwellings owned by involved landholders. Signed agreements from these affected landholders have been obtained by Newtricity and mitigation measures will be implemented where feasible and applicable at the request of the landholder.

Blade Throw

A *Blade Throw Risk* report was undertaken by DNV GL (2015d) to consider the rare phenomenon of a structural failure in a WTG blade during operation, resulting in the ejection of projectiles into the surrounding area. The assessment found that the risk of death, personal injury or damage to property from a blade throw event is extremely small and well within the risk levels typically deemed acceptable to society.

Health Impacts

Concerns regarding the potential effects that wind farm developments have on human health are generally associated with:

- audible noise;
- inaudible and low frequency noise;
- shadow flicker and blade glint; and
- electromagnetic emissions.

Based on a review of the available literature and drawing on the outcomes of the specialist shadow flicker and noise assessments, the Project is not expected to impact on the health of residents located in proximity to the Project. In particular, the National Health and Medical Research Council (NHMRC 2015a) released the Statement: Evidence on Wind Farms and Human Health on 11 February 2015, which concluded:

'There is no direct evidence that exposure to wind farm noise affects physical or mental health. While exposure to environmental noise is associated with health effects, these effects occur at much higher levels of noise than are likely to be perceived by people living in close proximity to wind farms in Australia. The parallel evidence assessed suggests that there are unlikely to be any significant effects on physical or mental health at distances greater than 1,500 m from wind farms.'

Furthermore, NSW Health in their submission during the public exhibition of the Draft Wind Farm Guidelines (DP&I 2011) stated that:

"NSW Health advises that there is currently no health evidence to support a generic 2 km separation distance from a proposed wind turbine. Mandatory enhanced assessment of potential impacts for neighbours within a 2 km radius of proposed wind turbines needs to be justified on non-Health grounds."

Bushfire Risk

An assessment of the potential bush fire risks was undertaken by ERM and documented in the *Biala Wind Farm Bushfire Hazard and Risk Assessment*. The risk of fire from wind farm developments is considered low given the on-board control systems designed to mitigate the risk of fire. All WTGs are located in areas mapped as low fire hazard and with the implementation of the prescribed measures documented in this EIS, the risk of bushfire can me effectively managed.

E14. Cumulative Impacts

The Draft Wind Farm Guidelines state that:

"Cumulative impacts may occur where other existing or future activities have impacts similar to the development proposed. It includes wind farms, but is not limited to wind farms, and could include other types of development. The area that needs to be considered will vary depending on the issue, and the spatial extent of the associated impact."

Given the suitability of the Southern Tablelands region for wind energy projects, there are several operational, approved and proposed wind farms within the vicinity of the PA and broader region. Gullen Range Wind Farm and Gunning Wind Farm are the closest existing wind farms to the PA, located 5.5 km and 7.2 km from the PA respectively.

The assessment of potential cumulative impacts concluded:

- The Project together with the Gullen Range and Gunning Wind Farms have the potential to contribute to the regional ecological impacts when considered in combination with the Biala Wind Farm. Such impacts relate primarily to avifauna (bird and bat species) in terms of blade strike or alterations to flight paths. Cumulative impacts are expected to be minor given that there is no continuous length of WTGs between the PA and nearby wind farms developments.
- In terms of operational noise, the Project complies with the relevant noise assessment criteria at all of the involved and non-involved residential dwellings when incorporating the cumulative noise impacts from the Gunning and Gullen Range Wind Farm developments.
- The surrounding road network has sufficient capacity to accommodate the likely cumulative traffic generation of any nearby future developments.
- The Project is generally not expected to contribute to cumulative EMI impacts, however should they arise, measures identified by DNV GL (2015b) can be readily implemented to mitigate such impacts.
- The Project is not expected to contribute to cumulative impacts on aviation safety as the identified potential impacts relating to wake turbulence on low flying aircraft is primarily confined to the PA.

E15. Environmental Management

An Environmental Management Framework will be developed to guide proposed activities associated with the construction, operation and 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 Framework will be elaborated in the Construction Environmental Management Plan (CEMP), Operational Environmental Management Plan (OEMP) and Decommissioning and Rehabilitation Plan prepared for the Project.

As a result of the detailed specialist assessments undertaken, mitigation measures have been identified to reduce and manage potential environment impacts arising from the Project. The mitigation measures set out for each environmental aspect would form the basis of the CEMP and OEMP to ensure the Project minimises impacts to the environment and local community.

E16. Conclusion

The Biala Wind Farm is expected to make an important contribution to the local and regional economy and contribute positively to the achievement of State and Federal policy objectives by increasing the supply of renewable energy and reducing GHG emissions.

The Project involves a generating capacity of approximately 77.5 MW and an estimated capital investment value of $192 million and will provide significant benefits at the State, regional and local level by:

- supplementing the renewable energy supply in NSW and producing clean electricity to power up to 33,200 homes per annum;
- supporting increased direct and indirect employment opportunities at the State, regional and local levels during the construction and operational phases of the Project;
- increasing demand for local goods and services during the construction and operational phases of the Project;
- diversifying existing income streams for involved landholders whilst supporting the continued use of land for productive agricultural operations; and
- improving the local road network surrounding the PA and contributing to local community facilities and infrastructure through the Community Enhancement Program.

In conclusion, the EIS has 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 PA. As a result, the Project is regarded to be in the public interest.

1 INTRODUCTION

This chapter provides a brief overview of the Project, the Proponent, the development application process and the structure of the Environmental Impact Statement.

1.1 Overview

Newtricity is seeking approval for the construction and operation of the Biala Wind Farm situated near the locality of Biala in the Southern Tablelands region of New South Wales (NSW) (the Project). The Project is located approximately 14.5 km south-west of Crookwell and 8.5 km east of Biala, and is wholly contained within the Upper Lachlan Local Government Area (LGA).

The Project will involve the construction of up to 31 wind turbine generators (WTGs) at a maximum tip height of 185 metres (m) above ground level (AGL) and an indicative generation capacity of 77.5 MW (based on a rated capacity of 2.5 MW). Support infrastructure includes the electrical reticulation network and on-site substation, internal access roads and permanent operations and maintenance facilities together with a temporary concrete batching plant, site offices and equipment storage area that will be utilised during the construction period.

The Project Area (PA) covers approximately 1,936 hectares (ha), on which the WTGs, electrical reticulation network, access roads and ancillary structures will be located. The PA encompasses 37 land parcels collectively owned by four private landholders. The PA and broader region is extensively cleared for the purpose of agricultural grazing and is generally characterised by rolling hills and gentle ridgelines with pockets of remnant vegetation. The location of the Project is shown in *Figure 1-1* and the Project Area (PA) is shown in *Figure 1-2*.

A 132 kilovolt (kV) overhead transmission line is proposed to connect the on-site substation to the existing 132 kV Yass to Goulburn transmission line located approximately 22 kilometres (km) south of the wind farm site. Approval for the transmission line will be sought separately and is therefore not assessed in detail in this Environmental Impact Statement (EIS) (refer *Sections 3.8* and *6.9* for more information).

The Project will have an estimated capital investment value of $192 million.

Photograph 1-1 View of the Typical Landscape within the Project Area (ERM 2014)

Client:	Newtricity		
Drawing No:	0178462m_BWF_EIS_G001_R3.mxd		
Date:	18/03/2015	Drawing Size: A3	
Drawn By:	GR	Reviewed By: ED	

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.

Figure 1-1 - Project Location

Biala Wind Farm
Environmental Impact Statement

Environmental Resources Management ANZ

Auckland, Brisbane, Canberra, Christchurch, Melbourne, Newcastle, Perth, Port Macquarie, Sydney

ERM

WATTLE GREEK

SANDY CREEK

BIALA CREEK

LONG GULLY

GRABBEN GULLEN ROAD

BIALA ROAD

Legend

- Project Area
- Road
- Track (Existing)
- Waterway (minor)
- Creeks

Data Source:
Imagery : Fugro Spatial Solutions Satellite Imagery, April 2014
DLPI : DCDB and DTDB, Oct 2014

0 250 500m

N

Client:	Newtricity		
Drawing No:	0178462m_BWF_EIS_G002_R2.mxd		
Date:	18/03/2015	Drawing Size: A3	
Drawn By:	GR	Reviewed By: ED	

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.

Figure 1-2 - Project Area

Biala Wind Farm
Environmental Impact Statement

Environmental Resources Management ANZ

Auckland, Brisbane, Canberra, Christchurch, Melbourne, Newcastle, Perth, Port Macquarie, Sydney

ERM

1.2 The Proponent

Newtricity is an Australian owned family business specialising in wind energy developments, with investors based in Ireland. The investors were previously involved in a company called Airtricity prior to its sale in 2008. During the period of their involvement, Airtricity was an Irish based wind farm developer, owner and operator and developed multiple wind farms throughout Ireland, Scotland and the United States of America (USA). Details of the Proponent are outlined below:

Proponent:	Newtricity
Primary Contact:	Annmaree Lavery
Address:	C/o Environmental Resources Management Locked 3012, Australia Square NSW 1215
Phone:	02 8584 8888
Email:	newtricity@optusnet.com.au
Website:	http://www.newtricity.com.au

In developing and operating the Project, Newtricity is committed to:

- complying with all environmental legislation and to avoid, remedy or mitigate all significant adverse environmental effects;
- implementing an open and flexible stakeholder engagement program;
- accurately recording and reporting on environmental monitoring; and
- ensuring that all project employees receive adequate training and are made aware of, and understand, the requirements imposed on the company by environmental legislation.

1.3 State Significant Development Application

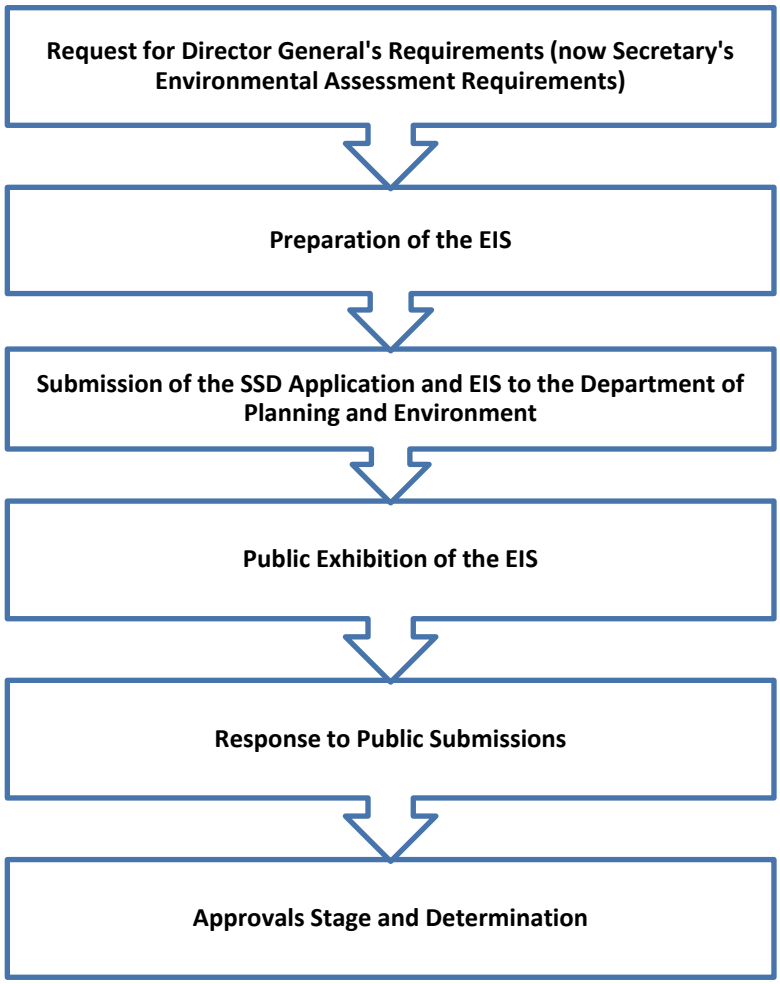
The Project was declared a State Significant Development (SSD) in accordance with clause 20, Schedule 1 of the *State Environmental Planning Policy (State and Regional Development) 2011* and will be assessed under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Environmental Resources Management Australia Pty Ltd (ERM) has been commissioned by Newtricity to coordinate the technical environmental assessments and prepare this EIS to support the SSD Application. This EIS has been prepared in accordance with the EIS preparation requirements as outlined under Schedule 2 of the *Environmental Planning and Assessment Regulation 2000.* The EIS has also been prepared to address the *Draft NSW Planning Guidelines for Wind Farms, December 2011* (Draft Wind Farm Guidelines), released for public exhibition in December 2011 by the Department of Planning and Infrastructure (DP&I).

1.3.1 Planning Process

An overview of the SSD Application process is outlined in *Figure 1-3* and described below.

Figure 1-3 State Significant Development Process



- **Secretary's Environmental Assessment Requirements (SEARs) -** a preliminary environmental assessment (PEA) report was prepared and submitted to the NSW Department of Planning and Infrastructure (now Department of Planning and Environment (DP&E)) in July 2013. Director General's Requirements (DGRs) were initially issued for the Project on 12 August 2013. Following changes to the scope of the Project including the removal of the transmission line from the PA, revised assessment requirements, now referred to as SEARs, were issued for the Project on 19 May 2015. The SEARs form the basis of the assessment criteria for the Project.

- **Preparation of the EIS** - the scope of the impact assessment was derived from the environmental scoping stage and risk assessment undertaken in the initial stages of the Project to identify potential impacts. Potential impacts identified during the environmental risk assessment, together with the SEARs (and original DGRs), formed the overarching scope of the EIS.

- **Submission of the EIS** - the EIS will be submitted to DP&E for review and comment to determine its adequacy for public exhibition.

- **Public Exhibition** - the EIS will be placed on public exhibition by DP&E for a period of up to 60 days. Submissions can be submitted on the DP&E Major Projects website: www.planning.nsw.gov.au**.** During the exhibition period, submissions from the Upper Lachlan Shire Council (Council) and relevant State agencies and other authorities will also be sought.

- **Response to Public Submissions** - if required, responses to the submissions received will be prepared by the Proponent and submitted to DP&E in a timely manner.

- **Approvals Stage** - DP&E will consult further with Council and the relevant State agencies and other authorities on draft conditions of consent. The assessment report will then be finalised and determined by either a delegated officer of DP&E, the Minister, or forwarded to the Planning and Assessment Commission (PAC) for determination. If approved, conditions of consent will be provided with the letter of determination.

1.3.2 Environmental Assessment Team

The environmental assessment team consists of ERM's in-house technical experts and sub-consultants. *Table 1-1* provides a summary of the environmental assessment team and their contributions to the EIS and supporting specialist assessments.

Table 1-1 Environmental Assessment Team

Company	Technical Component
ERM	• Stakeholder and Community Engagement Strategy • Ecology Impact Assessment • Supplementary Acoustic Assessment • Aboriginal and Historic Cultural Heritage Assessment • Water Supply, Water Quality and Hydrology Assessment • Bushfire Hazard and Risk Assessment • Preliminary Decommissioning and Rehabilitation Plan
GTA Consultants	• Transport Impact Assessment
DNV GL	• Wind Farm Noise Impact Assessment • Electromagnetic Fields and Electromagnetic Interference Assessment • Shadow Flicker Assessment • Blade Throw Risk
Clouston Associates	• Landscape Character and Visual Impact Assessment
Aviation Projects	• Aeronautical Impact Assessment

1.4 Structure and Content of the EIS

This EIS has been prepared to ensure that the Project is described adequately; addresses the SEARs; assesses the potential environmental impacts; and identifies proposed mitigation measures.

The EIS consists of two volumes with the main environmental assessment contained in *Volume 1* and the supporting specialist assessments and other documentation contained in *Volumes 2 to 6*. The overall structure of the EIS is outlined in *Table 1-2* and *Table 1-3*.

Table 1-2 *EIS Volume 1 Structure*

Volume 1: Environmental Assessment		
Chapter No.	**Chapter Title**	**Chapter Summary**
1	Introduction	Provides an overview of the Project, the Proponent and the SSD Planning Process.
2	Strategic Justification	Outlines the Project objectives and gives consideration to Government policies, energy demand and air quality.
3	Project Description	Provides a detailed description of the proposed development including the key components during both the construction and operational phases.
4	Site Analysis	Identifies the existing conditions of the PA and surrounding area.
5	Project Alternatives	Discusses the alternatives to undertaking the Project including alternatives considered in relation to siting, design and operation.
6	Statutory Framework	Describes the relevant Commonwealth, State and local legislative framework in relation to the Project.
7	Community and Stakeholder Engagement	Summarises the consultation activities undertaken with key external stakeholders (including government agencies, authorities and the local community).
8	Environmental Risk Assessment	Describes the approach and outcome of the environmental risk assessment and the impact assessment approach undertaken for the Project.
9	Biodiversity	*Chapters 9 to 16* describe the physical, biological, cultural, social and economic environments within and in the vicinity of the PA, the potential risks and impacts of the Project upon the existing environment, and the mitigation and management measures that would be undertaken to minimise these risks and impacts.
10	Noise and Vibration	
11	Landscape and Visual	
12	Cultural Heritage	
13	Traffic and Transport	
14	Water Supply, Water Quality and Hydrology	
15	Socio-Economic Issues	
16	Hazards and Risks	
17	Cumulative Impacts	Describes the potential cumulative impacts of the Project in combination with existing and other publicly proposed wind farms in the region.
18	Environmental Management	Provides an overview of the Environmental Management Framework to be developed for the Project and includes a summary of the mitigation measures identified within *Chapter 9 to Chapter 16*.
19	Conclusion	Presents the conclusions of the EIS.
20	References	Lists all material referenced in this EIS.

Table 1-3 *EIS Volumes 2 to 6*

Volumes 2 to 6: Specialist Assessments	
Annex Ref.	**Annex Title**
A	Secretary's Environmental Assessment Requirements
B	Newtricity Biala Wind Farm – Electricity Network Connection and Line Route Options (Clarence Consultants, July 2015)
C	EPBC Referral Determination
D	Biala Wind Farm - Stage 2 Stakeholder and Community Engagement Strategy (ERM, March 2015)
E	Consultation Material
F	Biala Wind Farm - Ecology Impact Assessment (ERM, June 2015)
G	Biala Wind Farm -Wind Farm Noise Impact Assessment (DNV GL, June 2015)
H	Biala Wind Farm - Supplementary Acoustics Assessment (ERM, July 2015)
I	Biala Wind Farm - Landscape Character and Visual Impact Assessment (Clouston Associates, July 2015)
J	Biala Wind Farm - Aboriginal and Historic Cultural Heritage Assessment (ERM, June 2015)
K	Biala Wind Farm Significant Development - Transport Impact Assessment (GTA, July 2015)
L	Biala Wind Farm - Water Supply, Water Quality and Hydrology Assessment (ERM, July 2015)
M	Aeronautical Impact Assessment, Biala Wind Farm (Aviation Projects, June 2015)
N	Biala Wind Farm - EMI and EMF Assessment (DNV GL, July 2015)
O	Biala Wind Farm - Shadow Flicker and Blade Glint Assessment (DNV GL, July 2015)
P	Biala Wind Farm - Blade Throw Risk (DNV GL, June 2015)
Q	Biala Wind Farm - Bushfire Hazard and Risk Assessment (ERM, July 2015)
R	Biala Wind Farm - Preliminary Decommissioning and Rehabilitation Plan (ERM, July 2015)

1.4.1 Secretary's Environmental Assessment Requirements

A copy of the SEARs issued on 19 May 2015 are provided in *Annex A* together with correspondence from ERM in relation to the changes in the scope of the Project, including the removal of the transmission line from the PA. *Table 1-4* provides a summary of the SEARs and includes a reference to where each requirement has been addressed in the EIS and corresponding specialist assessment.

Table 1-4 Secretary's Environmental Assessment Requirements (19 May 2015)

Issues	Requirements	Document Reference
General EIS Requirements	The Environmental Impact Statement must meet the minimum form and content requirements of Schedule 2 of the Environmental Planning and Assessment Regulation 2000 and include the following: 1. A detailed description of the development (Clause 6 of Schedule 2 to the EP&A Regulation), for both the wind farm and associated infrastructure, including: • details of construction, operation and decommissioning, including compliance with building standards and relevant codes/specifications for the construction of wind farms;	*Chapter 3*
	• the proposed external cladding materials, underground/overhead cabling between turbines, electrical substations, meteorological monitoring masts, access roads (including internal access tracks), road/intersection upgrades, obstacle lighting; and temporary facilities such as concrete batching plants and construction compounds;	*Chapter 3*
	• site plans and maps at an adequate scale with dimensions showing: - the location and dimensions of all project components, including coordinates in latitude/longitude and maximum AHD heights of the turbines;	*Chapter 3*
	- existing environmental features (e.g. watercourses, vegetation communities), infrastructure, land use (including nearby residences and turbines within 2 km of a dwelling or approved dwelling, and the location/siting of the development (including associated infrastructure) in the context of the existing environment;	*Chapters 4, 9 and 14*
	• a timeline identifying the development's proposed construction and operation components, their envisaged lifespan and arrangements for decommissioning (including the proposed funding arrangements and how agreements with associated landowners have addressed decommissioning liabilities); and	*Chapter 3 and Annex R*
	• resourcing requirements (e.g. water supply and sand/gravel).	*Chapters 3 and 14*
	2. A summary of the EIS and description of the strategic need, justification, objectives and outcomes (Clause 7 of Schedule 2 to the EP&A Regulation) for the wind farm and associated infrastructure, including: • a justification for the development taking into consideration the objects of the EP&A Act, including how the principles of ecological sustainable development will be incorporated in the design, construction and ongoing operation phases of the development;	*Chapter 6*
	• a strategic assessment of the need, scale, scope and location for the project including consideration of: - the predicted electricity demand in NSW and the National Electricity Market; - the Commonwealth's Renewable Energy Target Scheme; - the greenhouse gas benefits of the project (quantified and substantiated), taking into consideration sources of electricity that could realistically be replaced (using the NSW wind farm greenhouse gas savings tool – www.environment.nsw.gov.au/climatechange/greenhousegassavingstool);	*Chapter 2*

Issues	Requirements	Document Reference
	• an analysis of feasible alternatives to the carrying out of the development, including: - an assessment of the environmental costs and benefits of the development relative to alternatives and the consequences of not carrying out the development, the suitability of the chosen option and whether or not the development is in the public interest; - an analysis of the suitability of the project with respect to potential land use conflicts with existing and future surrounding land uses (including other proposed or approved wind farms, existing or proposed electricity transmission lines, rural residential development, building entitlements and subdivision potential), land of significant scenic value, land of high agricultural value, mineral resources, forestry, conservation areas and Crown land, taking into account local and strategic land use objectives, the potential for social and economic impacts on the local community, and the Environmentally Sensitive Area Mapping held by Upper Lachlan Shire Council; and - description of the alternatives considered (location and/or design) for all project components, and justification for the preferred project demonstrating its benefits on a local and strategic scale and how it achieves stated objectives and any measures to offset residual impacts (e.g. community enhancement programmes);	*Chapters 4, 5 and 15*
	• an identification of how relevant planning, land use and development matters (including relevant strategic and statutory matters) have been considered in the impact assessment (direct, indirect and cumulative impacts) and/or in developing management mitigation measures, including Section 79C of the EP&A Act, applicable State Environmental Planning Policies (SEPP), Local Environmental Plans, the nature and extent of any prohibitions that apply to the development and demonstration that the site is suitable for the proposed use (including in accordance with SEPP 55 - Remediation of Land).	*Chapter 6*
	The EIS must also: • provide an overview of the approvals process for the transmission line connection to the existing high voltage electricity network under Part 5 of the EP&A Act, including timing, responsibilities, and how this process would integrate with the planning and development of the wind farm under Part 4 of the EP&A Act.	*Chapter 6 and Annex B*
	• sufficient information to demonstrate the feasibility of the transmission line having regard to the acceptability of likely environmental impacts (including cumulative impacts), land use constraints, and any technical constraints associated with connecting to the existing high voltage electricity network; and	*Chapter 5 and Annex B*
	• consider the minimum form and content requirements of the Draft NSW Planning Guidelines: Wind Farms (DoPI 2011), including procedures for consulting with the community and stakeholders, and meeting assessment requirements.	*Chapter 6*
	Notwithstanding the key issues specified below, the EIS must include an environmental risk assessment to identify the potential environmental impacts associated with the development. Where relevant, the assessment of the key issues below, and any other significant issues identified in the risk assessment, must include: • adequate baseline data;	*Chapter 8* and Specialist Assessments
	• consideration of potential cumulative impacts due to other development in the vicinity. Particular consideration should be given to other nearby existing and proposed wind farms, including Gullen Range, Gunning and Crookwell 1, 2 and 3; and	*Chapter 17*

Issues	Requirements	Document Reference
	• measures to avoid, minimise and if necessary, offset the predicted impacts, including detailed contingency plans for managing any significant risks to the environment.	*Chapters 9-16 and 18*, and Specialist Assessments
Landscape and Visual	• Provide a comprehensive assessment of the landscape character and values and any scenic or significant vistas of the area potentially affected by the project taking into account cumulative impacts from surrounding proposed, approved or operational wind farms in the locality, including an assessment of the significance of landscape values and character in a local and regional context. This should describe community and stakeholder values of the local and regional visual amenity and quality, and perceptions of the project based on surveys and consultation;	*Chapter 11 and Annex I*
	• assess the impact of shadow "flicker", blade "glint" and night lighting from the wind farm;	*Chapter 16, Annex M, Annex O and Annex P*
	• identify the zone of visual influence of the wind farm including consideration to night lighting (no less than 10 km) and assess the visual impact of all project components on this landscape;	*Chapter 11 and Annex I*
	• include photomontages of the project taken from potentially affected residences and in particular from all non-host dwellings within 2 km of a proposed wind turbine (including approved but not yet developed dwellings or subdivisions with residential rights), settlements and significant public view points, and provide a clear description of proposed visual amenity mitigation and management measures for both the wind farm and the transmission line. The photomontages must include representative views of turbine night lighting if proposed;	*Annex I*
	• provide an assessment of the feasibility, effectiveness and reliability of proposed mitigation measures and any residual impacts after these measures have been implemented; and	*Annex I*
	• if any agreements with residents in regard to visual impacts are proposed, provide sufficient information to enable a clear understanding of what has been agreed and what matters are covered by any such agreements.	N/A – No agreements will residents are proposed at this stage
Noise and Vibration	• Include a comprehensive noise assessment of all phases and components of the project taking into account cumulative impacts from surrounding approved or operational wind farms in the locality including: turbine operation, the operation of the electrical substation, construction noise (focusing on high noise-generating construction scenarios and works outside of standard construction hours), traffic noise during construction and operation, and vibration generating activities (including blasting) during construction and/ or operation. The assessment must identify noise/ vibration sensitive locations (including approved but not yet developed dwellings), baseline conditions based on monitoring results, the levels and character of noise (e.g. tonality, impulsiveness, low frequency etc) generated by noise sources, noise/ vibration criteria, modelling assumptions and worst case and representative noise/ vibration impacts. The assessment should be based on separate daytime (7am to 10pm) and night time periods (10pm to 7am);	*Chapter 10, Annex G and Annex H*
	• in relation to wind turbine operation, determine the noise impacts under operating meteorological conditions (i.e. wind speeds from cut in to rated power), including impacts under meteorological conditions that exacerbate impacts (including varying atmospheric stability classes and the van den Berg effect for wind turbines). The probability of such occurrences must be quantified;	
	• include monitoring to ensure that there is adequate wind speed/profile data and ambient background noise data that is representative for all sensitive receptors;	

Issues	Requirements	Document Reference
	• provide justification for the nominated average background noise level used in the assessment process, considering any significant difference between daytime and night time background noise levels at background noise levels higher than 30 dB(A);	
	• consider special audible characteristics, including tonality, amplitude modulation, and low frequency noise (apply penalties where relevant), and identify any risks with respect to tonal, low frequency or infra-noise;	
	• clearly outline the noise mitigation, monitoring and management measures that would be applied to the project. This must include an assessment of the feasibility, effectiveness and reliability of proposed measures and any residual impacts after these measures have been incorporated;	
	• if any noise agreements with residents are proposed for areas where noise criteria cannot be met, provide sufficient information to enable a clear understanding of what has been agreed and what criteria have been used to frame any such agreements; and	
	• include a contingency strategy that provides for additional noise attenuation should higher noise levels than those predicted result following commissioning and/or should noise agreements with landowners not eventuate.	
	The assessment must be undertaken in a manner that is consistent with the following guidelines: • Wind Turbines - the South Australian Environment Protection Authority's *Wind Farms Environmental Noise Guidelines* (2003) however, measurements shall be taken at hub height; • Substation – *NSW Industrial Noise Policy* (EPA, 2000); • Site Establishment and Construction - *Interim Construction Noise Guidelines* (DECC, 2009); • Traffic Noise – *NSW Road Noise Policy* (DECCW 2011); and • Vibration - *Assessing Vibration: A Technical Guideline* (DECC, 2006).	
Biodiversity	• Include an ecological assessment of potential impacts on terrestrial and aquatic ecosystems (including Wattle Creek, Biala Creek and groundwater dependent ecosystems);	*Chapter 9 and Annex F.* Note - It was agreed with OEH to assess impacts in accordance with the methods prescribed in the DGRs issued in 2013 rather than the *Framework for Biodiversity Assessment*.
	• assess and document impacts in accordance with the Framework for Biodiversity Assessment unless otherwise agreed by the Office of Environment and Heritage (OEH);	
	• provide justification for site selection of the proposed turbine locations taking into account the potential to use areas of lower habitat value within the site;	
	• identify threatened species, populations and communities listed under both State and Commonwealth legislation that have the potential to occur on site with particular reference to species identified by the OEH letters dated 2 August 2013 and 9 January 2015*;*	
	• map existing vegetation by vegetation/ community type and include details on existing site conditions, including whether the vegetation comprises a highly modified or over-cleared landscape and the types and quality of habitat resources available (vegetation mapping should consider any Environmentally Sensitive Area Mapping held by upper Lachlan shire council and any areas subject to an agreement with South East Local Land Services);	
	• map rivers, streams, wetlands and estuaries (as described in Appendix 2 of the Framework for Biodiversity Assessment);	

Issues	Requirements	Document Reference
	• describe baseline conditions for any water resources likely to be affected including water quality objectives (as endorsed by the NSW Government http://www.environment.nsw.qov.aulieo/index.htm) and indicator and trigger values/criteria for the environmental values identified in the water quality objectives in accordance with ANZECC (2000) Guidelines for Fresh and Marine Water Quality and or local objectives, criteria or targets endorsed by the NSW Government;	
	• provide details of the survey methodology employed including survey effort and representativeness for each species targeted and clear justification for species that were discounted from requiring field surveys or further assessment;	
	• demonstrate a design philosophy of impact avoidance on ecological values, and in particular, ecological values of high significance;	
	• provide a worst case estimate of vegetation to be cleared (in hectares), including quantifying impacts (in hectares) by vegetation type and threatened species habitat (as relevant);	
	• assess the significance of impacts to native vegetation, listed threatened species, populations and communities and their habitats with consideration to local and region-based ecological implications, including edge effects, habitat connectivity and distribution of species. The assessment must consider impacts to in-stream and riparian ecology from works close to waterways and/ or waterway crossings. In addition, impact of the project on birds and bats from blade strikes, low air pressure zones at the blade tips (barotrauma), and alteration to movement patterns resulting from the turbines must be assessed, including demonstration of how the project has been sited to avoid and/ or minimise such impacts;	
	• consider cumulative effects, including the effects of multiple wind farms in the vicinity on bird/bat strike, movement patterns and loss of habitat;	
	• include details of how flora and fauna impacts would be managed during construction and operation including adaptive management, rehabilitation/ regeneration measures and maintenance protocols;	
	• demonstrate how the project (with the incorporation of all proposed measures to avoid, mitigate and/ or offset impacts) achieves a biodiversity outcome consistent with the NSW Government Offsets Policy for Major Projects. Sufficient details must be provided of the specific areas and management proposed to offset the impacts of the project on biodiversity, and how the offset areas will be secured in perpetuity; and	
	• address the risk of weed spread, both noxious and environmental weeds, and identify mitigation measures.	
Heritage	• Include sufficient information to demonstrate the likely impacts of the project on Aboriginal heritage values/items (archaeological and cultural) and outline proposed mitigation measures (including consideration of the effectiveness and reliability of the measures) in accordance with the *Guide to investigation, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH, 2011) and the *Code of Practice for the Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010). The assessment must be undertaken by suitably qualified heritage consultants and demonstrate effective consultation with Aboriginal communities in determining and assessing impacts, developing options and selecting options and mitigation measures (including the final proposed measures) be undertaken and documented in accordance with the Aboriginal cultural heritage consultation requirements for proponents (DECCW 2010); and	*Chapter 12 and Annex J*

Issues	Requirements	Document Reference
	• provide sufficient information to demonstrate the likely impacts of the project on historic heritage values (including heritage vistas) and, where impacts to State or local historic heritage items are proposed, outline proposed mitigation and management measures (including consideration of the effectiveness and reliability of the measures) generally consistent with the guidelines in the NSW Heritage Manual. Where impacts to State or local historic heritage items are proposed, a statement of heritage significance must be included.	*Chapter 12 and Annex J*
Traffic and Transport	• Details of traffic volumes (both light and heavy vehicles) and transport routes during construction and operation;	*Chapter 13 and Annex K*
	• assess the potential traffic impacts of the project on road network function (including intersection level of service) and safety, and including impact on existing transport including school bus routes and freight operations;	
	• assess the capacity of the existing road network to accommodate the type and volume of traffic generated by the project (including over-mass /over-dimensional traffic) during construction and operation, differentiating between various raw material deliveries and staff and contractors, including full details of any required upgrades to roads, bridges, site access provisions (for safe access to the public road network) or other road features;	
	• details of measures to mitigate and/or manage potential impacts, including construction traffic control, road dilapidation surveys and measures to control soil erosion and dust generated by traffic volumes;	
	• details of access roads within the site including how these would connect to the existing public road network (i.e. site access) and ongoing operational maintenance requirements for on-site roads;	
	• consideration of relevant RMS and Council traffic/road policies; and	
	• consideration of appropriate road upgrades and/or maintenance contributions to Council over the life of the project to address impacts on the local road network.	
Hazard and Risks	• Aviation Safety: potential impacts on aviation safety, including cumulative effects of multiple wind farms in the vicinity, potential wake/turbulence issues, the need for aviation hazard lighting, considering nearby aerodromes and aircraft landing areas, defined air traffic routes, aircraft operating heights, approach/departure procedures, radar interference, communication systems, and navigation aids. Aerodromes within 30 km of the turbines should be identified and impacts on obstacle limitation surfaces addressed. Assess the impact of the turbines on the safe and efficient aerial application of agricultural fertilisers and pesticides in the vicinity of the turbines and transmission line. An Aeronautical Impact Statement (AIS) prepared by an appropriately qualified person including the associated height and cords for each turbine;	*Chapter 16 and Annex M*
	• Telecommunications: identify possible effects on telecommunications systems, assess impacts and mitigation measures including undertaking a full engineering assessment to examine the potential impacts as well as analysis and agreement on the implementation of suitable options to avoid potential disruptions to radio communication services; which may include the installation and maintenance of alternative sites;	*Chapter 16 and Annex N*
	• Health: consider and document health issues, focusing on neighbours with dwellings within 2 km of proposed wind turbines. identify potential hazards and risks associated with electric and magnetic fields and demonstrate the application of the principles of Prudent Avoidance;	*Chapter 16*

Issues	Requirements	Document Reference
	• Bushfire Hazards: identify potential hazards and risks associated with bushfires/use of bushfire prone land, including the risks that a wind farm will cause bush fire and any potential impacts on the aerial fighting of bush fires incorporating options to switch off turbine during bushfire, and demonstrating compliance with *Planning for Bush Fire Protection 2006*; and	*Chapter 16 and Annex Q*
	• Blade throw: assess blade throw risks.	*Chapter 16 and Annex P*
Water Supply, Water Quality and Hydrology	• Identify water demands, and determine whether an adequate and secure water supply is available for the project;	*Chapter 14 and Annex L*
	• identify water sources (surface and groundwater), water disposal/discharge methods and water storage structures in the form of a water balance;	
	• include the statutory (licensing) context of the water supply sources;	
	• assess potential environmental impacts associated with the use of the identified water sources including impacts on groundwater and implications for existing licensed users/basic landholder rights;	
	• assess potential environmental impacts associated with any proposed discharges, and proposed monitoring methodology where required;	
	• assess the potential to intercept groundwater, including predicted dewatering volumes, zone of drawdown and associated impact, water quality and disposal methods;	
	• where the project involves crossing or works within 40 m of waterways, identify likely impacts to the waterways, how the waterways are proposed to be crossed and be designed in accordance with the NSW Office of Water *Guidelines for Controlled Activities* (2010);	
	• describe the measures to minimise hydrological, water quality, aquatic and riparian impacts, including contingency requirements to address surface and groundwater impacts; and	
	• identify how works within steep gradient land or highly erosive soil types will be managed during construction and operation, including in relation to access roads.	
Consultation	During the preparation of the EIS, you must consult with relevant local, State and Commonwealth Government authorities, service providers, community groups and affected landowners. In particular you must consult with: • Upper Lachlan Shire Council; • South East Local Land Services; • Local Aboriginal Land Council; • Office of Environment and Heritage • Environment Protection Authority; • NSW Trade and Investment Department (Resources & Energy); • Department of Primary Industries (Catchments and Lands (Crown Lands), Fisheries NSW, Agriculture NSW, and NSW Office of Water); • NSW Roads and Maritime Services; • NSW Rural Fire Service; • Air Services Australia;	*Chapter 7* and Specialist Assessments

Issues	Requirements	Document Reference
	• Civil Aviation Safety Authority; • Department of Defence; • NSW Government Telco Authority and other registered communications licensees (including emergency services); • Aerial Agricultural Society of Australia; • relevant service providers; • relevant minerals stakeholders (including exploration and mining title holders); and • the public, including community groups and adjoining and affected landowners (including "associated" and "non-associated" residences). The EIS must: • demonstrate effective consultation with stakeholders, and that the level of consultation with each stakeholder is commensurate with their degree of interest/concern or likely impact; • provide evidence of consultation with all neighbours with dwellings within 2 km of proposed wind turbines to identify any issues and potential approaches to mitigate any adverse impacts, including details of any written agreements; • clearly describe the consultation process undertaken for each stakeholder/group; including details of the dates of consultation and copies of any information disseminated as part of the consultation process (subject to confidentiality); • describe the issues raised during consultation and how and where these have been addressed in the EIS; and • provide details of the status of the community consultative committee required to be formed by the Applicant under the provisions of the *Draft NSW Planning Guidelines: Wind Farms* (as updated).	

2 STRATEGIC JUSTIFICATION

This chapter outlines the key objectives and justification for the Project in the context of reducing Australia's greenhouse gas emissions, meeting future energy demands, supporting State and Commonwealth renewable energy targets and contributing to economic development in the region.

2.1 Project Objectives

The objectives of the Project are to:

- provide a source of renewable energy to supplement NSW and National energy requirements and assist in reducing greenhouse gas (GHG) emissions;
- contribute to the additional generating capacity required to meet the growing energy demand in NSW;
- contribute to NSW and Commonwealth targets for renewable energy;
- provide additional income streams for involved landholders;
- provide both direct and indirect employment opportunities during construction and operation;
- liaise and work with the community and all potentially affected stakeholders in the identification, mitigation and/or monitoring of any potential environmental effects;
- ensure quality, safety and environmental standards are maintained;
- recycle and reuse materials where practical and economically feasible; and
- minimise all potential adverse environmental impacts and where practical, maximise all potential positive environmental effects.

An analysis of the Project against the objectives of the EP&A Act is provided in *Chapter 6*.

2.2 Greenhouse Gas Emissions

Australia's per capita GHG emissions are the highest of any Organisation for Economic Cooperation and Development (OECD) country and are among the highest in the world. In 2012-2013, per capita emissions (including emissions from land use, land use change and forestry) were 249 tonnes carbon dioxide equivalent (CO_2-e). Australia's per capita emissions are nearly twice the OECD average and more than four times the world average (Garnaut 2011). NSW currently generates in the order of 155 million tonnes (Mt) of CO_2 emissions per year with the stationary energy sector, which includes emissions from fuel consumption for electrical generation, accounting for approximately 47 percent (%) of total GHG emissions across the State.

Australia is heavily dependent on fossil fuels for electricity generation. Over 90% of Australia's electricity is derived from the use of fossil fuels, with coal use (both black and brown coal) accounting for over 70% of Australia's electricity generation (BREE 2013). While Australia does have abundant fossil fuel resources, it is well understood that burning fossil fuels results in the emission of GHG.

The CSIRO (2011) has stated that:

"Greenhouse gas emissions from human activities are more than 90 per cent likely to have caused most of the global warming since the mid-20th century."

In the most recent reporting year of 2012, electricity and energy generation contributed around 51% of Australia's total GHG emissions (DoE 2012). At 0.883 t CO2-e/MWh, the average emissions intensity of electricity generated in Australia is almost twice the world average (IEA 2011) and reflects our reliance on coal for electricity generation.

Emissions from electricity generation are projected to increase by 6% between 2010 and 2020 (DECCE 2010). Without key policies, such as the Renewable Energy Target (RET) scheme and measures to encourage energy efficiency, the rate of GHG emissions will likely continue to grow. The Australian Energy Market Operator's annual electricity forecasting report suggests an average annual growth in energy demand for the 10-year outlook period to be approximately 1.3% (AEMO 2013). Investment in new generating capacity will therefore be required to meet the growing energy demand.

Meeting the current challenge of increasing GHG emissions and the growing energy demand will require an approach that includes improving energy efficiency and diversifying the energy mix through the investments in renewable energy. Despite abundant renewable energy resources, only approximately 8% of Australia's electricity was generated from renewable sources in 2012, indicating that further investment to increase the supply of energy from clean energy sources is warranted. In 2013, wind energy generated about 3.2% of Australia's electricity (Windicator). By 2029-2030 wind energy projects are expected to account for 12% of total Australian stationary energy generation (ABARE 2010).Coal and gas will continue to play an important role in Australia's energy future in the short-to-medium term. There is a need however, for a significant investment in clean energy technologies including wind energy, to assist in meeting the growing energy demand in a manner that does not contribute to increasing GHG emissions.

2.2.1 Greenhouse Gas Benefits of the Project

During its operational phase, the Project would generate electricity without producing GHG emissions. Furthermore, the Project would be displacing electricity produced by fossil fuel sources such as coal and gas, thereby reducing the overall amount of GHG emissions produced by the stationary energy sector.

To estimate the potential GHG emissions savings that large scale wind farm developments would have in NSW, the NSW Office of Environment and Heritage's (OEH) *Wind Farm Greenhouse Gas Savings Tool* (WFGGT) (OEH 2015c) can be used as a method to calculate the expected GHG savings. The WFGGT considers a range of variables describing prospective wind farms in NSW to model reductions in the amount of CO_2-e expected to result from the operation of a wind farm. This includes:

- the location of the wind farm;
- total electrical generation capacity; and
- commencement of operation of the wind farm.

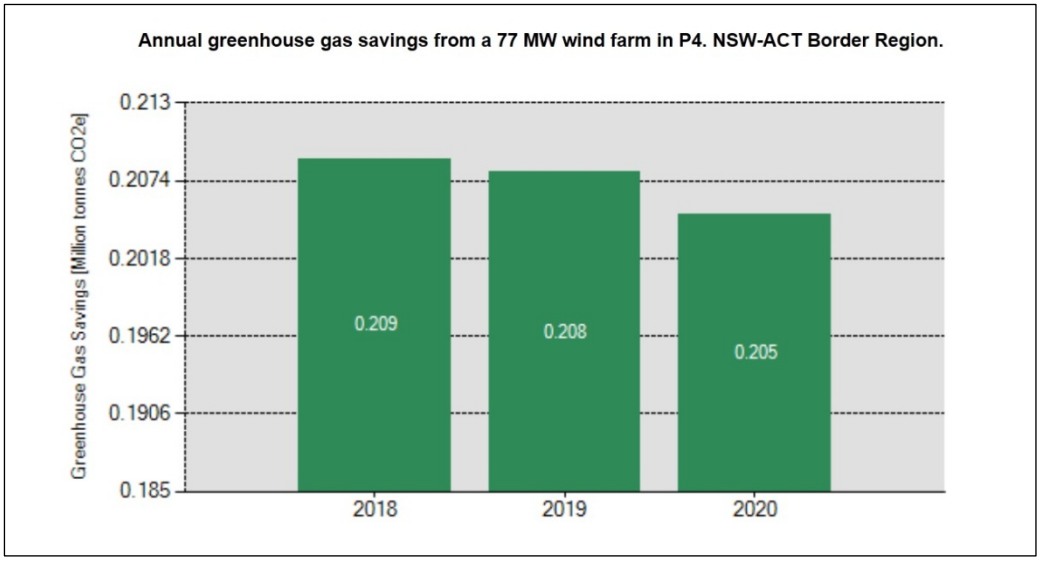
According to the WFGGT, assuming an indicative operational capacity of 77.5 MW, the Project will:

- save over 0.6 Mt of GHG emissions by 2020;
- generate 242 gigawatt hours (GWh) of electricity annually; and
- produce enough electricity to power 33,200 homes annually (based on the average NSW household electricity consumption of 7.3 MWh/year).

For the purposes of the WFGGT, it has been assumed that the Project will be operational in 2018 and is located in Precinct 4 of the NSW Renewable Energy Precincts: NSW/ACT Border Region.

Annual GHG savings from the Project based on modelling from the WFGGT is outlined in *Figure 2-1*.

Figure 2-1 *Greenhouse Gas Saving From the Biala Wind Farm*



2.3 Wind Energy

There are many benefits to the development of wind energy technology as a renewable energy source. Unlike conventional energy sources, wind energy can produce electricity locally, thereby reducing transference distances and loss of energy in the process (Diesendorf 2007). Furthermore, wind energy is a clean energy source that does not involve the harmful side-effects associated with other energy sources, such as the risk of gas explosion (Diesendorf 2007).

Wind energy is the world's fastest growing source of renewable electricity around the globe (Diesendorf 2006). Wind energy can make a significant contribution to Australia's clean energy future as it is a mature, proven and cost-effective technology. Over the past six years, global wind power capacity has continued to grow at an average cumulative rate of 23% worldwide, which is the equivalent of almost double Australia's current residential electricity consumption. Installed wind power capacity in Australia has grown from 1.8% at the end of 2009, to 3.2% at the end of 2013 (Windicator 2014).

Wind energy provides the following additional benefits:

- wind farms are compatible with the continued use of land for agricultural purposes;
- following decommissioning, wind farm sites are capable of being readily returned to their original state;
- results in carbon emissions savings as energy produced replaces energy that is otherwise provided from non-renewable sources; and
- construction and development of the wind farm provides opportunity for a diversified construction skill base.

2.4 Policy Framework

2.4.1 Australian Renewable Energy Target Scheme

The Renewable Energy Target (RET) scheme outlines the Australian Government's commitment to reducing GHG emissions and expanding the use of renewable energy sources by 2020. The RET scheme is designed to *"ensure that 20% of Australia's electricity supply comes from renewable energy sources by 2020"* (Australian Government 2015) and to:

- *"encourage the additional generation of electricity from renewable sources;*
- *reduce emissions of greenhouse gases in the electricity sector; and*
- *ensure that renewable energy sources are ecologically sustainable."* (Clean Energy Regulator 2012)

The RET policy creates a competitive market for new renewable energy projects as it places a legal obligation on electricity retailers to purchase Renewable Energy Certificates (RECs) from accredited renewable electricity generators.

The RET was divided into two parts in January 2011 - the 'Large-scale Renewable Energy Target' (LRET) and the 'Small-scale Renewable Energy Scheme (SRES). The LRET encourages large scale energy generation to be produced using technologies such as wind, hydro, biomass, solar and tidal energy, while the SRES targets small-scale technologies, such as solar water heaters and rooftop photo-voltaic systems.

Until recently, the annual target for the LRET increased annually up to 41,000 GWh by 2020. Based on these annual targets, it was estimated that the LRET would drive investment in an additional 7 GWh of wind energy by 2020 (SKM MMA 2012) and generate $14.5 billion of investment in large-scale renewable energy projects by 2020 (Roam Consulting 2014). In addition, more than 24,000 Australians were employed in the renewable energy sector in 2012 and the RET (based on the earlier target) was expected to generate 18,400 jobs by 2020 consisting of 9,700 jobs in large-scale renewables like wind and bioenergy and 8,700 jobs in household renewable energy, such as solar power and solar hot water (Roam Consulting 2014).

In February 2014, the Australian Government announced the review of the REF scheme by an Expert Panel. The purpose of the review was to *"examine the operation, costs and benefits of the RET, including the economic, environmental and social impacts, the extent to which the objectives of the scheme are being met and the interaction of the RET with other Commonwealth and state and territory policies"* (Australian Government 2014). Following the release of the Expert Panel's review of the, the Australian Government passed legislation in July 2015 to reduce the RET from 41,000 GWh to 33,000 GWh.

Notwithstanding this reduction in the RET, wind power remains the most economical form of large-scale renewable energy and is expected to play a significant role in meeting the LRET. The Biala Wind Farm would have an indcative generation capacity of 77.5 MW (based on a 2.5 MW WTG) and would contribute directly to the RET.

2.4.2 NSW Renewable Energy Target

The *NSW Renewable Energy Action Plan 2013* (REAP) (DTI 2013) has been developed to support the achievement of the national target of 20% renewable energy by 2020. The REAP positions NSW to increase the utilisation of energy from renewable sources at the least cost to customers and with maximum benefits to NSW. The REAP notes that wind energy is one of the most commercially viable and cost-effective renewable energy sources for large scale installation and a key driver in meeting the national target of 20% renewable energy sources by 2020. In addition, the REAP acknowledges that by international standards, NSW has excellent wind resources with many of the best locations being located in proximity to existing electricity grid infrastructure.

The PA is located in an area with consistently high wind speed, as indicated by extensive wind speed modelling and other recent wind farm developments in the area, which supports the viability of the Project. In addition, the PA is located in proximity to existing electrical grid infrastructure, capable of receiving and transmitting energy produced from the Project. Specific details pertaining to the capability of connecting the Project to the national electricity grid, including the options assessed are outlined in *Chapter 5.*

In summary, the Biala Wind Farm supports the REAP and RET objective of 20% renewable energy by increasing the supply of energy generated by wind, which is considered a renewable technology leader in cost competiveness.

2.4.3 Predicted Electricity Demand

The Annual Electricity Statement of Opportunities (ESOO) released by the Australian Energy Market Operator Limited assesses the adequacy of existing and committed electricity supply to meet operational consumption in all National Electricity Market (NEM) regions and indicates when additional investment in generation or demand-side participation may be required to maintain electricity supply reliability.

It is acknowledged that the 2014 ESOO indicates that *"for the first time in the National Electricity Market's (NEM) history, as a result of decreasing operational consumption, no new capacity is required in any NEM region to maintain supply-adequacy over the next 10 years"* (AEMO 2014 p1). Consistent with other states in Australia, the results for NSW indicate that, provided existing generation remains available, new capacity is not required to maintain reliability under high, medium and low economic growth scenarios until 2023-2024 (AEMO 2014).

Notwithstanding the latest results of the ESOO, dependency on fossil-fuelled energy remains high in Australia and therefore opportunities exist to increase energy generation from renewable sources (such as wind power) in an effort to further reduce GHG emissions and mitigate climate change. It is anticipated that the energy produced from the Project would be 100% renewable energy and would be fed directly into the electricity grid and sold on the NEM.

2.5 Project Benefits

2.5.1 Environmental Benefits

The key environmental benefit associated with the Project therefore relates to the fact that wind farms do not generate GHG emissions during electricity production (NSW Legislative Council 2009). The Project would comprise up to 31 WTGs, generating an indicative capacity of 77.5 MW of wind energy. Subject to approval, the Project would therefore equate to savings of approximately 200,000 tonnes of GHGs per annum. The electricity generated by the Project could supply up to 33,200 households with energy annually.

Wind energy also plays a role in mitigating other adverse environmental impacts such as landscape degradation from fossil fuel exploration and mining, the pollution caused by accidental oil spills, and waste from fuel (GWEC 2010). In addition, wind power generation does not require large water resources or make large tracts of land unusable, as the WTGs and associated infrastructure require, on average, approximately 0.1% of land upon a site (GWEC 2010). This is generally consistent with the Project, with the anticipated worst case disturbance footprint (encompassing the permanent and temporary infrastructure) calculated to be 42.37 ha or approximately 2% of the total PA. It is anticipated that the existing agricultural activities occurring within the PA can continue to coexist with the wind farm.

2.5.2 Economic Benefits

The Clean Energy Council engaged SKM to develop a National and State based snapshot to model the anticipated economic benefit in terms of employment and economic stimulus based on the size of a wind farm development. This model is outlined in the report Wind Farm Investment, Employment and Carbon Abatement in Australia (SKM 2012).

The model was used to predict the total economic impact and direct employment impact that the Project would have on the local region during both the construction and operation. The key attributes used in the model and the projected economic stimulus are summarised in *Table 2-1*.

Table 2-1 ***Anticipated Economic Stimulus in the Local Region***

Attribute	Figure
Total number of wind turbines	31
Rated capacity of each turbine	2.5 MW-3.5MW
Total installed capacity	Indicatve capacity of 77.5 MW (based on 2.5 MW WTG)
Economic Stimulus -Construction Phase	
Total Economic Impact	$70 million
Direct Employment	74 over 24 month period
Economic Stimulus -Operation Phase	
Total Economic Impact	$4.65 Million per annum
Direct Employment	Approximately seven per annum

The anticipated financial contributions to the local and regional economy as outlined in *Table 2-1* are likely to occur through:

- use of local contractors and suppliers (where feasible and applicable) during construction;
- employment of local service and maintenance staff during construction and operation;
- use of local services (accommodation facilities, food outlets, restaurants , super markets etc.) particularly during construction;
- upgrades to local roads surrounding the PA (as outlined in *Chapter 13*); and
- lease payments to local landholders hosting Project related infrastructure.

In discussions with Council, the Proponent intends to establish a Community Enhancement Program in accordance with Upper Lachlan Development Control Plan 2010 (DCP 2010). In accordance with the DCP 2010, the Proponent will contribute $2,500 per WTG per annum, which equates to $77,500 per annum in direct contributions throughout the operational life of the Project. It is anticipated that funds will be spent to improve community assets such as recreational facilities, public open space and public amenities.

2.5.3 Social Benefits

Social impacts associated with the Project are discussed in *Chapter 15*, however the key social benefits include:

- supporting national and international efforts to reduce the potential impacts of climate change through reductions in GHG emissions;
- local employment opportunities and up-skilling of the local workforce;
- increased demand for local goods and services particularly during the construction phase;
- funding local infrastructure and other projects via the establishment of a community enhancement program in consultation with Council; and
- beneficial social outcomes arising from landholder payments flowing through the local economy.

3 PROJECT DESCRIPTION

This chapter 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. An analysis of the Project Area is discussed in detail in Chapter 4.

3.1 Project Overview

The Project will consist of the following permanent components:

- up to 31 WTGs with a maximum height of 185 m AGL (to the blade tip) and adjacent hardstands for use as crane pads and assembly areas;
- a central electrical substation including transformers, switchgear, insulators and other ancillary equipment;
- operations and maintenance facilities;
- up to three meteorological monitoring masts across the PA;
- underground 33 kV electrical reticulation and fibre optic cabling connecting the WTGs to the on-site substation; and
- an internal private access road network (up to a combined total length of approximately 27 km) connecting the WTGs and other proposed infrastructure to the public road network.

A 132 kV overhead transmission line is proposed to connect the on-site substation to the existing Essential Energy Yass to Goulburn 132 kV overhead transmission line network, located approximately 22 km south of the PA. As discussed previously, approval for the transmission line connection will be sought separately from the Project. Further detail on the transmission line connection is provided at *Section 3.8*.

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

- site offices, storage and car parking facilities;
- temporary concrete batching plant;
- earthworks for access roads, WTG platforms and foundations;
- cleared hardstand areas for construction equipment and storage (construction laydown areas);
- temporary site buildings and facilities for construction contractors; and
- the use and storage of hazardous substances.

The key Project components are discussed in further detail below. The proposed layout of the Project including the WTGs, access roads and supporting infrastructure is shown in *Figure 3-1* to *Figure 3-4*.

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T25
T26
T27
T28
T29
T30
T31
WATTLE CREEK
LONG GULLY
SANDY CREEK
BIALA CREEK
GRABBEN GULLEN ROAD
BIALA ROAD

Legend
- Project
- Proposed Turbine
- Access Roads
- Access Roads (Optional)
- O&M Facilities (Permanent)
- Substation (Permanent)
- Offices, Parking, Storage (Temporary)
- Batching Plant (Temporary)

Data Source:
Imagery : Fugro Spatial Solutions
Satellite Imagery, April 2014
DLPI : DCDB and DTDB, Oct 2014

0 250 500 m

N

Client:	Newtricity		
Drawing No:	0178462m_BWF_EIS_G003_R1.mxd		
Date:	18/03/2015	Drawing Size: A3	
Drawn By:	GR	Reviewed By: ED	

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.

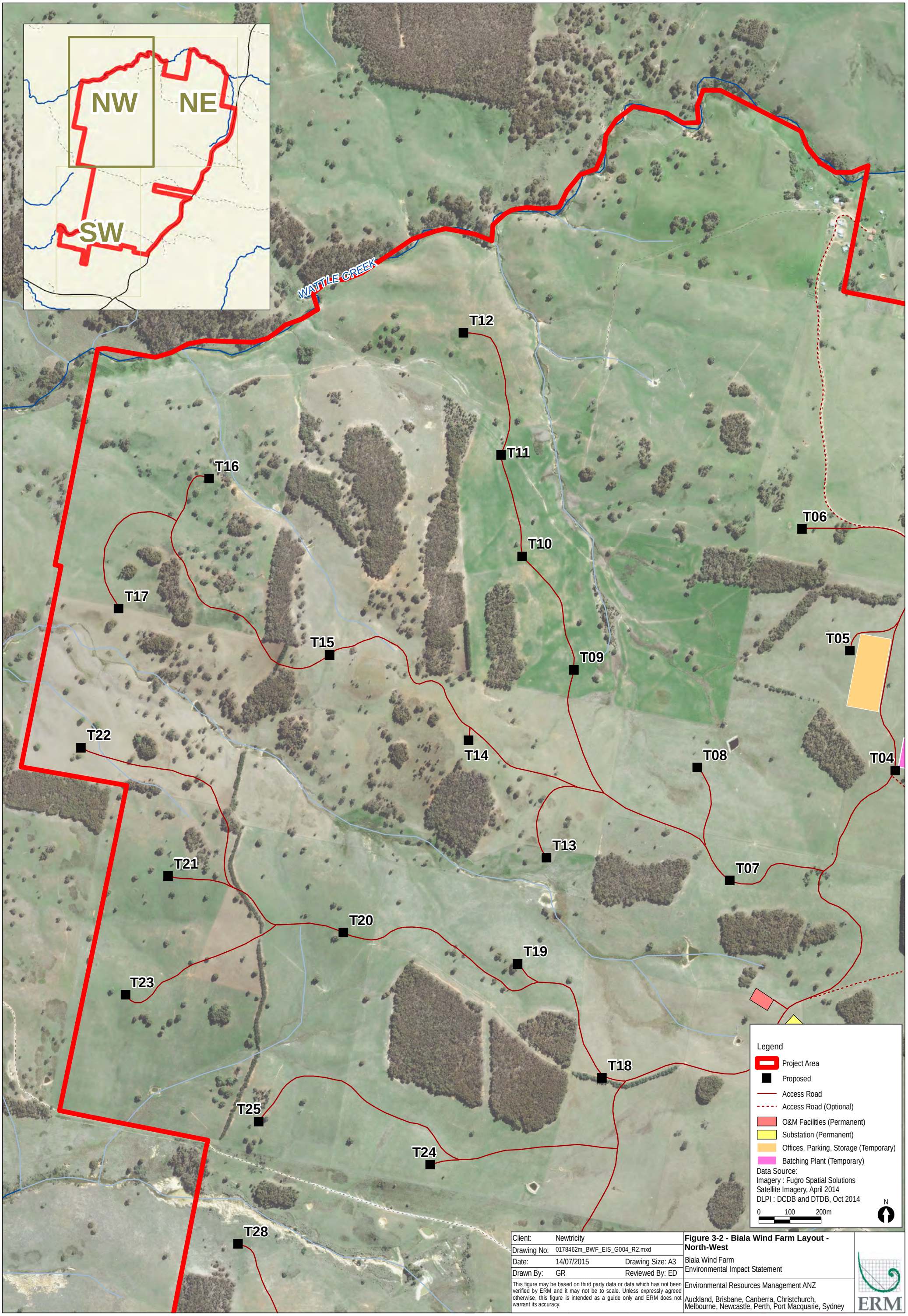
Figure 3-1 - Biala Wind Farm Layout

Biala Wind Farm
Environmental Impact Statement

Environmental Resources Management ANZ

Auckland, Brisbane, Canberra, Christchurch, Melbourne, Newcastle, Perth, Port Macquarie, Sydney

ERM



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Date:	14/07/2015	Drawing Size: A3
Drawn By:	GR	Reviewed By: ED

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Figure 3-2 - Biala Wind Farm Layout - North-West

Biala Wind Farm
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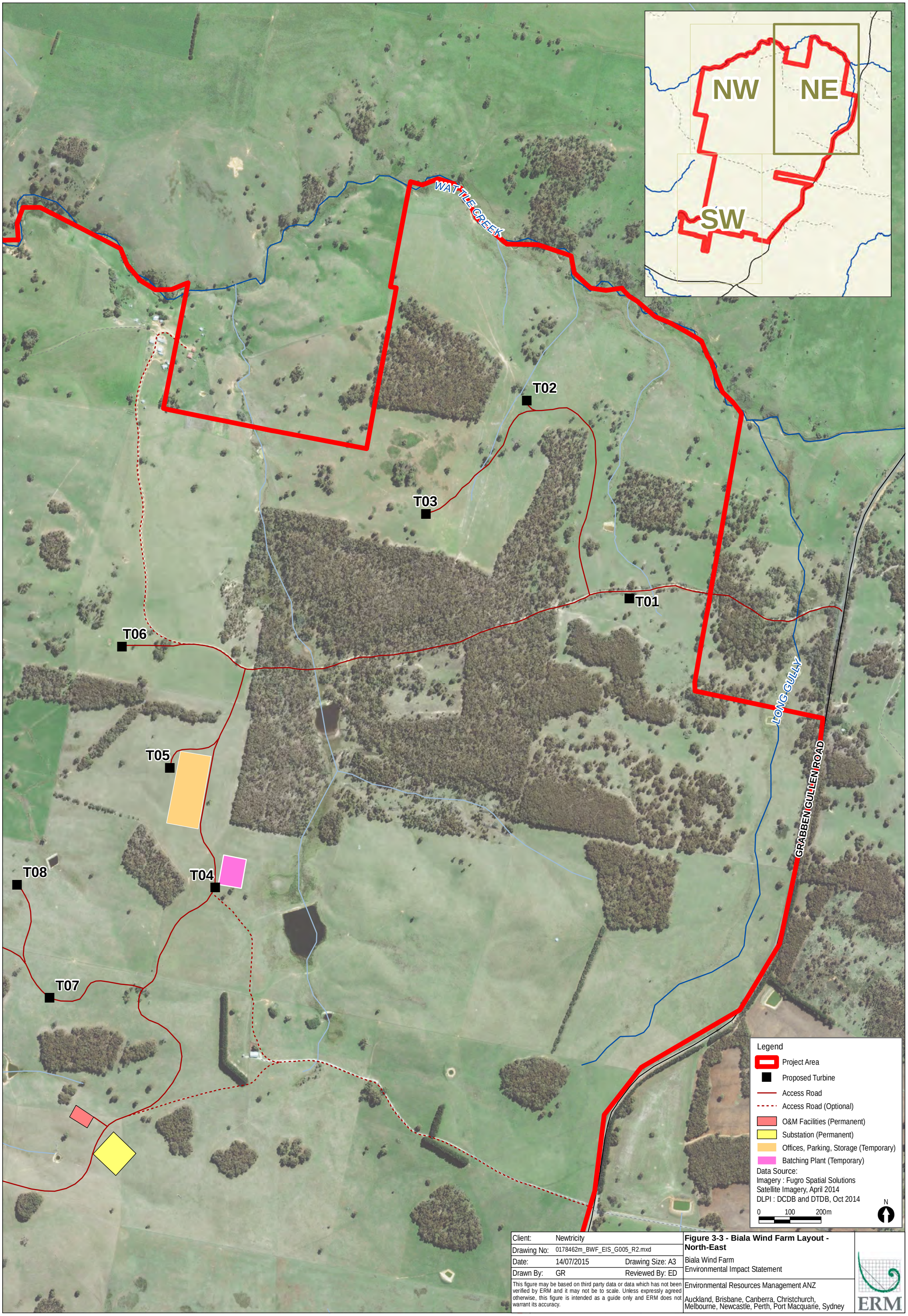

Client:	Newtricity		**Figure 3-3 - Biala Wind Farm Layout - North-East**
Drawing No:	0178462m_BWF_EIS_G005_R2.mxd		Biala Wind Farm Environmental Impact Statement
Date:	14/07/2015	Drawing Size: A3	
Drawn By:	GR	Reviewed By: ED	Environmental Resources Management ANZ

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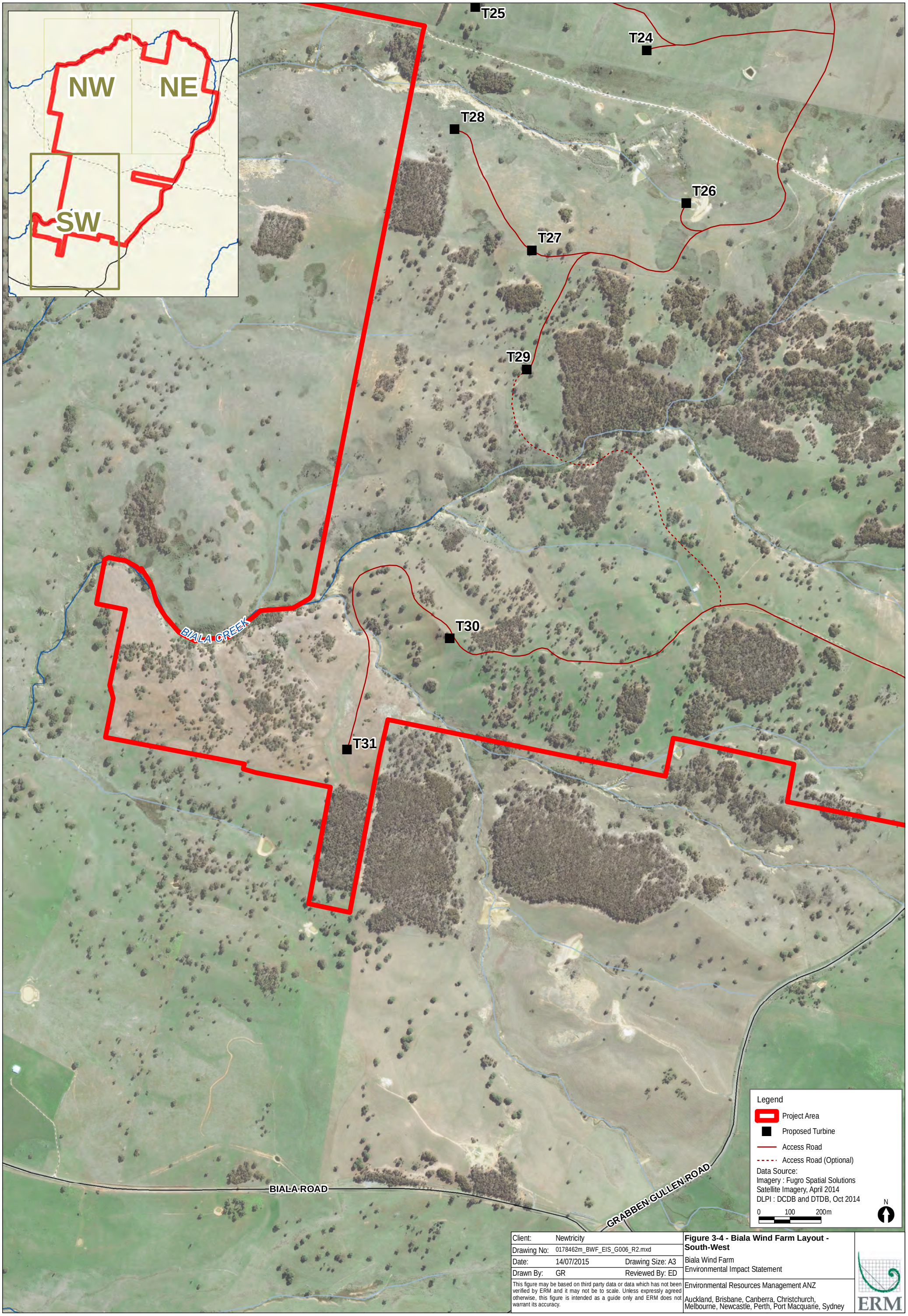

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Figure 3-4 - Biala Wind Farm Layout - South-West

Biala Wind Farm
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3.2 Project Components

3.2.1 Wind Turbine Generators

The Project will involve the construction and operation of up to 31 WTGs within the PA. The WTG model to be used for the Project is yet to be selected, with a range of models currently under consideration. It is anticipated that the selected WTG model will be in compliance with the relevant building standards and codes, including *IEC 61400-23 Wind turbine generator systems – Part 23: Full-scale structural testing of rotor blades* and *IEC 62305-1/3/4 Protection against lightning*.

The selected model will have a maximum generation capacity of up to 3.5 MW, however the dimensions of the WTG components including blade length, and hub and blade tip heights will vary depending on the model selected. In order to provide flexibility in selecting the WTG model, the WTG dimensions adopted for assessment as part of this EIS are the largest of the model options being considered for the Project, including a WTG with a rotor diameter of up to 150 m (blade length of up to 75 m) giving an overall tip height of up to 185 m, as shown in *Figure 3-5*.

Each WTG consists of a tower, nacelle, hub and rotor. These elements will all be painted a similar colour, within a white to light grey colour palette. The painted surfaces will be non-reflective. The process of installing the WTGs is outlined in *Section 3.4.5*.

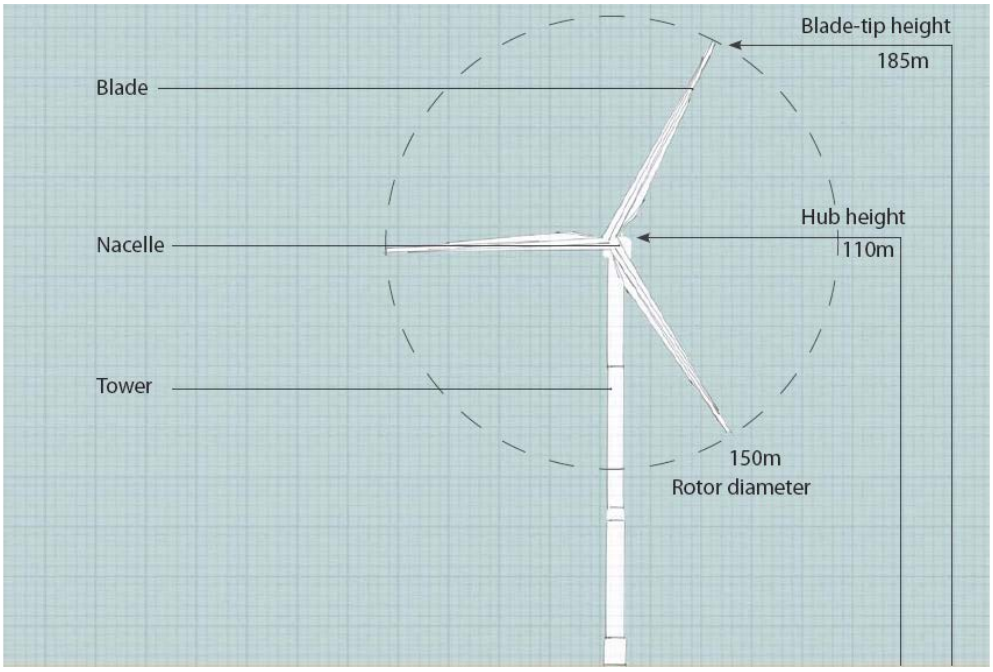

Figure 3-5 ***Proposed WTG Dimensions (Source: Clouston Associates 2015)***

Towers and Blades

The wind turbine tower supports the wind turbine rotor and nacelle. Each WTG will be mounted on a concrete foundation (approximately 25 m by 25 m) located on a cleared hardstand area. The actual foundation type to be utilised will be based on the results of geotechnical surveys undertaken prior to commencement of construction at each WTG site.

Nacelle

The nacelle is the housing that sits on the top of the turbine tower and accommodates the generator, control systems, pitch and yaw drives. The nacelle may also include the transformer and gearbox (if used) and is typically constructed of fibreglass. Given the nature of the components housed within the nacelle, oil containment and sound insulation will be provided for within each WTG.

Wind Turbine Rotor

The rotor, which includes the blades, is the portion of the WTG that captures the energy from the wind. The energy captured by the rotating blades is transferred to a generator housed within the nacelle. Blades are generally made of fibreglass reinforced with epoxy and carbon fibre. The rotor is controlled by a central wind turbine control unit (microprocessor). The microprocessor controls the rotational speed of the rotor and the pitch of the blades, therefore enabling the rotor to maximise energy production from the wind resource and ensure the safe and reliable operation of the WTG. When wind speeds get too high the microprocessor controls the pitch of the blades to stop the WTG rotating, which minimises wear on the components from operating at too high wind speeds.

Each WTG will have a transformer located in either the tower behind the nacelle or mounted external to the WTG on the hardstand area. The transformer is required to 'step-up' the voltage of the electricity produced by each WTG to the on-site distribution voltage of 33 kV. Each WTG will be connected to the on-site substation via a network of underground power and communication cables.

Obstacle Lighting

The Project may require obstacle lighting at night time or during periods of reduced visibility. Whilst the Aeronautical Impact Assessment (Aviation Projects 2015) provided at *Annex M* concluded that the Project will not require obstacle lighting to maintain an acceptable level of aviation safety, the Civil Aviation Safety Authority (CASA) issued correspondence in May 2015 stating *'CASA recommends that the wind farm is lit with steady red low intensity lighting at night as per Section 9.4 of the MOS Part 139.'* The Biala Wind Farm Obstacle Lighting Design prepared by Aviation Projects (2015) shows that obstacle lighting of 18 of the proposed WTGs may be required. Consultation with CASA regarding the requirement for obstacle lighting is ongoing and will be resolved prior to Project approval. Images of typical WTG obstacle lighting is provided at *Photograph 3-1.*

Photograph 3-1 Typical WTG Obstacle Lighting (Source: Clouston Associates 2015)

Meteorological Monitoring Masts

There is currently one meteorological monitoring mast within the PA, however this will likely be decommissioned during the construction phase. To monitor the operational performance of the Project, up to three permanent masts are proposed to be installed. These will likely be supported by a small concrete foundation (approximately 1 m²) and guy wires. The height of each mast will be approximately 110 m AGL, equivalent to the hub height of the installed WTGs.

3.2.2 Electrical Reticulation Network

On-site Substation

An electrical substation compound is proposed on-site with approximate dimensions of 95 m by 100 m. The primary purpose of the electrical substation is the reception, transformation and distribution of electrical power and energy. The electrical substation will house a series of transformers, switch gear, and ancillary equipment for the transformation and distribution of energy. The transformers and radiators in the electrical substation will be located on foundations and will be surrounded by concrete bunds designed with sufficient capacity to retain 100% of the oil contained within each transformer.

The location of the substation is identified in the wind farm layout plan provided at *Figure 3-1*. An image of a typical wind farm substation is provided at *Photograph 3-2*.

Photograph 3-2 Typical Wind Farm Sub-station (Source: DP Energy 2010)

33 kV Cable and Fibre Optic Network

Each of the 31 WTGs will be connected to the on-site substation via a 33 kV electrical cable and fibre optic network. Whilst the electrical reticulation network will be finalised during the detailed design phase, it is anticipated that the underground cabling will generally fall within the footprint of the internal access roads, however some deviations away from the access roads may be required given potential topographical or other constraints. Any deviations will avoid areas of heritage and ecological constraints. The trenching for underground electrical cabling will be approximately 1 m wide by 1 m deep, with a works area of approximately 5 m wide adjacent to the trench to accommodate the excavator and stockpiling of spoil and bedding sand. Trenches will be progressively backfilled during the course of the construction works.

Due to topographical constraints, it is also anticipated that a 900 m long overhead 33 kV transmission line will be required to connect WTGs T29 to T30, towards the southern portion of the PA.

The underground electrical reticulation network and access roads are required to cross some non-perennial watercourses and drainage lines. Potential impacts arising from crossing waterways and drainage lines are addressed in *Chapter 14*.

3.3 Site Layout

The proposed layout of permanent infrastructure was determined based on the outcomes of specialist assessments discussed in the later chapters of this EIS, and lease agreements with involved landholders hosting the Project infrastructure. Temporary facilities associated with construction of the Project are outlined in *Section 3.4*.

3.3.1 WTG Layout

A total of 31 WTGs are proposed to be installed as shown in *Figure 3-1*. The location of the WTGs was determined with consideration to:

- minimising impacts to environmentally sensitive areas;
- obtaining lease agreements with the four involved landholders; and
- maximising exposure to the wind resource through positioning on elevated locations along gently sloping ridgelines.

The central coordinates and maximum heights of the WTGs are provided in *Table 3-1*.

Table 3-1 WTG Coordinates

WTG No.	Easting (m)*	Northing (m)*	Elevation (m AHD)
T01	717864	6171824	897.10
T02	717535	6172459	874.05
T03	717211	6172095	893.43
T04	716535	6170896	902.10
T05	716389	6171280	902.74
T06	716235	6171670	899.25
T07	716003	6170542	902.35
T08	715899	6170905	882.96
T09	715503	6171219	867.37
T10	715337	6171583	858.02
T11	715269	6171908	845.33
T12	715149	6172300	836.29
T13	715415	6170615	870.79
T14	715165	6170992	900.18
T15	714719	6171266	864.39
T16	714332	6171832	827.41
T17	714042	6171415	822.83
T18	715593	6169908	893.78
T19	715322	6170274	890.55
T20	714763	6170375	870.43
T21	714201	6170556	862.31

WTG No.	Easting (m)*	Northing (m)*	Elevation (m AHD)
T22	713921	6170969	822.48
T23	714064	6170175	862.38
T24	715042	6169630	877.46
T25	714491	6169769	857.28
T26	715169	6169139	858.59
T27	714673	6168987	865.63
T28	714425	6169376	836.00
T29	714657	6168605	850.02
T30	714409	6167741	832.77
T31	714079	6167384	813.34
* Coordinate System is WGS84 Zone 55H.			

3.3.2 Site Access

The PA is located adjacent to Grabben Gullen Road, which provides direct access to the proposed internal access road network (refer *Section 3.3.3*). Vehicle access to the PA is proposed from two intersections along Grabben Gullen Road, as shown in *Figure 3-1*. A third optional access road may be utilised to access the central portion of the PA from Grabben Gullen Road.

3.3.3 Internal Access Roads

The construction and maintenance of the Project will require construction of up to approximately 27 km of private access roads within the PA. The roads will provide ongoing access to the WTGs and other Project infrastructure. Where possible, the internal road network will be aligned on the route of existing farm or other access roads. The internal roads will be up to 8 m wide (with approximately 1 m shoulders on either side), with localised widening where required to support transportation of the WTG components. The proposed internal road network is shown in *Figures 3-1* to *Figure 3-4*.

3.3.4 Crane Pads and Assembly Areas

A hardstand will be required adjacent to the base of each WTG to enable the assembly and erection of the tower, nacelle and blade components. The final design will depend on the topography of the surrounding land, however each crane pad will consist of crushed rock hardstand of approximately 40 m by 80 m.

Whilst it is anticipated that the majority of crane pads will remain in situ to allow for future maintenance or removal of the WTGs, there may be the opportunity to apply a top soil layer to the laydown portions to allow grazing activities to resume.

3.3.5 Permanent Operations and Maintenance Facility

A permanent site operations and maintenance facility will be constructed to provide for all operations and maintenance activities associated with the Project. Car parking facilities will also be provided for employee and service vehicles.

During operations, up to seven permanent staff will occupy these premises. Whilst most activity is anticipated to occur during business hours Monday to Friday, access to the wind farm site will be required on a 24 hour basis, seven days a week.

3.4 Project Construction

3.4.1 Staging of Construction Activities

In general, construction activities will commence with site establishment followed by the construction of the internal road access roads, crane pads and laydown areas at the WTG locations. The laying of the underground electrical cabling, which will generally be sited within the shoulder of the access roads, will progress in conjunction with the access track construction. These activities will be followed by the construction of the concrete footings for the WTGs and any additional meteorological monitoring mast should they be considered necessary.

Once footings are in place and the concrete adequately cured, the WTGs can be erected. Following delivery of the main WTG components, it is anticipated that crane operations associated with WTG erection will take two or three days to complete for each WTG, depending on weather conditions.

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

Assuming approval for the Project is granted in the second quarter of 2016, the Project is expected to be operational in 2018 based on an anticipated construction timeframe of approximately 24 months. The timing of key Project milestones is presented in *Figure 3-6*.

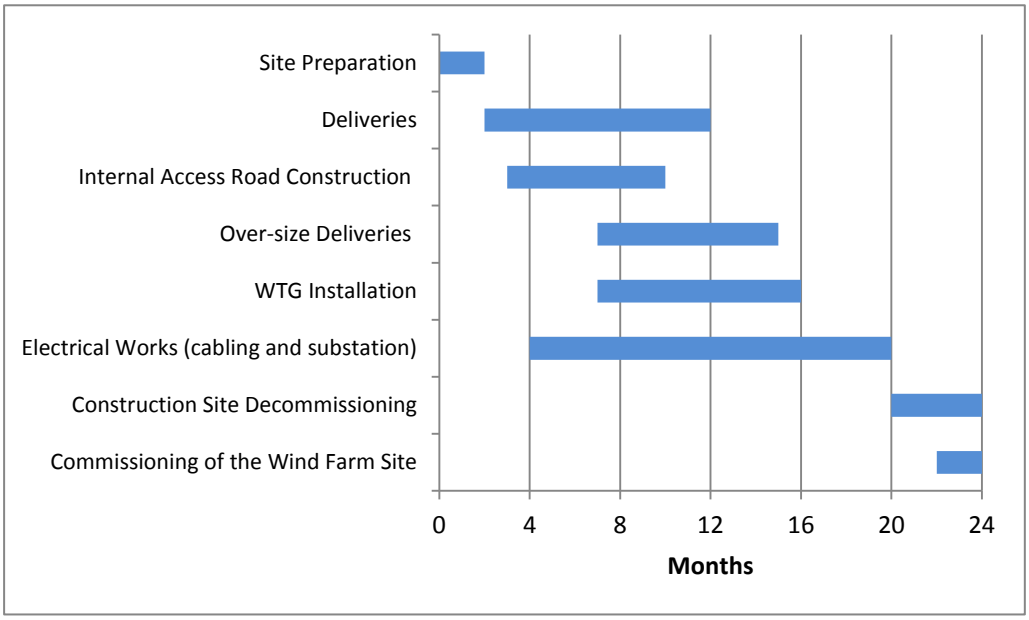

Figure 3-6 ***Anticipated Timeline for Construction Phase of the Project***

3.4.2 Transport of Materials and Equipment

WTG Transport

To facilitate transportation and ease of installation, the WTG tower support structure is manufactured in up to six sections. Due to the size of the WTG components, the truck and trailer configurations to transport the components are classified as Restricted Access Vehicles (RAVs). RAVs require permits which specify the designated route for travel, the number of escorts required and the time in which the RAVs can travel through certain road zones.

The proposed transport routes including details of road upgrades for required for the transport of oversized project components are discussed in detail in *Chapter 13*. In summary, the RAV route from Port Kembla to the PA would involve access via the Hume Highway, the southern interchange through Goulburn, Crookwell-Goulburn Road and then bypassing the Crookwell Township via Grange Road, Cullen Street, Kialla Road and Range Road connecting to Grabben Gullen Road. This route was used to provide access for RAVs as part of the Gullen Range Wind Farm. The section of Range Road between the Gullen Range Wind Farm site access and Grabben Gullen Road is proposed to be upgraded to support the use of the road by RAVs.

The final RAV route will be dependent on further consultation and approval from Roads and Maritime Services (RMS), Upper Lachlan Shire Council and private property owners along the route, and subject to approval to remove vegetation.

Other 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 concrete trucks. It is expected that the presence of the temporary concrete batching plant will reduce the number of external concrete truck movements to and from the PA.

Light vehicles comprising cars, four-wheel drives and utility vehicles attributed to Project personnel will frequent the PA during construction and operation of the Project.

It is anticipated that general construction vehicles will access the PA from the north using the RAV route via Goulburn or from the Hume Highway to the south using Grabben Gullen Road via the township of Gunning.

An assessment of the road network capability to support the RAVs and all construction and operational traffic is provided in *Chapter 13.*

3.4.3 WTG Installation

Excavation for the WTG foundations will be carried out with mechanical equipment. The design of the WTG foundations will depend on localised geotechnical conditions, however will likely consist of concrete based footings. Topsoil and spoil from excavations will be stockpiled for reuse to backfill over the foundation and for vegetation rehabilitation of the PA. Excess materials will be utilised in other locations across the PA.

The towers, nacelles and blades will be lifted off delivery trucks using mobile cranes. Cranes will then assist in the assembly of the rotors and the installation of the towers, nacelles and rotors.

3.4.4 Temporary Concrete Batching Plant

A temporary concrete batching plant is proposed to provide concrete for the WTG foundations but may also provide materials for building foundations, bunding and culverts. The indicative location of the batching plant is shown in *Figure 3-1* and *Photograph 3-3*.

The batching plant is likely to include a slump stand, water tanks and stockpiles of gravel and sand. Whilst the exact details of the facility will be determined during the detailed design phase, typically the area required for the plant and storage of materials for each will be approximately 74 m by 95 m at each WTG precinct. The batching plant will be bunded to contain runoff and potential contaminants.

Materials for the plant will be primarily sourced from an external supplier to be determined during the procurement phase of the Project. It is anticipated that cement will be stored in a silo adjacent to the batching process machinery. Concrete agitators will transfer the concrete from the batching plant to the WTG foundation locations.

The concrete batching plant will be removed following the completion of the construction phase and the area rehabilitated and returned to agricultural use.

Photograph 3-3 Approximate Location of the Concrete Batching Plant - Looking East Towards Dam 1 (ERM 2015)

3.4.5 Resource Requirements

Construction materials including gravel, aggregate and sand will be required for the construction of hardstands to support Project infrastructure, including internal access roads and installation of electrical cabling. It is anticipated that material from the excavation of crane pad sites will be recycled into the construction of roads, however this will need to be confirmed upon geotechnical testing of the excavated material as the works commence. Otherwise gravel, aggregate and sand will be sourced externally and following consultation with stakeholders, is likely to be sourced from the east around the Goulburn/Marulan area. Construction materials will be transported to the PA by trucks and stockpiled within the laydown areas.

Water supply for the concrete batching plant, dust suppression and other construction activities will also be required on-site. It is anticipated that water required for construction will be supplied from existing on-site dams (subject to seasonal availability) or alternatively from an off-site local source (subject to approval).

3.4.6 Construction Work Force

It is anticipated that during construction up to 74 full time equivalent (FTE) staff will be directly employed based on modelled estimates outlined in SKM (2012) *Wind Farm Investment, Employment and Carbon Abatement in Australia.*

3.4.7 Construction Hours

It is anticipated that construction of the Project will be undertaken in general accordance with the DECC (2009) *Interim Noise Construction Noise Guideline*, with the hours of work being:

- Monday to Friday: 7.00am-6.00pm;
- Saturday: 8.00am-1.00pm; and
- no works on Sunday or public holidays.

3.4.8 Temporary Site Offices, Car Parking and Storage

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

3.4.9 Post Construction Site Rehabilitation

The PA will be progressively rehabilitated throughout the course of construction. All temporary plant and equipment will be removed, with areas revegetated and rehabilitated as required under consultation with host landowners. Adequate sediment, soil and erosional 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* (Landcom 2004).

3.5 Development Footprint

The Development Footprint for the Project includes the Permanent and Temporary Development Footprints. These are:

- Permanent Development Footprint (the area of land that will be subject to permanent alteration as a result of installation and operation of Project infrastructure) covers 25.23 ha and is comprised of:
  - access roads (8 m wide, plus 1 m shoulder either side);
  - substation and other facilities;
  - crane hardstand and WTG foundation (a circular area 0.09 ha[1] centred on each of the 31 WTG points); and
- Temporary Development Footprint (the area of land that will be temporarily disturbed during construction of the Project and rehabilitated following construction) covers 17.15 ha and is comprised of:
  - access road construction (additional 1 m either side of the permanent access road);
  - concrete batching plant; and
  - laydown areas (a concentric circle of 0.32 ha around the 'crane hardstand and WTG foundation's permanent footprint).

The anticipated worst-case Development Footprint for the Project is 42.37 ha, comprising approximately 2% of the total PA. The estimated Development Footprint for key Project components is outlined in *Table 3-2*.

[1] This circular area of impact has been used as an indicative disturbance area based on the sum of the nominal areas. It is a circular representation of an equivalent area to the proposed disturbance area, which will be a square shape. These will become known during the detailed design phase. Using a circular impact area provides a representative measure of the vegetation types to be disturbed in the absence of a detailed design showing the configuration of the rectangle and square at each WTG.

Table 3-2 ***Estimated Development Footprint of Key Project Components***

Project Component	Estimated Permanent Footprint (ha)	Estimated Temporary Footprint (ha)	Total (ha)
WTGs (including footing)	2.8	-	2.8
Crane pad and assembly areas	-	9.8	9.8
Access roads*	21.8	5.4	27.2
Operations and maintenance building	0.28	-	0.28
Substation	0.96	-	0.96
Temporary site office, parking and storage/laydown facilities	-	2.4	2.4
Temporary concrete batching plant	-	0.7	0.7
Wind monitoring masts	0.0003	-	0.0003
Temporary crane pad for monitoring mast installation	-	0.45	0.45

Notes:

The sum of all infrastructure footprints is slightly higher than the total Development Footprint due to overlap between infrastructure items.

* Underground 33 kV electrical reticulation network will generally be located within the disturbance footprint of the access road network.

3.6 Project Operation

Upon commissioning, the Project will be operational 24 hours per day, seven days per week. The Project will be controlled by a remote supervisory control and data acquisition (SCADA) from a control room located within the permanent site operations and maintenance facility. Where required, assistance from an off-site SCADA engineering team may be sought. The SCADA system will allow remote operation of all WTGs with the ability to shut-down individual or all WTGs if required. The SCADA system also allows for the Project to operate at optimal capacity through synchronising with the internal WTG control systems to alter rotor speed and blade pitch to depending on wind conditions.

3.6.1 Servicing and Maintenance

Regular maintenance will be undertaken on WTGs and other plant and equipment by internal and specialised contractors throughout the operation of the Project. It is anticipated that up to seven FTE technical personnel and maintenance staff will be employed during operation.

Circumstances may arise where unplanned equipment failure occurs due to environmental events or other factors. The majority of repairs can be undertaken during routine maintenance; however WTG components requiring replacement would need to be undertaken using a crane in a similar manner to their installation. In addition, replacement of WTGs may occur throughout the operational life of the Project as improved technologies become available.

3.7 Decommissioning and Rehabilitation

The Proponent has entered long-term lease agreements with the landholders for the construction and operation of the Project. The WTGs have an expected 25 year operating life, 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;

- 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 associated infrastructure in accordance with a Decommissioning and Rehabilitation Plan.

A Preliminary Decommissioning and Rehabilitation Plan (ERM 2015g) has been prepared for the Project in accordance with the SEARs and is provided in *Annex R*.

It is the responsibility of Newtricity or the wind farm owner at the time of decommissioning to fund and execute the decommissioning of the Project. In general, all above ground structures including the WTGs and substation, will be removed and the land rehabilitated to ensure it can be returned to agricultural use. It is anticipated that other below ground infrastructure, including the WTG foundations and hardstands, will be left in situ and covered in clean fill material, with the area adequately graded to reflect the slope of the surrounding area and to minimise the risk of soil erosion.

3.8 Transmission Line Connection

3.8.1 Overview

A 132 kV overhead transmission line connection is proposed to connect the on-site substation to the existing Essential Energy 132 kV overhead transmission line network. At the time of preparing this EIS, the alignment of the transmission line had not been finalised, however a 500 m wide corridor extending to the existing Essential Energy 132 kV Yass to Goulburn line has been identified based on preliminary investigation and is shown in *Figure 3-7*. The alternative line route options that have been considered are discussed in *Chapter 5*.

The proposed 132 kV transmission line is anticipated to comprise concrete or galvanised steel poles, typically 18 -20 m high and spaced up to 200 m apart. The conductors (wires) will be aluminium and will be designed to be a minimum of 8 m above the ground at maximum operating temperature.

The poles will generally be 'direct buried' in the ground avoiding the use of large concrete pads at the base of the pole. Depending on the slope of the pole locations, it may be necessary to establish 'construction pages' adjacent to some poles. These level areas would be typically 20 m by 20 m.

There will be 4 wires, one of which will be an earth shield wire, protecting the line from lighting strikes. The line will ideally have a minimum of deviations as they necessitate 'backstays' to support the conductor tension. Minimising backstays reduces the impact on cropping and machinery operations in the vicinity of the poles.

Photograph 3-4 shows the proposed configuration of the proposed transmission line.

ABBEY COLLINS ROAD
RANGE ROAD
BIALA
BIALA ROAD
GRABBEN GULLEN ROAD
GURRUNDAH
GURRUNDAH ROAD
MERRILL
CLANCYS ROAD
SAPPHIRE ROAD
SHAWS ROAD
FISH RIVER
CULLERIN ROAD
GUNNING
YASS STREET
HUME HIGHWAY
bing

Legend
- Project Area
- Proposed Transmission Line Corridor
- Existing Goulburn to Yass 132 kV Transmission line

Data Source:
Bing Imagery : Nov 2012
DLPI : DCDB and DTDB, Oct 2014

0 0.85 1.7km

N

Client:	Newtricity	
Drawing No:	0178462m_BWF_EIS_G012_R3.mxd	
Date:	15/07/2015	Drawing Size: A3
Drawn By:	GR	Reviewed By: ED

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Figure 3-7 - Proposed 132 kV Overhead Transmission Line Corridor

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Photograph 3-4 Proposed Biala 132kV Transmission Line Configuration (Source: Clarence Consultants 2015)

3.8.2 Ownership and Easements

The 132 kV transmission line will be designed and constructed to meet Essential Energy standards and after construction will become owned and operated by Essential Energy.

The transmission line will be centred on a 40 m wide easement registered to Essential Energy. For the safe operation of the transmission line, certain activities will be restricted within the easement such as planting and growing trees, construction of buildings, or erection of antennae or masts in accordance with Essential Energy requirements. The use of the land for agricultural purposes such as cropping and grazing is unlikely to be affected by the transmission line.