Rye Park *Wind Farm*

Environmental Assessment | January 2014

MP10-0223

EPURON

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Prepared By:

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Foreword

As one of the leading renewable energy developers in New South Wales, Epuron is proud of its proposal to build the Rye Park Wind Farm. This wind farm will provide multiple opportunities to capture much needed investment and job creation in the local area, and also brings environmental benefits that clean, green, renewable energy provides to the wider community.

Wind farms play a vital role in delivering renewable energy to meet New South Wales and Australia's growing demand for cleaner sources of electricity. They also reduce harmful greenhouse gas emissions and help to secure a more sustainable future.

Epuron strives to ensure that its projects are developed and built in a manner that recognises the importance of an ongoing, long-term relationship with its landowners and the local community.

We believe this renewable energy project enjoys the support of the majority of people living in the local community and trust this application demonstrates our thoroughness and allows you to make an informed decision on the project's merits.

In preparing this Environmental Assessment for the Rye Park Wind Farm we would like to thank the many stakeholders and community members that have provided their feedback and contribution towards its preparation.

Sincerely,

Martin Poole
Executive Director

Andrew Durran
Executive Director

Addendum 21 March 2014

The Environmental Assessment for the Rye Park Wind Farm (MP 10_0223) was prepared in accordance with Part 3A of the Environmental Planning and Assessment Act 1979. On 13 March 2014 the NSW Department of Planning and Infrastructure advised that the Environmental Assessment was adequate for public exhibition.

On 21 March 2014, by order of the Minister for Planning and Infrastructure published in the NSW Government Gazette, the project ceased to be a transitional Part 3A project and became a 'State Significant Development'. Accordingly, the environmental assessment requirements and the statement of environmental assessment under Part 3A are taken to be environmental assessment requirements and an Environmental Impact Statement under the corresponding provisions of Part4 (clause 6(3)(b), Schedule 6A Transitional arrangements—repeal of Part 3A, Environmental Planning and Assessment Act 1979).

For clarity, when reading this Environmental Assessment, any reference to Part 3A is to be read as a reference to State Significant Development (Division 4.1 of Part 4, Environmental Planning and Assessment Act 1979).

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1 Executive Summary

1.1 Introduction

The purpose of the executive summary is to provide an overview of the key elements of the proposed Rye Park Wind Farm, a 126 turbine wind farm project located to the north of Yass and southeast of Boorowa, New South Wales. The site sits on the edge of the Southern Tablelands and the South West Slopes in the vicinity of the township of Rye Park. The site is approximately 250 km south west of Sydney and is located on freehold and leasehold land within and adjacent to agricultural areas, predominantly used for grazing sheep and cattle.

The site has been selected for its exposed windy ridges, cleared grazing land and proximity to the national electricity grid. The majority of land in the region is currently used for commercial agriculture (sheep and cattle grazing) and has been cleared and grazed over many decades.

The Environmental Assessment (EA) has been prepared to assess the potential environmental impacts and highlight the key benefits associated with the development of the Rye Park Wind Farm. The project will be assessed as a Major Project under Part 3A of the NSW Environmental Planning and Assessments Act 1979. Under this Act the project also meets the criteria for Critical Infrastructure as a renewable power generator with the capacity to generate in excess of 30 MW.

The Proponent for the Project is Rye Park Wind Farm Pty Ltd, a wholly owned subsidiary of Epuron Pty Ltd, an Australian renewable energy company established in North Sydney in 2003. Epuron is one of the most experienced wind energy development companies in NSW, with approved projects including Cullerin Range, Conroy's Gap, Gullen Range, Silverton and White Rock wind farms.

This executive summary provides an overview of the EA. Further details of each aspect of the EA can be found throughout the document and in the specialist studies that are appendices to this EA.

Figure 1-1 A ridge forming part of the Rye Park Wind Farm at the corner of Cooks Hill and Rye Park – Dalton roads

1.2 Project Outline

The Rye Park Wind Farm would involve the construction, operation and decommissioning of up to 126 wind turbines, together with the ancillary structures, access tracks and electrical infrastructure required to connect the project into the existing national electricity network. Figure 1-2 on the following page shows the proposed turbine layout and site boundary.

This project would directly involve approximately 38 properties that are currently used for agriculture and grazing purposes. These existing uses would continue with minimal interruption from the wind farm during construction and operation.

The wind turbines would have a maximum tip height (tower plus blades) of 157 metres above ground level and would be located on a series of ridgelines running north to south near the towns of Yass and Rye Park.

The wind turbines would be electrically connected by a series of underground and overhead cables joining each wind turbine to one of two on-site collection substations. A new overhead powerline, rated at up to 330 kV (nominal) capacity and approximately 35 km in length, running north-south along the length of the wind farm site would connect to the two collection substations and the wind farm connection substation. A short span of new overhead 330 kV powerline, approximately 100-200 metres in length, would connect the wind farm connection substation to the existing 330 kV TransGrid transmission line, which crosses the southern end of the site.

Additional permanent structures such as an operations and maintenance facility would be required as well as temporary construction facilities. Minor upgrades to local roads would be required for the delivery, installation and maintenance of wind turbines and the related facilities.

Table 1-1 Summary of the project

Aspect of the Project	*Description*
Project Summary	Construction and operation of a 126 turbine wind farm approximately 250 kilometres south west of Sydney, NSW. The project would have the ability to produce around 1,192,000 MWh of renewable energy every year, equivalent to the average consumption of around 149,000 homes (based on a 36% capacity factor).
Infrastructure & Facilities	The site will accommodate a wind farm connection substation, up to two collection substations, overhead powerlines and an operations and maintenance facility. Access tracks approximately 5-6 metres wide (wider at bends) would connect all of the wind turbines and associated infrastructure.
Electrical Connection	Underground and overhead electrical cabling and a new overhead powerline would connect the wind turbines to the on-site collection substations and wind farm connection substation. The collection substations would include transformers to step up the voltage from 22 kV or 33 kV to 330 kV and the wind farm would be connected to the existing transmission network via a connection substation adjacent to the existing 330 kV transmission line.
Employment	The construction phase would create approximately 363 jobs in direct employment and there would be a requirement for around 34 ongoing operation and maintenance jobs during the life of the wind farm.
Project Life	Once installed, the turbines would operate for an economic life of up to thirty years. After this time the turbines may be refurbished/replaced to improve their performance or decommissioned and removed from the site.
Environmental Benefits	Carbon Dioxide (CO_2) emissions reductions of 1,153,000 tonnes per year and an increased renewable generation source for NSW.
Installed Capacity	The project would have 126 turbines with an installed capacity in the range of 189 –378 MW based on 126 wind turbines at 1.5 - 3.0MW each.

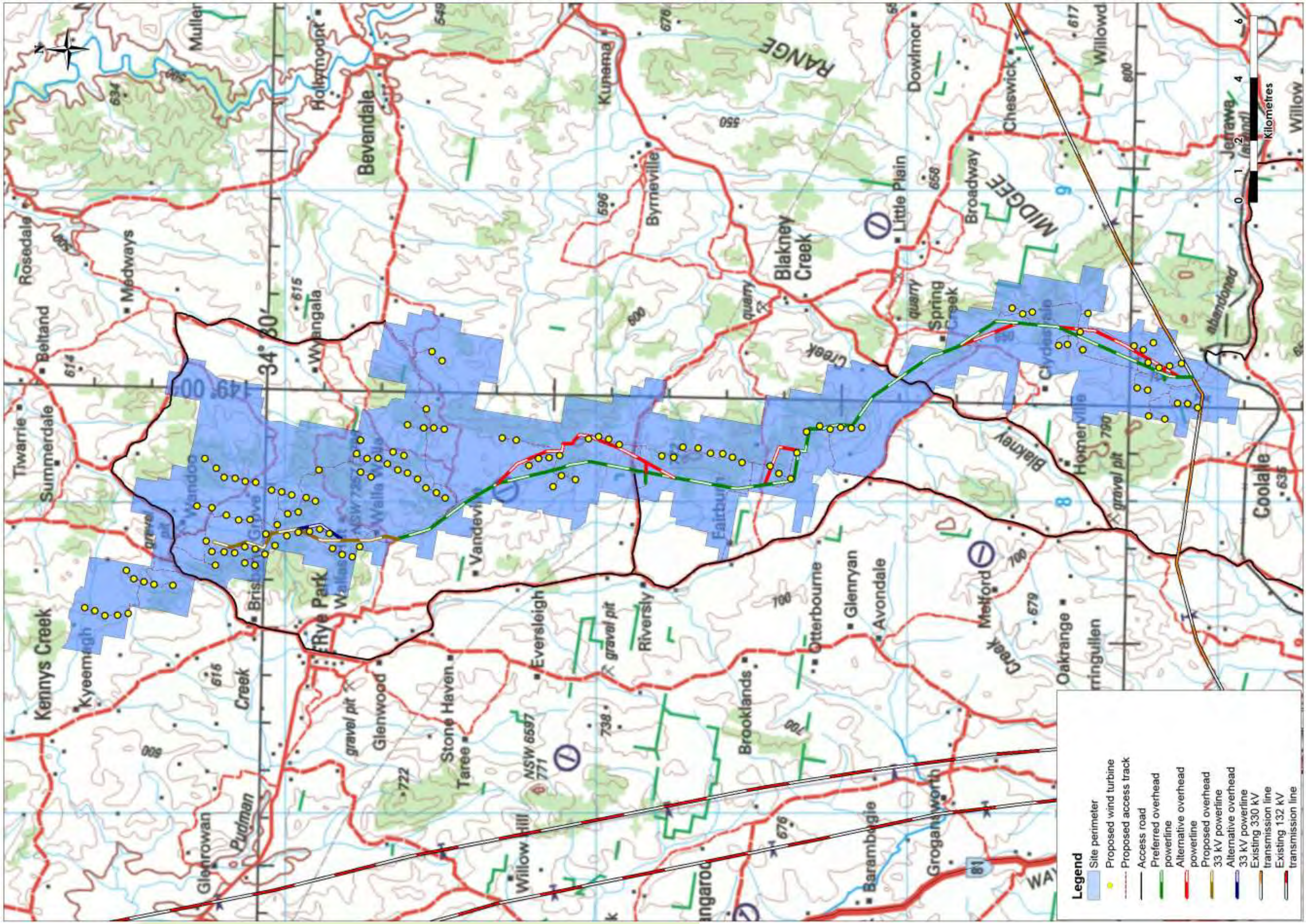

Figure 1-2 Rye Park Wind Farm turbine layout & site boundary

1.3 Strategic Justification

The NSW Government is developing the Renewable Energy Action Plan (REAP) to support the achievement of the national target of 20% renewable energy by 2020. The REAP positions NSW to increase the use of energy from renewable sources, such as wind energy, at least cost to the energy customer and with maximum benefits flowing to NSW.

The need for power

Primary drivers for developing renewable energy projects in NSW such as the Rye Park Wind Farm are: meeting a growing demand for electricity, the need for reducing greenhouse gas (GHG) emissions through clean energy generation sources, and contributing toward state and federal renewable energy targets.

Electricity consumption continues to grow, and the additional demand must be met by either increased fossil fuel generation or an increase in generation from renewable sources such as wind power.

TransGrid's Annual Planning Report (2012) and AEMO's Annual Electricity Statement of Opportunities (2011) confirms that growth in demand for electricity will soon exceed supply during peak times. Over the next 10 years energy use in NSW is expected to increase at an average of 1.6% per year. By 2020 electricity demand in NSW is expected to be 87,745 GWh/an, an increase of approximately 13,000 GWh/an over today's consumption (AEMO, 2011; TransGrid, 2012).

Meeting this demand will require our existing electricity generators to increase their annual output and the development of additional power generation will also be required. AEMO has estimated that additional power generating capacity will be required to manage peak periods in NSW by summer 2018/19. Alternative sources of generation need to be developed to meet this expected demand growth to ensure reliability of supply and avoid power outages and blackouts (TransGrid, 2012).

The Rye Park Wind Farm would contribute towards this growing demand for generation and decrease the country's dependence on fossil fuel power stations, which currently contribute over 90% of electricity generation in the NEM. The Rye Park Wind Farm represents a large sized wind farm with an installed capacity of around 378 MW based on a 3.0 MW turbine.

Based on the *NSW wind farm greenhouse gas savings tool* developed by the Department of Environment, Climate Change and Water (DECCW), the Rye Park Wind Farm will reduce greenhouse gas emissions by around 1,153,000 t CO_2e per annum. This is equivalent to taking 314,000 cars off our roads, and will contribute to global efforts to mitigate climate change.

The benefits to the region

There are also benefits to the local economy through job creation and investment. The Proponent is committed to developing this project in a way which minimises the adverse local impacts while maximising the potential energy in the wind resource and the benefits to the local community.

The project offers the following benefits:

- Production of more than 1,192,000 MWh of electricity per year - sufficient for the average consumption of around 149,000 homes;
- Improvement to the security of electricity supply through diversification of generation sources and locations;
- Reduction of greenhouse gas emissions by approximately 1,153,000 t CO_2e per annum;
- Contribution to the State and Federal Governments' target of providing 20% of consumed energy from renewable sources by 2020; and
- Creation of local employment opportunities and local economic benefits; and,
- An injection of up to $1,708 million into the Australian economy through the inclusion of flow on effects and multipliers.
- The creation of up to 363 direct employment jobs in the region during the construction phase and up to 34 permanent jobs for the life of the project.

1.4 Consideration of Alternatives

Site Selection

The site for the proposed Rye Park Wind Farm was fundamentally identified due to its excellent wind resource, proximity to an existing strong transmission network and the identification of willing landowners. A prefeasibility assessment revealed the site had excellent potential due to its elevated ridgelines, access via a main highway and relatively low density of residential houses.

Design Principles

Potential wind farm sites in NSW are typically located in areas with elevated ridgelines and strong prevailing winds. Due to these geographical attributes the potential turbine locations are more limited than on flatter areas such as near the coastal plains. Standard distances between turbines must be considered in conjunction with the prevailing wind conditions to avoid unnecessary turbulence that can lead to a decrease in energy yield and mechanical stress on the turbines. While the final turbine model has not yet been selected, a likely turbine size of 3.0 MW was considered when developing the layout for this EA as this presents the maximum design impact.

Layout Adjustments

The design of the wind farm layout was an iterative process that sought to maximise the energy potential of the site while minimising amenity impacts to the surrounding community. Community feedback and various expert assessments were considered when adjusting the turbine locations in order to design the most appropriate layout given the surrounding environment. In some instances, turbines were relocated and in some cases deleted to avoid or minimise impacts in response to issues such as noise, ecological, heritage and community concerns.

1.5 Planning Context

State Legislation

The determination process for the proposed Rye Park Wind Farm is governed by the NSW Environmental Planning and Assessment Act 1979 (EP&A Act). Having a capital investment value of more than $30 million, the Rye Park Wind Farm is a Transitional Part 3A project ('critical infrastructure', having the capacity to generate in excess of 30 megawatts). The determination is to be made by the Planning Assessment Commission, under delegation from the Minister.

The local Councils are not the Consent Authority for this project, and there is no obligation to comply with all relevant Development Control Plans (DCPs) prepared by each Council. However, compliance or otherwise against these DCPs must be taken into consideration in carrying out the assessment.

The Director General of the Department of Planning has issued requirements for Epuron to consider and address in this EA (known as the Director General's Requirements or DGRs). These requirements incorporate inputs from the various government agencies that will provide advice to the Department in the assessment of this proposal.

The steps in the planning determination process are outlined in Table 1-2.

Table 1-2 Planning Assessment Process

Stage of the Assessment	***Description***
Project Application and Preliminary Environmental Assessment	A Preliminary Environmental Assessment (PEA) is conducted by the Proponent to support the Project Application and give context around the site and potential issues that would need to be considered. This was submitted by Epuron in January 2011.
Director General Requirements (DGRs)	Using the PEA and advice from other governmental departments the Department of Planning and Infrastructure (DPI) issues DGRs. This is a list of issues that must be addressed by the proponent in an EA. The DGRs were issued to Epuron on 14 February 2011 and Supplementary DGRs were issued to Epuron on 16 August 2011.
Environmental Assessment and Consultation	The Proponent prepares an EA following the DGRs. This involves extensive studies to be conducted on site as well as consultation with the local community and other stakeholders.
Submission and Departmental Review of the EA	The Proponent submits the EA and supporting studies to the DPI who undertakes a review of the EA to ensure the document is acceptable and

Stage of the Assessment	Description
	addresses all issues raised in the DGRs. The DPI may require further work to be carried out by the Proponent.
Public Exhibition	The EA is placed on display locally and electronically for the public to review and provide feedback via submissions to the DPI. It is expected the EA will be on display for a minimum of 60 days.
Response to Submissions	The DPI provides the Proponent with a summary of issues raised in submissions. The Proponent is required to respond to each issue that is raised in the submissions and submit a Submissions Report to support the EA.
Determination	The DPI considers the EA and the Submissions Report, preparing its advice and recommendations for the Minister for Planning and Infrastructure, and the Planning Assessment Commission (as delegate of the Minister) determines the application.

About This Report

This EA was prepared with the intention of providing the reader with a clear concise overview of the project details, the rationale behind the project and the issues that have been considered from a social and environmental perspective. Additional detail is provided in the attachments and appendices. The EA references these sections wherever relevant in order to aid the reader in locating the more detailed sections.

This EA document comprises the following sections:

Main Report: Environmental Assessment for the proposed Rye Park Wind Farm

Attachments:

Attachment 1 – Involved Land Parcels

Attachment 2 – Residence Coordinates

Attachment 3 – Turbine Coordinates

Attachment 4 – Letter Confirming Part 3A Position

Attachment 5 – Director General’s Requirements and Supplementary Director General’s Requirements

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Appendix A – Assessment including photomontages prepared for uninvolved landowner dwellings within 2 km of a wind turbine

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1.6 Consultation

In 2010 the NSW Government commissioned a report *‘Community Attitudes to Wind Farms in NSW’* to assess residents attitudes towards targets set to achieve 20% renewable energy sources by 2020. The survey was conducted by telephone of 2022 resident’s aged 18 years and older and 300 businesses across the 6 Renewable Energy Precincts, including the ACT/NSW Border Areas and a control area in regional NSW.

One of the key findings from this study was the overall support for wind farms as a source of energy generation within the vicinity of a residence. 85% of the population across the precincts supported wind farms in NSW, with 80% supporting them within their local precinct, and 79% supporting a wind farm being built 10 km from their residence.

Based on this survey, including observations made by the project consultation team, it can be concluded that communities in the Yass Valley region are generally supportive of wind farms. The survey also showed that a majority of the population did not feel they had adequate information about wind farms, even in areas where general wind farm awareness was much greater.

Epuron prepared a Project Consultation Plan to inform and guide the community consultation and development program for the Rye Park Wind Farm. The Project Consultation Plan focused on providing information to the local community about the project and the assessment process and outlining the mitigation of potential impacts. The Project Consultation Plan was implemented and has proved to be effective and has included individual consultation with neighbouring residents of the project, newsletters, a Community Consultation Committee as well as an information 'Open House' day held in Rye Park in July 2012.

1.7 Landscape and Visual Impacts

The Landscape and Visual Impact Assessment (LVIA) for the proposal has been prepared by the specialist consultant Green Bean Design (GBD). The LVIA involved a comprehensive evaluation of the visual character of the landscape in which the wind farm would be located, and an assessment of the potential significance of landscape and visual impacts that may result from the construction and operation of the wind farm, taking into account appropriate mitigation measures.

In terms of overall landscape sensitivity, the LVIA determined that in aggregate each of the five Landscape Characteristic Areas within the 10km wind farm viewshed had a medium/medium to high sensitivity to accommodate change, and represented a landscape that is reasonably typical of other landscape types found in surrounding areas of the Southern Tablelands. The landscape values have been considered and determined as a set of professional judgements on the importance to society of the local and regional landscape surrounding the proposed wind farm and are not considered to have the potential to have a significant impact on existing landscape values.

The LVIA identified a total of 51 potential involved and uninvolved residential view locations within the Rye Park wind farm 2 km viewshed. An assessment of each potential residential view location indicated that for the Rye Park wind turbine design layout:

- 10 of the 51 residential view locations have been determined to have a low visual significance;
- 10 of the 51 residential view locations have been determined to have a low to medium visual significance;
- 12 of the 51 residential view locations have been determined to have a medium visual significance;
- 17 of the 51 residential view locations have been determined to have a medium to high visual significance; and
- 2 of the 51 residential view locations have been determined to have a high visual significance.

The LVIA determined that the majority of residential dwellings and public viewpoints located beyond the 2 km wind turbine offset are unlikely to be significantly impacted by the wind farm development.

Taking into account the mitigation measures outlined in Section 9.4, the LVIA concludes that the Rye Park wind farm project would have an overall medium visual significance on the majority of uninvolved residential view locations within the 10 km viewshed as well public view locations.

The LVIA identified 27 residential view locations within 2 km of the proposed 330 kV powerline route (including the three alternative route options). An assessment of the potential visual significance of the proposed powerline indicated that:

- 9 of the 27 residential dwellings would have a Nil visual significance;
- 12 of the 27 residential dwellings would have a Low visual significance;
- 3 of the 27 residential dwellings would have a Low to Medium visual significance; and
- 3 of the 27 residential dwellings would have a Medium visual significance.

1.8 Cumulative Impacts

An assessment of cumulative environmental impacts has been undertaken to consider the potential impact of the Rye Park proposal in the context of existing and proposed developments to ensure that any potential impacts are not considered in isolation.

The nearby proposed Bango and Rugby wind farm developments shown in Figure 1-3 are currently in the planning stage and are not yet approved. The proposed location and number of turbines associated with these developments was not publically available during the preparation of this EA. As the Yass Valley and Conroys Gap wind farm developments are around 20 km from the Rye Park wind farm site it is considered unlikely that they will contribute to any material additional cumulative impact. The potential for cumulative impact will ultimately be dependent on a number of factors such as the selected turbine type, separation distance between turbines, layout of turbines relative to the proposed Rye Park project and the actual sequence of projects constructed if commenced following approval.

An assessment of potential cumulative impact arising from visual, noise, traffic, ecology and heritage effects were assessed against the proposed wind farms and shown to have a minimal to negligible impact.

Whilst some degree of intervisibility between proposed projects is expected, the nature and extent of the undulating landform surrounding each of the project sites, would partially limit the overall potential for 'direct' and 'indirect' views for many of the residential dwellings located between them. Long distance views (around 30 km) can be obtained toward the existing operational Gunning and Cullerin wind farms from elevated areas of the landscape to the south east of the Rye Park project area. Although visible, these wind farms are unlikely to result in any significant additional level of 'direct' and 'indirect' cumulative impact within the Rye Park 10 km viewshed due to the distance affect on overall visibility between the existing and proposed wind farms.

Cumulative impacts are assessed and discussed further in Section 16.7.

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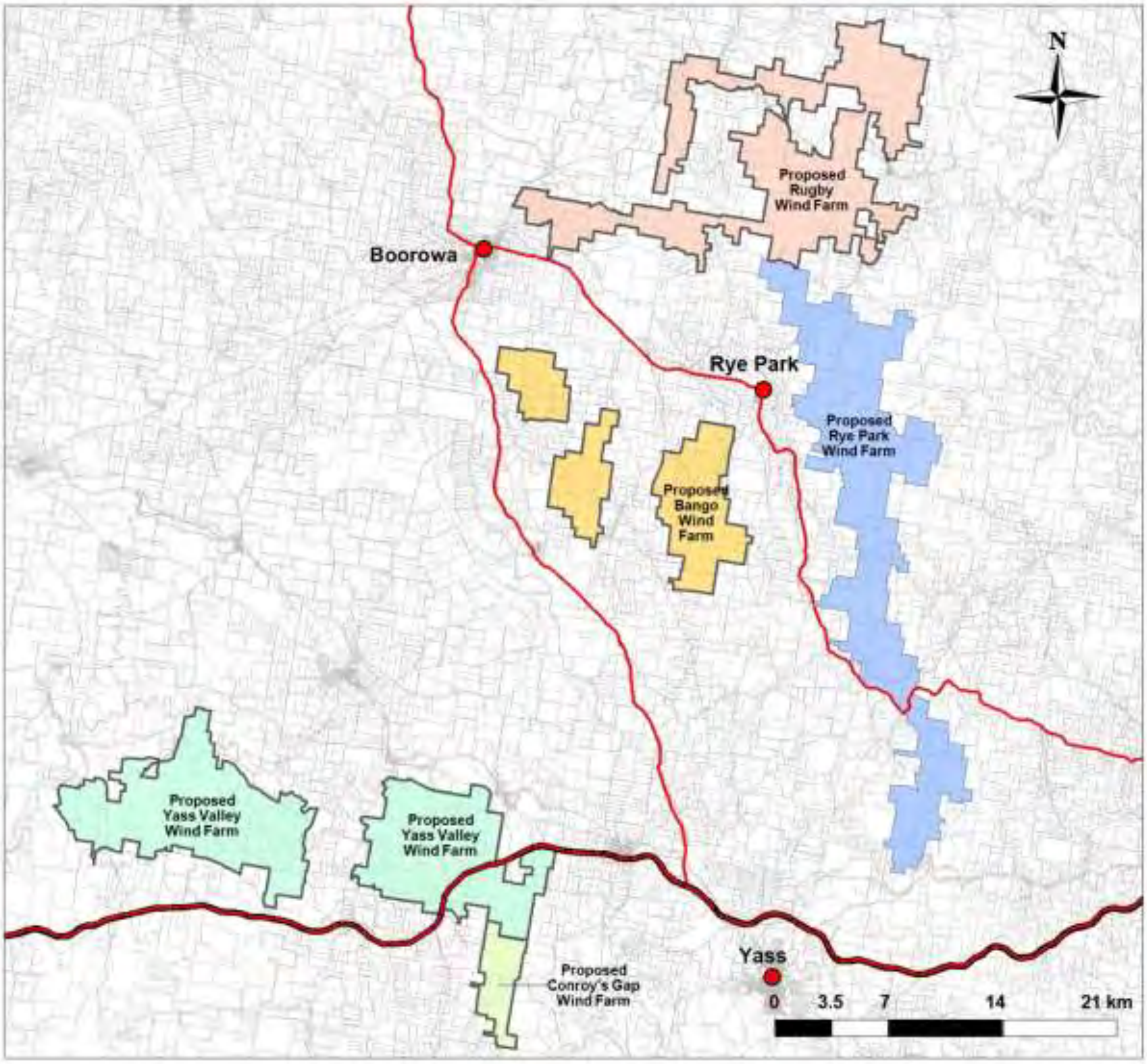

Figure 1-3 Proposed wind farms in the Yass region

1.9 Environmental Noise

A full assessment of the wind farms operational and construction noise was undertaken by an expert consultant, SLR Consulting Australia Pty Ltd. The Noise Impact Assessment (NIA) in Appendix B compares the wind farms predicted level to the limits set out in the South Australian Environmental Protection Authority “Environmental Noise Guidelines for Wind Farms (February 2003)” and World Health Organization limits to determine compliance. The assessment of noise from the wind turbines was completed by plotting the predicted noise levels against the limit curves for all wind speeds.

The results of the assessment showed that some minor exceedances were predicted in the initial layout and compliance could be achieved using Sound Management Mode on some turbines in the current layout. The result of the assessment showed that the noise levels of the mitigated layout were predicted to meet the relevant criteria at all receptor locations.

The project is yet to select and finalise the wind turbine make and model. Upon finalising the wind turbine selection a revised noise prediction and assessment will be completed to confirm compliance. Should any noise impacts be identified that exceed criteria then adaptive management practises could be implemented to mitigate or remove the impact.

As requested by the NSW Department of Planning and Infrastructure, additional assessments have been undertaken under the recently released NSW Draft Wind Farm Noise Guidelines. Assessments into low frequency noise and tonality have been undertaken and the results do not indicate any further investigation into these Special Audible Characteristics is required under the draft guidelines.

Construction noise was assessed based on the Interim Construction Noise Guidelines. Construction noise was predicted at all receivers using worst case construction impacts. A number of receivers were deemed 'noise affected' under the guidelines and it is recommended that a more detailed construction management plan be developed by prior to construction.

Blasting impact has been assessed and found to be acceptable. Construction traffic noise under a worse case has been found to comply with the NSW Road Noise Policy requirements. Substation and Transmission line noise predictions have been made and compared to the appropriate NSW Industrial noise policy limit and found to comply.

1.10 Ecology

Epuron commissioned a Biodiversity Assessment (BA) by NGH Environmental to assess the biodiversity impacts of the project with particular attention to threatened entities (species, populations and communities).

The project area is characterised by cleared farmland, mostly derived from former Box-Gum Woodland on the lower slopes and flats with Inland Scribbly Gum Dry Forest vegetation on the steeper sheltered slopes. Remnant stands of the original vegetation remain as paddock trees or larger scattered patches of forest/woodland on the lower slopes with more extensive forested areas on the ridge tops. The pasture ranges from exotic to native species dominated. This pattern of vegetation and land-use onsite is common across the locality.

Eleven vegetation types occur across the project site. No threatened flora species were detected during the surveys. A threatened species evaluation was undertaken to determine the presence of habitat in the project area and the likelihood of impact from the proposal for each species and community with potential to occur. Four threatened flora species and one EEC were identified with potential for impact.

Nine species of threatened birds and three species of threatened microbats were recorded during surveys in the project area: Brown Treecreeper (*Climacteris picumnus*), Diamond Firetail (*Stagonopleura guttata*), Speckled Warbler (*Pyrrholaemus sagittatus*), Flame Robin (*Petroica phoenicea*), Scarlet Robin (*Petroica multicolour*), Hooded Robin (*Melanodryas cucullata cucullata*), Varied Sittella (*Daphoenositta chrysoptera*), White-fronted Chat (*Epthianura albifrons*), Superb Parrot (*Polytelis swainsonii*), Eastern Bentwing-bat (*Miniopterus schreibersii oriane*), Eastern False (*Pipistrelle Falsistrellus tasmaniensis*) and the Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*). Additional fauna species were identified with potential for impact.

Constraints mapping was used to inform the infrastructure layout. The proponent has undertaken several rounds of infrastructure layout revision to avoid impacts in areas identified as a high constraint in NGH Environmental's report and subsequent correspondence. Design measures to avoid impacts associated with vegetation clearing including loss of Box-Gum Woodland EEC and connectivity, are provided in the BA and include removing or relocating turbines from several areas.

Design measures to avoid blade-strike impacts associated with the operational phase of a wind farm including proximity to nest trees, were also undertaken and are summarised in the BA. These included removing or relocating turbines in close proximity to identified nests and in areas that may affect landscape connectivity.

Based on the assessments of significance, impacts arising from the proposal upon the threatened community and species known and likely to occur in the project area are considered manageable and unlikely to be significant. A Species Impact Statement (SIS) under the EP&A Act is not considered necessary. A referral to the Commonwealth government under the Environmental Protection & Biodiversity Conservation (EPBC) Act is also not considered necessary but will be progressed by the Proponent to achieve certainty. This conclusion assumes the effective implementation of the management measures provided in the BA.

1.11 Cultural Heritage

A Cultural Heritage Assessment was undertaken for the project by an expert consultant, NSW Archaeology, with input from the local Aboriginal community. The assessment considered the heritage and archaeological context of the project area to develop a methodology to help target a field survey of the study area for Aboriginal and non-indigenous heritage items.

The following five local groups are the registered aboriginal parties for the Project and were consulted and contributed to the preparation of the cultural heritage assessment:

- Onerwal Local Aboriginal Land Group;
- Carl and Tina Brown;

- Gunjeewong Cultural Heritage Aboriginal Corporation;
- Gundungurra Aboriginal Heritage Association Inc; and
- Buru Ngunawal Aboriginal Corporation.

Epuron would like thank these local groups for their contribution and assistance to the project.

A nine day field survey was undertaken during July 2012 with the assistance of the Buru Ngunawal Aboriginal Group. Results of the field survey showed proposed impact areas were assessed to be of low archaeological and heritage significance primarily due to their location on very rocky ridgelines and situated away from streams and rivers. It was predicted that aboriginal land use would have historically been related to low levels of hunting, gathering and transit through country. A very low density of small stone artefacts was found to be present on the project site.

Three European milky quartz outcrops were recorded across the project site and should be avoided during construction. These outcrops would have been used for the extraction of raw materials last century by European settlers.

1.12 Additional Issues

Traffic and Transport

The construction phase of the project presents the most traffic issues associated with the project as it generates the greatest volume of traffic. A Traffic and Transport Assessment considered the potential issues associated with the proposed wind farm and provided mitigation measures to minimise and avoid such issues.

Access to the site would primarily be via the Hume Highway at the southern end of the site. New unsealed tracks would be constructed to access the temporary construction compounds, operation and maintenance facility, connection substation, collection substations and the turbine locations across the site. Additional traffic generated from the project would not constitute a significant increase in existing volumes on the Hume Highway.

The operational phase would have a very minimal impact to traffic volumes as the turbines would be maintained by a relatively small crew of technicians likely to be based out of Yass or Canberra.

Aviation

Epuron has consulted with the relevant aviation associations in relation to air safety and potential hazards caused by the construction of turbines. The location of the proposed turbines would not encroach on an Obstacle Limitation Surface (OLS) of any registered or regulated aerodrome. The closest Civil Aviation Safety Authority (CASA) certified and registered aerodromes to the proposed wind farm site are Canberra and Goulburn airports, approximately 70 km to the south-southeast and 80 km to the east of the site respectively.

The presence and location of eleven agricultural airstrips identified within 5 km of the project have been assessed and considered in the design of the wind farm to ensure turbines do not encroach on any of the existing landing areas. The closest turbine to an existing agricultural landing strip is 570 m.

1.13 Land Management

Land Use

The wind farm project infrastructure is located on private property that is primarily used for grazing and agricultural purposes. Once operational the wind farm will have a negligible impact on normal farming operations and the agricultural capacity of the land as it would occupy only a few per cent of land from the involved landowner properties.

Hydrology and Drainage

The layout for the wind turbines and associated wind farm infrastructure has been designed with particular emphasis on protecting existing streams and ephemeral watercourses. The layout avoids crossing or interfering with watercourses wherever possible. This is to avoid and minimise any adverse impacts to the existing drainage and hydrological regime in the local area.

The water required for construction of this project will be sourced from Burrinjuck Dam in the Yass catchment area or from the Yass reservoir and permission will be obtained from the Yass Valley Council.

Once the wind farm is completed it will require only a small volume of water. This will be obtained through the use of storage tanks collecting water runoff from any of the permanent structures.

Soils and Landforms

The project is not predicted to have any significant adverse environmental impacts on the site or its surrounds, geology or soils as the overall surface disturbance is relatively small in size and manner.

A detailed geotechnical assessment would be conducted once the turbine locations have been finalised to determine the ground conditions and stability at each turbine site. No geotechnical issues are anticipated due to the favourable geological characteristics of the area.

An Environmental Management Plan (EMP) would be developed in accordance with the Best Practice Guidelines for Wind Energy Projects and the project consent conditions to ensure that issues such as erosion, weed control, air quality and drainage are appropriately addressed.

1.14 Environmental Management

Prior to the commencement of construction works a Construction Environmental Management Plan (CEMP) will be prepared to the satisfaction of the relevant authorities to manage and mitigate environmental impacts on the wind farm site. The CEMP will incorporate all relevant processes and mitigation measures for development activity and will include:

- Traffic and Transport;
- Erosion & Sediment Control Plan;
- Landscape Management Plan;
- Soil & Water Management;
- Chemical and Fuel Storage - to avoid pollution of surface and ground waters;
- Fire Management;
- Rail Safety Management Plan;
- Waste Generation and Disposal; and
- Additional measures mentioned in the Statement of Commitments.

Prior to the commencement of permanent wind farm operations an Operational Environmental Management Plan (OEMP) will be prepared to the satisfaction of the relevant authorities to manage and mitigate environmental impacts on the wind farm site. The OEMP will incorporate all relevant processes and mitigation measures for wind farm operations and will include:

- Health and Safety;
- Community and Communications
- Waste Generation and Disposal; and
- Additional measures mentioned in the Statement of Commitments.

1.15 Statement of Commitments

As a result of the thorough investigations undertaken a wide range of mitigation measures have been identified for the proposed Rye Park Wind Farm. These mitigation measures will be implemented where specified and relevant throughout the project to address potential issues arising from visual, noise, traffic, ecology, communications and impacts to the local community. The mitigation measures set out for each issue have been documented as a draft Statement of Commitments which would form the basis of the Construction and Environmental Management Plans (CEMP) and the Operational Environmental Management Plan (OEMP) to ensure that the project achieves maximum benefits while minimising the impacts to the local environment and community.

1.16 Contact Information and Further Details

Address:	Rye Park Wind Farm Pty Ltd c/- Epuron Level 11, 75 Miller Street North Sydney NSW 2060
Phone:	(02) 8456 7400
Email:	info@epuron.com.au
Web:	www.epuron.com.au

2 Introduction – Project & Proponent

2.1 Overview of the Project

The proposed Rye Park Wind Farm is located to the north of Yass and southeast of Boorowa, New South Wales, on the edge of the Southern Tablelands and the South West Slopes in the vicinity of the township of Rye Park. The site is in close proximity to a number of proposed wind farms, as shown in Figure 2-1.

Figure 2-1 Proposed Rye Park Wind Farm location

The proposed site is located on freehold land within and adjacent to agricultural areas. The closest rural centre is the town of Yass, 10 km to the southwest from the southern boundary of the site. There are a number of local residences that surround the site; these have been identified through reviews of cadastral and topographic mapping, on-site inspection and aerial imagery.

The project would involve the construction, operation and maintenance of up to 126 wind turbines, together with the ancillary structures, access tracks and electrical infrastructure required to connect the project into the existing electricity network.

The turbines would be placed along a series of ridgelines and surrounding hilltops in order to maximise the renewable energy produced by the wind (see Figure 3-4 in Section 3.2 for details of the turbine layout).

2.2 Proponent and Stakeholders

Proponent: Rye Park Wind Farm Pty Ltd

The Proponent of the proposed Rye Park Wind Farm is Rye Park Wind Farm Pty Ltd; a wholly owned subsidiary of Epuron Pty Ltd. Epuron is the most experienced wind energy development company in NSW. Epuron commenced its operations in 2003 as Taurus Energy Pty Ltd and since that time, in NSW, has developed the largest wind farm, the largest number of wind farms, and the largest number of wind turbines as indicated in Table 2-1.

Epuron is therefore one of the largest wind farm developers in Australia.

Epuron operates out of its offices in North Sydney where it has a professional team with considerable development expertise and proven track record. Epuron undertakes its own developments including wind monitoring, site layout and design. For environmental assessments such as ecology, archaeology, noise and visual, appropriate specialists are engaged.

Table 2-1 New South Wales wind farm projects developed by Epuron

Project	Turbines / Size	Development Status	Region
Cullerin Range	15 turbines 30 MW	Operating – now owned by Origin Energy	Southern Tablelands
Conroy's Gap	15 turbines 30 MW	Development Approved	Southern Tablelands
Snowy Plains	15 turbines 30 MW	Development Approved	Monaro
Gullen Range	73 turbines	Development Approved, Under Construction – now owned by Goldwind Australia	Southern Tablelands
Silverton	598 turbines Stage 1 - 282 Stage 2 - 316	Joint Venture (JV) with Macquarie Capital Wind Fund – now owned by AGL Project Approval - stage 1 Concept Approval - stage 2	Far Western NSW
Yass Valley	152 turbines	Awaiting completion of Submission Report	Southern Tablelands
White Rock	119 turbines 238 MW	Development Approved	New England Tablelands
Eden	7 turbines 14 MW	Statement of Environmental Impacts lodged and awaiting determination	Illawarra / South Coast
Liverpool Range	Up to 550 turbines	Environmental Assessment lodged in December 2012 for assessment	Orana, Hunter & Northern Inlands

Consent Authority: Department of Planning and Infrastructure

The project will be assessed as a transitional Part 3A development project under the Environmental Planning and Assessment Act 1979 (the EP&A Act), accordingly the Consent Authority is the NSW Minister for Planning assisted by the Department of Planning and Infrastructure.

An additional consent may be required from the Federal Government, through the Department of Sustainability, Environment, Water, Population and Communities, under the Environmental Protection and Biodiversity Conservation (EPBC) Act 1999.

An outline of the assessment processes including consultation with the community and other government agencies is found in Sections 1 and 7.

Key Stakeholders

During the development of this project, Epuron and its consultants have actively engaged with a number of key stakeholders including:

- local councils – Boorowa Council, Yass Valley Council and the Upper Lachlan Shire Council;
- State Government agencies – to receive specialised advice on the assessment of key issues;
- local community – involved and neighbouring or nearby landowners as well as community groups; and
- TransGrid – the high voltage electricity transmission infrastructure that the project would connect into is owned and operated by TransGrid.

During the assessment process the Department of Planning and Infrastructure (DPI) will seek comments on the project from key stakeholders and relevant government agencies, which will include a review of this Environmental Assessment (EA).

2.3 Development Application Process

Purpose of this document

This EA has been prepared to support the Development Application of the Rye Park Wind Farm and to address the Director General's Requirements (DGRs) issued by the NSW Department of Planning and Infrastructure.

This EA presents:

- a detailed description of the project;
- a summary of the development and assessment process;
- findings and recommendations from the detailed EA studies; and
- a description of the consultation plan Epuron is implementing in relation to this project.

Overview of the planning process

The proposal is a transitional Part 3A project application and is required to be assessed under both state and federal government environmental legislation, specifically the *Environmental Planning and Assessment Act 1979 (NSW)* and the federal *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). The proposal will also have regard, to the maximum extent possible, to the draft NSW Wind Farm Planning Guidelines (2012).

In relation to this EA, we note:

- The proposed Rye Park Wind Farm would have a capital cost in excess of $30 million and in the Minister's opinion is considered to be a Major Project, under Part 3A of the EP&A Act (Minister's opinion dated 8 December 2010, included in Attachment 4). Part 3A of the EP&A Act consolidates the assessment and approval regime for all Major Projects that require the approval of the NSW Minister for Planning and Infrastructure.
- The proposed Rye Park Wind Farm has the capacity to generate in excess of 30 Megawatts and therefore is a Critical Infrastructure Project under section 75C of the EP&A Act by virtue of the Critical Infrastructure declaration made by the NSW Minister for Planning on 11 November 2009.

The assessment process for the project is as follows:

- The Proponent of a Major Project first submits a Project Application for the approval of the Minister for Planning and Infrastructure.
- The Department of Planning and Infrastructure seeks input from key government agencies in detailing the requirements of the EA.
- The Director-General of Department of Planning and Infrastructure then issues the Proponent with requirements for the EA, indicating the issues to be addressed, the level of assessment required and consultation requirements. These are the DGRs.

- The DGRs may also require the Proponent to include in the EA a Statement of Commitments (SOC) the Proponent is prepared to make for environmental management and mitigation measures on the site.
- After an EA has been prepared and submitted to the DPI, the report is placed on public exhibition for a minimum of 60 days during which time submissions from the community, local government and state agencies are accepted.
- Following the consultation period, the Director-General may require the Proponent to respond to the submissions, revise the proposal or revise the Statement of Commitments.

Consistent with former Part 3A, this assessment was preceded by an issues scoping exercise to identify and prioritise issues related to the project. A Preliminary Environmental Assessment identifying and prioritising issues relating to the project was submitted to the Department of Planning and Infrastructure (DPI) on the 14 January 2011. The DPI responded on 14 February 2011 and 16 August 2011 with the DGRs and Supplementary DGRs for this EA.

2.4 Content in this Environmental Assessment

This EA draws together a number of specialist studies investigating the potential impacts of the wind farm. The findings of these studies have been summarised into the EA and are also included as standalone documents appended to this EA. This EA concludes with a Statement of Commitments to which the Proponent would commit, pending approval of the proposal, in order to manage identified impacts.

A brief summary of the sections in this EA is as follows:

- **Section 1** – The Executive Summary aims to give a brief overview of the wind farm and how impacts will be managed.
- **Section 2** – Introduces the project and the process.
- **Section 3** – Provides a detailed description of the project and the activities involved with each stage of development.
- **Section 4** – Provides a context for the project in the form of an overview of the current energy situation and how wind energy fits in to this, including justification for the project.
- **Section 5** – Describes the alternatives considered for this project
- **Section 6** – Provides a description of the planning process
- **Section 7** – Details Epuron's community consultation process
- **Section 8** – Addresses the risk analysis of the issues identified in the DGRs
- **Section 9** – Visual and Landscape Impact Assessment
- **Section 10** – Operation and Construction Noise Impacts
- **Section 11** – Ecological Assessment
- **Section 12** – Aboriginal and European Heritage Assessment
- **Section 13** – Traffic and Transport
- **Section 14** – Hazards and Risks
- **Section 15** – Water Supply, Water Quality and Hydrology
- **Section 16** – General Environmental Assessment
- **Section 17** – Epuron's draft Statement of Commitments
- **Section 18** – Conclusions

3 The Project

3.1 Description of the Project

This section of the EA provides a detailed description of the project and in particular outlines the work associated with the construction and operation of the wind farm and all associated infrastructure.

This EA has assessed the impacts of locating wind farm components within an up to 200 m wide corridor in which all proposed infrastructure will be contained, comprising a total area of approximately 4,850 hectares (Project Corridor). The assessed Project Corridor is shown on Figure 3-2 and Figure 3-3.

The main components of the proposed wind farm included in this application, each of which will be located within the assessed Project Corridor, are:

- up to 126 wind turbines, each with:
    - a capacity between 1.5 and 3.0 MW;
    - three blades mounted on a tubular steel tower, with a combined height of blade and tower limited to a maximum tip height of 157 metres;
    - an adjacent pad mounted wind turbine transformer, crane hardstand area, and related turbine lay down area;
- a new 330 kV wind farm connection substation located adjacent to the existing TransGrid 330 kV transmission line (Yass – Bannaby) that traverses the southern section of the site;
- up to two new 22 or 33/330 kV collection substations located across the wind farm;
- a new overhead powerline approximately 35 km in length, rated at up to 330 kV (nominal) capacity, running north-south along the length of the wind farm site to the two collection substations. The new powerline would be mounted on a single pole type structure and may be single-circuit or double-circuit as required;
- underground and overhead 22 or 33 kV electrical cabling linking the wind turbines to the on-site collection substations and connection substation. This will include the crossing of existing roads such as Rye Park Rugby Road toward the northern end of the site and Blakney Creek Road toward the southern end of the site;
- an operation and maintenance facility incorporating a control room and equipment storage facilities;
- temporary concrete batching plants and construction facilities;
- access tracks required for each wind turbine and the related facilities above;
- minor upgrades to local roads, as required for the delivery, installation and maintenance of wind turbines and the related facilities above; and
- up to six permanent monitoring masts for wind speed verification, weather and general monitoring purposes. The permanent monitoring masts may be either static guyed or un-guyed structures and will be to a minimum height of the wind turbine hubs.

A range of wind turbines is being considered for the Project with a capacity between 1.5 and 3.0 megawatts. For consistency of presentation the calculations used throughout this EA assume an indicative wind farm capacity of 378 MW based on a typical 3.0 MW turbine.

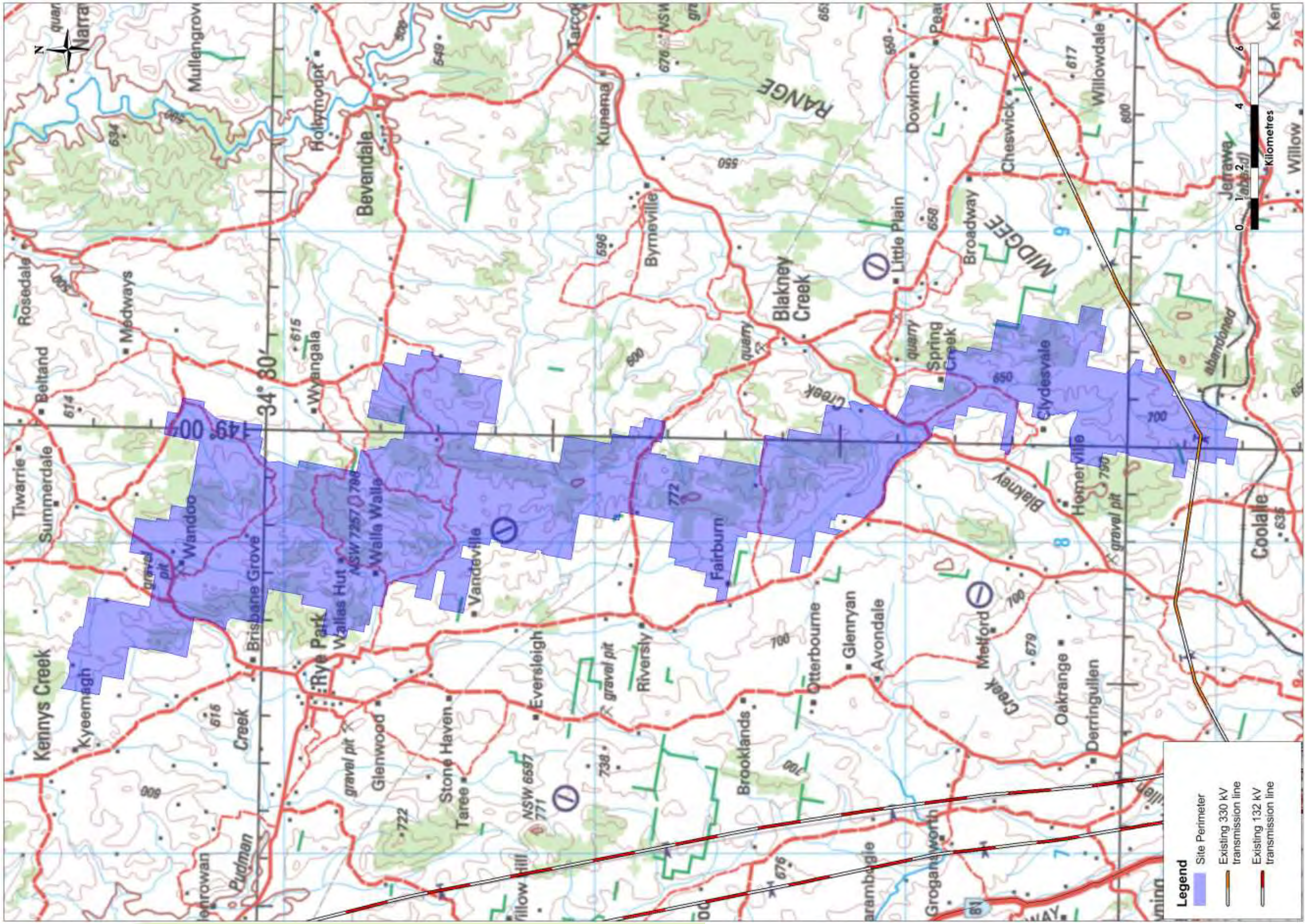

Figure 3-1 Locality and site boundary of the Rye Park Wind Farm

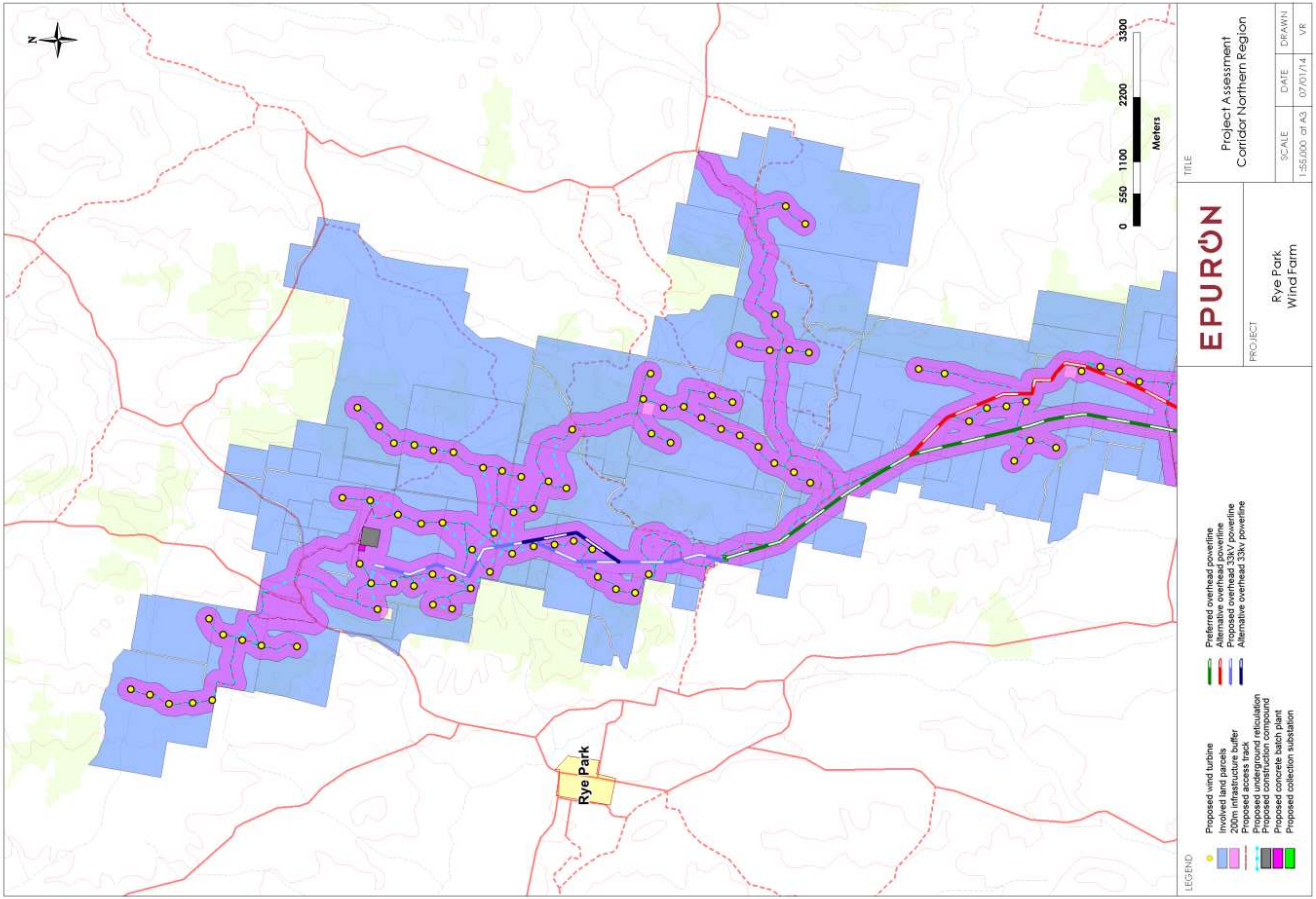

Figure 3-2 Project Assessment Corridor (Northern Region)

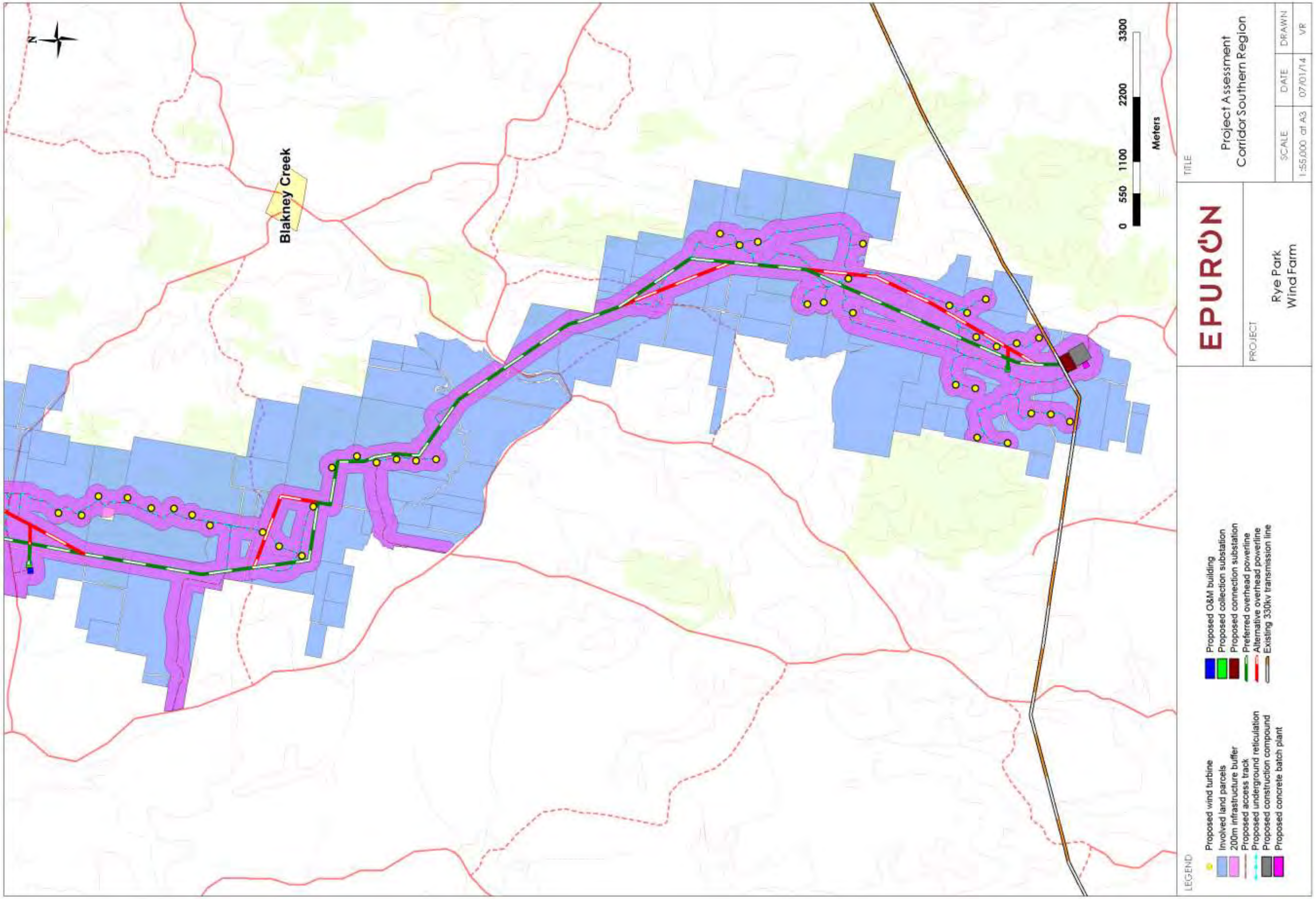

Figure 3-3 Project Assessment Corridor (Southern Region)

3.2 Wind Farm Layout

General

As outlined above, all wind farm components will be located within the assessed Project Corridor.

This EA has assessed an indicative wind farm layout which has been through a number of design optimisations and iterations. The design process is focused around three core principles:

- minimising and/or avoiding where possible negative environmental and community impacts;
- maximising positive impacts (clean energy production and greenhouse gas reduction); and
- incorporating practical limitations in relation to the construction and operation of the site, including costs.

Where there is a conflict or dynamic tension between these core principles, Epuron has used its experience and judgement, taking into consideration a balanced view of the public good in finalising the layout.

Preliminary Layout

In 2009-10 a preliminary layout accommodating up to 180 wind turbine locations was prepared to guide initial landowner discussions and the progression of community consultation engagement. This layout was based primarily on early wind speed analysis and a desktop review of available terrain and mapping data. Some early feedback was available from discussions with landowners, but there were no results from field studies or identified land-use constraints, as these were not available at the time the preliminary layout was prepared. The preliminary layout has been subsequently revised and improved, taking into account updated technical and environmental constraints, community consultation feedback and results of the various environmental assessments conducted.

Revised Layout

Based on updated information and feedback received on the preliminary layout, a revised layout proposing 131 wind turbines was prepared in 2011-12 for consultation. Release of this layout was intended to inform ongoing design iterations and consultation and was largely prepared with input from;

- feedback on the preliminary layout;
- constraints identified during initial field studies;
- around 2 years of wind data;
- feedback from consultation discussions with stakeholders, and
- input from discussions with involved landowners regarding their properties.

This layout was also featured at the public open day held in Rye Park on 26 July 2012. A number of other layout iterations have been made available for discussions with landowners and stakeholders at various times to accommodate the evolving nature of information impacting certain areas of the wind farm.

Current Layout

The current project layout contained in this report is indicative only and is subject to detailed design. The indicative layout has been prepared on the basis of the best knowledge available at this time, and incorporates the avoidance, mitigation and management measures outlined in this report. The Project assessed in this report has assumed the maximum impact of each of the project components to ensure that the “worst-case” scenario is assessed.

The current layout includes 126 wind turbine locations spanning a distance of about 38 km from north to south and 10 km from east to west. Approval is sought for the two overhead powerline routes, proposed and alternate, identified on the site although only one route or a mix thereof will be constructed. This EA seeks planning approval to locate all wind farm components within the assessed Project Corridor. An overview can be seen in Figure 3-4 and detailed maps of landowners, vegetation and indicative turbines layouts can be seen in Figure 3-6 through Figure 3-9, Figure 3-12 and Figure 3-13. These detailed maps have been spilt into northern and southern regions to show the indicative layout in greater detail. This division is shown in Figure 3-5.

The current turbine layout reflects the typical spacing required for the wind turbine under consideration, while maximising the total energy output of the wind farm balanced against the identified constraints.

A description of the key improvements made to the layout over time with reasons for each improvement is included in Section 5.2. Issues identified through the community consultation process guided the design and implementation of the various impact assessments, which also informed the preparation of this layout.

Avoiding and minimising impact to the flora and fauna has been considered during all stages of design through the use of mapped constraint areas identified during the detailed field assessments. Archaeology, noise and visual impact assessments have also contributed to this current layout. The assessments were carried out on the basis of the most representative project impacts likely to occur, however a worst case impact assessment was also considered. These studies are included in Sections 9 - 12 and also as appendices to the EA.

To prepare this current layout, the following resources and constraints were considered for the site, including:

- high resolution aerial photography and topographic contours (to produce vegetation and roughness maps);
- wind speed data collected on site and correlated with locally available data sources;
- location of residences in the vicinity, particularly those dwellings within 2 km of a proposed turbine;
- results of background noise assessment including predicted noise limits at residences;
- results of ecological and archaeological assessments;
- results of landscape and visual impact assessment on and around the site;
- information on other identified constraints within and around the site;
- information on communications links and aviation requirements in the vicinity of the site; and
- accessibility for delivery of large scale wind turbine components.

Final Layout

Detailed geotechnical investigations and final engineering design is carried out once consent conditions are known and a wind turbine supplier has been selected. This is because each wind turbine model is different and requires different spacing, access and exit gradients and crane requirements. Accordingly, the detailed design of the final wind farm layout (including the final locations of all turbines, on-site access roads and hardstands and associated infrastructure) cannot be determined until the construction contractor surveyor traverses the entire project site and incorporates the requirements of the final conditions of approval. It is therefore essential for efficient project delivery that the consent authority provides this necessary flexibility by authorising the micrositing of infrastructure, in accordance with the conditions of approval, anywhere within the assessed Project Corridor. Accordingly;

- the current layout is indicative only and subject to detailed design; and
- Epuron seeks consent to microsite turbines and infrastructure anywhere within the assessed Project Corridor.

The current turbine layout has undergone a preliminary review to determine if the layout is reasonably suitable for construction, meets planning guidelines and would comply with expected consent conditions. However, relocation of specific turbines and infrastructure within the assessed Project Corridor may be required prior to construction to take into account a number of factors including:

- final turbine selection and wind farm design;
- final wind speed assessment and energy yield analysis;
- additional site constraints identified through ongoing investigations;
- constraints identified in relation to constructability or construction cost minimisation; and
- constraints identified after the results of final geotechnical investigations at turbine locations are completed.

Depending on final turbine selection, it is possible that not all turbines proposed would be installed to ensure that the project continues to meet all conditions of approval.

To that end, a final layout would be prepared after final turbine selection has taken place and prior to the commencement of construction. This final layout would include adjustments to ensure all criteria are achieved. Further surveys and variations would be submitted for approval by the Director-General of Planning in accordance with the final conditions of approval.

Epuron would ensure that any minor changes do not create a detrimental overall impact and if any revisions are material, will resubmit noise and /or visual impact assessments based on the revised layout prior to construction.

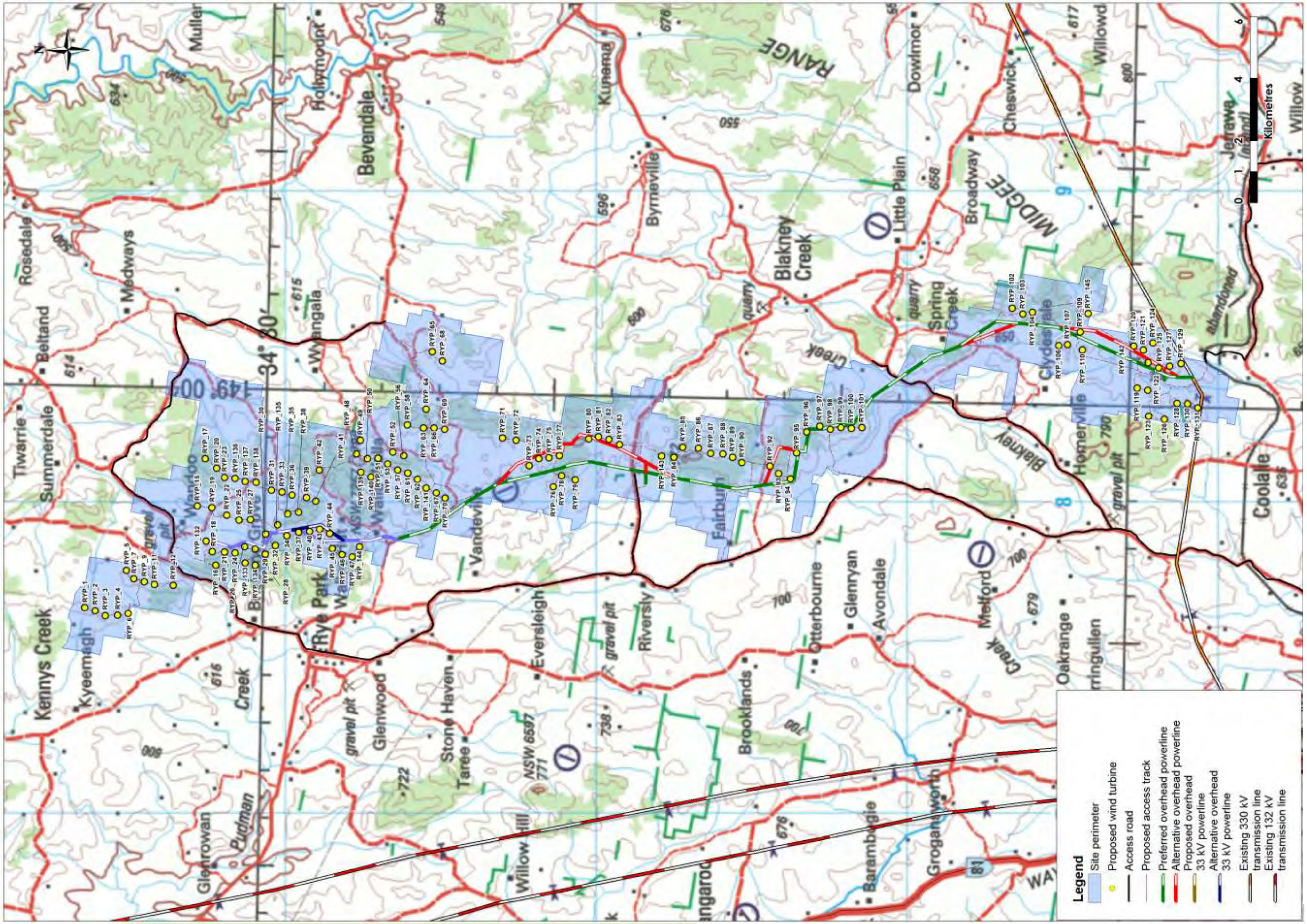

Figure 3-4 Site layout overview for the proposed Rye Park Wind Farm

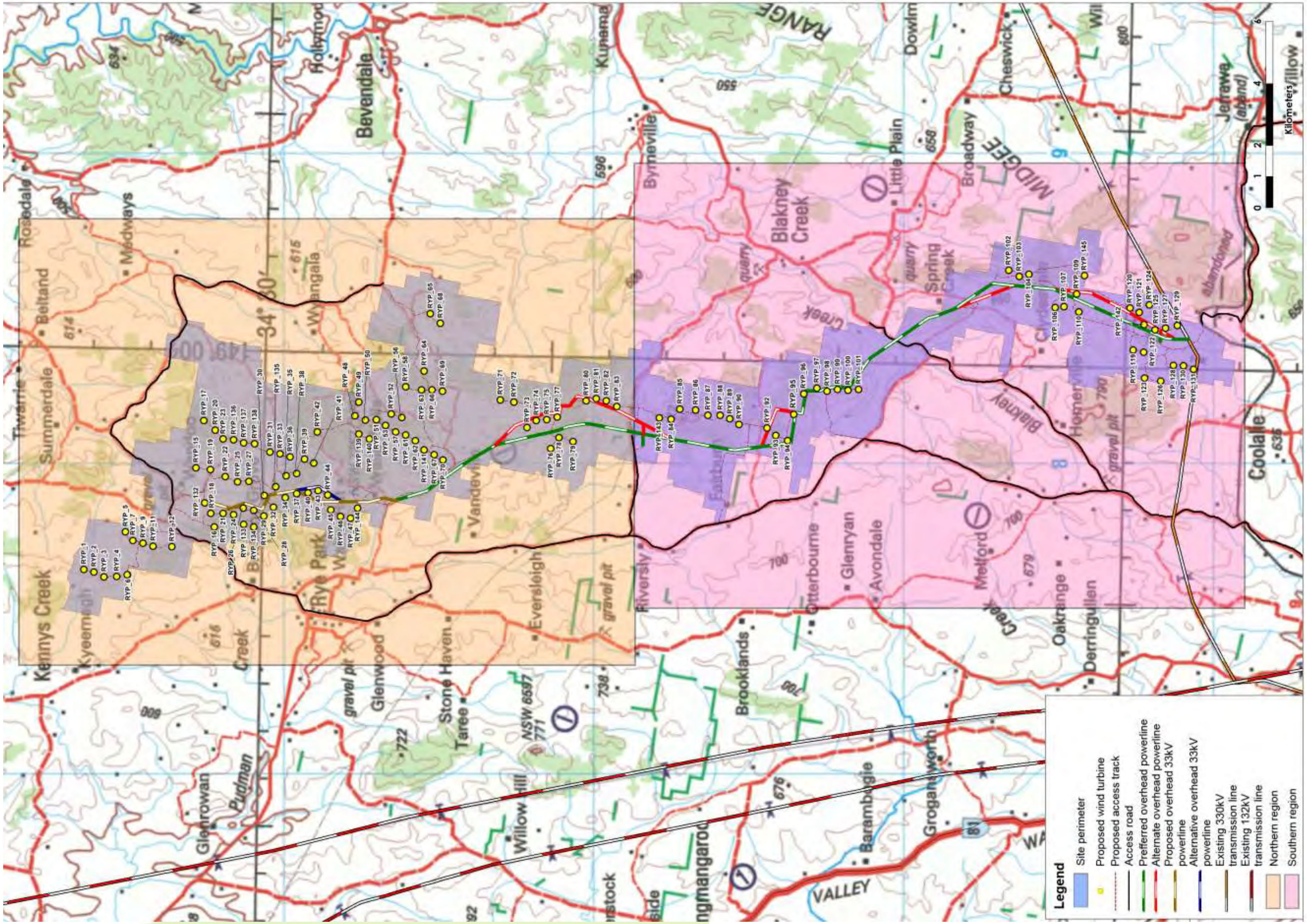

Figure 3-5 Division of the wind farm site at Flakney Creek Road into north and south regions

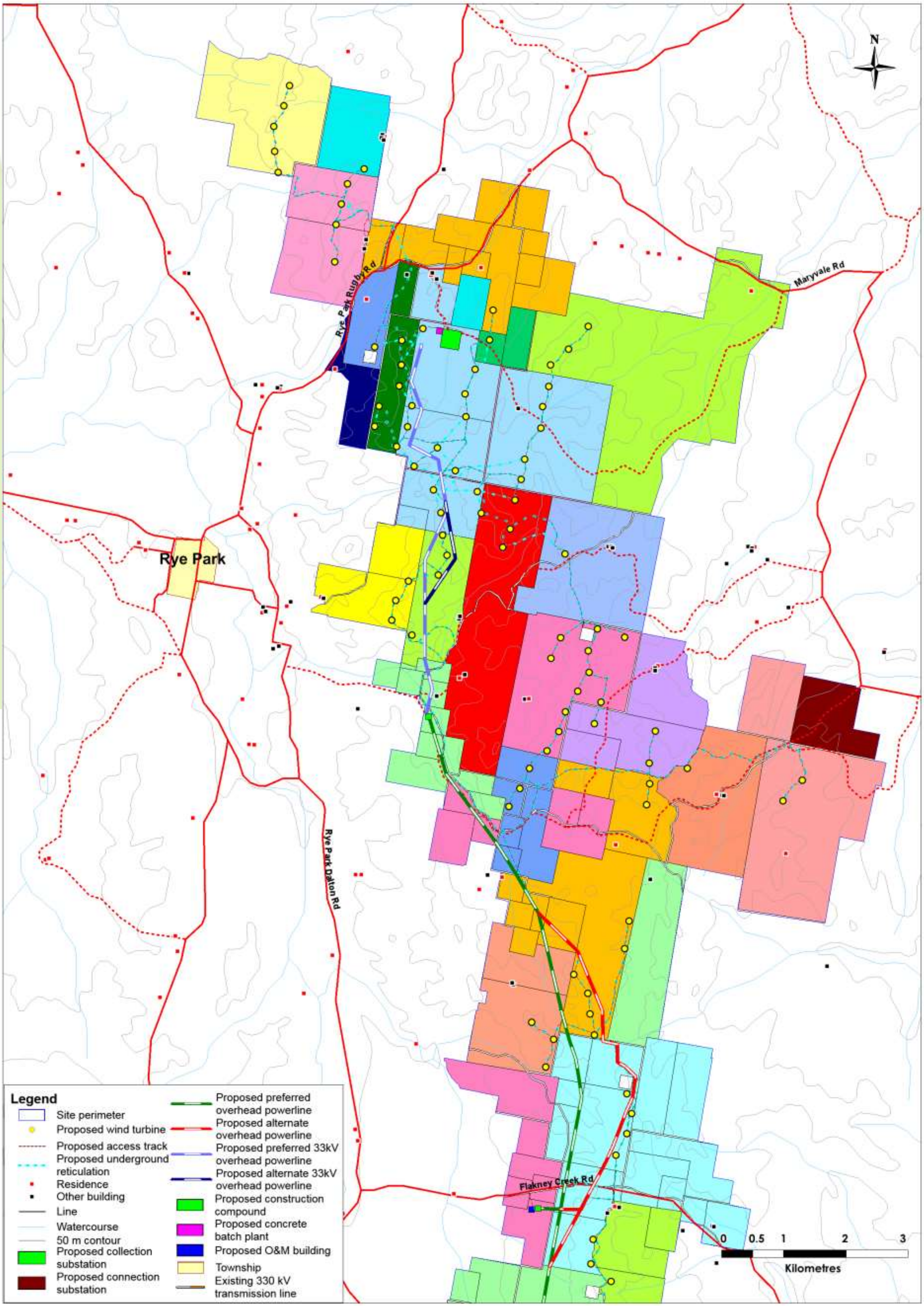

Figure 3-6 Northern landowners involved in the Rye Park Wind Farm (colour denotes an individual landowner's property)

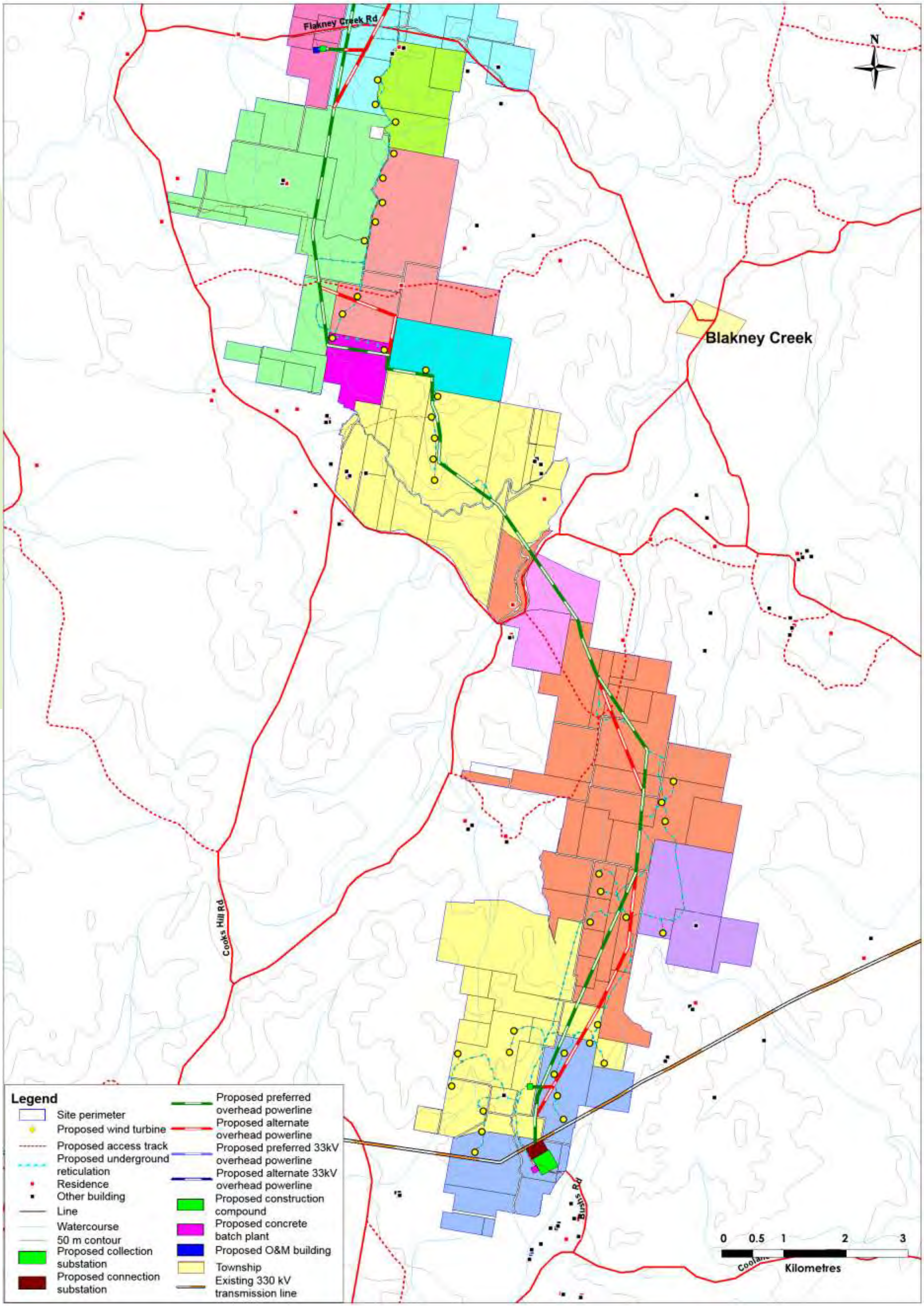

Figure 3-7 Southern landowners involved in the Rye Park Wind Farm (colour denotes an individual landowner's property)

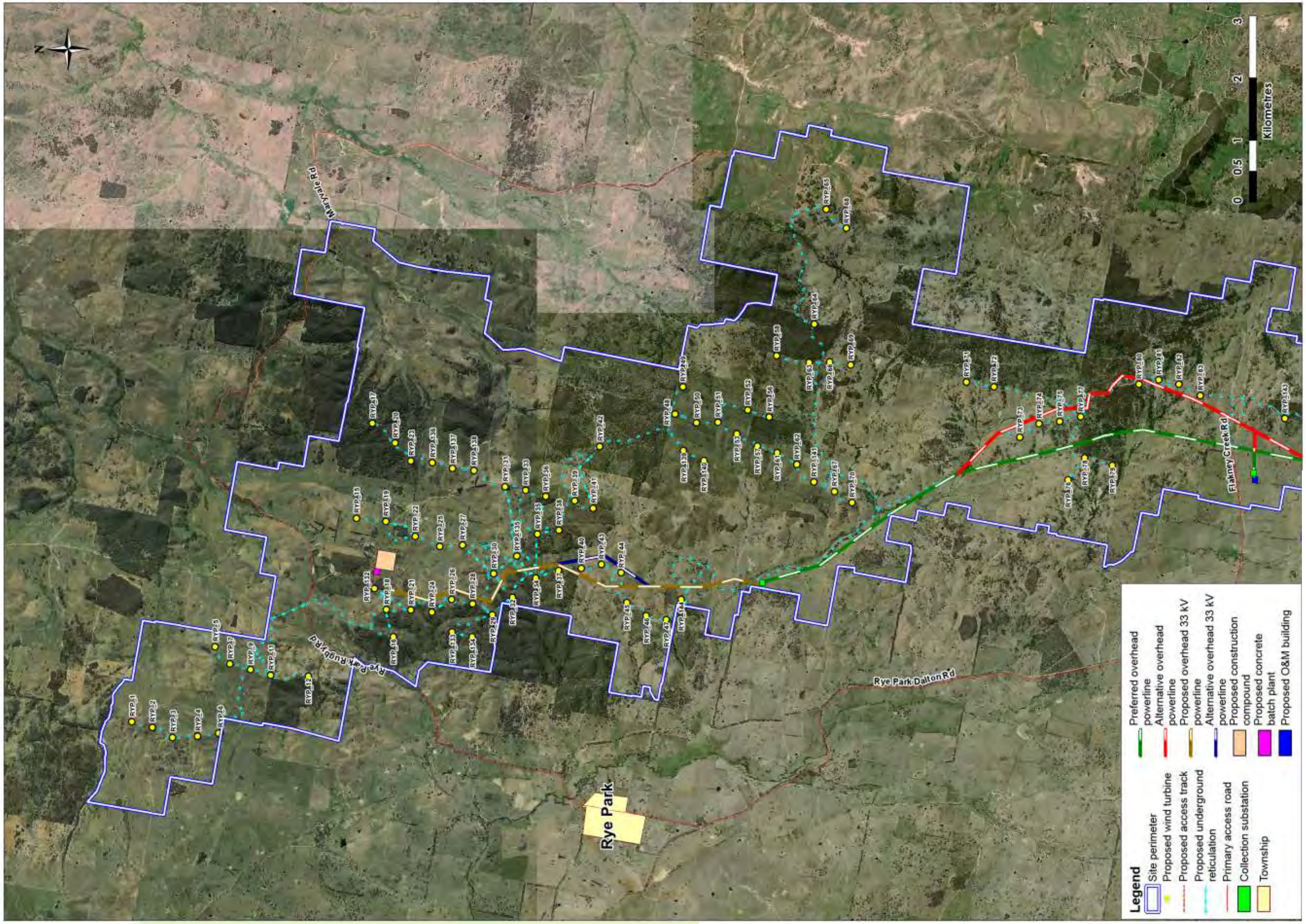

Figure 3-8 Aerial view of the vegetation north of Flakney Creek Road

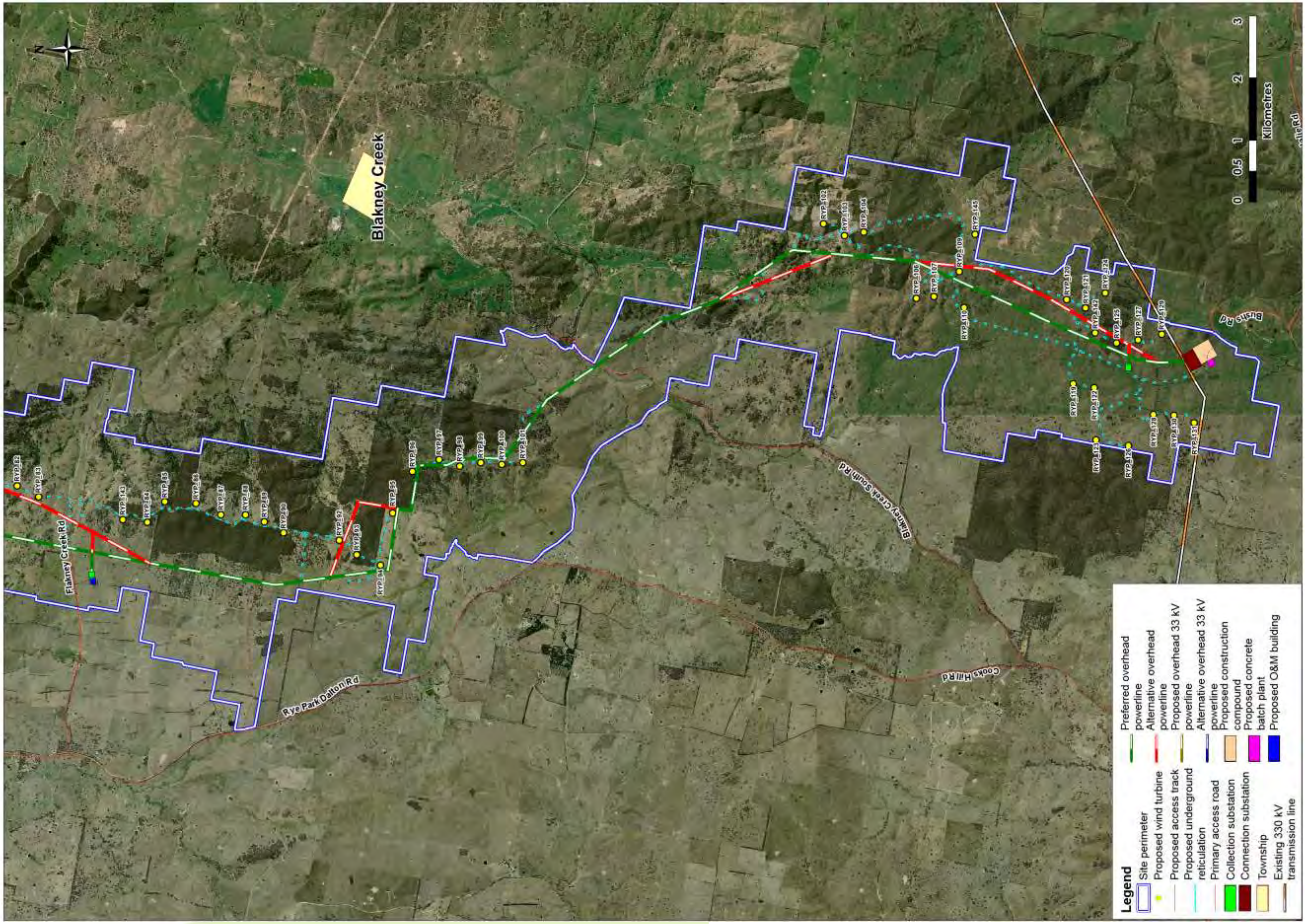

Figure 3-9 An aerial view of the vegetation south of Flakney Creek Road

3.3 Wind Turbine Selection

Wind Turbines under Consideration

Epuron has not yet selected the turbine model to be used for this project. A number of turbines are under consideration for the proposal, each with varying characteristics including physical dimensions and technical attributes, production capacity and cost considerations.

In general, different characteristics of turbine models require different turbine layouts, however to simplify the environmental assessment of the project, an indicative layout has been developed that reflects the characteristics of a large range of turbine models.

For the purpose of assessing the wind farm impacts, Epuron bases its assessment on understanding both typical and worst-case impacts likely from the range of turbines under consideration. In general, only three impacts are materially affected by the turbine selection:

- visual impacts are carried out on worst case turbine size, using the blade tip height when vertical as the indicator of turbine size;
- noise impacts are carried out on worst case noise profiles; and
- energy production (which typically increases with the physical size of the wind turbine).

All other impacts are driven primarily by the turbine layout rather than the selection of the turbine model.

Final wind turbine selection would be carried out based on commercial and technical considerations within the consent conditions stipulated by the DPI. In particular, a final assessment of potential noise impacts would be undertaken prior to construction based on the final turbine selection and layout.

Wind Turbines

The wind turbines under consideration have a typical hub height of 80 m – 101 m and a typical blade length of 45 m – 56/57 m (or 90 m – 115 m overall rotor diameter). The tallest wind turbine tip height combination under consideration is 157 m.

Each wind turbine would be a three bladed type of the “up-wind” design, meaning that the blades face into the wind and in front of the tower and nacelle. This design reduces noise levels generated during operation.

Each wind turbine would have a rated power capacity of between 1.5 MW and 3.0 MW, subject to final turbine selection.

Nacelle

The nacelle is the housing at the top of the tower that encloses the generator, gearbox (unless direct drive), and control gear including motors, pumps, brakes and electrical components. This control gear ensures that the wind turbine always faces into the wind, and adjusts blade angles to maximise power output and minimise blade noise. The nacelle also houses winches to assist in lifting maintenance equipment or smaller replacement parts to the nacelle.

The nacelle design takes into account acoustic considerations to minimise noise emissions from mechanical components.

Tower

The tower is of tubular steel or concrete construction typically 80-101 m high, tapering from around 5-6 m in diameter at the base to around 3-4 m at the top. Exact dimensions would depend on the wind turbine design selected. The tower is constructed in up to five sections, each section bolted or welded together via an internal flange arrangement. Within the core of the tower are the power and control cables and an access ladder or mechanical person lift to the nacelle (with safety climb system).

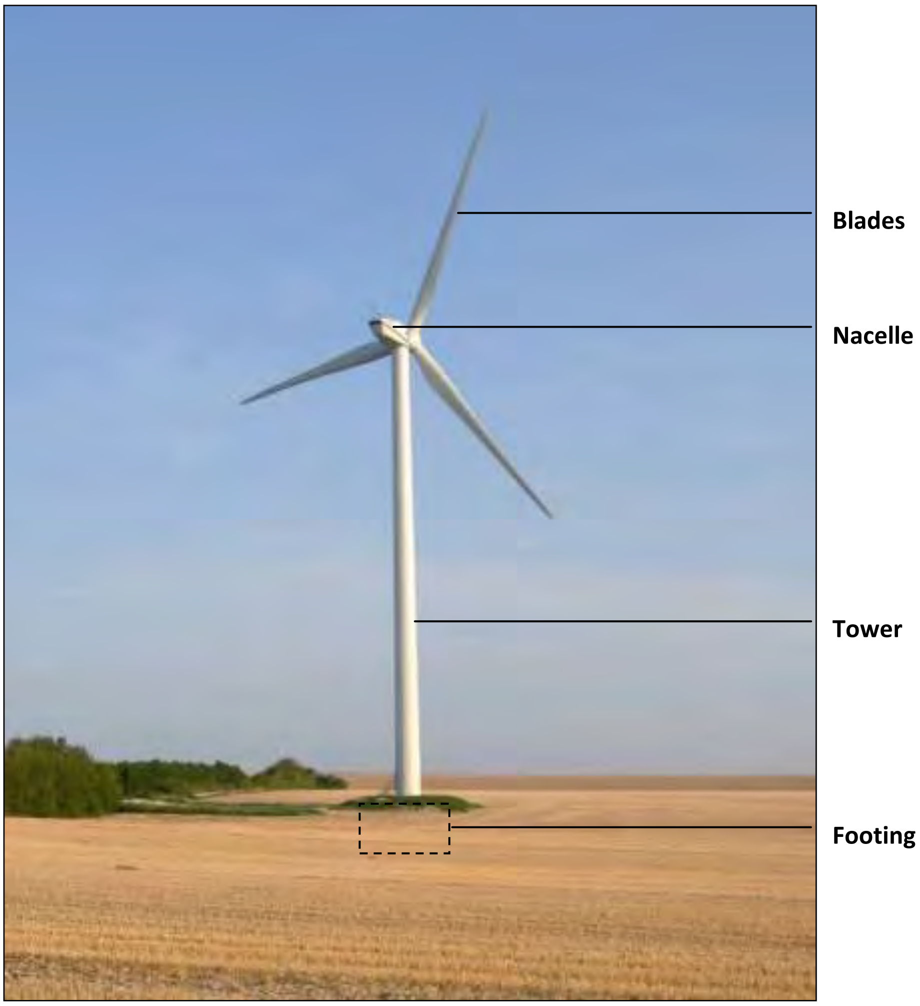

Figure 3-10 Typical wind turbine installed on an 80m tower (Photo courtesy REpower Systems AG)

Access Tracks, Hardstands and Footings

The tower would be mounted on a reinforced concrete footing and would require removal of rock and subsoil at the base of each turbine. A number of footing design options are under consideration including a gravity footing (where subsoil geology is less stable) and a rock-bolted footing (where subsoil geology provides good bedrock). A combination of these footing designs may be used on the site depending on the geology identified at each turbine location.

Each wind turbine would require an access track and electrical cabling to the site collection / connection substations. Access tracks would be a minimum of 5-6 m wide (wider at bends and passing lanes) and be all weather graded gravel tracks. Hardstand areas required beneath each turbine would be approximately 25 m x 45 m (1125 m^2). The shape and exact size of the hardstand area is subject to final turbine selection and crane lifting requirements. The hardstand area is used for delivery and storage of turbine components, assembly of the turbine components and for the turbine installation cranes.

Access tracks and hardstands areas would generally be left in situ after construction to allow for any required maintenance and repairs.

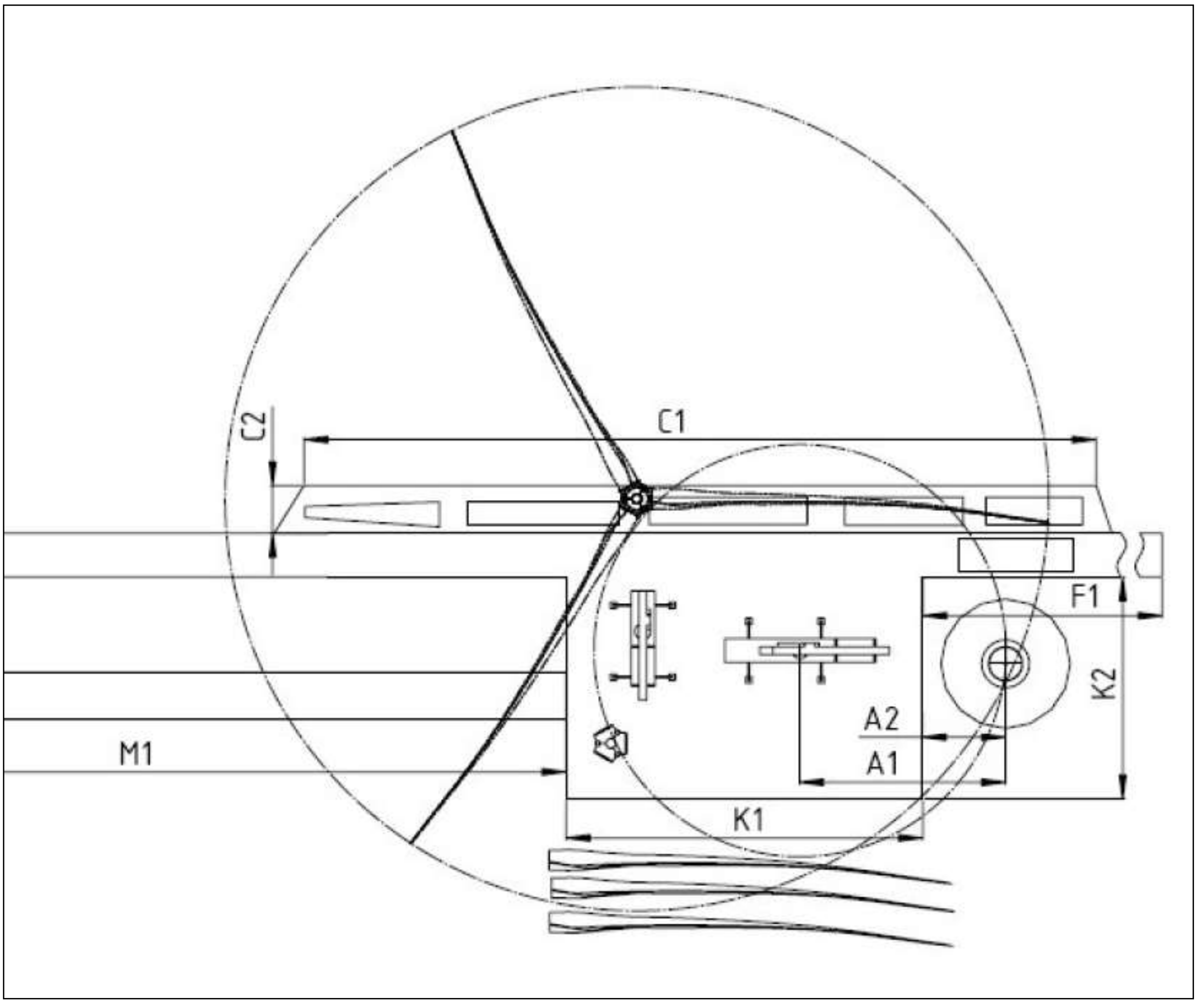

Figure 3-11 Example crane hardstand area (Source: REpower)

Transformer

Each wind turbine generator would produce power at typically 690 V, and up to 1,000 V. Power is then transformed at each wind turbine to either 22 kV or 33 kV for reticulation around the site. The transformer for each wind turbine would be located either within the base of the tower, in the nacelle, or externally adjacent to the tower as a small pad-mount transformer, depending on the specific wind turbine model selected. The transformer would be either a dry-type transformer, or would be suitably bunded.

Lightning Protection

Each wind turbine would have a lightning protection system installed. This system includes lightning rods through each wind turbine blade, an earth mat built into the foundations of the wind turbine, and lightning protection around the various electronic components within the wind turbine.

Obstacle Lighting

Depending on the requirements of the aviation authorities including CASA, aviation obstacle lighting of turbines may be required to be installed. This lighting where required is usually a number of red flashing beacons mounted on the nacelle of some of the wind turbines.

The guidelines in relation to aviation warning lighting are currently changing as described in Section 14.1 Hazards and Risks.

Epuron will not install aviation obstacle lighting unless required to do so by CASA, the consent conditions relating to the project or the requirements or recommendations of any other relevant authority.

Wind Turbine Controls and Operation

Each wind turbine would have its own individual control system, and would be fully automated. Start-up and shutdown (including safety shutdowns) are fully automated, with manual interruption available via onsite control systems and remote computer.

Generally, wind turbines would commence operation at wind speeds around 3 – 5 metres per second (11 – 18 kilometres per hour) and gradually increase in production to their rated capacity, usually at wind speeds around 12 – 15 metres per second (44 – 54 kilometres per hour). Once at this rated capacity, the wind turbine would control its output by altering the pitch of the wind turbine blades. Under high wind conditions in excess of 25 metres per second (90 kilometres per hour) the wind turbine would automatically shut down to prevent damage. It would continue measuring the wind speeds during this state via an anemometer mounted on the nacelle, and would restart once wind speeds drop to a suitable level.

Various operating constraints can be programmed into the control system to prevent or limit operation under certain conditions. For example, if operational issues are identified such as excess noise or shadow flicker under certain conditions, these conditions can be pre-programmed into the control system and individual wind turbines automatically controlled or shut down or limited whenever these conditions are present.

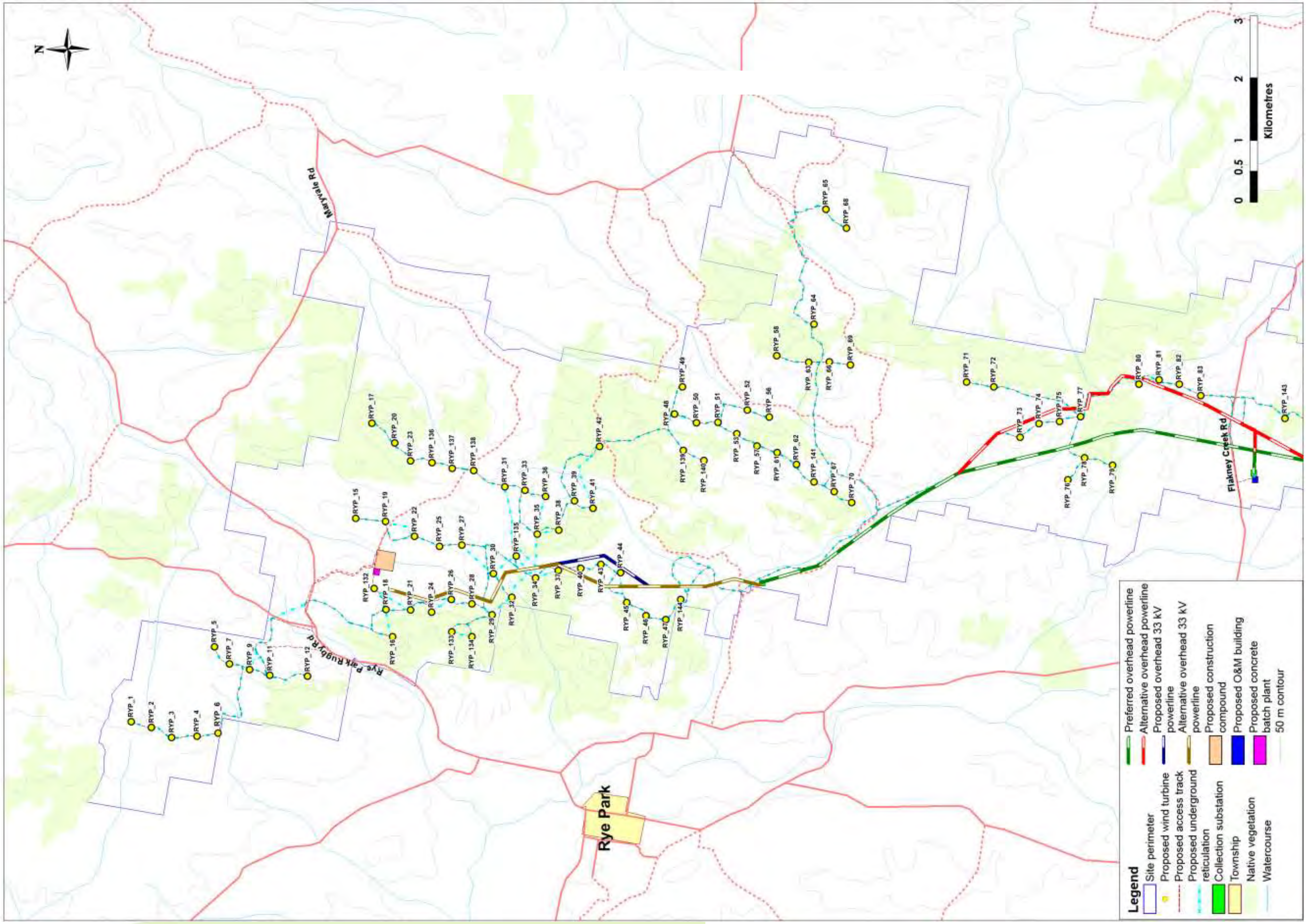

Figure 3-12 Detailed wind turbine layout & identification north of Flakney Creek Road

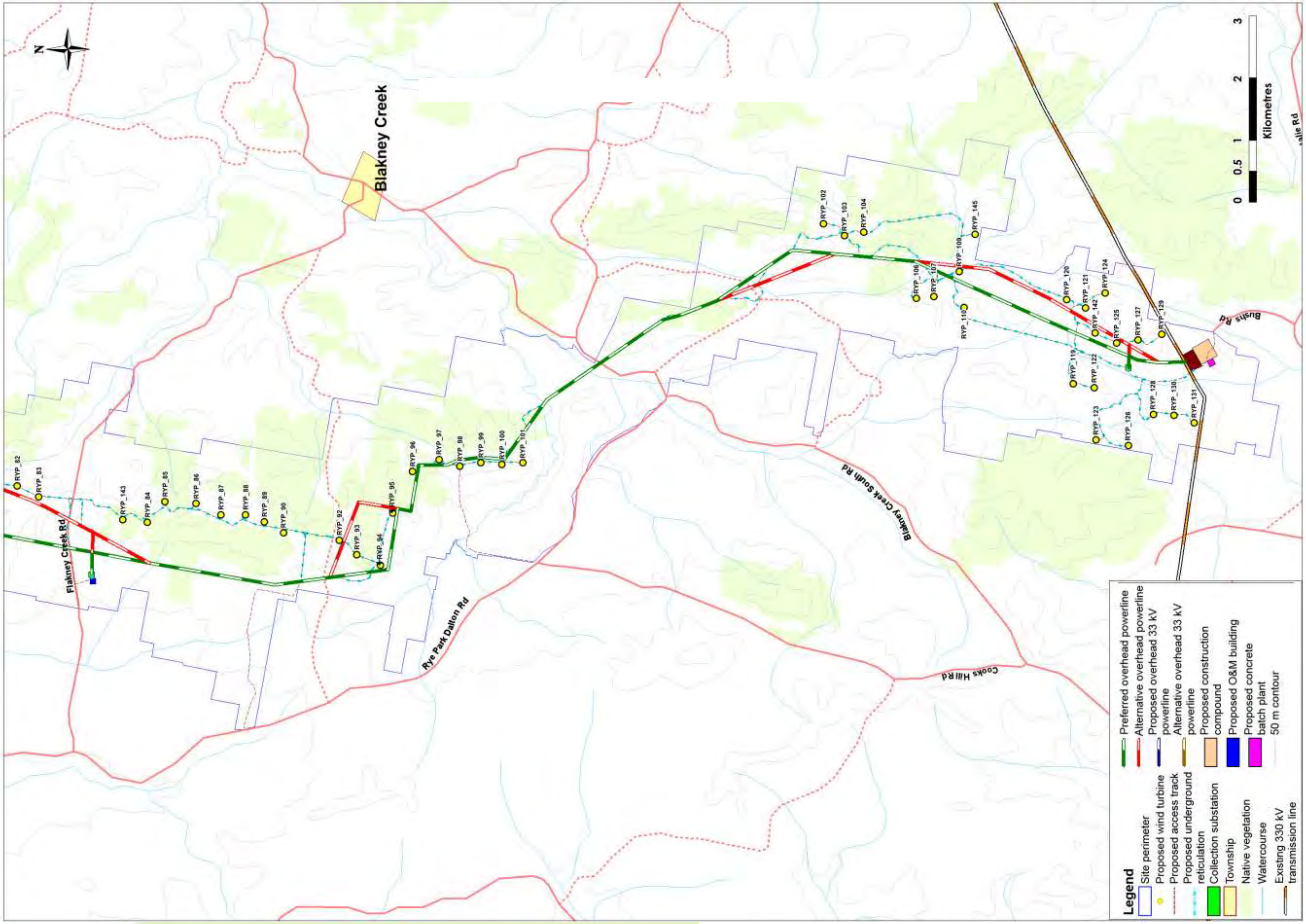

Figure 3-13 Detailed wind turbine layout & identification south of Flakney Creek Road

3.4 Connection to the Electricity Grid

Introduction

To export power from the wind farm, it is necessary to connect the wind turbines to the national electricity grid. This is achieved through a combination of underground and overhead electricity cables connecting the turbines to the collection substations, which then connects into the electricity grid via an overhead powerline to the wind farm connection substation.

Epuron has submitted a Grid Connection Enquiry to TransGrid and carried out a grid connection assessment to confirm that TransGrid's existing 330 kV transmission line that crosses the southern section of the site has sufficient capacity to allow export from the wind farm.

The primary onsite electrical works would include:

- A new 330 kV wind farm connection substation, including step up / down transformers and connecting transmission line will be located adjacent to the existing 330 kV TransGrid transmission line that crosses the southern section of the site.
- A new overhead powerline, approximately 35 km long, will run north-south along the length of the wind farm site to the two new collection substations. The new overhead powerline will be rated at up to 330 kV (nominal) capacity and mounted on a single pole type structure. The powerline may be single-circuit or double-circuit as required.
- Up to two new collection substations will be located on the wind farm site. The two new collection substations will collect power generated by the turbines and deliver to the new overhead powerline.
- A network of underground and overhead electrical cables, at 22 kV or 33 kV, reticulating power from the turbines to the collection substations. The underground and overhead electrical reticulation network will include the crossing of existing roads, such as Rye Park Rugby toward the northern end of the site and Blakney Creek Road toward the southern end of the site.
- Associated communications network necessary for site operations and control.
- An operations and maintenance facility including wind farm controls and power supply.

Wind Farm Connection Substation and Connection to TransGrid Transmission Line

A new 330 kV wind farm connection substation will be constructed to connect the wind farm into the existing 330 kV TransGrid Yass – Bannaby transmission line No 61 located at the south of the site. This connection substation would cover an area approximately 3-4 hectares plus an access road, Transgrid switching station, car park, communications tower and site facilities.

The connection substation may require up to two large power transformers to change the voltage, from reticulation voltage (22 kV or 33 kV) and overhead powerline voltage (up to 330 kV), up to transmission voltage (330 kV). The transformers are likely to be of the oil-cooled variety, and therefore may contain considerable quantities of oil. Provision would be made in the design of the substation for containment of any oil which may leak or spill. Other equipment in the substation includes circuit breakers and a busbar arrangement.

The connection substation will include all necessary ancillary equipment including a number of short spans of 330 kV connecting transmission line, control room and amenities, communication equipment, control cubicles, voltage and current transformers, and circuit breakers for control and protection of the substation. The connection substation also requires a telecommunications tower (cable, optic fibre and/or microwave links) and low voltage electricity connections (415 V – 11,000 V) from local services.

The connection substation area would be marked by a security fence to prevent trespassers and stock ingress. The ground would be covered partly by crushed rock and partly by concrete pads for equipment, walkways and cable covers, and would have an earth grid extending outside of the boundary of the security fence.

The connection substation will include an appropriate bushfire Asset Protection Zone (APZ) that complies with the RFS *Planning for Bushfire Protection* guidelines. This has been evaluated based on the vegetation type and slope. The site parameters (predominantly flat land with limited continuous canopy cover) indicate that a compliant inner protection area (which can be maintained under continued grazing practices) and outer protection area would be achievable.

Typically the 330 kV connection substation would take up an area of approximately 3-4 hectares and would be generally on an east-west layout orientated in parallel to the existing No 61 330kV Transgrid transmission line. The proposed location for the connection substation has been identified and is shown in Figure 3-22. A number of short spans of 330 kV connecting transmission line would connect the connection substation to the existing 330 kV TransGrid transmission line.

Typical civil works will be required in the construction of the new connection substation, including;

- Site preparation and earthworks
- Drainage and major cable trenches
- Minor equipment footing and security fencing
- Access road
- Substation surfacing
- Landscaping
- Auxiliary services buildings

In addition to the connection substation construction, the substation confines would include a car park, an auxiliary services building, two secondary system buildings (which are modular buildings) and communications facilities. A connection substation access road approximately 6m in width would be connected to the wind farm access roads.

Figure 3-14 **TransGrid's 330 kV Macarthur Substation in western Sydney**

Deviation of the Transgrid Line No 61 from Structure 45 – 48

A new transmission line corridor shown on Figure 3-22 is to be established to connect the existing TransGrid Line No.61 330kV transmission line to the new connection substation. The transmission line will include a 60m easement in which any vegetation with a mature height of 4m or above will be selectively cleared. This is considered a reasonable clearing methodology given the limited amount of vegetation located within any new alignment between these structures and the riparian zone needing to be maintained as much as possible.

Construction of up to 6 off 330kV transmission line steel lattice structures will be required to connect the new connection substation into Line No 61 between Structures 45 and 48 and final location within the corridor will be determined at the detailed design stage. Each new structure will require a construction footprint of approximately 40m x 30m to establish up to 2 pads at each structure and to erect the structures. New structures will be of similar height and appearance to the existing Transgrid transmission line structures.

Decommissioning and Removal of Redundant Line No 61 Structures and Equipment

Once the transmission line is deviated to connect the existing No.61 330kV transmission line to the new connection substation, a portion of the No.61 330kV transmission line will become redundant (between existing structures 45-48). All redundant structures and associated conductors shall be dismantled and removed (will be recycled or appropriately licensed waste facility).

Radio Repeater Site

Route diverse communications paths are required to maintain transmission network system security and reliability. As such, the establishment of the Rye Park 330kV Connection Substation will require protection grade communications from the site to TransGrid's Yass and Gullen Range switchyards, including appropriate SCADA signals back to TransGrid's system operations control centre.

To meet these requirements, a radio repeater site (RRS) is to be located within the connection substation confines. The RRS is to comprise of the following:

- Installation of a 60m steel lattice communications tower at the Rye Park 330kV Connection Substation adjacent to the substation auxiliary services building, including the installation of antennas, waveguides, cable tray and earthing;
- Supply and installation of duplicated PDH microwave equipment for a single hop microwave link from the Rye Park 330kV Substation – Yass RRS; and
- Supply and installation of duplicated P MUX equipment at the Rye Park 330kV Substation Station.

Transgrid have noted that the communication path profile between the proposed Rye Park 330kV Substation and Yass RRS needs to be confirmed via further field survey to confirm the required structure height and the location of the actual communications structure. Subject to their further detailed analysis, there is potential that the 60m steel lattice tower could be replaced with a 40m concrete monopole structure (and still establish line of site with the Yass RRS). Similarly there is a risk that line of sight cannot be established and a remote RRS establishment would be required. Following the further work TransGrid will advise if there is any change in scope required but have confirmed the 60m steel lattice tower RRS within the substation is the most likely option.

Overhead Powerline

A new overhead powerline, approximately 35 km long, will run up the length of the wind farm site and connect into the two new collection substations. Approval is sought for the two overhead powerline routes, proposed and alternate, identified on the site although only one route or a mix thereof will be constructed.

Powerline structures come in many designs however most are either steel or concrete pole design or a steel lattice tower design. The type of design used may vary depending on the preferred voltage, different ground conditions, carrying weights, strain angles, clearance requirements as well as local environmental conditions including local constraints (e.g. archaeological) and visual amenity.

Based on electrical design assessments for the wind farm it is proposed the new overhead powerline will be rated at up to 330 kV (nominal) capacity and will be mounted on a single pole type structure as shown below and would be up to 45 m high. The new overhead powerline would be either single-circuit or double-circuit design.

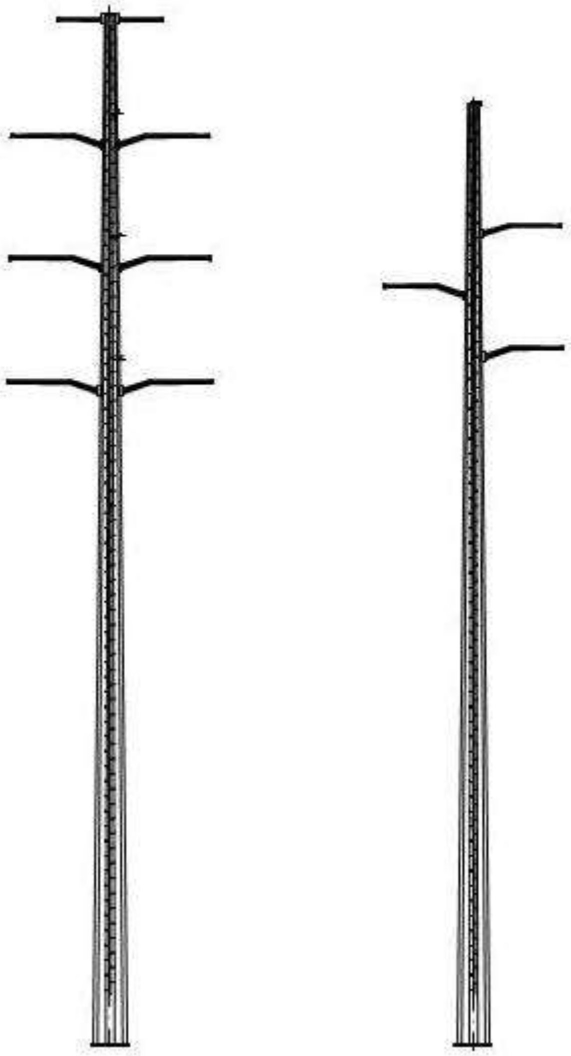

Figure 3-15 Example of a double circuit (left) and single circuit (right) 330 kV overhead powerline mounted on a single pole type structure

Collection Substations

It is proposed up to two new collection substations will be located on the wind farm site. The two new collection substations will collect power generated by the turbines and deliver it to the new overhead powerline running north-south along the length of the wind farm site.

Each collection substation will include all necessary ancillary equipment such as a control room and amenities, communication equipment, control cubicles, voltage and current transformers, and circuit breakers for control and protection of the substation. The collection substation also requires telecommunications (cable, optic fibre and/or microwave links) and low voltage electricity connections (415 V – 11,000 V) from local services.

The perimeter of each collection substation area would be marked by a security fence to prevent trespassers and stock ingress. The ground would be covered partly by crushed rock and partly by concrete pads for equipment, walkways and cable covers, and would have an earth grid extending outside of the boundary of the security fence.

The collection substation will include an appropriate bushfire Asset Protection Zone that complies with the RFS *Planning for Bushfire Protection* guidelines. This has been evaluated based on the vegetation type and slope. The site parameters (predominantly flat land with limited continuous canopy cover) indicate that a compliant inner protection area (which can be maintained under continued grazing practices) and outer protection area would be achievable.

Typically each collection substation would occupy an area of approximately 100 m x 100 m. The proposed locations for each collection substation have been identified and are shown in Figure 3-20 and Figure 3-21.

Onsite Electrical Reticulation

From each wind turbine, the power voltage is stepped up from generation voltage to either 22 kV or 33 kV for either underground or overhead reticulation cabling from each group of turbines to the collection substations.

In general, overhead cabling offers benefits as it minimises ground disturbance and is significantly lower in cost. There are practical limitations installing overhead cabling on ridges where turbines are located, as well as increased visual impact.

Typically underground cabling is used to connect turbines along the ridgelines and overhead cabling is used to transport power between adjacent ridges and from groups of turbines to the collection substations. Cable trenches would, where practical, be dug within or adjacent to the onsite access tracks to minimise any related ground disturbance. Short spur connections would diverge from the main cable route which would approximately follow the main access route at each group of turbines. Subject to ground conditions underground cables would require a trench of 0.75 – 1 m deep and be typically 0.3 – 1 m wide. Parts of the underground network will cross existing roads such as Rye Park Rugby Road at the northern end of the site.

Statements of Commitment accompany this proposal to ensure that micro-siting is used to minimise environmental (particularly ecological) impacts. This would be undertaken with the assistance of an ecologist, especially where routes are located near sensitive environmental features.

A detailed view of the proposed overhead powerline and onsite electrical reticulation can be seen below in Figure 3-16 and Figure 3-17.

Communications

A suitable communications network will be established across the wind farm site to enable appropriate operation and control including the required interaction with the TransGrid electricity grid. This may involve underground, overhead or microwave communication systems.

Operations and Maintenance Facilities

A permanent operations and maintenance facility will be constructed on the wind farm site and requires connection to low voltage electricity supply (415 V – 11,000 V) from local services. The facility will be 100 m x 100 m in size.

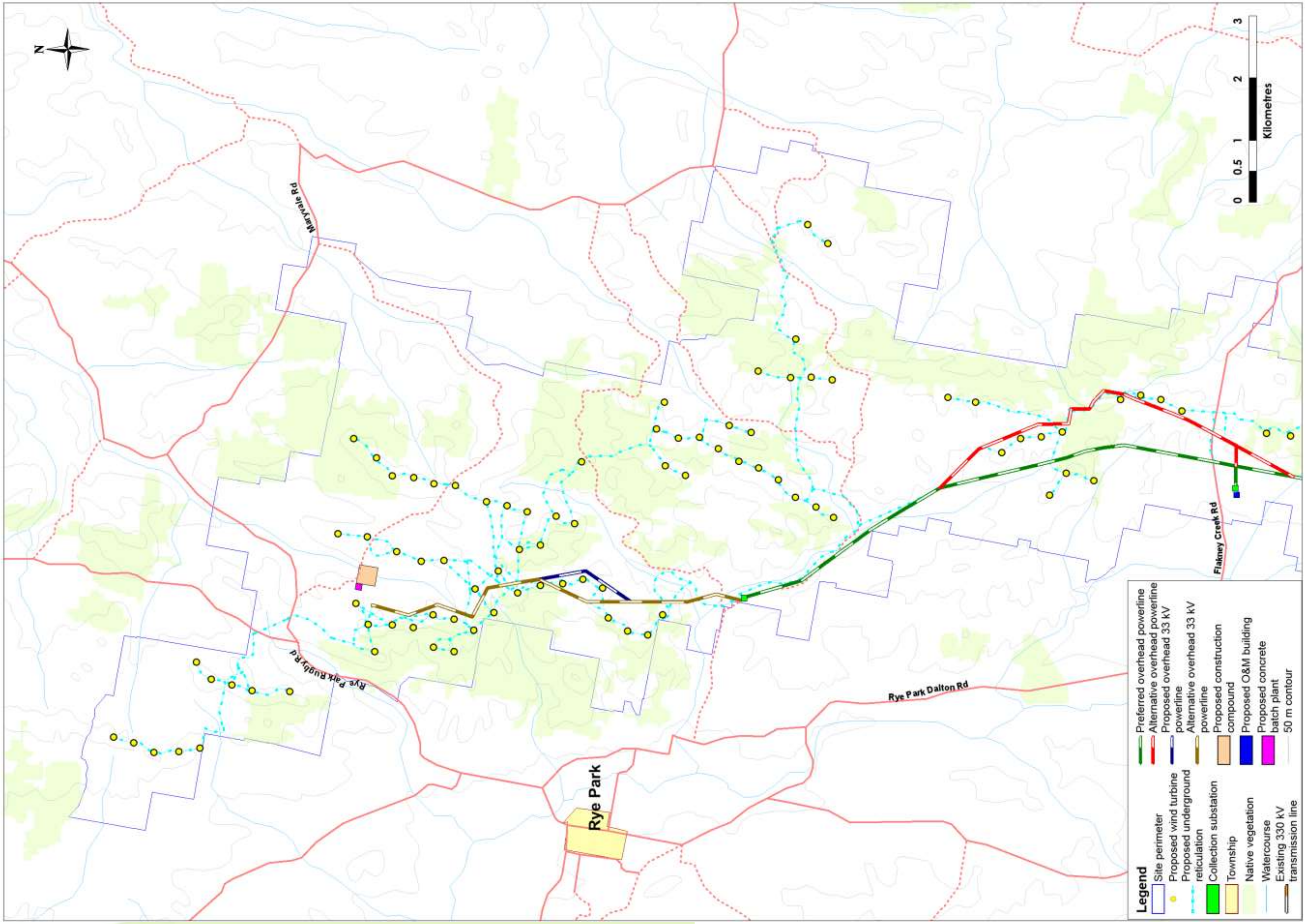

Figure 3-16 Detailed overhead powerline & underground electrical reticulation layout north of Flakney Creek Road

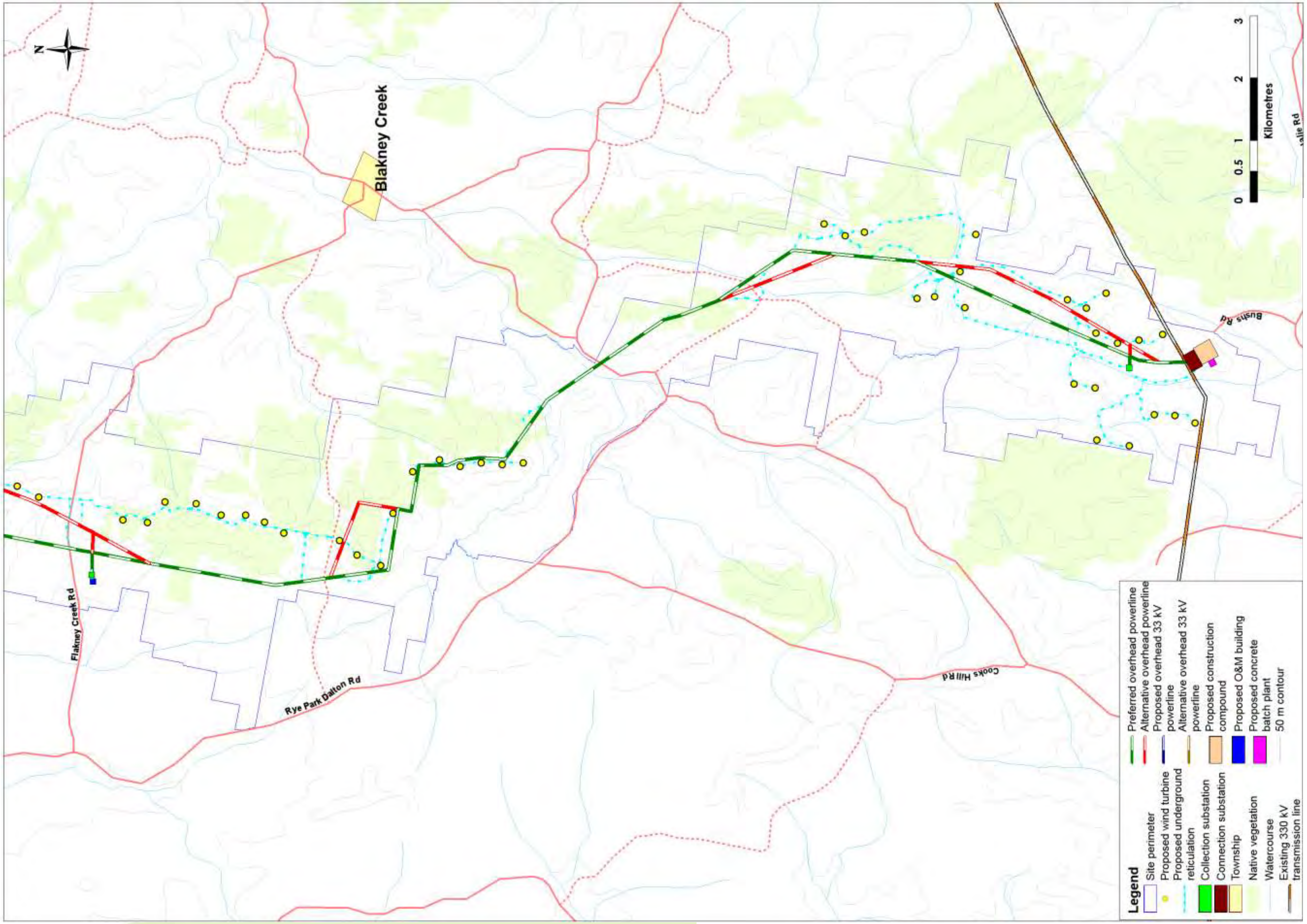

Figure 3-17 Detailed overhead powerline & underground electrical reticulation south of Flakney Creek Road

3.5 Access to and Around the Site

Main Access

The primary access to the project site will be via the Hume Highway. This is a major duel carriageway highway between Sydney and Yass and will comfortably handle the additional traffic generated during the construction of the wind farm. The turn off to and from the wind farm will be signposted and designed to allow vehicles to exit and enter the highway safely.

Alternate access to the site will be via the town of Boorowa. The alternate route follows Lachlan Valley Way from the south end of the site turning off the Hume Highway just pass the Yass turn off. A suitable route has been selected around the outskirts of Boorowa following consultation with council. The route will follow the Rye Park Boorowa Road heading to Rye Park.

A detailed Traffic and Transport study has been conducted and is summarised in Section 13.

Access tracks

On site access tracks required for construction and operation would be unsealed formations with a minimum width of 5 - 6 m. Access tracks are required to the base of each wind turbine location and to the location of the connection substation, collection substations, overhead powerline route and operation and maintenance facility. New gates and possibly new or realigned fences may also be required to protect stock during the construction phase and at property boundary crossings.

Once the construction phase has finished, the crane hardstands and access tracks would be maintained to allow maintenance and repairs to the wind turbines. These tracks can also be used for normal farm access and for emergency or fire vehicle access.

In locating access tracks on site, every effort would be made to:

- minimise the number and length of access tracks;
- locate access tracks along the route of existing farm tracks;
- locate access tracks to minimise clearing of native vegetation;
- locate access tracks to minimise impact on sensitive ecological or heritage areas;
- construct access tracks with due regard to erosion and drainage; and
- construct access tracks with due regard to landowners ongoing farming practises

A detailed view of the proposed access tracks can be seen below in Figure 3-18 and Figure 3-19.

Vehicle management

Prior to the commencement of construction a Traffic Management Plan (TMP) would be prepared to properly manage traffic impacts on public roads as detailed in Section 13. It would be developed in consultation with the roads authorities to ensure that the measures are adequate to address potential safety and asset degradation impacts.

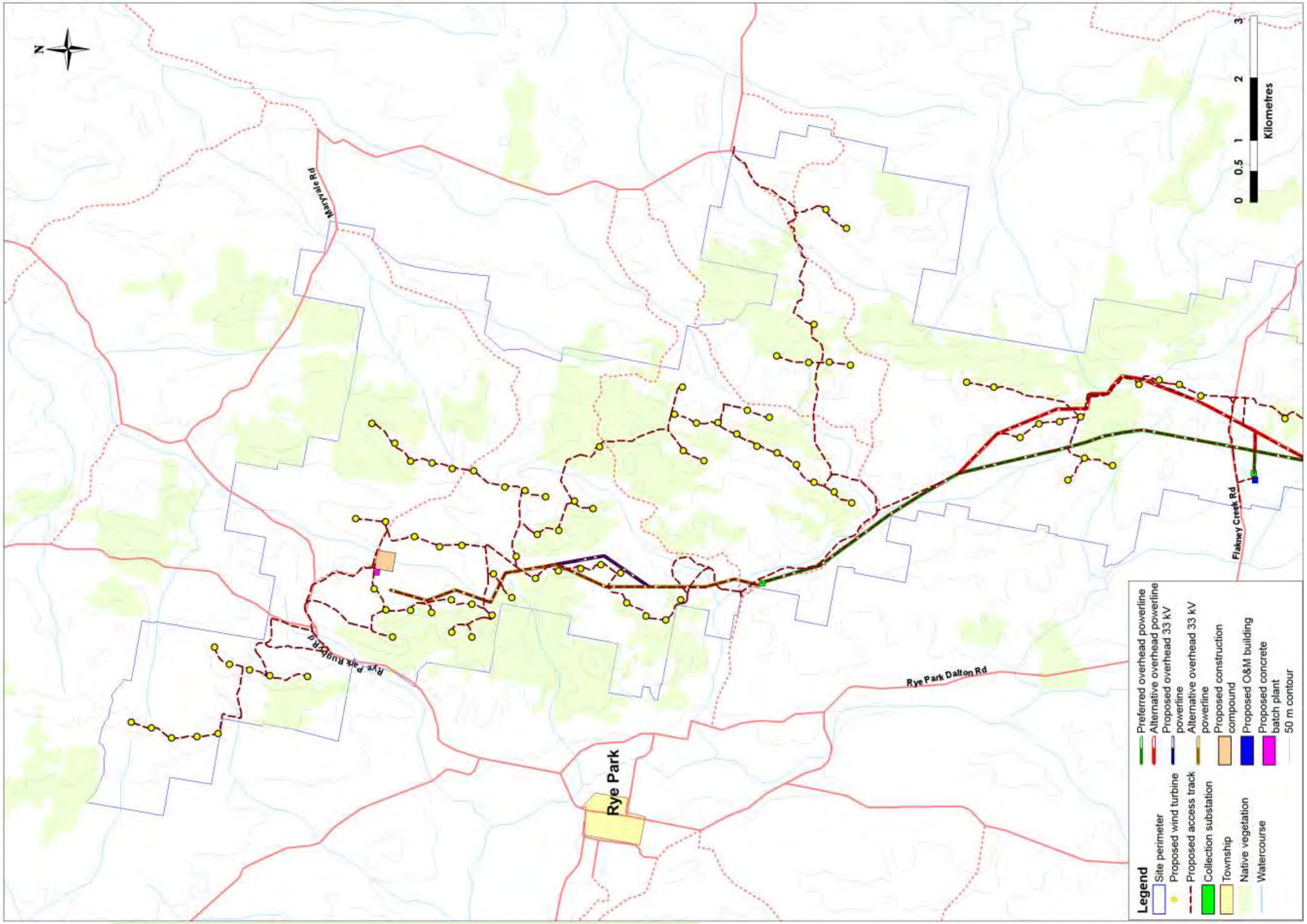

Figure 3-18 Detailed site access tracks layout north of Flakney Creek Road

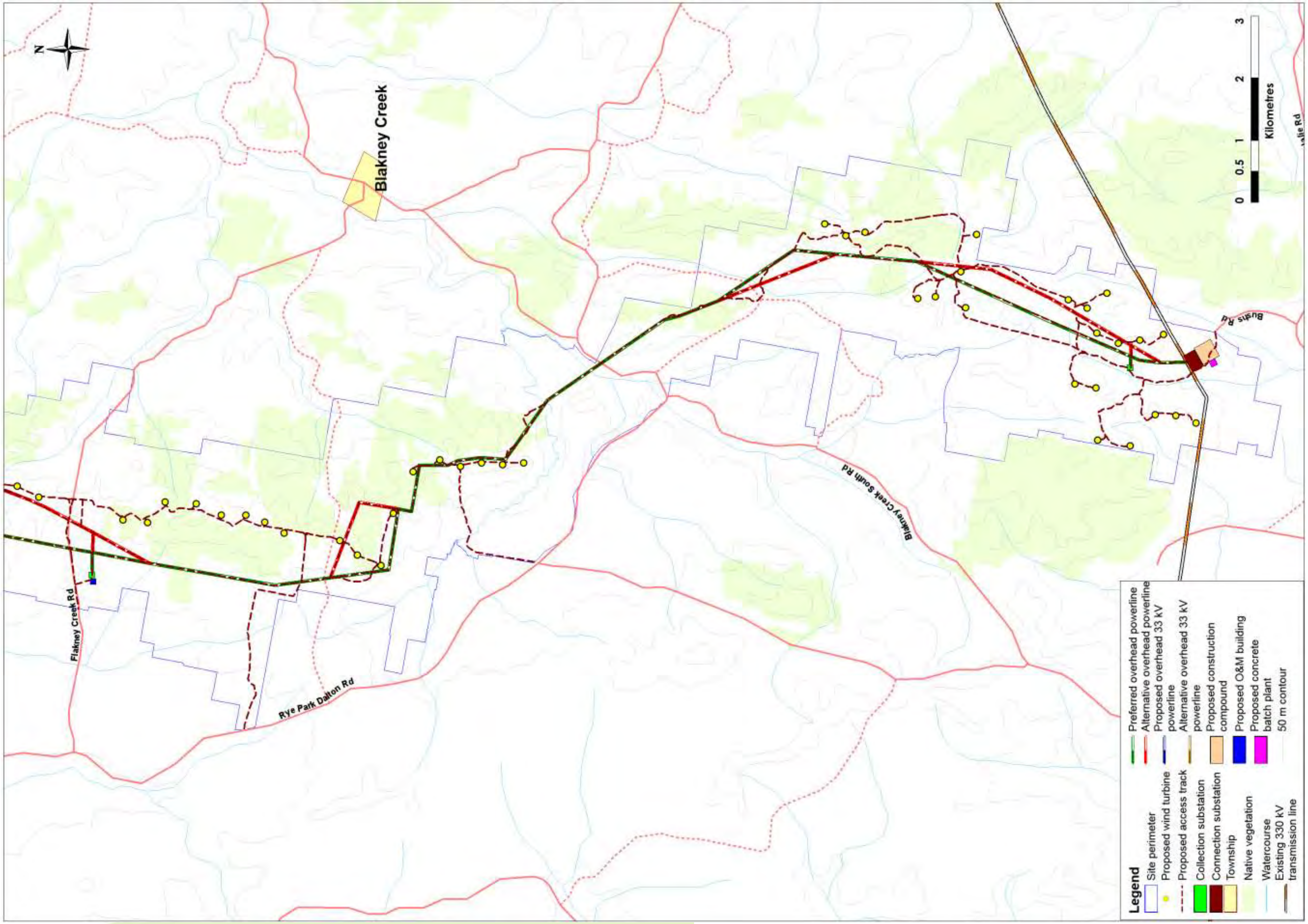

Figure 3-19 Detailed site access tracks layout south of Flakney Creek Road

3.6 Additional Permanent Facilities

Operations and Maintenance Facilities

A permanent operations and maintenance facility, up to 100 x 100 metres in size, will be constructed on the wind farm site for managing operations and maintenance activity. The facility would likely be located near to the central collection substation on the wind farm as shown in. The facility will include car parking, offices and amenities for the maintenance staff, a control room and storage facilities for spares and equipment needed for the maintenance and operation of the wind turbines.

Control and Communication Cabling

In addition to the electrical cabling, control and communications cabling is required from the maintenance facility to each wind turbine, and to the various substations. This communication cabling is typically optical fibre cable and would be installed using the same method and route as the power cabling described above, that is, strung from the same poles as overhead lines, or buried in the same cable trench as the electrical cables.

Wind Monitoring Equipment

Epuron is currently operating five temporary wind monitoring masts on the site to assess wind speeds at or near proposed turbine locations. Following construction, up to 6 permanent wind monitoring masts would be required to assist the control and operation of the wind farm. These would be either static guyed or un-guyed structures and will be to a minimum height of the wind turbine hubs with remotely operated wind monitoring equipment installed at multiple heights on each mast.

Pending final wind turbine placements, it may be necessary to move or install additional temporary wind monitoring masts to verify wind speeds across the site.

The temporary and permanent masts would be located within the development envelope assessed in the various studies reported in this document. Epuron will inform CASA and the Department of Defence of the location of any monitoring masts constructed.

3.7 Temporary Facilities

During the construction phase up to two construction compounds will be established on the site. The compounds will include car parking, site offices, and amenities for the construction work force, and lay down areas for the temporary storage of construction materials, plant, equipment and wind turbine components. A temporary power supply will be required to be connected to the construction compounds.

Site Offices

During the construction phase up to 363 staff would be working on site at any time. Suitable locations for up to two site offices would be selected, avoiding areas that are regarded as having environmental constraints. The site offices may include several demountable buildings and amenities blocks located on site for the duration of construction. Sufficient parking would be provided for the expected usage.

Rock Crushing

Materials excavated during the construction of wind turbine footings may be able to be reused for other purposes such as road base for the access roads and upgrades. Mobile rock crushers would be used for these purposes during construction.

Concrete Batch Plants

During construction up to two concrete batching plants would be required on site and are typically located proximate to the construction compounds. A typical concrete batch plant would involve a level area of approximately 100 x 100 m to locate the loading bays, hoppers, cement and admixture silos, concrete truck loading hardstand, water tank and stockpiles for aggregate and sands. The batching plant would include an in-ground water recycling / first flush pit to prevent dirty water escaping onto the surrounding area, and would be fully remediated after the construction phase. The proposed locations are shown in Figure 3-22 and Figure 3-23. The concrete batching plant would produce around 400 m^3 of concrete per day when a turbine foundation is being poured. The operational period would be for 18-24 months and each plant would produce around 850 tonnes of concrete per day. This is equivalent to around 110,000 tonnes of concrete during the construction phase for foundations. The batch plant operations would therefore require a license to be issued by DECCW (under the Protection of the Environment Operations Act 1997), given the amount exceeds the license threshold of 150 tonnes per day. License conditions specified by DECCW are likely to include operational protocols and monitoring.

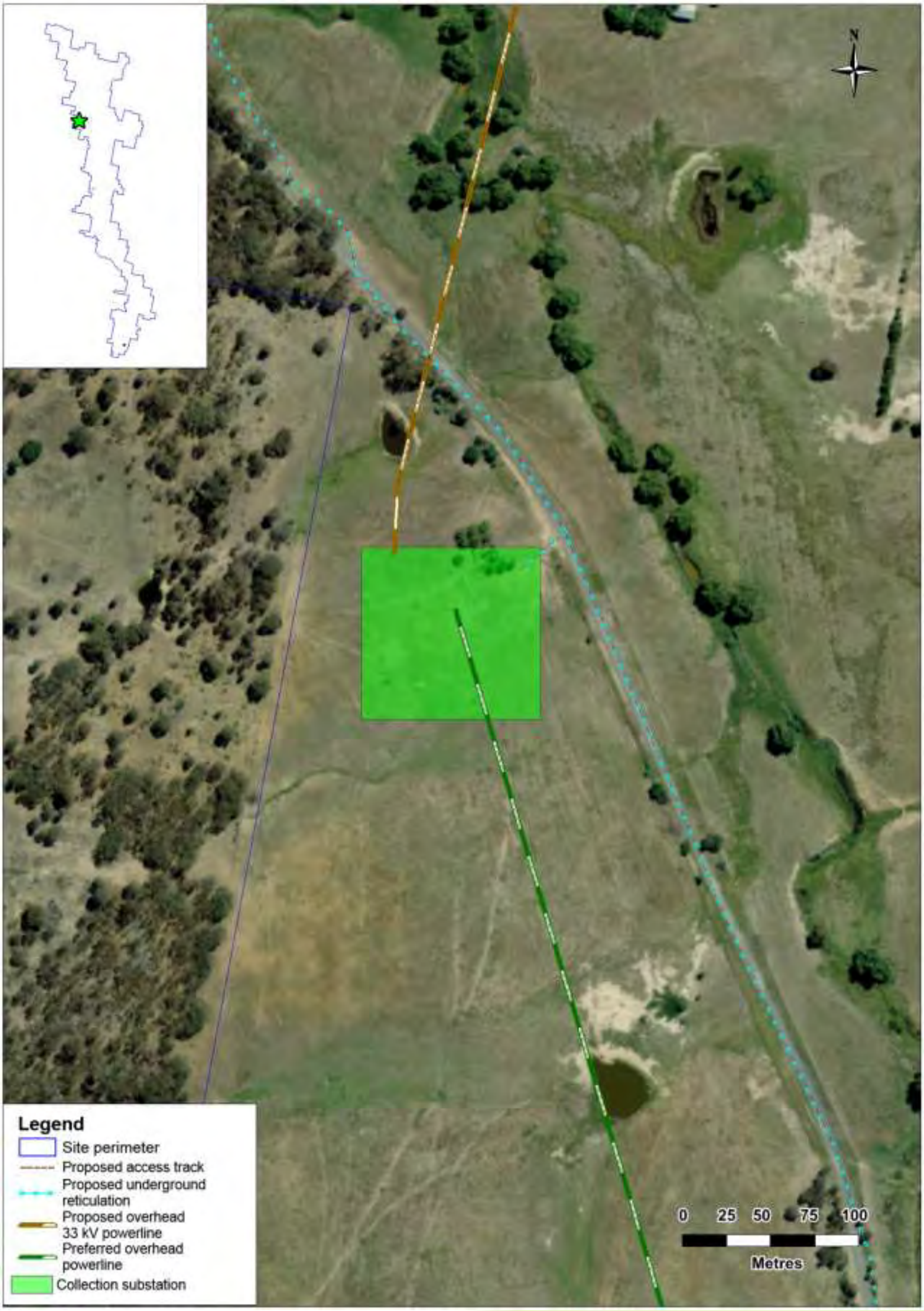

Figure 3-20 Proposed northern wind farm collection substation

Figure 3-21 Proposed central wind farm collection substation and permanent operation and maintenance facility

Figure 3-22 Proposed wind farm connection substation, southern construction compound, line deviation route and concrete batch plant

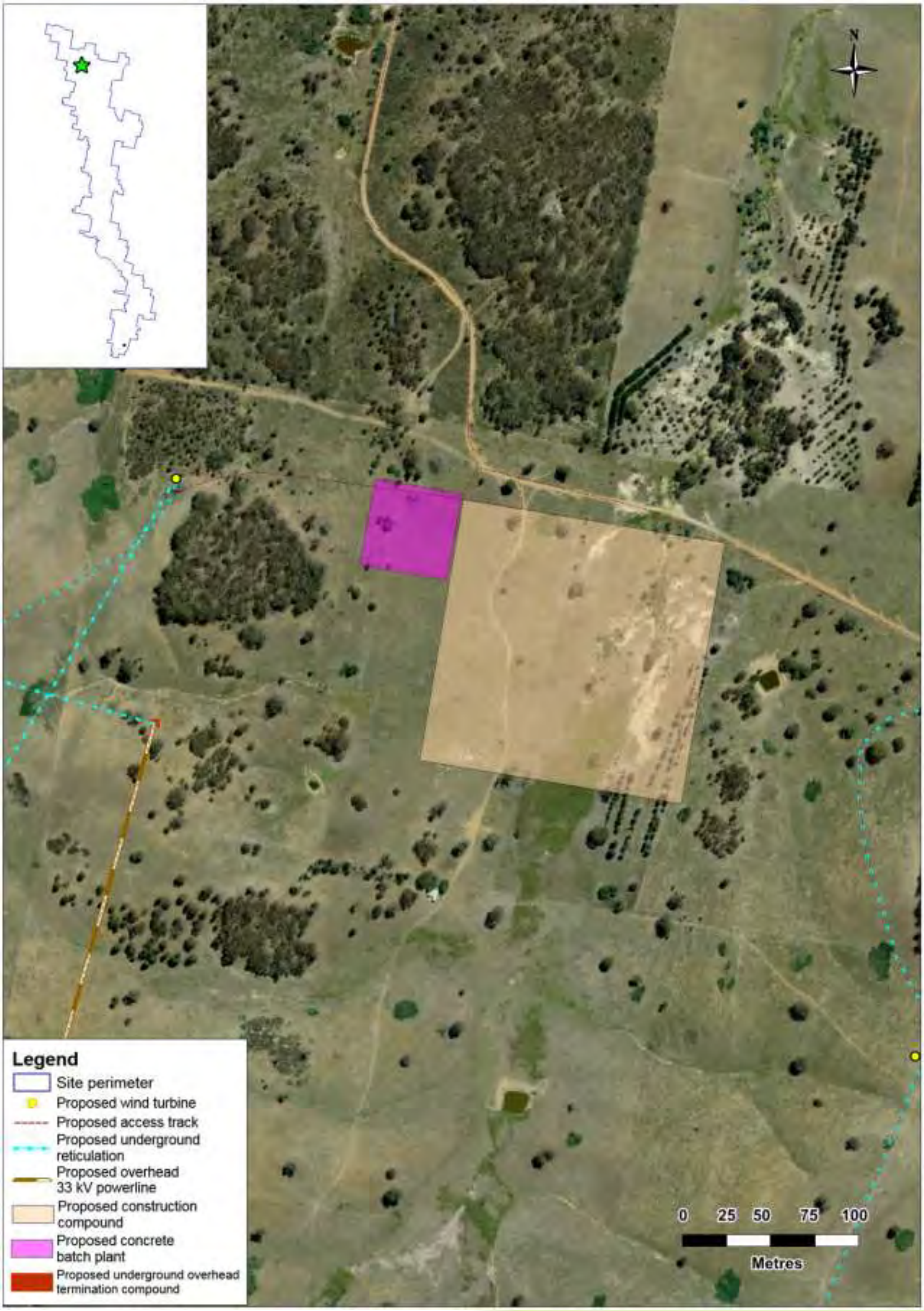

Figure 3-23 Proposed northern construction compound and concrete batch plant

3.8 Site Disturbance and Impact Areas

The proposed wind farm requires the construction of a number of elements including turbines, turbine foundations, underground and overhead powerlines, substations, control buildings and access roads on the site.

During the construction activities additional areas of the site would be impacted to provide construction compounds, concrete batching plants and storage areas. These areas can be rehabilitated and restored following the completion of the construction program. Table 3-1 and Table 3-2 present the calculated area of the site impacted by the project based on the turbine layout. Some of these impacts would be for the duration of the wind farm operation and some are temporary impacts during the construction phase.

Table 3-1 Development footprint and site disturbance areas

Project Components	Typical Dimensions	Quantity	Total Area (ha)
Footing and Hardstand#	25 x 60 m	125	18.9
Access and spur roads*#	10 m	88.9 km	88.9
Underground powerlines onsite**	1 m	88.9 km	8.9
Overhead Powerline^	60 m	36.9 km	147.7
Connection Substation	3-4 hectares	1	4
Collection Substations	100 x 100 m	2	2
Operations and Maintenance facilities and Control Building	100 x 100 m	1	1
Concrete batch plants	100 x 100 m	2	2
Construction compound, staging and storage areas	300 x 300 m	2	18

* Access tracks around the site are anticipated to be 5-6 metres in width, however, a 10 metre width has been used to assess the likely impact due to cut and fill operations in order to achieve the required slope and increased width needed at bends.
**The impact area associated with underground cables has been incorporated into the figures for access tracks.
Habitat permanently removed
^ Habitat would be modified for underground and overhead electrical cabling and overhead powerline maintenance. This would include clearing and trimming vegetation for each power pole and maintaining clearance from electrical conductors between poles.

Table 3-2 Summary of impacted vegetation within the site

Vegetation types	Permanent habitat loss within each condition class (ha)				
	Good	**Moderate**	**Poor**	**Unknown**	**Total**
Box-Gum Woodland	6	0	6	8	21
Box-Gum Woodland Derived Grassland	0	0	3	0	3
Inland Scribbly Gum Forest	17	15	10	11	52
Argyle Apple Forest	0	0	0	0	0
Brittle Gum Forest	0	0	1	0	1
Sifton Bush Shrubland	4	2	0	1	7
Native pasture	1	8	11	8	27
Exotic/planted	0	0	3	0	3
				Total	114

Note: The dimensions used for the vegetation impacts in Table 3.2 and the BA are estimates of the actual disturbance rather than typical footprint dimensions reflected in Table 3.1. The actual vegetation impacts for the final confirmed layout and dimensions will be confirmed prior to construction as part of the Offset Plan prepared in consultation with OEH.

3.9 Project Implementation

The establishment of the wind farm can be considered as occurring in four phases. These include construction, operation, refurbishment and/or decommissioning of the wind farm. A description of activities under these headings follows.

3.9.1 Phase 1: Wind Farm Construction

The construction phase of the wind farm is likely to occur over an 18-24 month period and would include activities such as:

- transportation of people, materials and equipment to site;
- civil works for access track construction, turbine and monitoring mast footings and trenching for cables;
- establishment, operation and removal of any required construction equipment such as rock breaking equipment and concrete batching plants;
- potential use of blasting in foundation excavation, if required;
- installation of wind turbines using large mobile cranes;
- construction of site substations, connection to on-site 330kV transmission line, and onsite overhead powerlines and electrical cables;
- construction of additional facilities (temporary and permanent) as required;
- construction, use and removal of temporary offices and facilities;
- temporary storage of plant, water, aggregates and other equipment; and
- restoration and revegetation of disturbed onsite areas on completion of construction works.

In general, construction would commence with site establishment, construction of access tracks and all other site civil works, including preparation of hardstand areas, and laying of cables. This would be followed by preparation of concrete footings, which must be cured prior to installation of wind turbines and monitoring masts.

Wind turbine construction and erection can be relatively fast once the footings are prepared, with wind turbines installed at a rate of approximately 2-3 per week, subject to weather. The towers are erected in sections, the nacelles lifted to the top of the towers, and finally blades lifted and bolted to the hub or preassembled on the ground and lifted as a unit.

The necessary substation construction and grid connection works would be carried out in parallel.

The commissioning phase would include pre-commissioning checks on all high-voltage equipment prior to connection to the TransGrid transmission network. Once the wind farm electrical connections have been commissioned and energised, each wind turbine is then separately commissioned and placed into service.

On completion of construction, remaining disturbed areas would be remediated and all waste materials removed and disposed of appropriately.

3.9.2 Phase 2: Wind Farm Operation

While the wind farm operation would be controlled remotely, the wind turbines and other equipment would require regular maintenance. It is possible that some equipment may require major repair or replacement. During the initial operating years, operator attendance may be more regular while wind farm operation is being fine-tuned and optimised.

Once installed, the turbines would operate for an economic life of twenty to thirty years. After this time the turbines may be refurbished/replaced to improve their performance or decommissioned and removed from the site.

Routine Maintenance

To ensure the wind farm operates in a safe and reliable manner, it would require regular inspection and maintenance on an ‘as needs’ basis. This would generally be carried out using standard light vehicles.

In addition, regular scheduled maintenance is required, generally at 3, 6 and 12 monthly intervals. As a guide, each turbine requires approximately 7 days of maintenance per year. This does not require the use of major equipment, and could be carried out in a normal utility or small truck and would not require any additional works or infrastructure.

Major Repairs

It is possible that major unexpected or unscheduled equipment failures could take place during the life of the wind farm. While wind turbines and electrical components are designed for a 20 - 30 year life, failures can occur, for example due to lightning strike.

Most repairs can be carried out in a similar manner to routine maintenance, with some exceptions:

Replacement of wind turbine blades, if necessary, would require bringing new blades to the affected turbine and installation of these blades using large cranes. The requirements are similar to the construction phase, and the access tracks established for construction would be used.

Replacement of wind turbine generators or gearboxes may require a crane and low loader truck to access the wind farm.

Replacement of substation transformers would require a low loader truck to access the site.

Site monitoring program

A post-construction monitoring program would be established to determine any additional impacts resulting from the operation of the wind farm. The Operational Environmental Management Plan would contain specific monitoring programs required and would assess key issues such as noise compliance.

Further details of the monitoring and adaptive management mechanisms are included in Section 17.

3.9.3 Phase 3: Wind Turbine Refurbishment / Replacement

The life of a modern wind turbine is typically 20 - 30 years, at which point individual wind turbines would be refurbished, replaced, overhauled or removed. Individual turbines may also fail at shorter duration for various reasons as discussed above.

Replacement, refurbishment and recommissioning would involve similar road access arrangements to construction, and would require access for large cranes and transport vehicles to dismantle and remove the existing turbines and to install replacement turbines.

Existing substations and cabling would be largely reused. It is also possible that the existing footings and towers could also be reused, subject to the design of turbines available at the time of replacement / recommissioning. This would allow a significant cost saving for the wind farm.

Any refurbishment or turbine replacement would comply with the ongoing requirements of the project approval under this application.

3.9.4 Phase 4: Wind Farm Decommissioning

Decommissioning the wind farm at the end of its commercial life is the proponent’s obligation and cost. It would involve reinstating similar road access arrangements to construction, and would require access for large cranes and transport vehicles to dismantle and remove the turbines and associated infrastructure. All underground infrastructure such as foundations and cable trenches would remain in situ and all above ground infrastructure would be removed. Some infrastructure such as access roads and buildings may be required by the landowner to remain in place after decommissioning and will not be removed. The decommissioning period is likely to be significantly shorter and with significantly fewer truck movements than the construction phase.

A Decommissioning and Rehabilitation Plan for the project is attached as Appendix G.

3.9.5 Staging of Works

It is possible that not all turbines, access tracks or other equipment outlined in this EA would be ultimately required for the project. Likewise, market, seasonal, or operational requirements may mean that the actual construction of the wind turbines may occur in stages or groups over a number of years.

Construction works packages, such as civil and electrical works, may be required to commence at different times or in stages as a result of receiving certain final development approvals or certifications to commence at different times.

3.9.6 Construction Hours

In general, construction activities associated with the project that would generate audible noise in excess of the requirements of the NSW Interim Construction Noise Guidelines at any residence would be undertaken during the daylights hours of:

Monday – Friday:	7am – 6pm
Saturday:	8am – 1pm
Sunday and public holidays:	Not currently proposed

These working hours have been proposed to allow reasonable efficiencies of effort to achieve maximum productivity and to minimise the overall construction duration but should not be restricted to daylight hours. Variations to these hours may be required subject to weather and seasonal impacts.

However, some activities (including delivery to site of major equipment, and turbine installation) may occur outside of these hours due to logistic, safety or weather related reasons.

Turbine crane lifts, for example, can only be carried out during periods of lower wind speeds because of operational limitations with the tall cranes and it is possible that out of hours work would be required for this purpose. This scenario has occurred at other wind farms (for example Cape Bridgewater, Victoria) where night crane operations have been required because of strong winds occurring during the day.

Likewise, the requirements of NSW Police or roads authorities may limit transport of major equipment to and from the site to outside of normal working hours.

Any construction activities outside of the standard construction hours will only be undertaken in the following circumstances;

- Construction activities that generate noise that is:
  - no more than 5dB(A) above rating background level at any residence in accordance with the ICNG (Table 2 of the ICNG); and
  - no more than the noise management levels specified in Table 3 of the ICNG at other sensitive receivers; or
- for the delivery of material required outside those hours by the NSW police Force or other authorities for safety reasons (section 10.11.2); or
- where it is required in an emergency to avoid the loss of life, property and/or to prevent environmental harm;
- works as approved through the out-of-hours work protocol outlined in the Construction Noise and Vibration Management Plan as part of the Construction Environmental Management Plan.

3.10 Crown Land

The proposed Rye Park Wind Farm has no turbines and associated blades that encroach and impact on any Crown Land which includes Crown Parcels, Crown Roads and Crown Waterways. Permanent and temporary facilities including O&M building, construction compound, substation and concrete batching plant also do not encroach and impact on any Crown Land. Each individual infrastructure item is documented relative to its potential impact on the type of Crown Land, shown in Table 3-3 to Table 3-6.

There are five Crown Parcels within the site perimeter. These are Lot 7001 DP 1026328, Lot 7301 DP 1147658, Lot 7001 DP 1033069, Lot 7002 DP 1033069 and Lot 7001 DP 1026213. Figure 3-24 through Figure 3-27 show infrastructure relative to these respective Crown Parcels. No turbines, associated blades, facilities, access tracks, underground cabling and overhead powerlines encroach and impact on any Crown Parcels. This is summarised in Table 3-3. To ensure that Crown Land is not encroached upon by any infrastructure all infrastructure relative to the cadastre will be surveyed prior to construction. In addition, claim area ALC 10992 has been avoided and no infrastructure is proposed on this land.

In some instances access tracks and underground cabling cross or run along Crown Roads. Table 3-4 represents the number of instances where infrastructures crosses or runs along Crown Road's where the Crown Road is an unformed paper road i.e. there is not any existing public road. Table 3-5 represents the number of instances where infrastructure crosses or runs along Crown Roads where there is an existing public road.

A survey of all infrastructures relative to the cadastre will be carried out prior to construction to accurately confirm there are no turbines and associated blades encroaching on Crown Roads.

In some instances access tracks, underground cabling and overhead powerlines cross Crown Waterways. Only two Crown Waterways are crossed, however there are multiple instances of this as summarised in Table 3-6.

A survey of all infrastructures relative to the cadastre will be carried out prior to construction to accurately confirm there are no turbines and associated blades encroaching on Crown Waterways.

There are no turbines or infrastructure placed on, encroaching or impacting Trig Reserves. The Survey Infrastructure and Geodesy department in the Land and Property Information Division has been consulted and the project has considered the requirements set out in 'General Guidelines for positioning of and construction of Wind Turbines near Trigonometrical Stations' V1.3 dated Jun'12.

Table 3-3 Infrastructure relative to Crown Parcels

Infrastructure	Encroaches Crown Parcels
Turbines and blade	0
Facilities - O&M building, construction compound, substation, concrete batching plant	0
Access tracks	0
Underground cabling	0
Overhead powerline	0

Table 3-4 Infrastructure relative to Crown Road – Unformed Paper Roads

Infrastructure	Crosses road	Runs along road
Turbines and blade	0	0
Facilities - O&M building, construction compound, substation, concrete batching plant	0	0
Access tracks	37	2
Underground cabling	36	2
Overhead powerline	19	0

Table 3-5 Infrastructure relative to Crown Road – Existing Public Roads

Infrastructure	Crosses road	Runs along road
Turbines and blade	0	0
Facilities - O&M building, construction compound, substation, concrete batching plant	0	0
Access tracks	3	3
Underground cabling	3	3
Overhead powerline	2	0

Table 3-6 Infrastructure relative to Crown Waterways

Infrastructure	Crosses waterways
Turbines and blade	0
Facilities - O&M building, construction	0

Infrastructure	*Crosses waterways*
compound, substation, concrete batching plant	
Access tracks	15
Underground cabling	14
Overhead powerline	14

Figure 3-24 Crown Lands parcel located within the project boundary

Figure 3-25 Crown Lands parcel located within the project boundary

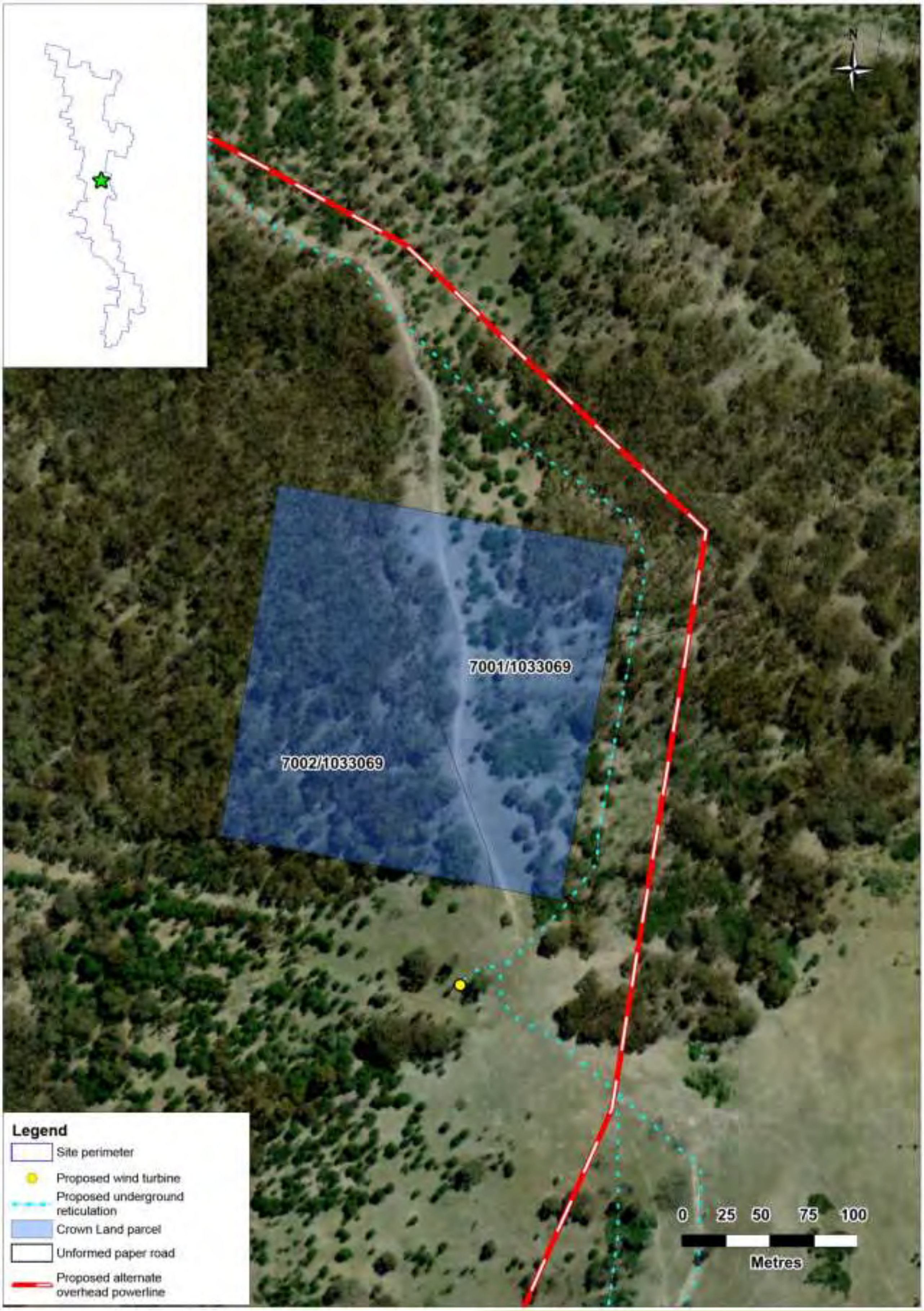

Figure 3-26 Crown Lands parcel located within the project boundary

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Figure 3-27 Crown Lands parcel located within the project boundary

3.11 Local Government Areas

The proposed Rye Park Wind Farm is located across three LGAs; Boorowa Council, Upper Lachlan Shire Council and Yass Valley Council. The boundaries of the three LGAs can be seen in Figure 3-28, with the distribution of proposed wind turbines summarised in Table 3-7. The final number of wind turbines in each LGA may be subject to change as micrositing of turbines may occur later in the development process.

Local Government planning instruments and policies are discussed further in Section 6.1.10

Table 3-7 Summary of the number of proposed wind turbines in each LGA

Local Government Area	*Proposed number of turbines*
Boorowa Council	83
Upper Lachlan Shire Council	26
Yass Valley Council	17

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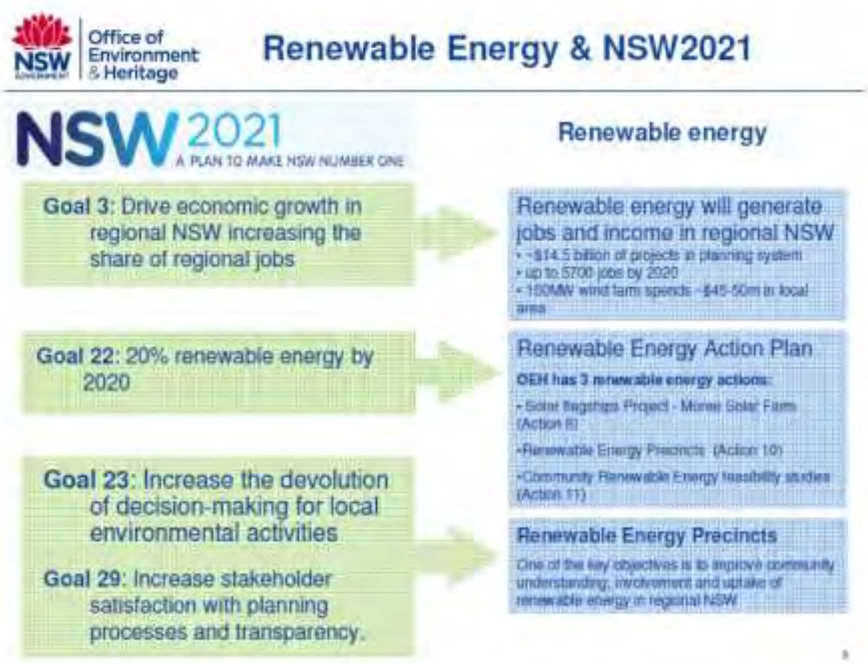
Figure 3-28 Distribution of wind farm infrastructure across the three LGA boundaries

4 Strategic Justification

This section provides a justification for the project in the context of its local and regional setting. It provides a summary of the energy context and in particular the need for additional electricity supply in NSW. It also outlines the benefits of the project including reducing Australia's greenhouse gas emissions, supporting Federal and State renewable energy targets as well as other local and wider community benefits.

The NSW State Plan has created specific goals underlining the States commitment to achieving 20% renewable energy by 2020 and driving economic growth in regional NSW. The Minister for Energy recently released the draft NSW Renewable Energy Action Plan which states that NSW is open for business in renewable energy and is keen to capture the jobs and investment that comes with it. Below is an outline of the NSW government's plans to assist the development of renewable energy in NSW.



The justification for the Rye Park Wind Farm development is based on the following forecasts:

- In full operation, it would generate more than 1,192 GWh of electricity per year - sufficient for the average consumption of around 149,000 homes.
- It would improve the security of electricity supply through diversification of generation locations.
- It would reduce greenhouse gas emissions by approximately 1,153,000 tonnes of carbon dioxide equivalent (CO_2e) per annum[1] or the equivalent of 314,000 cars removed from the roads
- It would contribute to the State and Federal Governments' target of providing 20% of consumed energy from renewable sources by 2020.
- It would contribute to the NSW Government's target of reducing greenhouse gas emissions by 60% by the year 2050.
- It would create local employment opportunities and inject funds of up to $556.4 million into the Australian economy.
- In addition to these primary benefits there are also secondary benefits and opportunities for improvement in infrastructure, tourism and ecology.

[1] Calculated using the NSW Wind Farm Greenhouse Gas Savings Tool developed by DECCW

4.1 Meeting Our Changing Electricity Demand

Electricity consumption continues to grow, and the additional demand must be met by either increased fossil fuel generation or an increase in generation from renewable sources such as wind power.

TransGrid's Annual Planning Report (2012) and AEMO's Annual Electricity Statement of Opportunities (2011) confirms that growth in electricity demand will soon exceed supply during peak times. Over the next 10 years energy use in NSW is expected to increase at an average of 1.6% per year (current total of 74,902 GWh for 2010/11). By 2020 NSW electricity demand is expected to be 87,745 GWh/an, an increase of approximately 13,000 GWh/an over today's consumption (AEMO, 2011; TransGrid, 2012).

Meeting this demand will require our existing electricity generators to increase their annual output, however at some point additional power generators will be also be required. AEMO has estimated that additional power generating capacity will be required to manage peak periods in NSW by summer 2018/19. Options need to be developed to meet this expected demand growth to ensure reliability of supply and evade power outages and blackouts (TransGrid, 2012). This is demonstrated in AEMO's Annual Electricity Statement of Opportunities report, as illustrated in Figure 4-1.

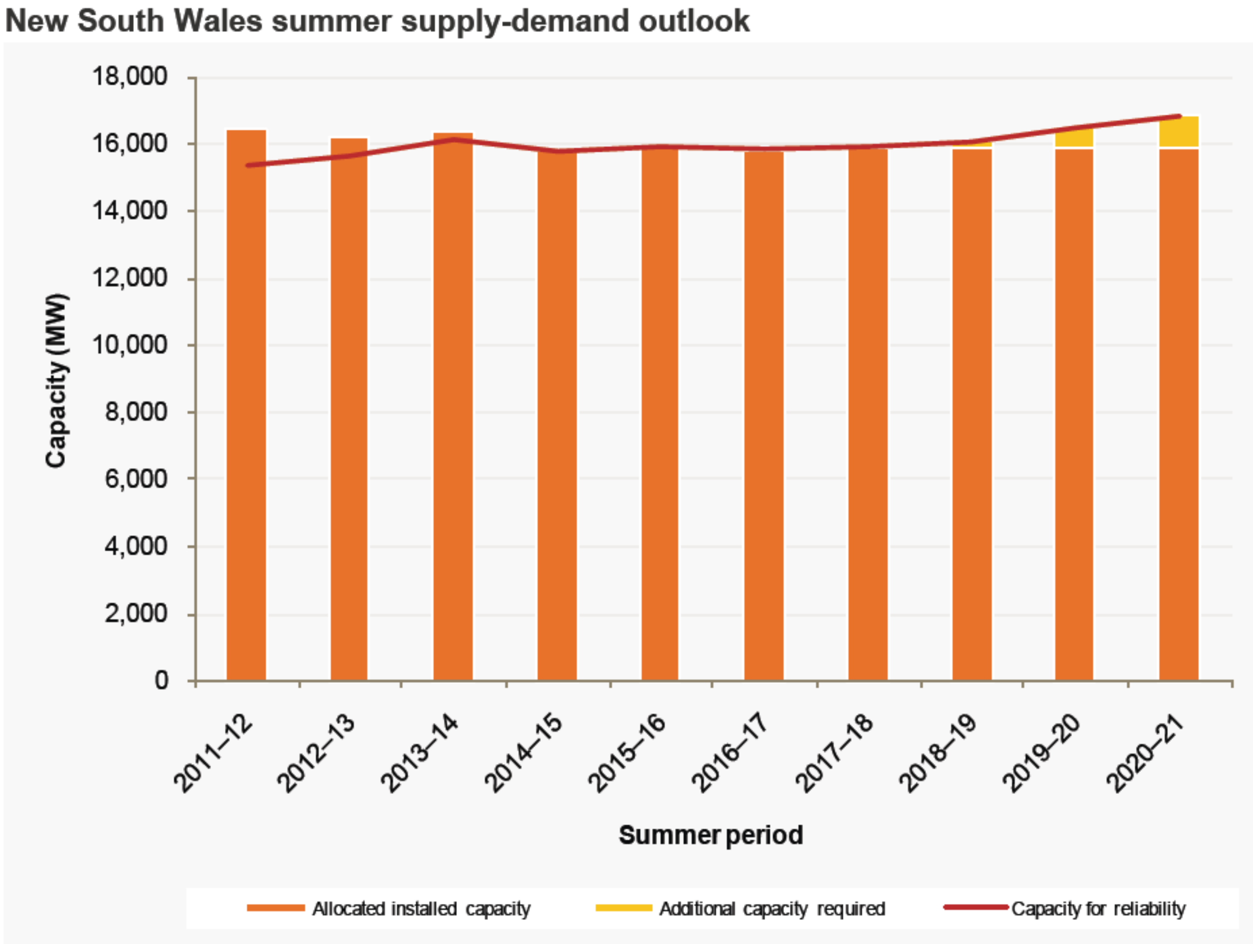


Figure 4-1 Test AEMO NSW Summer Generation Capacity Outlook (AEMO, 2010)

4.1.1 Quantifying the Electricity Generation from this Project

Electricity production from wind farms is variable. At any point in time a wind farm could be generating anywhere in the range of 0 to 100% of its power output, depending on the local wind speeds.

However, in the same way that the weather can be predicted hours to weeks in advance, the likely wind farm power output at any point in time can also be predicted with reasonable accuracy. In its role as electricity market operator, AEMO has established a Wind Energy Forecasting System to help it understand the likely wind farm production from minutes to days in advance. This system enables AEMO to reliably operate the electricity market taking into consideration the variability of all components including the constantly changing load, availability of and loading on transmission lines, plant outages at major power stations, and the changing output of wind farms.

In that context, while the output of wind farms is variable, it is also predictable and dependable.

The Rye Park Wind Farm represents a large sized wind farm with an installed capacity likely to be approximately 378 MW (based on 126 wind turbines with a capacity of 3.0 MW).

Epuron has carried out significant wind monitoring on the site to confirm the expected long term wind regime. Based on Epuron's analysis of wind speeds at the site, the project is expected to produce in the order of 1,192 GWh of electricity per year over its operating life.

The energy produced from the wind farm would be 100% renewable energy and would be fed directly into the electricity grid and sold on the National Electricity Market (NEM).

4.2 Reducing Greenhouse Gas Emissions

4.2.1 Context

There is scientific evidence that the earth's climate is changing. Observations have shown global increases in air and ocean temperatures, the widespread melting of snow and ice and rising sea levels (IPCC, 2008). It has further been observed that many of the world's natural systems are already being affected by the change of regional climates, in particular temperature increases (IPCC, 2008). Other indicators include altered rainfall patterns and more frequent or intense weather patterns such as heatwaves, drought, and storms. In Australia, this change in the climate is anticipated to have an impact on water supply and quality, ecosystems and conservation, agriculture and forestry, fisheries, settlements and industry and human health.

The drivers for climate change have been identified as being from both natural and anthropogenic forces, however a main contributor is the release of greenhouse gases GHG into the atmosphere (IPCC, 2008).

The Intergovernmental Panel for Climate Change (IPCC) has acknowledged that it is very likely that human greenhouse gas emissions have directly influenced global temperatures to increase, as well as lead to other climate impacts. As greenhouse gas emissions stay in the atmosphere for decades, a predicted warming of around 0.2°C per decade is already expected regardless of future emission levels. However, if greenhouse gas emissions continue to be emitted at their current rate then further and more extreme changes to the global climate system will be experienced. Therefore, a reduction in greenhouse gas emissions would reduce the rate and magnitude of climate change. The IPPC recognises that mitigation efforts over the next 20-30 years will be crucial to stabilising the amount of change (IPCC, 2008).

Referring to the Australian context, Department of Climate Change and Department of Sustainability, Environment, Water, Population and Communities reports show that greenhouse gas emissions from the stationary energy sector, is the largest and fastest growing area in terms of greenhouse gas emissions in Australia. The stationary energy sector accounted for 52% of total emissions in 2009 and within this sector, emissions from electricity generation contributed over 70%. Furthermore, stationary energy emissions between 1990 and 2009 energy have increased by 51% (DSEWPC, 2011).

In regards to NSW, the vast majority of Greenhouse Gas Emissions in 2007 were from the stationary energy sector, emitting 61 Mt CO_2-e. During this year, the generation of electricity accounted for over 37% of all emissions in NSW. Between 1990 and 2007 emissions from stationary energy grew by 33% to a total amount of 79 Mt CO_2-e (OEH, 2009).

4.2.2 Options to Reduce our Emissions

The IPCC has identified key technologies and practices for the energy sector that are currently commercially available which could be used to mitigate the effects of Greenhouse Gas emissions. They include:

- improved supply and distribution efficiency (transmission and distribution of electricity);
- fuel switching from coal to gas;
- utilisation of nuclear power;
- utilisation of renewable heat and power (hydropower, solar, wind, geothermal and bioenergy);
- utilisation of combined heat and power technologies; and,
- early applications of carbon dioxide capture and storage (e.g. storage of removed CO_2 from natural gas).

In addition the IPCC has also identified policies, measures and instruments shown to be environmentally effective. These include:

- reduction of fossil fuel subsidies;
- an increase of taxes or carbon charges on fossil fuels;
- feed-in tariffs for renewable energy technologies;
- renewable energy obligations; and
- renewable energy producer subsidies.

In 2006 the NSW Government committed to reduce greenhouse gas emissions by 60% by 2050 (DECCW, 2009). In considering this level of reduction to the power generation sector in NSW, we should note:

- By 2050 electricity consumption is expected to more than double compared to 2006 (DPMC, 2006).
- Achieving a 60% reduction in emissions, whilst doubling our electricity use, requires an >70% reduction in greenhouse gas emissions per unit of electricity generated.
- Even if our entire fossil fuel power generation fleet was converted to natural gas, this would not even halve our existing level of emissions, and do nothing to address growth.
- Accordingly, to achieve this target, as a minimum all of our electricity growth over the next 40 years must be met with zero emission power sources.
- Wind energy is currently the most economic zero emission power source.

4.2.3 Contributions to reducing greenhouse gas emissions

During its operational phase, the Rye Park Wind Farm would generate electricity without producing greenhouse gas emissions. In addition the wind farm would be displacing electricity produced by fossil fuel sources (coal and gas), and hence, would reduce the overall amount of GHG emissions produced by the stationary energy sector (electricity generation).

To estimate the potential GHG emissions savings that large scale wind farm developments would have in NSW, DECCW commissioned McLennan Magasanik Associates to conduct a study and subsequently developed a tool to calculate the expected savings from the wind farm based on its size and location. This tool can be accessed via the DECCW website at http://www.environment.nsw.gov.au/climatechange/greenhousegassavingstool.htm.

The results of the study as they relate to this project showed the following:

- In NSW wind farms would initially almost exclusively displace fossil fuel generation from coal and, to a lesser extent, gas.
- The savings from a wind farm the size of Rye Park in the South Western Slopes would initially reduce GHG emissions by 1,153,000 t CO_2e per annum.
- If CPRS was introduced in 2015 the overall emissions in the NSW energy sector would be reduced as a result of gas generation replacing coal, therefore reducing the GHG emissions savings directly related to wind generation.
- The impact on the management of the network due to the variability of wind would be negligible and the emissions savings would greatly outweigh any such impact.

Figure 4-2 presents the results from the study, showing the estimated GHG emissions savings for three different scenarios; a single wind farm of 150 MW, 500 MW representing future developments in each region, and 3000 MW representing the total capacity estimated for wind development in NSW (DECCW, 2010c).

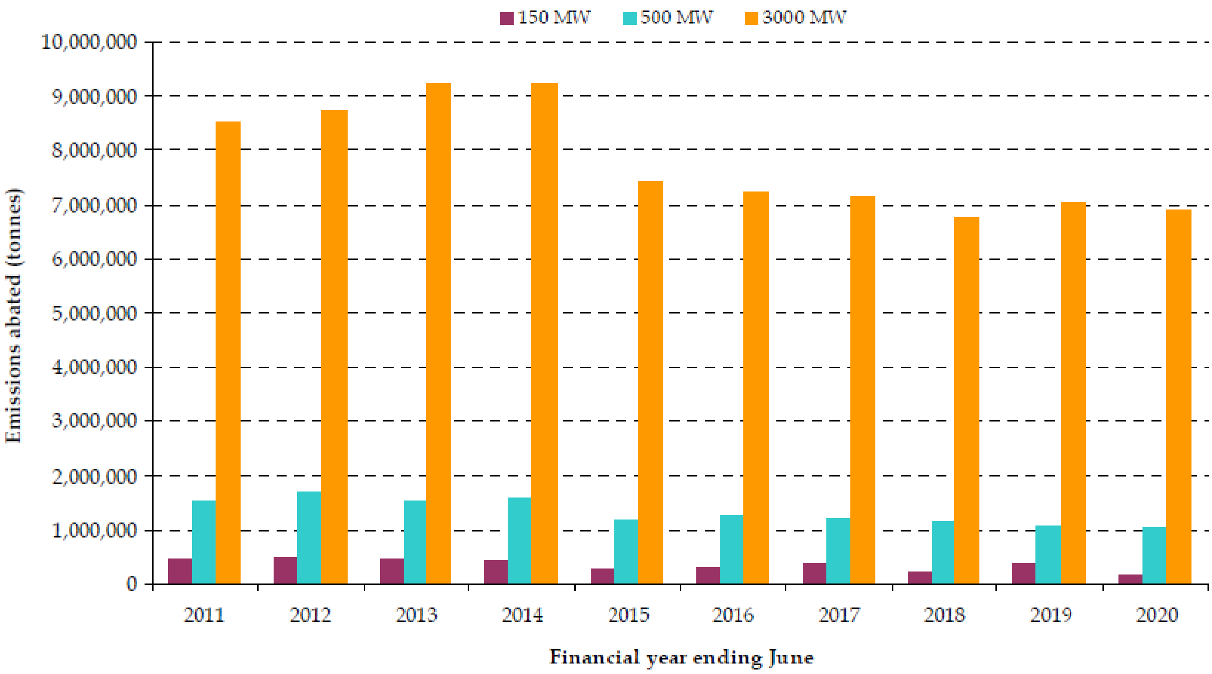


Figure 4-2 Estimated GHG emissions savings for three different scenarios

The greenhouse gas contributing the most to climate change is CO_2. Between 1970 and 2004 the amount of CO_2 being emitted from human-based activities increased by 80% and the current level of CO_2 in the atmosphere is now higher than ever measured (IPCC, 2008). This large increase is predominantly due to the burning of fossil fuels, such as coal, gas and oil. Between 1990 and 2007 emissions from stationary energy grew by 33% to a total amount of 79 $MtCO_2$-e (OEH, 2009).

An indicator used to determine the amount of greenhouse gases emitted per MWh of electricity supplied to the NSW grid in a particular year is the NSW Annual Pool Value (GGAS, 2011). Table 4-1 shows that the Annual Pool Value is calculated by dividing the total energy supplied to the NSW grid by the total NSW emissions in that year.

To account for one-off highs or lows that may be experienced in a particular year the Pool Coefficient is determined. This value is calculated by averaging the five Annual Pool Values from previous years, with a lag of two years (GGAS, 2010). So the NSW Pool Coefficient for 2011 is the average of the Annual Pool Values from 2003 to 2009.

Table 4-1 NSW Annual Pool Values and Pool Coefficients (2003-2009)

Year	Total NSW emissions (tco2-e)	Total NSW sent out generation (MWH)	Annual pool value tco2- e/MWH	Pool coefficient tco2- e/MWH
2003	63,431,793	66,800,866	0.950	0.897
2004	65,979,036	67,276,401	0.981	0.906
2005	65,896,606	69,341,455	0.950	0.913
2006	70,010,515	72,222,646	0.969	0.929
2007	69,810,669	71,015,242	0.983	0.941
2008	71,394,801	72,646,917	0.983	0.954
2009	68,585,696	69,450,575	0.988	0.967
2010	66,242,294	69,051,955	0.959	0.973
2011	TBA	TBA	TBA	0.975

Source: GGAS, 2011

Figure 4-3 Historical NSW Pool Value and Pool Coefficient (2000-2010) (GGAS, 2012)

The 2012 Pool Coefficient value indicates that presently for every MWh of electricity supplied to the NSW electricity pool, 975 kg of greenhouse gases are emitted. At this point in time, approximately 90% of electricity in the NEM is generated by fossil fuel power stations, primarily coal fired. Therefore it can be assumed that for every megawatt-hour of electricity generated at a coal power station 975 kg of greenhouse gases are emitted.

The Annual Pool Value is calculated using the total sent out electricity from all technologies, including that from renewable energy. It is expected that the more electricity supplied to the pool from renewable sources, reducing the amount required from coal power stations, the lower the Annual Pool Value and the lower the Pool Coefficient.

The Rye Park Wind Farm will generate 1,192 GWh per annum and on this basis, would result in a reduction in greenhouse gas emissions of approximately 1,153,000 tonnes of $C0_2$.

4.3 The Role of Renewable Energy

4.3.1 Federal Renewable Energy Target

The Australian Government's Mandatory Renewable Energy Target (MRET) scheme was established in 2001 to expand the renewable energy market and increase the amount of renewables being utilised in Australia's electricity supply. The MRET advocated that an additional 2%, or 9,500 GWh, of renewable energy was to be sourced by 2010 (DCC, 2009a).

In 2007, the NSW State Government introduced new legislation called the Renewable Energy (NSW) Bill as part of their Greenhouse Policy to encourage additional generation of renewable energy. The NSW Renewable Energy Target (NRET) required 10% of electricity to be sourced from renewable energy by 2010 and 15% by 2020 (DEUS, 2006). This Bill was overtaken by the introduction of legislation at the Federal level and therefore not legislated.

In August 2009 the Federal Government introduced a revised renewable energy scheme. The Renewable Energy Target (RET) is an expansion of the MRET and required an additional 45,000 GWh of electricity (approximately 20% of Australia's total electricity supply) to be sourced from renewable projects by 2020 (DCC, 2009). This requires an additional 8,000 - 10,000 MW of new renewable energy generators to be built across Australia in the next decade.

In February 2010 the Federal Government amended the RET scheme by dividing the renewable sources into two categories, the small-scale renewable energy generators and large scale renewable energy generators. The purpose of this move was to ensure continued ongoing investment in large scale renewable energy projects (i.e. those projects greater than 30 MW).

Epuron estimates that around one third of the renewable energy generation required to meet this target will need to be built in NSW, and predominantly be supplied by wind generation.

The Rye Park Wind Farm would have a generation capacity of 378 MW (based on a 3.0 MW turbine) and would contribute directly to the RET.

4.3.2 State Renewable Energy Targets

The Draft NSW Renewable Energy Action Plan 2012 supports the national target of 20% renewable energy by 2020. In 2011 renewable generation in NSW was 7.8%. The plan promotes the use of energy from renewable sources at least cost to the energy consumer and with maximum benefits to NSW. The Plan cites Bureau of Resources and Energy Economics statistics 2012 indicating that wind is presently the lowest cost renewable technology but for biogas (landfill), and that wind is predicted to be the least cost renewable source of electricity beyond 2030.

The proposed Rye Park Wind Farm supports the Draft NSW Renewable Energy Action Plan 2012 objective of 20% renewable energy by increasing the supply of electricity from wind, the most economical form of large-scale renewable energy.

4.4 Economic Stimulus

The Clean Energy Council commissioned Sinclair Knight Merz (SKM) to prepare a report into the investment costs and benefits of wind farms in Australia. SKM released the report '*Wind Farm Investment, Employment and Carbon Abatement in Australia'* in June 2012 which presents an updated national and state-based snapshot of wind farm investment, jobs and carbon abatement.

The model used in this report has been applied to the proposed Rye Park Wind Farm to estimate the potential economic stimulus. It predicts that the Rye Park Wind Farm will have a capital expenditure of around $565 million and a direct impact of $115 million in the local region during the construction phase. It is expected to create 369 jobs in the region during the construction phase and 35 ongoing fulltime roles.

This economic injection would also contribute to the local economy through:

- use of local contractors (where possible) in construction of the wind farm;
- use of local services (food and accommodation, fuel, general stores etc.) during the construction period;
- ongoing use of these local services during the operation of the wind farm;
- lease payments to local landholders; and
- provision of ongoing local jobs in operating and maintaining the wind farm.

4.5 Secondary Project Benefits and Opportunities

In addition to the increase in renewable energy supply, the proposed Rye Park Wind Farm would provide a variety of benefits and opportunities.

4.5.1 Infrastructure

Infrastructure required for development of the wind farm would also benefit the local community. The proponent would fund the upgrading of some local roads as outlined in the Traffic and Transport report. The works that would mainly benefit the region include the modifications necessary to segments along the Rye Park Dalton and Coolalie Roads. Other infrastructure works would include the provision of traffic signs and guide posts.

4.5.2 Tourism

Although the establishment and operation of a tourist facility is not part of this proposal, the Rye Park Wind Farm would provide an opportunity to increase the regional tourism industry, which currently is a main contributor to the economy. In the year ending June 2012, domestic tourism generated $343 million in the Capital region of NSW (Tourism NSW, 2012b), in which the Rye Park Wind Farm would be situated. While initial interest is likely to be higher than on-going interest, the wind farm could be utilised as an additional attraction to secure visitors to the local townships. This would lead to further contributions to the local service industry.

4.5.3 Social impacts

Public perception studies have shown that more realistic and positive perceptions accompany actual physical experience of wind farms. Fear of the unknown can exaggerate perceptions of visual and noise impacts particularly (Tourism NSW, 2012a).

While it is certain that not all members of the community will view the proposed development of wind farms favourably, in some communities, investment in clean energy production can become a point of pride to local residents. For example, during wind farm community consultation in Berridale, NSW, many participants spoke with pride about the Snowy Hydro Scheme and the appropriateness of similar clean energy developments in their shire. The Southern Tablelands – South West Slopes region looks well placed to become a leader in the Australian wind industry. The results of the NSW DECCW Survey 2010 ((Warren et al., 2005)- refer to Section 7.1) indicate that support for renewables is high.

4.5.4 Community Enhancement Fund

Under the Part 3A planning process in NSW, contributions from a project to a community enhancement fund are voluntary.

During the consultation process for the project, particularly Community Consultation Committee (CCC) meetings, Epuron sought feedback on how best to establish a community fund and to identify what type of local support is required from the project.

In general the communities' consultation feedback was:

"How best to establish a community fund"

- Councils prefer that if a community fund is established it is managed by them (local councils).
- Community wants to have a say in where and how any community funds are managed and spent.
- Draft Wind Guidelines say community contributions may be required under the EP&A Act 1979 or through a voluntary planning agreement.
- Community funds where implemented for other projects have been considered through combinations of the above.

"Identify what type of local support is required from the project"

- Upgrade and improve local roads near the project.
- Improvements to the township of Rye Park and better local amenities.
- Better mobile phone and internet reception in town.
- Chance to reopen some businesses in town.
- Provide attraction to keep younger people and families in the local area through long term benefits and job creation.

Following this consultation feedback Epuron outlined its position, as follows, to the CCC and community regarding the establishment of a community fund for the project:

- Epuron designs its wind farms to minimise impacts to the environment and local community.
- Each project should be assessed (by DPI) and determined specifically on its merits (and without being influenced by any promise of community or other funding).
- Epuron strongly believes in the value of community contributions and believes that the final investor who funds the construction and operation of the project should engage with and support the local community, including through annual financial contributions to the community.
- Epuron believes that such community contributions should be:
  - applied towards local environmental, social and community initiatives led by local residents;
  - directed to initiatives raised by residents proximate to the development or likely to be impacted;
  - established at the commencement of operation and continue for the life of the development; and,
  - regularly reviewed to ensure they are providing ongoing benefits to the community.
- Epuron considers that the CCC, working with the developer and ultimate project owner, is ideally placed to help develop a community fund and its administration process.
- The project is a major infrastructure project that can only be built by a major energy utility. Epuron will not be the ultimate project owner and accordingly it is not appropriate for Epuron to determine the final details

of any community fund, and nor should these be determined as part of a development application or consent process.

- Accordingly, Epuron will not propose any specific amount payable to a community fund as part of its development application. However, it will commit to an ongoing consultation process to determine an appropriate basis for the establishment of a community fund.
- The EA's Statement of Commitments will set out the Community Fund details

Accordingly a community enhancement fund has not been proposed for the project, however, the proponent will continue consultation on a possible format for a community enhancement program, as well as suggesting useful projects for the local area, so as to maximise the benefit of the project to the wider community.

The statement of commitments proposed by Epuron will require that the proponent:

- At least 6 months prior to the commencement of operations, call a meeting of the Community Consultation Committee and consult with Council(s) with respect to establishment of the community fund;
- Prior to the commencement of operation of the project, establish that community fund as required and publically announce the administration processes and current funding commitments of the fund; and,
- Regularly make publicly available the details of the fund including its administration processes, funds made available, funding commitments and outcomes.

4.6 Suitability of the Project

A comprehensive assessment of the proposed project has recognised that the development is suitable on a local level in terms of existing and future land use impacts. The following sections outline where this EA discusses the suitability of the project and the reasons behind the justification.

4.6.1 Strategic Land Use

The proposed site and the adjacent land parcels are zoned as land use 1(a) Rural Agriculture, RU1 & RU2, as discussed in Section 6.1.10. This land has been set aside by the local councils for agricultural purposes, and the land is currently used for commercial agriculture (sheep and cattle grazing) and rural residences.

While in operation the proposed wind farm would not impact on the day-to-day farming activities currently being carried out by the existing landowners. The turbine footprint and access tracks would occupy only a few per cent of the landowners' property and through strategic planning and consultation infrastructure would not occupy productive land. Normal farming operations may be affected during the construction phase, primarily due to increased traffic and activity on site. The magnitude of these impacts is such that it is not expected to cause economic loss to the landowners.

When considering the existing and future land uses, the proposed site is suitable for a wind farm. All local councils have strategically identified the site and its surrounds as being important agricultural land and there is no future intention to modify this zoning. The wind farm would coexist with the existing farming operations without any major disturbances to productivity but would make the land more economically viable for agriculture.

4.6.2 Grid Connection

An assessment into the capacity and security of the existing transmission network was conducted to determine the feasibility of the site and the impact that the project could have on the network. Connection strategies for proposed projects in the area have been assessed using publicly available information and best estimates where this information is not available.

The likely timing for construction of the other proposed and approved wind farm projects in the area and the status of their grid connection process is unknown. Technical studies required as part of the connection process will ensure that there will be no material impact on the security or performance of the electricity network from other proposed wind farms connecting in the vicinity of the Rye Park Wind Farm.

A grid connection enquiry has been lodged with the Network operator, TransGrid.

A description of the grid connection works and wind farm powerline are set out in Section 3.4.

5 Consideration of Alternatives

5.1 Site Selection

Site selection is crucial in wind farm development due to the market based structure of the electricity industry. The projects that exhibit the best characteristics for wind farm development (best energy yield with the lowest cost) will be the projects that get built. It is the combination of these characteristics that makes suitable sites for wind farms reasonably rare in NSW. Appropriate locations are found where:

- wind speeds are consistently high (around 7.5-8 m/s as an annual hub height average);
- capacity at existing transmission lines is available on or near the project site;
- transportation of turbines would be possible with only minor upgrades to roads;
- native vegetation cover is sparse or would be minimally impacted;
- housing in the immediate vicinity is relatively sparse; and
- involved landowners are interested in hosting turbines on their land.

To date Epuron has successfully developed nine wind farm projects in NSW, six of which have been granted development approval, with the other three currently in the assessment phase.

Epuron has developed projects in the Northern Tablelands, the South-West Slopes, South Coast and Far West New South Wales, prior to investigating sites in the Southern Tablelands area. As a result Epuron has developed a wide network of monitoring masts with around 30 currently active across NSW and South Australia (including five on site). After modelling data from these masts further investigations were undertaken to assess the feasibility of the project. In addition to having a consistently high wind resource, the project area also featured:

- ridgelines suitable for turbine locations;
- a low population density (ABS, 2011a); and
- an existing transmission network.

In addition to these characteristics, the engagement of interested landowners enabled the project development to progress. The selected development envelope for the turbine and infrastructure layout was chosen over earlier alternatives based on its commercial viability, landowner consent and reduced environmental impacts.

5.2 Improvements to Infrastructure Layout

The current layout that is presented in this EA has gone through an iterative design and assessment process, with turbine locations being repositioned, deleted and in some cases added to areas previously not utilised. The purpose of this process is to design a layout that efficiently harnesses the energy in the wind with minimal impacts to the existing environment (including ecology, land use productivity as well as visual and noise amenity for surrounding residents) whilst considering community feedback and incorporating it where possible.

The layout initially proposed for the Rye Park Wind Farm contained around 145 turbines locations, proposed overhead power line corridor options, and two potential substation locations. This layout was developed using a wind resource map created from existing monitoring mast data, along with preliminary topographic features (contours) and satellite imagery. Experience gained from previous projects was applied to areas such as noise and ecology in determining the exact locations, however, detailed studies would be required to confirm these locations were appropriate.

Epuron received feedback from neighbouring dwelling landowners regarding nearby turbines. As such a number of turbines were removed to reduce both noise and visual impacts to neighbouring dwellings. Turbines were also relocated or removed from parts of the site to minimise impacts to native flora and other identified constraints, such as communications.

Figure 5-1 shows the initial layout overlaid on the current layout. The proposed overhead power line has been consolidated and a single wind farm connection substation is chosen and two other collection substations have also been included. Figure 5-2 and Figure 5-3 show in more detail the areas that have undergone the most significant changes.

Along with the relocation or deletion of turbines, the associated access tracks were modified. While the impact of an access track is less than a turbine, every attempt was made to reroute access tracks away from sensitive vegetation. In some cases, however, it was concluded that the impact caused in clearing a small area of vegetation on the top of the ridge would have a lower impact than relocating the track on the side of the slope where the overall impact of the cut and fill required to construct the track would have an impact over a much larger area.

Powerlines were rerouted or deleted, where possible, to: minimise the impact to biodiversity constrained areas and position powerlines in low lying and thus less visible areas.

In summary a total of 52 turbines were removed and 21 turbines relocated or microsited due to constraints identified such as environmental or feedback from consultation with surrounding landowners mostly regarding proximity, noise and visual impact.

Table 5-1 List of improvements made to the layout iterations

Turbine label (current layout)	*Reason for re-design*
RYP_1	Relocated by 150 m south due to feedback from R1. Reduction in noise and visual impact.
RYP_2	Relocated by 150 m south due to feedback from R1. Reduction in noise and visual impact.
RYP_5	Additional location in unconstrained area
RYP_7	Moved 150 m south due to turbine spacing constraint
{RYP_7_LayoutRev2}	Removed due to feedback from R2, R11, R13 and R14 regarding noise and visual impact
{RYP_8_LayoutRev3}	Removed due to ecological constraints and feedback from R24 regarding noise and visual impacts
RYP_9	Moved 150 m south due to turbine spacing constraint
{RYP_9_LayoutRev2}	Removed due to feedback from R2, R11, R13 and R14 regarding noise and visual impact
{RYP_10 – layoutRev3}	Removed to bird strike/operational issue and feedback from R11, R2, R13 and R14 regarding noise and visual impact.
{RYP_13 – layoutRev2}	Removed due to feedback from R11, R13 and R14 regarding noise and visual impacts
{RYP_14 – layoutRev2}	Removed due to feedback from R11, R13 and R14 regarding noise and visual impacts
{RYP_16 – layoutRev2}	Removed due to feedback from R11, R13 and R14 regarding noise and visual impacts
{RYP_16 – layoutRev3}	Removed due to feedback from R11, R13, R14 and R24 regarding noise and visual impacts
{RYP_17 – layoutRev2}	Removed due to feedback from R11, R13 and R14 regarding noise and visual impacts
RYP_16	Additional location in an unconstrained area. Feedback from R14 landowner to be an involved landowner
RYP_18	Microsited due to additional turbine on ridge
RYP_21	Microsited due to additional turbine on ridge
RYP_24	Microsited due to additional turbine on ridge
RYP_26	Microsited due to additional turbine on ridge
RYP_28	Microsited due to additional turbine on ridge
RYP_29	Microsited due to additional turbine on ridge
RYP_36	Microsite further away from ecology constraint
RYP_40	Microsite further away from ecology constraint
{RYP_45 - layout	Removed due to ecology constraint

Turbine label (current layout)	*Reason for re-design*
Rev3}	
{RYP_47 - layout Rev3}	Removed due to ecology constraint
{RYP_47 - layout Rev2}	Removed due to feedback from R30, R33 regarding noise and visual impact
RYP_48	Microsite - spacing constraint from RYP_50. Addition of new turbine RYP_141
{RYP_48 - layout Rev2}	Removed due to feedback from R30, R33 regarding noise and visual impact
RYP_49	Moved 100 m south on advice from NGH regarding potential ecological constraint
RYP_50	Microsited - spacing constraint from RYP_51 from addition of new turbine RYP_141
{RYP_50 - layout Rev2}	Removed due to feedback from R30, R33 regarding noise and visual impact
RYP_51	Microsited - spacing constraint from RYP_53 from addition of new turbine RYP_141
RYP_52	Microsited - spacing constraint from RYP_53
RYP_53	Microsited - spacing constraint from RYP_57 from addition of new turbine RYP_141
RYP_54	Removed due to NGH constraint - Fauna
RYP_55	Removed due to NGH constraint - Fauna
{RYP_55 - layout Rev2}	Removed due to ecological constraint and feedback from R30, R33 regarding noise and visual impact
RYP_56	Microsited - spacing constraint from RYP_52
{RYP_56 - layout Rev3}	Removed due to landowner feedback regarding proximity of turbines, house now not within 2 km of turbines. Feedback from R30, R33, R34, R35 regarding noise and visual impact
RYP_57	Microsited - spacing constraint from RYP_61 from addition of new turbine RYP_141
RYP_60	Removed due to ecological constraint and Feedback from R30, R33, R34, R35 regarding noise and visual impact
{RYP_60 - layout Rev3}	Removed due to ecological constraint and feedback from R30, R33, R34, R35 regarding noise and visual impact
RYP_61	Microsited - spacing constraint from RYP_62 from addition of new turbine RYP_141
{RYP_61 - layout Rev3}	Removed due to ecological constraint and feedback from R30, R33, R34, R35 regarding noise and visual impact
RYP_62	Microsite - spacing constraint from RYP_141 from addition of new turbine RYP_141
{RYP_65 - layout Rev2}	Removed due to consultation feedback from R41 regarding noise and visual impact
{RYP_66 - layout Rev2}	Removed due to consultation feedback from R41 regarding noise and visual impact
RYP_71	Microsited to highest point to avoid ecological constraints and feedback from R36 & R38 regarding noise and visual impact.
RYP_72	Microsited to highest point to avoid ecological constraints and feedback from R36 & R38 regarding noise and visual impact.
{RYP_75 - layout Rev3}	Removed due to ecological constraint and feedback from R40 and R42 regarding noise and visual impact
RYP_76	New turbine added
RYP_77	Relocated 200 m north to avoid ecological constraint
{RYP_77 - layout Rev3}	Removed due to ecological constraint and feedback from R40 and R42 regarding noise and visual impact

Turbine label (current layout)	Reason for re-design
RYP_78	New turbine added
{RYP_78 - layout Rev2}	Removed due to ecological constraint and feedback from R45 and R46 regarding noise and visual impact
RYP_79	New turbine added
{RYP_79 - layout Rev3}	Removed due to ecological constraint and feedback from R40 and R42 regarding noise and visual impact
RYP_80	Microsited 60 m south to avoid ecological constraint
{RYP_80 - layout Rev3}	Removed due to ecological constraint and feedback from R40 and R42 regarding noise and visual
{RYP_82 - layout Rev3}	Removed due to ecological constraint and feedback from R40 and R42 regarding noise and visual
{RYP_83 - layout Rev3}	Removed due to ecological constraint and feedback from R40 and R42 regarding noise and visual impact
{RYP_85 - layout Rev3}	Removed due to ecological constraint and feedback from R40 and R42 regarding noise and visual impact
{RYP_86 - layout Rev2}	Removed due to ecological constraint and feedback from nearby landowner, landowner now not within 2km of turbines
{RYP_87 - layout Rev2}	Removed due to ecological constraint and feedback from nearby landowner, landowner now not within 2km of turbines
{RYP_87 - layout Rev3}	Removed due to ecological constraint and feedback from R40 and R42 regarding noise and visual impact
RYP_90	Microsited based on consideration of feedback from R45 and R44 regarding visual and noise impact
RYP_92	Relocated further away from ecological constraint
RYP_93	Microsite based on consideration of feedback from R45 regarding visual and noise impact
RYP_94	Microsite based on consideration of feedback from R45 regarding visual and noise impact
RYP_95	Microsite based on consideration of feedback from R45 regarding visual and noise impact
{RYP_97 - layout Rev3}	Removed due to consultation feedback from R44, R45, R46 regarding noise and visual impact
{RYP_101 - layout Rev2}	Removed due to consultation feedback regarding noise and visual impact from R54, R55, R56, R57 and R58
RYP_107	Relocated further away from ecological constraint
{RYP_108, RYP_109, RYP_110, RYP_111, RYP_112, RYP_113, RYP114 – layout Rev3]	Removed due to ecological constraint and feedback from nearby landowner, landowner now not within 2km of turbines
[RYP_109 – layout Rev2]	Removed due to ecological constraint and noise and visual impact feedback from dwelling R56
RYP_110	Microsited 50 m south away from ecological constraint
{RYP_118, RYP_119, RYP122, RYP125, RYP127, RYP_130, RYP132 – layout Rev3}	Removed due to consultation feedback regarding noise and visual impact from R54, R55, R56, R57 and R58
RYP_126	Moved to create 50 m buffer from forest. Microsited a further 10m East due to ecological constraint

Turbine label (current layout)	Reason for re-design
[RYP_126 – layout Rev3]	Removed due to noise and visual impact feedback from dwelling R56
RYP_128	Microsited further noise due to turbine spacing and visual and noise impacts from R59, R60, R61, R63
RYP_130	Microsited further noise due to turbine spacing and visual and noise impacts from R59, R60, R61, R63
{RYP_130 - Layout Rev3}	Removed due to feedback from R56 and R58 regarding noise and visual impacts
RYP_131	Microsited further noise due to proximity to transmission line and visual and noise impacts from R59, R60, R61, R63
RYP_132	Microsited due to additional turbine on ridge
{RYP_132 - Layout Rev3}	Removed due to feedback from R56 and R58 regarding noise and visual impacts
RYP_133	New turbine added
RYP_134	New turbine added
RYP_135	New turbine added
RYP_136	New turbine added due to dwelling constraint relieved
RYP_137	New turbine added due to dwelling constraint relieved
RYP_138	New turbine added due to dwelling constraint relieved
RYP_139	New turbine added
RYP_140	New turbine added
RYP_141	New turbine added
RYP_142	New turbine added
{RYP_142 – Layout Rev3}	Removed due to ecological constraint and feedback from R54 and R56 regarding noise and visual impact
RYP_143	New turbine added
{RYP_143 - Layout Rev3}	Removed due to ecological constraint and feedback from R54 and R56 regarding noise and visual impact
RYP_144	New turbine added due to dwelling constraint relieved. Microsited a further 110m North-East due to consultation feedback from landowner regarding project involvement.
RYP_145	Relocated 300 m east due to feedback from dwelling R56 regarding noise and visual impact
Substations	One of the potential connection substation locations was removed due to ecology constraint. Three additional collection substations and an underground overhead termination compound were added due to detailed electrical study.
Overhead powerline (up to 330 kV)	Potential overhead power line options were removed due to selection of preferred routes. Additional power lines added due to detailed electrical study. Alternate power line location in low lying, less visible area.