UNION FENOSA WIND AUSTRALIA

Berrybank Wind Farm
Chapter 5:

PLANNING CONTROLS

5 Planning Controls

This report details a planning application use and develop land for a wind energy facility including anemometers (wind monitoring masts) and business identification signage, and associated removal of native vegetation. This chapter provides an assessment of this proposal against the relevant planning policies and controls of the Golden Plains and Corangamite Planning Schemes as well as state frameworks and relevant guidelines.

As the site is within two municipalities, two separate assessments will be made against the Local Planning Policy Framework. As the development proposes to create a wind energy facility in excess of 30MW the responsible authority in this instance will be the Minister for Planning (Clause 61.01 of the planning scheme), who will make a decision after consulting with the two Councils and the recommendations of any planning panel.

5.1 State Planning Policy Framework

The State Planning Policy Framework contains a number of policies, which are of relevance to this permit application. Key policy directives requiring consideration include:

5.1.1 Clause 15.01 – Protection of Catchments, Waterways and Groundwater.

The objective of this clause is;

– *To assist the protection and, where possible, restoration of catchments, waterways, water bodies, groundwater, and the marine environment.*

The proposal supports the objective as all development and soil disturbance is set back at least 400m from significant water courses, the closest being Gnarpurt Chain of Ponds. Access tracks have also been sited such that interruption to natural drainage lines is minimised. Any soil disturbance resulting from turbine erection and access track construction will be stabilized and rehabilitated with grass and other erosion control measures, in accordance with a construction management plan prepared as part of the environmental management plan.

As all earthworks are relatively shallow (generally less than 3m) the turbine footings as constructed are not expected to intersect the groundwater table. Further, the actual area of land to be covered by the footings, access tracks and buildings, is very small in the context of the size of the site area (less than 1%).

The majority of the surface area of the subject site will be undisturbed and will continue to be used for the current agricultural practises of grazing and cropping.

5.1.2 Clause 15.04 – Air Quality

The objective of this clause is;

– *To assist the protection and improvement of air quality.*

The proposal supports the objective as it will decrease reliance on pollution-causing forms of electricity generation, such as coal and gas. The wind farm will displace up to approximately 911, 000 tonnes of CO2 equivalent per year, meaning that less polluting greenhouse gases will be emitted into the atmosphere as a direct result of the proposed wind farm.

Unlike most forms of energy, the wind farm will not impact air quality at the source of the electricity generation as turbines are free of emissions.

5.1.3 Clause 15.05 – Noise Abatement

The objective of this clause is;

– *To assist the control of noise effects on sensitive land uses.*

Based on the noise assessment undertaken and the report prepared by Marshall Day Acoustics, adequate buffer distances have been provided through turbine siting and

design to reduce noise impacts to nearby residents to acceptable limits. A number of turbine models are under consideration and the noise assessment recommends the use of low noise mode in certain circumstances to achieve the accepted noise standards. Further investigations into the noise characteristics of the wind farm will be undertaken when the turbine model has been selected.

The model conditions for wind farms (DPCD, 2009) contains a condition that requires turbine noise compliance assessment during operation of the wind farm to ensure the relevant standard is met. A similar condition has been applied to other wind farm projects. It is expected that this will be used as the basis for a similar condition that may be applied to any planning permit issued in relation to this project.

Further information on the noise characteristics of the proposed wind farm is found in **Chapter 8 – Noise**.

5.1.4 Clause 15.09 - Conservation of native flora and fauna

The objective of this clause is;

– *To assist the protection and conservation of biodiversity, including native vegetation retention and provision of habitats for native plants and animals and control of pest plants and animals.*

The site is a mosaic of improved grazing pastures and crops. It has been highly modified from its pre-disturbance state and very little intact native vegetation remains.

The proposal supports the objective in that a very low level of native vegetation is required to be removed to support the development. The project has employed the principles of Victorias Native Vegetation Framework in that the project has been designed to avoid native vegetation, and the vegetation loss that is unavoidable has been minimised. The turbines, access tracks, powerlines and associated buildings have been specifically designed to avoid native vegetation, especially that of medium or high conservation value.

Replanting of indigenous vegetation will be used to offset small amounts of native vegetation proposed to be removed.

In relation to conservation of native flora and fauna, the Flora and Fauna report found the following;

– *Potential flora and fauna issues do not represent significant constraints to the future development of the wind farm. The key issues and appropriate responses are presented summarised below; and,*

– *Risks to the Brolga from the project are considered to be low.*

Refer to **Section 9.3** for more information.

Critically, in contributing to greenhouse gas abatement through the construction of an additional renewable energy source, the impacts of climate change and therefore habitat alteration through warming and increased drought is at least in part reduced by the proposed wind farm.

5.1.5 Clause 15.12 – Energy efficiency

The objective of this clause is;

– *To encourage land use and development that is consistent with the efficient use of energy and the minimisation of greenhouse gas emissions.*

The development directly supports this clause in that by providing renewable energy it reduces reliance on fossil fuels and therefore greenhouse gas emissions. The proposed wind farm will displace up to 911,000 of greenhouse emissions per year.

5.1.6 Clause 15.14 – Renewable Energy

The objective of this clause is;

– *To promote the provision of renewable energy, including wind energy facilities, in a manner that ensures appropriate siting and design considerations are met.*

In particular it is policy to;

– *Facilitate the consideration of wind energy development proposals.*

– *Recognise that economically viable wind energy facilities are dependent on locations with consistently strong winds over the year and that such sites are likely to be close to the exposed coastline and may be highly localised.*

– *Consider the economic and environmental benefits to the broader community*

The proposal directly and specifically supports this objective by delivering renewable energy and significantly contributing to the renewable energy target. The wind farm will generate up to 250MW of renewable energy, enough to power approximately 171,000 houses, and displace 911,000 tonnes of greenhouse gases per year. The siting of the wind turbines in the proposal is based on thorough analysis of all impacts such that all siting and design considerations are met. Importantly, it is not located in a coastal location.

The wind farm has been informed by the location and design criteria and principles which are outlined in **Chapter 3**. If approved, the proposed wind farm will represent one of the largest wind energy facilities in Australia, and contribute in a meaningful way to the generation of clean energy and the reduction in greenhouse emissions.

The Socio-Economic Impact Assessment found;

– *In simple terms, the proposed Berrybank wind farm development is likely to stimulate the economy in the Corangamite and Golden Plains Shires as a result of greater income generation and subsequent expenditure in the region. The proposed wind farm development has the potential to deliver direct and indirect benefits for host communities and the local and regional economies.*

Planning and responsible authorities must take into account the '*Policy and Planning Guidelines for Development of Wind Energy Facilities in Victoria'*, (DPCD, 2003) in planning and assessing wind energy facilities. This policy had guided the location and the design of the wind farm as detailed in **Chapter 3.**

5.1.7 Clause 17.05 - Agriculture

The objective of this clause is;

– *To ensure that the State's agricultural base is protected from the unplanned loss of productive agricultural land due to permanent changes of land use and to enable protection of productive farmland which is of strategic significance in the local or regional context.*

The development proposes complementary land use which does not detrimentally affect agricultural activity as cropping, grazing and other agricultural activities can continue unaffected. Wind farms can be regarded as 'vertical farming'. The amount of land taken up during the operation phase by the turbines, access tracks and other associated infrastructure is small compared with the overall site area (less than 1%). The access tracks constructed can also be used for agricultural uses therefore aiding in the efficient use of land for farming purposes.

By diversifying the land use, a wind farm can increase the viability of the agricultural land due to the addition of an alternate revenue stream for land holders, the upgrading of local roads, and improved access tracks.

5.2 Local Planning Policy Framework (LPPF)

The Local Planning Policy Framework contains a number of policies, which are of relevance to this permit application. As outlined, the proposal is part contained within the Corangamite Shire and partly within the Golden Plains Shire. These will be discussed in turn.

Corangamite Planning Scheme (LPPF)

Key policy directives requiring consideration include the following.

5.2.1 21.03 – Vision and Strategic Framework Plan

The key issues as they relate to the proposal are the;

– *sustainable management and protection of natural resources of soil, water, flora, fauna and eco-systems;*

The development manages environmental impacts sensitively in accordance with Councils vision and will result in only minimal vegetation removal. In relation to conservation of native flora and fauna, the Flora and Fauna report found the following;

– *Potential flora and fauna issues do not represent significant constraints to the future development of the wind farm.*

As the area of land taken by the wind farm is very low, and the earthwork not significant it is considered that the potential for impacts on soil and water is very small. Any soil disturbance that results from the construction will be managed and rehabilitated with erosion control measures.

An Environmental Management Plan (EMP) will be prepared through a condition on any permit issued that will comprehensively assess the potential for impacts on soil, water, flora and fauna and ecosystems, and detail measures to mitigate the impacts. Further information on these considerations can be found at **Chapter 9** and **Chapter 16.**

– *productive agricultural, forestry and mining activities and protection of rural resources;*

The development proposes a complementary land use which does not detrimentally affect the agricultural activity as cropping, grazing and other agricultural activities can continue unaffected during the lifetime of the development.

– *sustainable economic development which provides local employment and training opportunities;*

The proposal represents a significant total investment of up to $484m with up to 240 full time equivalent jobs at the peak of the construction. Consultation with Council Economic Development Officers, both to date and planned, may increase the amount of this investment spent on the local economy. Personnel employed during the construction phase will contribute to the local economy through expenditure goods and services, including housing.

The attraction of new industries in the area, especially those that do not come at the expense of agriculture, will aid in addressing the population decline facing many rural communities.

5.2.2 Clause 21.04 – Objectives, Strategies and Implementation (Catchment Management)

The relevant objective is outlined below;

– *Ensure that natural and physical resources can meet the needs of future generations by safeguarding the life-supporting capacity of air, water, soil and ecosystems.*

The development supports this objective as through contributing to greenhouse gas abatement the proposed wind farm helps reduce air pollution through the mitigation of climate change impacts and the sustainability of ecosystems.

Future generations will benefit from the contribution the wind farm will make in increasing the proportion of Victorias electricity generated by clean and renewable forms.

5.2.3 Clause 21.04 – Objectives, Strategies and Implementation (Agriculture)

The relevant objective is outlined below;

– *Ensure that the use and development of rural land is both compatible and complementary to agricultural activities.*

– *Encourage agricultural diversity and promote opportunities for new farming enterprises.*

The development supports these objectives in that the development proposes a complementary land use which does not detrimentally affect the agricultural activity as cropping, grazing and other agricultural activities can continue during the lifetime of the development.

In addition, by diversifying the land use, a wind farm can increase the viability of the agricultural land due to the addition of an alternate revenue stream for land holders, the upgrading of local roads, and improved access tracks.

5.2.4 Clause 22.02 – Environment (Catchment and Land Protection)

The relevant objective is outlined below;

– *To ensure the sustainable development of natural resources of soil, water, flora, fauna, air and ecosystems.*

The development supports this objective as it will not result in the pollution of soil or water as the degree of soil disturbance is minimal and any works will be managed through an environmental management plan prepared to guide construction and operation.

The Minister for Planning has deemed that an EES was not required on the basis that the environmental impacts were not expected to be significant.

5.2.5 Clause 22.02 – Environment (Biodiversity)

The relevant objective is outlined below;

– *To ensure that the use and development of land takes into account the need to protect and enhance biological diversity by promoting ecologically sustainable land use and development.*

The development facilitates the protection of biological diversity by protecting the majority of habitat on the site and contributing to reducing climate change impacts on habitat. In addition the development has a very small footprint and therefore requires only minimal vegetation removal. The design of the wind farm has taken into account the presence of native vegetation and avoided the vast majority of areas.

In relation to conservation of native flora and fauna, the Flora and Fauna report found the following;

– *Potential flora and fauna issues do not represent significant constraints to the future development of the wind farm.*

5.2.6 22.03 – Economic Development (Agriculture)

The relevant objective is outlined below;

– *To support the diversification of agriculture, the development of agroforestry and the processing of agricultural products grown within the municipality.*

The development supports the diversification of agricultural land by the introduction of a compatible use that generates additional income, therefore increasing the economic viability of the land.

Golden Plains Planning Scheme (LPPF)

Key policy directives requiring consideration include the following;

5.2.7 21.03 – Municipal Vision, Corporate Vision and Framework Plan

The key issues as they relate to the proposal are the;

– *sustainable management and protection of natural resources of soil, water, flora, fauna and eco-systems;*

The development manages environmental impacts sensitively in accordance with the native vegetation framework and will result in only minimal vegetation removal.

In relation to conservation of native flora and fauna, the Flora and Fauna report found the following;

– *Potential flora and fauna issues do not represent significant constraints to the future development of the wind farm.*

An Environmental Management Plan (EMP) will be required under a future permit condition and will satisfy criteria in relation to soil, water, flora and fauna and ecosystems. Further information on these considerations can be found at **Chapter 9** and **Chapter 16.**

– *facilitating productive agricultural, forestry and mining activities and protection of rural resources;*

The development proposes a complementary land use which does not detrimentally affect the agricultural activity as cropping, grazing and other agricultural activities can continue unaffected during the lifetime of the development.

– *Supporting sustainable economic development;*

The proposal represents a significant total investment of up to $484m with up to 240 full time equivalents at the peak of the construction. Consultation with Council Economic Development Officers, both to date and planned, may increase the amount of this investment spent on the local economy. Personnel employed during the construction phase will contribute to the local economy through expenditure on goods and services.

5.2.8 21.04 – Objectives and Strategy (Economic Development)

A key objective of this clause is to;

– *Support sustainable value adding industries and service industries, particularly those which relate to the agricultural base, forestry and natural resources.*

The proposed wind farm adds value to the agricultural land, promotes environmental sustainability and does not detrimentally affect the underlying agricultural practices taking place on the land.

5.2.9 21.04 – Objectives and Strategy (Economic Development)

A key objective of this clause is to;

- *Ensure that the use and development of rural land is both compatible and complementary to agricultural activities.*
- *Encourage agricultural diversity and promote opportunities for new farming enterprises.*

The development supports these objectives in that the development proposes a complementary land use which does not detrimentally affect the agricultural activity as cropping, grazing and other agricultural activities can continue during the lifetime of the development.

Additionally, it represents diversity of land production using a renewable and abundant resource. The additional income generated by the wind farm will allow the land owners to increase investment into new farming enterprises.

5.2.10 22.08 – Environment

A key objective of this clause is to;

- *To ensure the sustainable development of natural resources of soil, water, flora, fauna, air and ecosystems.*

The development supports this objective as it will not result in the pollution of soil or water as the degree of soil disturbance is minimal and any works will be managed through an environmental management plan prepared to guide construction and operation. The design of the wind farm has taken into account the presence of native vegetation and avoided the vast majority of areas.

In relation to conservation of native flora and fauna, the Flora and Fauna report found that;

- *"potential flora and fauna issues do not represent significant constraints to the future development of the wind farm."*

5.3 Zones

The proposed wind energy facility is largely contained within the Farming Zone (Clause 35.07) pursuant to the Corangamite and Golden Plains Planning Schemes (refer to **Figure 12 – Zone Plan).**

The purpose of the zone is;

- *To implement the State Planning Policy Framework and the Local Planning Policy Framework, including the Municipal Strategic Statement and local planning policies.*
- *To provide for the use of land for agriculture.*
- *To encourage the retention of productive agricultural land.*
- *To ensure that non-agricultural uses, particularly dwellings, do not adversely affect the use of land for agriculture.*
- *To encourage use and development of land based on comprehensive and sustainable land management practices and infrastructure provision.*
- *To protect and enhance natural resources and the biodiversity of the area.*

Pursuant to Clause 35.07, a wind energy facility (including an anemometers (wind montoring masts)) is a section 2 use meaning that a planning permit is required to use land. A permit is also required to construct a building or carry out works associated with a use in section 2.

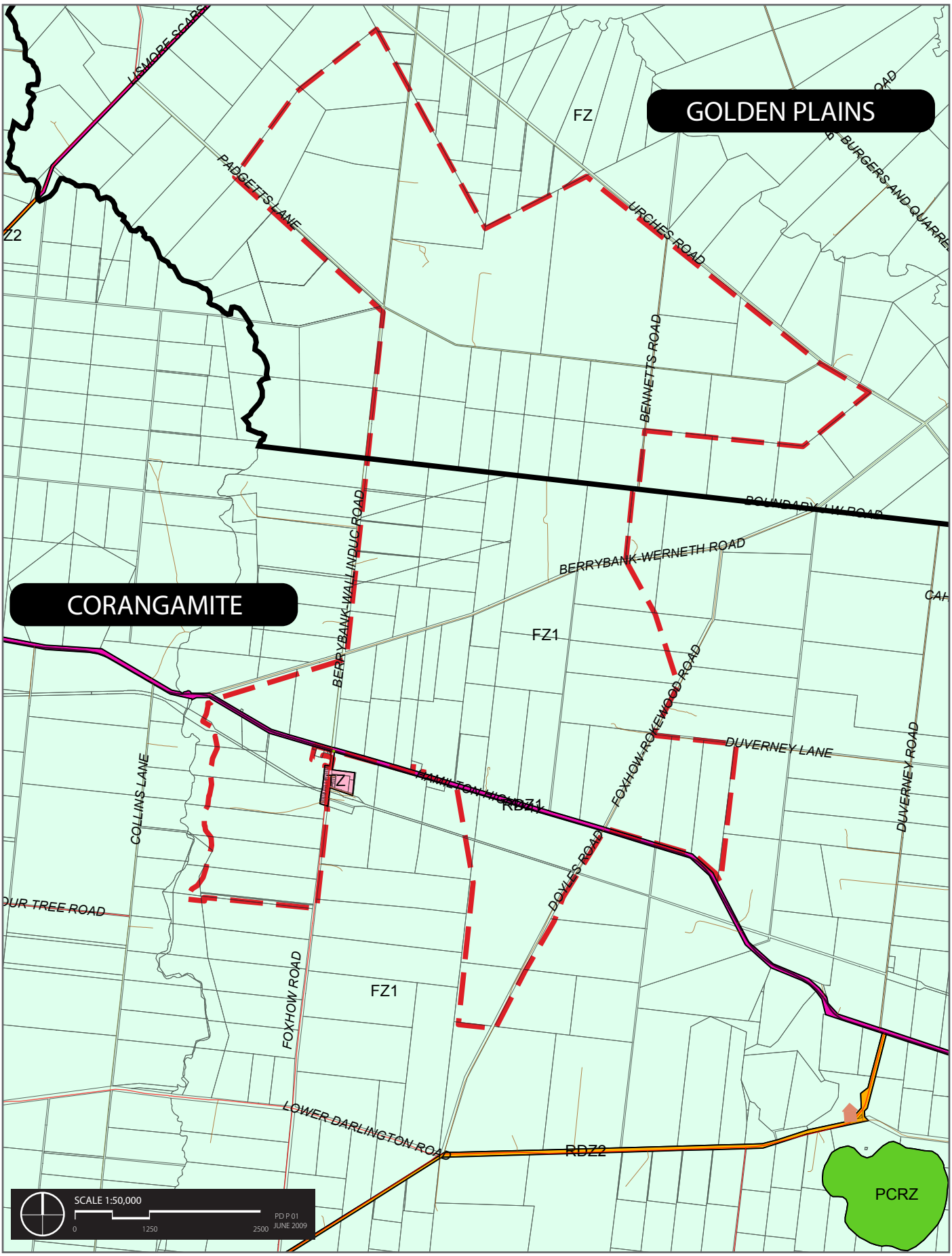


Figure 12 – Zone Plan

Source: Tract Consultants

The other components of the project, namely the overhead and underground powerlines, access tracks, temporary concrete batching plant, control building, maintenance building and substation, are considered to be contained within the broad definition of the wind energy facility, which is defined as follows:

'Land used to generate electricity by wind force. It includes any turbine, building or other structure or thing used in or in connection with the generation of electricity by wind force. It does not include:

a) turbines principally used to supply electricity for domestic or rural use of the land; or

b) an anemometer'.

The relevant decision guidelines for use and development of a wind energy facility in the farming zone and responses are set out below.

Table 6 – Decision Guidelines and Response – Farming Zone

Decision Guideline	Response
The State Planning Policy Framework and the Local Planning Policy Framework, including the Municipal Strategic Statement and local planning policies.	The relevant policies of the State and Local Planning Policy Framework have been addressed in **Section 5.1 and 5.2** of this report.
Any Regional Catchment Strategy and associated plan applying to the land.	The proposed development will protect soil and water resources as it is located more than 400m away from nearby watercourses, and will implement soil management techniques such as erosion control and rehabilitation.
How the use or development relates to sustainable land management.	The area subject to disturbance is minimal and any disturbed areas will be thoroughly rehabilitated. An EMP will be supplied as a condition on permit and will detail the specific land management strategies in response to the particular characteristics of the land.
Whether the site is suitable for the use or development and whether the proposal is compatible with adjoining and nearby land uses.	The site has an identified wind resource and otherwise meets the criteria for a wind farm and there are no significant environmental constraints to development of the land for this purpose. The predominant land use is agricultural and as such will not be impacted upon by the proposed land use, both on and off site. Significant buffers are proposed to reduce amenity impacts to nearby residences. The key economic and social benefits of the proposal include; - A capital investment of $484 million - Up to 240 construction jobs; - Up to 25 permanent jobs; - Increase in demand for goods and services such as accommodation, food and entertainment especially during the construction period.

	These are discussed further in **Chapter 6.**
Whether the use or development will support and enhance agricultural production.	Agricultural production will not be affected by the proposal as the footprint of the development is negligible. A second income stream for land owners will facilitate increased viability of the land for additional agricultural purposes and enterprises.
Whether the use or development will permanently remove land from agricultural production.	The land taken by the wind farm infrastructure is negligible and the operation of the wind farm is fully compatible with agriculture.
The potential for the use or development to limit the operation and expansion of adjoining and nearby agricultural uses.	Neighbouring agricultural land uses will not be affected by the proposal as a wind farm is fully compatible with all forms of agriculture.
The capacity of the site to sustain the agricultural use.	As cleared predominantly grazing land, the use is able to be accommodated without significant vegetation removal. The site does not have any significant constraints that prevent the use of the land for a wind energy facility. The existing agricultural use will be unaffected.
The agricultural qualities of the land, such as soil quality, access to water and access to rural infrastructure.	The proposal will not affect soil quality, access to water and rural infrastructure. Some road upgrades will be required to support the development which will be undertaken at the cost of the developer, but will benefit the wider community.
Any integrated land management plan prepared for the site.	An EMP will be supplied as a condition on permit and will detail the specific land management strategies in response to the particular characteristics of the land.
The impact of the proposal on the natural physical features and resources of the area, in particular on soil and water quality.	The site is located a significant distance from watercourses and will incorporate land management practises to preserve soil and water quality. An EMP will be prepared as a condition on permit and will detail the specific strategies to ensure the preservation of soil and land quality at the site. Any soil disturbance as a result of turbine erection and access track construction will be rehabilitated. This is further discussed in **Chapter 16** of this report.
The impact of the use or development on the flora and fauna on the site and its surrounds.	A Flora and Fauna assessment has been provided by Brett Lane and Associates and can be found at **Appendix 4.** A summary of this report is found in **Chapter 9.** The report concludes;

	Potential flora and fauna issues do not represent significant constraints to the future development of the wind farm. Native vegetation removal is restricted to 0.11 habitat hectares as a worse case scenario.
The need to protect and enhance the biodiversity of the area, including the retention of vegetation and faunal habitat and the need to revegetate land including riparian buffers along waterways, gullies, ridgelines, property boundaries and saline discharge and recharge area.	The vast majority of flora will be protected through the location of turbines and access tracks away from important stands of vegetation, both native and exotic. The proposed screen planting will consist of native species and will therefore create further habitat opportunities. The flora and fauna study concluded that; *Potential flora and fauna issues do not represent significant constraints to the future development of the wind farm.* In relation to threatened fauna the report found; *The majority of these threatened species are unlikely to occur in the study area due to a lack of suitable habitat or to habitat not being extensive enough to support a significant population.* Offset planting required through the application of the net gain framework will also increase habitat and lead to significant revegetation.
The need to locate buildings in one area to avoid any adverse impacts on surrounding agricultural uses and to minimise the loss of productive agricultural land.	The infrastructure (towers) are dispersed for efficiency reasons, however have a very small development footprint. Other infrastructure (substation) is minimal and is not envisaged to significantly interrupt the use of the land for agricultural purposes. As the proposed wind farm will have a negligible impact on agriculture, it is not considered that grouping infrastructure into one area is of any benefit.
The impact of the siting, design, height, bulk, colours and materials to be used, on the natural environment, major roads, vistas and water features and the measures to be undertaken to minimise any adverse impacts.	A visual assessment has been provided by Urbis and can be found at **Appendix 5.** The report concludes that; *As indicated by the research of other case studies of community perception, acceptance to the wind farm will vary widely depending on the viewer's preferences and biases. The residents and users of the landscape surrounding the site will reflect a range of sensitivities.* *The degree to which the changes to the landscape are perceived negatively will in the end depend on the actual users / residents.*

	Users of major roads such as the Hamilton Highway, particularly tourists, may perceive it as a feature. Whilst the turbines will have an impact on the landscape, screen planting has been proposed to mitigate adverse impacts from nearby houses. It is not considered that this landscape impact is unacceptable as the landscape has not been recognised as having significant values. The substation and control building are not located in sensitive areas and will be screened by new native vegetation plantings.
The impact on the character and appearance of the area or features of architectural, historic or scientific significance or of natural scenic beauty or importance.	The site does not contain any areas of architectural, historical or scientific significance or areas of significant natural beauty.
The location and design of existing and proposed infrastructure including roads, gas, water, drainage, telecommunications and sewerage facilities.	Infrastructure will be improved by the proposed development due to road upgrades required for haulage of turbine infrastructure. Other infrastructure will not be affected.
Whether the use and development will require traffic management measures.	A Traffic Impact Assessment (TIA) has been provided by Aecom can be found **at Appendix 3.** This assessment details the road upgrades required to support the wind energy facility. The traffic impact assessment concluded that; *Whilst there will be some impact to local roads, current volumes are presently very low in all cases and will be upgraded where relevant to support the proposal.*

A small part of the site area (Hamilton Highway) is zoned Road Zone Category 1. To adequately connect the turbines on both sides of the highway, two underground cable crossings of this road are required, as shown in **Figure 10 – Access and Infrastructure Plan.** Consultation has occurred with VicRoads, as manager of this road, to discuss the detailed requirements of these underground crossings. There are no other components of the wind farm proposed within this zone.

There is also a small part of the subject site within the Township Zone within the locality of Berrybank, as lots within this area are owed by the same owners as the larger adjacent rural/farming lot. A Wind Energy Facility is a section 2 use in this zone. No infrastructure of any kind is proposed within this zone.

5.4 Overlays

A Vegetation Protection Overlay (VPO2) pursuant to the Golden Plains Planning Scheme applies to the roadsides along Urches Road and Wilgul-Werneth Road.

The site is also affected by a Vegetation Protection Overlay (VPO2) pursuant to the Corangamite Planning Schemes which applies to Berrybank-Wallinduc Road, Hamilton Highway (north side) and Berrybank-Werneth Road.

Refer to **Figure 13 – Overlays** and **Figure 14 – Environmental Significance Overlay.**

The objectives of this clause are;

- *To implement the State Planning Policy Framework and the Local Planning Policy Framework, including the Municipal Strategic Statement and local planning policies.*
- *To protect areas of significant vegetation.*
- *To ensure that development minimises loss of vegetation.*
- *To preserve existing trees and other vegetation.*
- *To recognise vegetation protection areas as locations of special significance, natural beauty, interest and importance.*
- *To maintain and enhance habitat and habitat corridors for indigenous fauna.*
- *To encourage the regeneration of native vegetation.*

A permit is needed under this overlay to remove vegetation.

As the wind farm has been designed to avoid vegetation removal, only one area of vegetation removal is proposed in areas affected by the overlay. This occurs along Berrybank – Werneth Road to provide access from one side of the site to the other.

The mapping informing the VPO is not considered to be as current as that undertaken for this application by Brett Lane and Associates in 2007 and 2008. As a result, there are some areas covered by the VPO that are not considered to represent native vegetation as defined by the current study. An example of this exists along Berrybank – Werneth Road where the VPO extends the entire length of the road whereas the current study identified the native vegetation ceasing about 3km south of the intersection with Boundary Road. This point was chosen as the best location for the road crossing even through it is covered by a VPO.

An Environmental Significance Overlay affects areas around the site, but not any area within the subject site.

5.5 Particular Provisions

5.5.1 Clause 52.05 – Advertising Signs

As discussed in **Chapter 5**, two small business identification signs are proposed as part of the project (1.5m x 1m). This type of sign requires a planning permit in this zone, and must not exceed 3sqm. Under the planning scheme a business identification sign is;

- *A sign that provides business identification information about a business or industry on the land where it is displayed. The information may include the name of the business or building, the street number of the business premises, the nature of the business, a business logo or other business identification information.*

The purpose of Clause 52.05 is;

- *To regulate the display of signs and associated structures.*

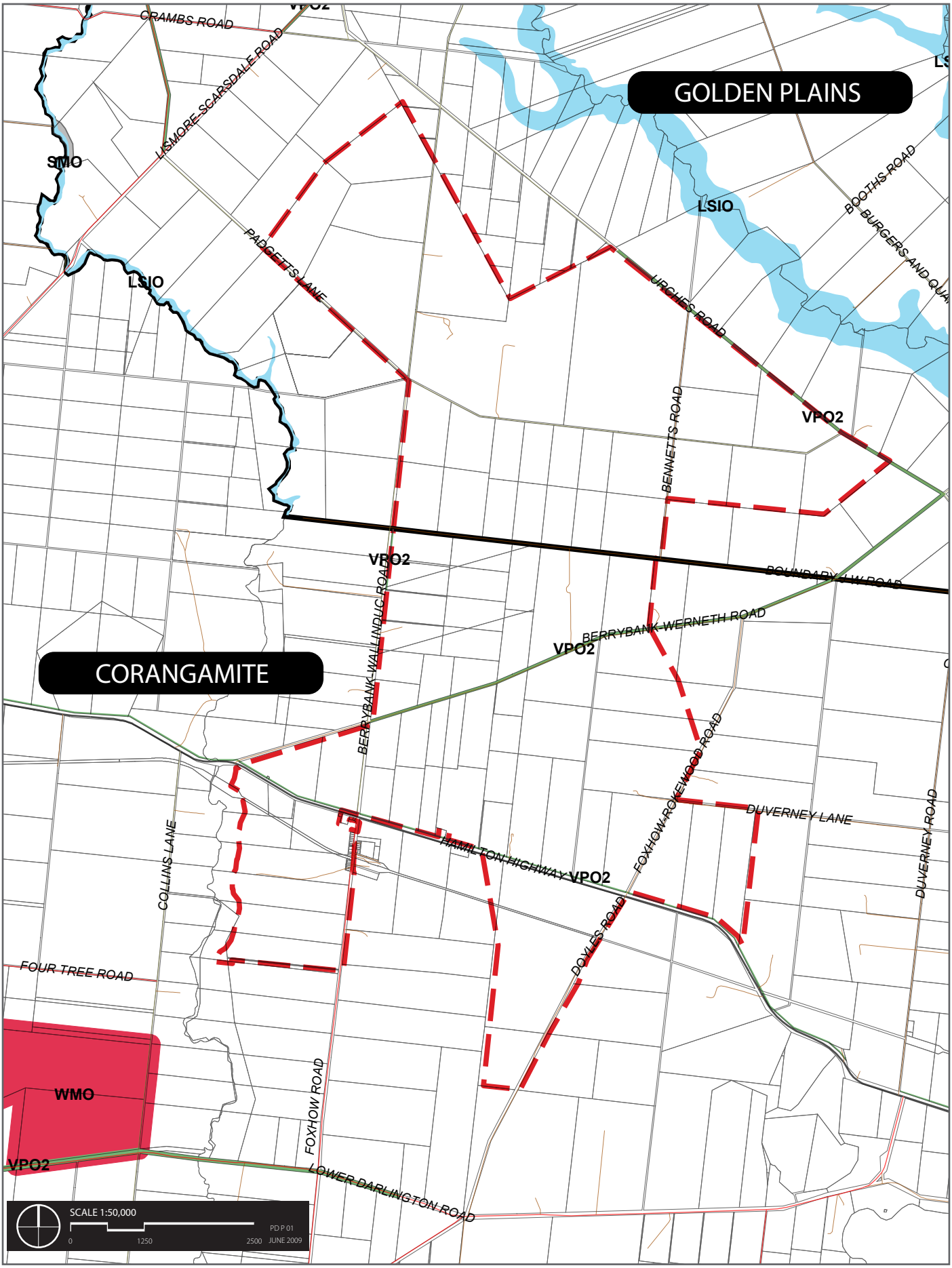


Figure 13 – Overlay Plan

Source: Tract Consultants

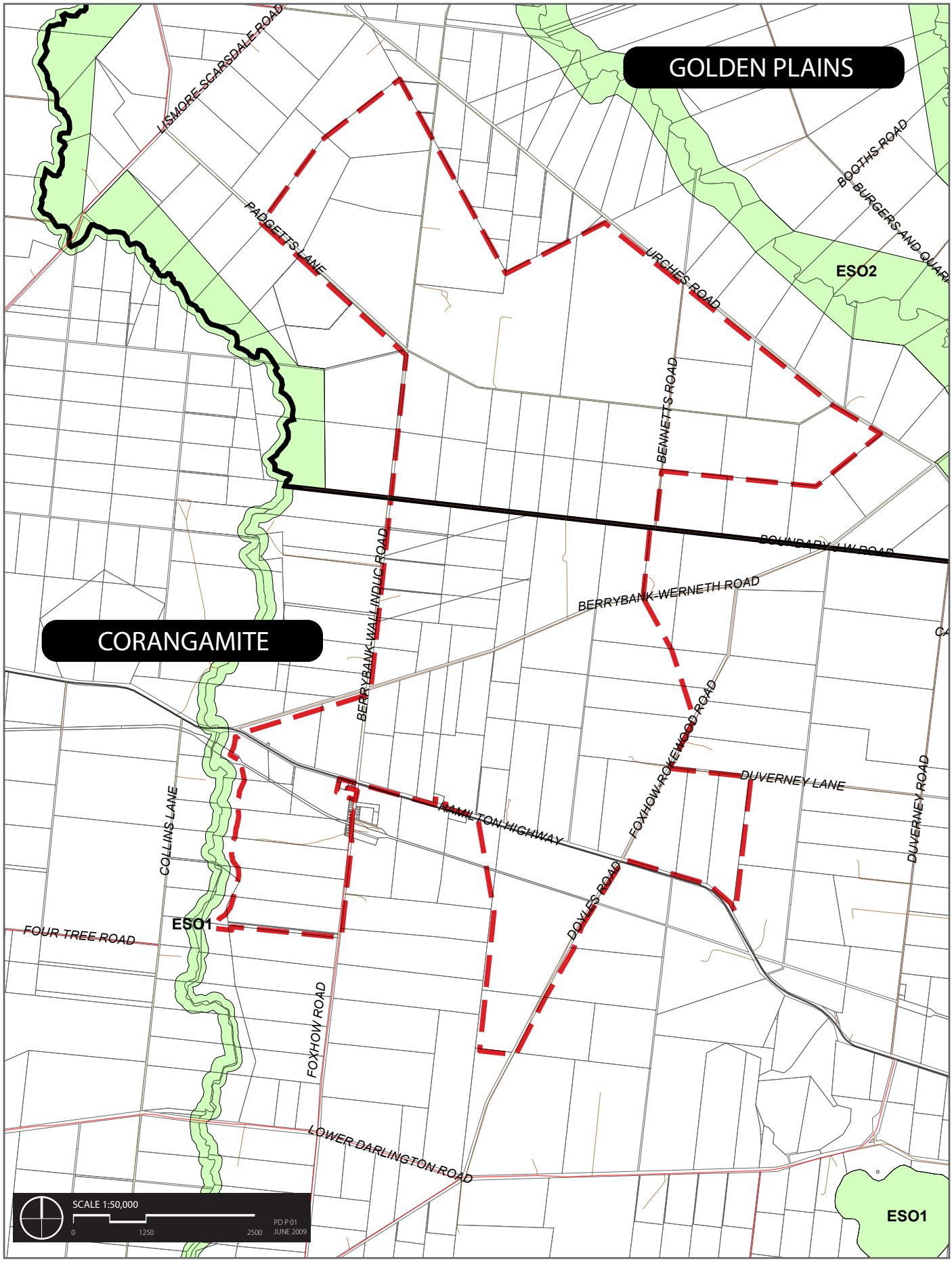


Figure 14 – Environmental Significance Overlay

Source: Tract Consultants

– *To provide for signs that are compatible with the amenity and visual appearance of an area, including the existing or desired future character.*

– *To ensure signs do not contribute to excessive visual clutter or visual disorder.*

– *To ensure that signs do not cause loss of amenity or adversely affect the natural or built environment or the safety, appearance or efficiency of a road.*

The visually unobtrusive nature of the signs will not detract from the amenity of the area. The signage would be small, unlit and simple in appearance and therefore would not affect the safe use of the Hamilton Highway. Refer to **Figure 10 – Access and Infrastructure Plan** for signage location.

5.5.2 Clause 52.10 – Uses with adverse amenity potential

The purpose of the clause is;

– *To define those types of industries and warehouses which if not appropriately designed and located may cause offence or unacceptable risk to the neighbourhood.*

The uses outlined within the clause include a temporary concrete batching plant which is proposed as part of the development during the construction phase. Following construction, the plant would be decommissioned and the land rehabilitated to its former agricultural use. The clause outlines a distance of 300m for a concrete batching plant to the nearest sensitive use.

The proposed location for the temporary batching plant (refer **Figure 10 – Access and Infrastructure Plan**) is well in excess of 300m to the nearest dwelling.

5.5.3 Clause 52.17 – Native Vegetation

The purpose of Clause 52.17 is;

– *To protect and conserve native vegetation to reduce the impact of land and water degradation and provide habitat for plants and animals.*

The objectives are outlined as follows;

– *To avoid the removal of native vegetation.*

– *If the removal of native vegetation cannot be avoided, to minimise the removal of native vegetation through appropriate planning and design.*

– *To appropriately offset the loss of native vegetation.*

– *To provide for the management and removal of native vegetation in accordance with a property vegetation plan.*

– *To manage vegetation near buildings to reduce the threat to life and property from wildfire.*

Under Clause 52.17, a permit is required to remove, destroy or lop native vegetation, including dead native vegetation.

This does not apply:

– *If the table to Clause 52.17-6 specifically states that a permit is not required.*

– *To the removal, destruction or lopping of native vegetation specified in the schedule to this clause.*

– *To an area specified in the schedule to this clause.*

– *As no exemption applies in this case a permit is required to remove the minimum amount of native vegetation required to facilitate the development.*

In siting turbines, access points and other essential infrastructure the principles of avoid, minimise and offset have been employed. A Flora and Fauna assessment has

been undertaken by Brett Lane and Associates and has outlined the quality of native vegetation at the site (refer to **Appendix 4).**

The location of turbines, access tracks and associated infrastructure has been designed to avoid areas of native vegetation. Some minor native vegetation removal is proposed and is unavoidable to allow road access to certain turbines and possibly to connect the turbines to the transmission network. Refer to **Figure 6 – Vegetation Plan** for information on areas of vegetation to be removed.

The flora and fauna report concluded that *'potential flora and fauna issues do not represent significant constraints to the future development of the wind farm'*.

Based on the field investigations and desktop reviews the flora and fauna report found that because the study area is almost entirely cleared and cropping and grazing is the predominant agricultural activity *'the likelihood of threatened flora or fauna species occurring in the study area is considered to be low'.*

The area of vegetation proposed to be removed totals 0.11Hectares and may potentially include the following threatened species;

- *Button Wrinklewort*
- *Clover Glycine*
- *Fragrant Leek-orchid*
- *Hairy Tails*
- *Large-fruit Fireweed*
- *Small Milkwort*
- *Spiny Rice-flower*
- *Trailing Hop-bush*
- *White Sunray*

It is noted that the actual loss of native vegetation is likely to be less than outlined subject to detail design of access points and other infrastructure. The flora and fauna assessment has been undertaken on the 6 substation and overhead powerline options when in reality only 1 will be required.

Prior to construction and once greater detail is know on the access tracks and substation location, detailed surveys will be undertaken to reveal the specific locations of significant species which will be avoided if possible. Appropriate offsets for the removal of native vegetation will be made in accordance with Victoria's Net Gain Framework. The actual offsets will be calculated during detailed design.

5.5.4 Clause 52.29 – Land adjacent to a Road Zone, Category 1, or a Public Acquisition Overlay for a Category 1 Road.

As no direct access is required to a category 1 road zone or public acquisition overlay for a category 1 road, this clause is not relevant to this application.

5.5.5 Clause 52.32 – Wind Energy Facility

The purpose of this clause is;

- *To facilitate the establishment and expansion of wind energy facilities, in appropriate locations, with minimal impact on the amenity of the area.*

The proposed development of a wind energy facility comprising 100 turbines and other associated infrastructure directly and specifically supports this clause as it proposes an increase in wind energy resources contributing to the renewable energy target and decreasing reliance on fossil fuels.

In assessing the location of the proposed development the proponent has had regard to the following location factors;

- Distance from coastline
- Low population density and considerable buffers to residential communities;
- Willing land owners;
- Large land holdings;
- Proximity to existing electricity grid;
- Appropriate terrain and land capability;
- Excellent wind resource;
- Location of available infrastructure.

Numerous assessments have been undertaken to ensure sound mitigation of any impacts arising out of the proposal. Summaries of these reports are contained in the following sections and full reports are found in appendices.

These include the following impacts;

- Economic and Social
- Visual
- Noise
- Flora and Fauna
- Aviation
- Transport
- Telecommunications
- Fire
- Shadow Flicker
- Heritage
- Geotechnical
- Cumulative Effects

The relevant decision guidelines for a wind energy facility and responses are set out below in table form;

Table 7 – Decision Guidelines and Response – Wind Energy Facility

Decision Guideline	Response
The views of the Sustainable Energy Association of Victoria about the contribution of the proposal to reducing greenhouse gas emissions.	Consultation has occurred with Sustainability Victoria, the successor to the Sustainable Energy Association of Victoria. The proposal represents a significant contribution to greenhouse gas reduction. Using the coefficients supplied by Sustainability Victoria, the proposal at capacity represents; ▪ 700,000 MWh of electricity; ▪ 911,000 of GHG displaced; ▪ 171,000 households energy use;

	▪ 444,000 people's energy use; ▪ 210,000 cars off the road; or, ▪ 136,000 trees being planted. The proposal is fully consistent with the charter of Sustainability Victoria in that it reduces the reliance on fossil fuels for energy production.
The effect of the proposal on the surrounding area in terms of noise, blade glint, shadow flicker and electromagnetic interference.	The effect of the proposal on noise is discussed at **Chapter 8**. The report undertaken to assess this potential impact of the development concluded that; *Using Vestas V90 wind turbines, all non-assessed sites further from the wind farm are predicted experience worst-case noise levels lower than 35dBA, and therefore comply with the NZS6808:1998 lowest possible limit of 40dBA by at least 5dBA.* *NZS6808:1998 24 hour and night-time noise limits are likely to be achieved using the remaining five (5) selected wind turbine models at all properties in the vicinity of the Berrybank Wind Farm if an appropriate noise management plan is implemented.* The effect of the proposal on shadow flicker is discussed at **Chapter 14**. The report undertaken to assess this potential impact of the development concluded that; *Whilst no offsite dwellings are likely to experience shadow flicker six on-site dwellings may, with three of these potentially experiencing greater than 30 hours (Victorian Wind Energy Guideline Standard).* *Of these three only one is habitable and the results of the analysis indicate that this is the least affected of the three.* The report found in relation to this dwelling (66) that; *"has an estimated shadow flicker duration of 38 hours per annum. This result is still likely to be conservative as cloud cover, reduced turbine dimensions, and the screening effect of vegetation have not been considered. If appropriate vegetation is planted to screen these turbines it is likely that less than 30 hours of shadow flicker per annum will be experienced"* The effect of the proposal on electromagnetic interference is discussed at **Chapter 12 – Telecommunications.** The report undertaken to assess this potential

	impact of the development concluded that; *It is not expected that stations at this distance from the site will be servicing customers in the vicinity of the site, and therefore inference to these signals is unlikely to be an issue.* *As analogue television is scheduled to be phased out during 2011 (the approximate timing of construction of the project if approved) interruption to television reception is extremely unlikely.*
The impact of the development on significant views, including visual corridors and sightlines.	The visual impacts of the proposal are discussed at **Chapter 7.** The report undertaken to assess this aspect of the development concluded that; *As indicated by the research of other case studies of community perception, acceptance to the wind farm will vary widely depending on the viewer's preferences and biases. The residents and users of the landscape surrounding the site will reflect a range of sensitivities.* *The degree to which the changes to the landscape are perceived negatively will in the end depend on the actual users / residents. Users of major roads such as the Hamilton Highway, particularly tourists, may perceive it as a feature.* In terms of the overall visual impact of the wind farm the report found that; *The project, as proposed, will change the landscape of the setting at the local, sub regional and, to a lesser extent, the regional level.* *As mentioned in the assessment process previously, the landscape character of the setting is already highly modified by past activities.* *Many of the homesteads in the area have a dense band of vegetation surrounding an intimate and secluded home yard. The effect of this, in a number of cases, has been to effectively contain the view shed from the house and surrounding yard itself, blocking more distant views.*
The impact of the facility on the natural environment and natural systems.	The proposed development is not expected to have any significant impacts on the natural environment or natural systems. The flora and fauna impacts of the proposal are discussed at **Chapter 9.** The report undertaken to assess this aspect of

	the development concluded that; *The study area is almost entirely cleared of native vegetation and the land use is agricultural, including cropping and grazing. As a result the likelihood of threatened flora or fauna species occurring in the study area is considered to be low.* And; *Potential flora and fauna issues do not represent significant constraints to the future development of the wind farm.*
The impact of the facility on cultural heritage.	The cultural heritage impacts of the proposal are discussed at **Chapter 15.** The report undertaken to assess this aspect of the development concluded that; *The report found that small (n <10) scatters of stone artefacts are the most probable cultural remains within the activity area, and but these provide little scientific information and require minimal management.* *None of the activity area is considered high archaeological potential.*
The views of the Civil Aviation Safety Authority if within a 30 kilometre radius of an airfield.	Consultation has occurred with CASA on behalf of UFWA by the Ambidji Group. The closest registered airfield is at Ballarat located approximately 50km north-east of the proposed development.
The Policy and Planning Guidelines for Development of Wind Energy Facilities in Victoria, 2003.	Refer to **Section 1.4** which outlines in table form where the required response is contained in this report.

UNION FENOSA WIND AUSTRALIA

Berrybank Wind Farm
Chapter 6:

ECONOMIC AND SOCIAL IMPACTS

6 Economic and Social Impacts

6.1 Introduction

Coffey Natural Systems has been engaged by Union Fenosa Wind Australia to conduct a socio-economic characterisation of the proposed wind farm development at Berrybank, Victoria. The potential impacts and benefits are summarised within this chapter. The full report prepared by Coffey Natural Systems is found at **Appendix 6.**

This socio-economic characterisation was prepared on the basis of a desktop review of available information sources, review of the community consultation program and outcomes and dialogue with project managers and consultants. The key objectives of the socio-economic characterisation are to:

- Establish a demographic and economic profile of Berrybank and the Shires of Corangamite and Golden Plains.
- Describe the scope of local and regional employment and economic impacts and opportunities.
- Identify relevant social policy objectives of the two Shires and broader region and identify how the proposed development complements these policy objectives.
- Review community consultation activities undertaken by the project proponent, assess community feedback and provide a qualitative assessment of social issues arising from consultation in the Berrybank region.

6.2 Economic impacts

Economic impacts as a consequence of the proposed wind farm may arise from three phases during the life cycle of the development:

- Planning and construction related impacts.
- Operational impacts.
- Decommissioning impacts.

In simple terms, the proposed Berrybank wind farm development is likely to stimulate the economy in the Corangamite and Golden Plains Shires as a result of greater income generation and subsequent expenditure in the region. The proposed wind farm development has the potential to deliver direct and indirect benefits for host communities and the local and regional economies.

6.3 Direct Impacts

Employment

It is estimated that up to 240 full time equivalents will be employed at the peak of construction during the 12 to 14 month construction period, expected to commence in the fourth quarter 2010, subject to planning approval. Ongoing operation and maintenance of the wind farm and substation will require up to 25 full time, permanent staff for the lifespan of the project. Employment growth is also likely to be observed in the project's supply chain with opportunities for suppliers of goods and services to the development. The direct employment opportunities will depend on the extent to which labour is sourced locally, regionally or otherwise.

Capital Investment

The total capital investment estimated for the Berrybank wind farm development is $484 million. **Table 8 – Estimated total capital investment** provides a breakdown of total capital investment based on current estimates.

Table 8 – Estimated total capital investment

Estimated total capital investment	$484 million	
Overseas expenditure – turbines	60 – 65% of capital investment	$290 million - $315 million
Australian expenditure	35 – 40% of capital investment	$170 million - $194 million
Towers – Victoria or South Australia	10% of capital investment	$48 million
Construction activities	25 – 30% of capital investment	$121 million - $145 million

Table 9 - Estimated Expenditure on Construction Activities in South-Western Victoria sets out a range of scenarios based on the proportion of construction related expenditure in the region of South-Western Victoria. Given the uncertainty in the distribution of capital, these scenarios are provided for indicative purposes and do not constitute detailed economic modelling.

Table 9 - Estimated Expenditure on Construction Activities in South-Western Victoria

Estimated expenditure on construction activities	25 – 30% of capital investment	$121 million - $145 million
Scenario A	25% of construction expenditure in region	$30.25 million – $36.25 million
Scenario B	33.33% of construction expenditure in region	$40 million - $48 million
Scenario C	50% of construction expenditure in region	$60.5 million - $72.5 million

The three scenarios provide a range of $30.25 million - $72.5 million for construction related expenditure in South-Western Victoria.

Land Use and Revenue

Additional income provided to landowners from the leases to the wind farm may slightly raise the average household income in the area by providing a new source of revenue for farmers. The additional income source helps to diversify the economic base of the local economy of the region and will enable it to better withstand agricultural commodity price declines, droughts and other negative shocks to the agricultural sector.

Contribution to Shire Councils

Based on current estimates for the total number of turbines and the generating capacity of the turbines, Union Fenosa Wind Australia will contribute in the range of $202,000 to $265,000 per year through increased revenue, pursuant to the *Electricity Industry Act* (s94). This estimated amount would be proportionately split between Corangamite and Golden Plains Shire having regard for the number of turbines and generating capacity. Over the life of the project, the financial contribution as a result of the project will be significant and will assist the Shire Councils in funding local services and infrastructure.

6.4 Indirect Impacts

The proposed Berrybank wind farm is likely to provide noticeable boosts to the local economy through various income and expenditure effects. Personnel employed during the construction phase may contribute to the local economy via expenditure of some proportion of their salaries on goods and services. The extent of this impact and the amount of money invested in the local economy is dependent on where the construction workforce is located.

In projects where the construction workforce is housed within a purpose-built camp and personnel travel to and from the region on a roster system, the economic benefits to the region can be hardly noticeable (disposable income tends to be spent where personnel travel to the camp from – often outside the region). Where a workforce is more integrated into the region, disposable income can provide a short-term positive impact on local businesses.

The Great South Coast, which contains the Corangamite Shire, applies a multiplier of 1.9 to new investment dollars spent in the region to obtain an estimate of indirect economic benefits (GSC, 2008).

Three scenarios were described earlier based on the proportion of construction related regional expenditure. Those scenarios resulted in a range of $30.25 million – $72.5 million, representing the estimated construction related expenditure in South-Western Victoria. Applying the regional economic multiplier of 1.9 to these scenarios provides an estimated economic benefit for the region in the range of $57.5 million – $138 million.

Indirect Employment Opportunities

Indirect employment opportunities are likely to be generated within the Corangamite and Golden Plains Shires and the surrounding region as a result of the proposed Berrybank wind farm development.

Employment multipliers used for similar developments are commonly applied at approximately two indirect jobs for each direct job created. Using this tool, it can be expected that the Berrybank wind farm development may create up to 50 indirect jobs during the operational life of the project.

Changes to land value

Impacts to the property market are primarily experienced during construction and commissioning of wind farms and once a wind farm is established, there appears to be little to no adverse impacts on land prices (Offor Sharp & Associates, 2003). Although the issue of land devaluation is frequently raised as an issue in relation to wind farm planning, there is a strong precedent in keeping this issue separate from planning decisions and approvals (URS, 2007).

Tourism impacts

Development of the proposed wind farm has the potential to affect the local tourism industry however it is difficult to predict the nature of impacts. Assessment of the influence of similar developments on tourism in regional areas has shown that both negative and positive impacts can occur.

Ultimately the economic impacts on the local tourism industry resulting from the wind farm development are likely to be minimal and the region's principal tourist attractions are unlikely to be negatively impacted.

Population impacts

The Berrybank wind farm is unlikely to have a significant impact on the local or regional population. Population increase through employment related migration to the project area may temporarily occur during the construction phase of the proposed wind farm, particularly if local resources cannot meet project labour demands and significant numbers of workers are sourced from areas outside the project area. Any change in

population will depend on where labour is sourced from and whether the workforce will commute from outside the region, or whether they will relocate to the project area and surrounding districts.

It should also be noted that any material increase in the population of Berrybank or surrounding districts, even if restricted to the 12 – 14 month construction period, may increase the demand on physical and social infrastructure and services.

Union Fenosa Wind Australia will work with the Shire Councils to discuss the impacts on facilities and services as the project progresses towards construction.

Increased demand for manufacturing and servicing capabilities

The proposed Berrybank wind farm development is one of many wind farm developments under consideration. The proposed Berrybank wind farm development will contribute to the need to increase manufacturing capacity in Australia for the fit out of wind farms during their whole life cycle (manufacturing of blades, towers, nacelles, turbines and ancillary equipment), creating a demand for new businesses and additional jobs in the repair and maintenance of wind farm equipment.

Community investment

Union Fenosa Wind Australia has expressed interest in supporting local community organisations in the Berrybank area. The activities of Union Fenosa are not limited to planning and development but extend to operating the wind farms with a view to becoming a long-term member of the community. With this in mind, Union Fenosa Wind Australia is exploring ways to contribute to the local community, beyond the benefits of short-term and long-term job creation.

Through their website and community newsletters, Union Fenosa Wind Australia has invited the local community to contribute ideas for how contributions to the local community can be made in a lasting and meaningful way (UFWA, 2008). In 2008, following representation from the local community, Union Fenosa Wind Australia made a $5,000 contribution to the Cressy Bowls Club to support bowling green upgrades. Union Fenosa Wind Australia is continuing to assess local investment projects in consultation with the local community.

Road Upgrades

The construction of approximately 100 wind turbines on agricultural land will require the mobilisation of heavy vehicles in the Berrybank region to deliver plant to the development sites. To support the construction of the proposed Berrybank wind farm, a number of key roads in the Berrybank region will be upgraded.

6.5 Social and policy objectives

It is important to have an appreciation for the social and policy context in which the Berrybank wind farm is being proposed. The relevant policy frameworks are established by the Shires of Corangamite and Golden Plains and the G21 Geelong Regional Alliance. Each of these bodies has established a broad policy framework under which objectives and activities are set to drive the social policy directions set by local and state government.

The proposed Berrybank wind farm development supports and reflects a number of state and local social and policy objectives. Of particular relevance to the proposed Berrybank wind farm development are policies centred on employment and economic development, environmental management, tourism and agriculture. A discussion of these can be found in the full report found at **Appendix 6.**

6.6 Identification of Potential Social Issues

The report identifies several potential social issues arising out of the proposed development. The potential issues have been identified through an analysis of the community responses during the consultation program, a literature review of similar

renewable energy projects and discussions with project managers and representatives of the Corangamite Shire Council.

The key issues include;

- Local employment opportunities including recommendations to;
  - > Develop an 'employ locally' policy by UFWA.
  - > Provide to the Corangamite and Golden Plains Council a detailed inventory of employment requirements during construction and operations.
- Local business opportunities including recommendations to;
  - > Develop a 'buy locally' policy by UFWA.
  - > Establish a collaborative approach involving Union Fenosa Wind Australia, Shire Councils, regional development boards and relevant chambers of commerce to implement local business assistance programs.
- Social cohesion including recommendations to;
  - > Develop a formal approach to community investment programs and partnerships which provide sustainable benefits to the community of Berrybank and surrounding districts.
  - > Establish a transparent process to set annual funding priorities in consultation with an appointed community reference panel.

Analysis of the following potential social issues have been undertaken;

- Land values
- Noise and shadow flicker
- Visual impacts
- Land Use
- Fauna impacts
- Bushfire hazards and fire management
- Construction workforce accommodation requirements
- Cumulative impacts

These issues and are further discussed at length in the full report found at **Appendix 6.**

6.7 Recommendations for future activities

The socio economic report makes several recommendations arising from the study. These recommendations are summarised below:

- Implement a coordinated and transparent communication and engagement strategy throughout the planning process and during construction and operation to assist in ensuring there is informed decision making and that wind farm advocates are created within the community. The strategy would explain the project milestones, activities, benefits, impacts, land and road access disruption and impact mitigation strategies.
- Formalise, maintain and promote a consultation register, grievance mechanism and issue / resolution tracking mechanism that ensures issues and grievances are recorded, followed up and reported back to the complainant with an explanation of how the matter has been closed out. This formal process would build on the email and telephone inquiry lines utilised by Union Fenosa Wind Australia. As part of the communication and engagement campaign, it will be critical to ensure that the process for lodging grievances is known to the community.

- Union Fenosa Wind Australia should establish an 'employ locally' policy for preferentially sourcing labour from the local community and region wherever practicable based on skills, experience and reasonable provision of training. The policy should be developed with some urgency, clearly articulating the first, second, third and subsequent priority areas for employment. It is recommended that the policy be developed in consultation with the local community and be promoted (for example, on the project website) once it has been signed-off.
- It is recommended that tender documents and contractual obligations on the construction contractor/s incorporate the 'employ locally' policy position.
- Union Fenosa Wind Australia and/or contractor(s) provide to the Corangamite and Golden Plains Council a detailed inventory of employment requirements during construction and operations. This information should also be made publicly available to enable interested local persons time to prepare and possibly even upskill in the event they are keen to pursue employment with the development.
- Union Fenosa Wind Australia should also consider the completion of a detailed skills and employment audit within the region to determine the availability of potential future employees.
- Union Fenosa Wind Australia should establish a 'buy locally' policy for preferentially sourcing goods and services locally wherever practicable, based on local capacity, ability to supply, quality and cost competitiveness. The policy should be developed with some urgency, clearly articulating the first, second, third and subsequent priority areas for project procurement requirements that have some likelihood of being sourced from nearby the project location. It is recommended that the policy be developed in consultation with the local community and be promoted (for example, on the project website) once it has been signed-off.
- It is recommended that tender documents and contractual obligations on the construction contractor/s incorporate the 'buy locally' policy position.
- It is recommended that Union Fenosa Wind Australia provide to the Corangamite and Golden Plains Council, and make publicly available, a detailed inventory of construction activities, labour requirements, services, materials and other procurement requirements associated with the project.
- Union Fenosa Wind Australia should consider a collaborative approach involving Shire Councils, regional development boards and relevant chambers of commerce to implement local business assistance programs.
- Develop a formal approach to community investment programs and partnerships which provide sustainable benefits to the community of Berrybank and surrounding districts. A transparent process should be established to set annual funding priorities in consultation with an appointed community reference panel.
- Establish a code of conduct for construction contractor staff through the construction contracts in consultation with the construction contractor/s.
- Consider the erection of appropriately placed road-side signs in the areas bordering the wind farm in consultation with the Shire Councils to emphasise the benefits of renewable energy and the positive environmental impacts associated with wind farms.
- Consider options for a establishing a presence at an existing visitor information centre and conducting wind farm tours to effectively communicate the benefits and merits of wind farm developments.
- Establish and maintain dialogue with the Lismore Group Country Fire Authority and local CFA officers in Berrybank to determine how CFA requirements and fire management plans can be considered in project design and execution.

- Identify opportunities to support appropriate training and/or equipment purchase to assist in up skilling volunteer fire fighters to fight fires in an altered rural landscape with wind turbines.
- Establish policies and management systems to incorporate bush fire risk minimisation strategies and to establish how fire bans will be considered in the scheduling and conduct or construction activities in consultation with the CFA and the construction contractor/s.
- Establish a dialogue with the Shire Councils to consider the potential impacts on social and physical infrastructure and services as a result of population changes within the region associated with the construction and operation of the proposed wind farm development.
- Commission a specific study in collaboration with the Council Shires to investigate possible impacts from a construction workforce requiring accommodation, and that the findings of this study inform the project's decisions on the preferred approach to accommodation.

UNION FENOSA WIND AUSTRALIA

Berrybank Wind Farm
Chapter 7:

VISUAL IMPACTS

7 Visual Impacts

7.1 Introduction

A report on the visual impacts of the development was undertaken by Urbis Pty Ltd. This report can be found at **Appendix 5.**

This report follows a preliminary landscape and visual assessment, including a summary of community perception studies, which was undertaken in late 2007 by ERM to inform a Notification Report submitted to the Minister for Planning for a determination on whether an EES was required.

The landscape and visual assessment analyses any potential impacts that may arise out of the development, in particular;

- *To identify any sensitive receivers that may be unacceptably impacted (according to relevant guidelines, policies, regulations and/or legislation) by visual amenity impacts from the operation of the proposed Berrybank Wind Farms.*
- *To address all Wind Farm visual impact related issues.*
- *To satisfy the requirements of relevant authorities.*

7.2 Methodology

The report outlines the following objectives for the visual impact assessment study;

- *define the viewshed of the development and define sensitive viewing locations;*
- *define the landscape character and quality of the setting;*
- *define community perceptions to wind farms that may influence the sensitivity level of viewers;*
- *describe the visual character of the main components of the development;*
- *assess the visual impacts of the development; and*
- *identify siting and layout measures that will minimise the adverse visual impacts of the development.*

Included in the study process are the following tasks:

- *A review of relevant policy, legislation, standards and guidelines regarding visual and landscape values and develop appropriate standards based on this review.*
- *A desktop review and site inspection to identify local scenic values, and photograph relevant viewpoints including major and local roads and residences.*
- *A review of public perceptions and attitudes towards Wind Farms.*
- *An assessment of the landscape's ability to absorb visual changes associated with the various stages of construction and operation of the project from all relevant viewpoints supported by visual simulations of the site pre-construction, during and post-construction and operation.*
- *Liaison with project planning and design engineers to optimise the arrangement and design of the Wind Farm and associated infrastructure to mitigate landscape and visual impacts.*
- *Analysis of the potential for cumulative impact.*
- *Identification of potential for mitigation measures.*
- *An assessment of the residual impacts of construction and operation of the project on landscape character and visual amenity for all relevant viewpoints.*

The methodology employs both a quantitative and qualitative approach to assessing the proposal;

- *Quantitative in that the report assesses the visibility of the proposal from particular viewpoints, and;*
- *Qualitative in that it;*
  - *addresses the contrast with the existing landscape character of the surrounding setting;*
  - *assesses the scenic quality of the landscape setting; and,*
  - *assesses the likely sensitivity of the viewers to the proposed development.*

The assessment uses the visual Management System (VMS) developed by the US Forestry Service whereby the visual impact of a proposed development is determined by evaluating the degree of visual modification / fit of the development in the context of the visual sensitivity of surrounding land use areas from which a proposed development may be visible.

7.3 Results

Significant Landscape Overlays are a tool available in the Victorian Planning Provisions for Councils to apply to selected areas of their municipality to highlight their landscape significance. They are typically applied to prominent hills, mountain ranges, coasts, and other areas noted for their landscape character.

Both Golden Plains and Corrangamite Shire make use of the SLO in their municipalities. The closest area covered by an SLO in Golden Plains is Mt Erip, about 25km the north east. The closest SLO in Corrangamite is Mt Widderin, about 30km to the north west. A SLO also exists in Colac Otway Shire on Warren Hill adjacent to Lake Corragamite, about 20km to the south east. The site is not subject to a SLO, nor is any land within 20km.

The report found that:

- *While no LSO's apply in the vicinity of the study area, the values protected by VPO's and ESO's can also provide a contribution to overall landscape character. In the case of the overlays present in the vicinity of the study area, the VPO's relate to small areas of vegetation which have a relatively minor influence on the overall landscape character of the setting.. The ESO's relate to the preservation of the environmental values of freshwater lakes. The lakes in the vicinity of the study area do not provide a significant recreation, scenic or tourist function that would result in a heightened level of visual sensitivity to the proposed development'.*

The report found that the landscape character of the site and surronds could be defined as outlined in **Table 2 - Landscape Units and Scenic Quality** (refer **Chapter 2**). It described the scenic quality of the site and surrounds as varying from low to moderate with the Agricultural / Pastoral Areas unit, as the most common landscape unit across the subject site, as having low scenic quality. It described this area as being characterised by 'extensive clearing and highly altered landscapes', and as a 'broad plain with minimal topographic variation'. It suggests that this area has moderate local cultural significance.

The report notes recent studies that have shown that the presence of wind farms in agricultural landscapes of lower scenic quality are often improved in the eye of the viewer as they add a degree of interest to an otherwise indistinctive landscape. The report states;

- *This finding should be considered when evaluating viewer sensitivity as it would have the effect of reducing the level of sensitivity.*

Please refer to **Figure 15- Visual Impacts of wind farms on scenic quality**

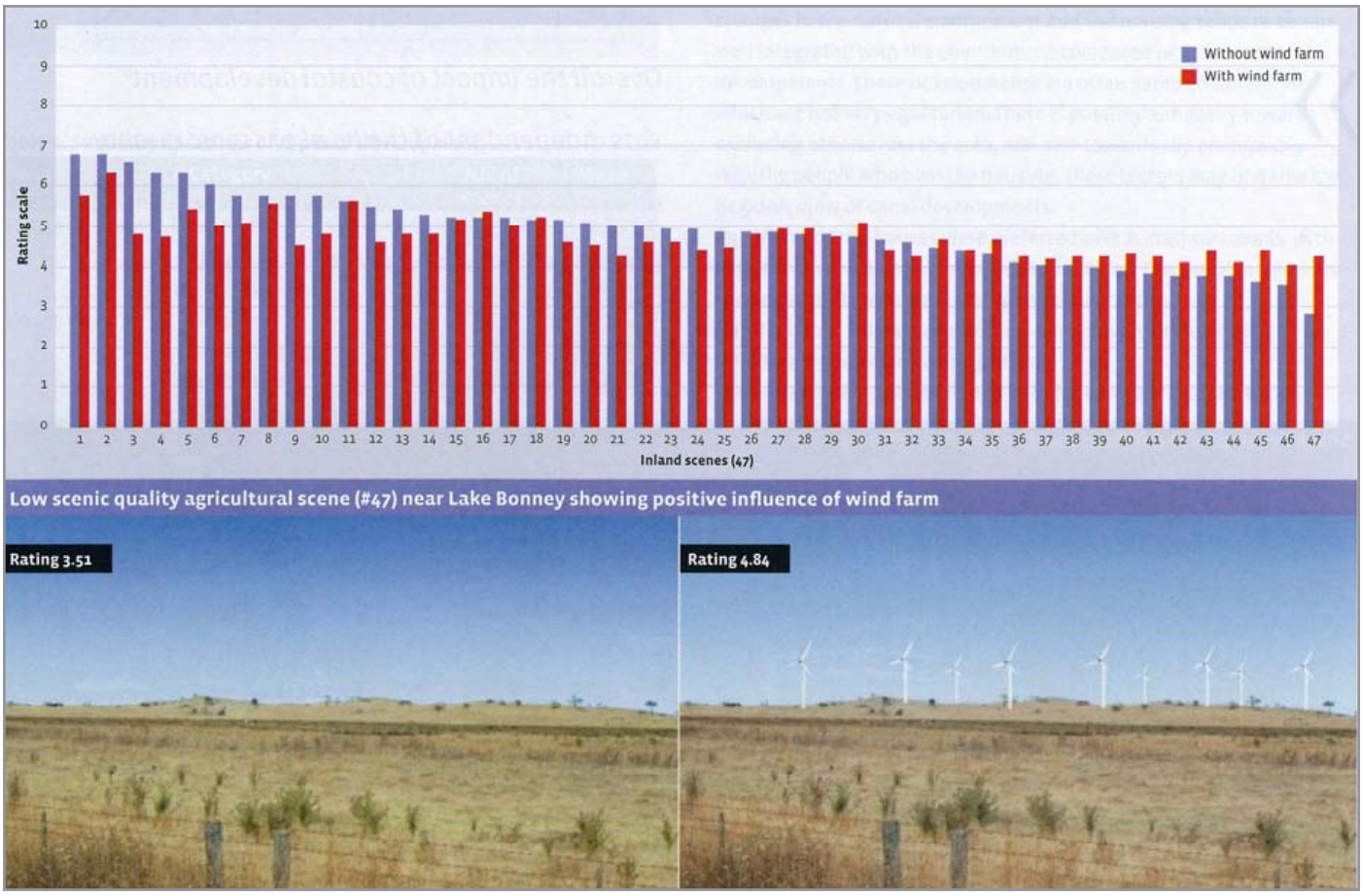


Figure 15 – Visual Impacts of wind farms on scenic quality

Source: Lothian - Australian Planner

The assessment also found that residents within an area have a higher affinity with the local landscape than do visitors to the area. Consultation undertaken for the Mt Bryan wind farm showed '*support for the development of a wind farm increases significantly once the location of the viewer from the wind farm site increases beyond 10km'*.

A 3D Digital Elevation Model was used to establish the Zone of Visual Influence (ZVI) which is the area from which views of a particular proposed development may be possible (refer to **Figure 16 – Turbine Visibility Zone).** The report reviewed the visual impact from twenty-three (23) viewpoints. The outcomes of the study are shown in the table below, **Table 10 – Potential Visual Prominence**

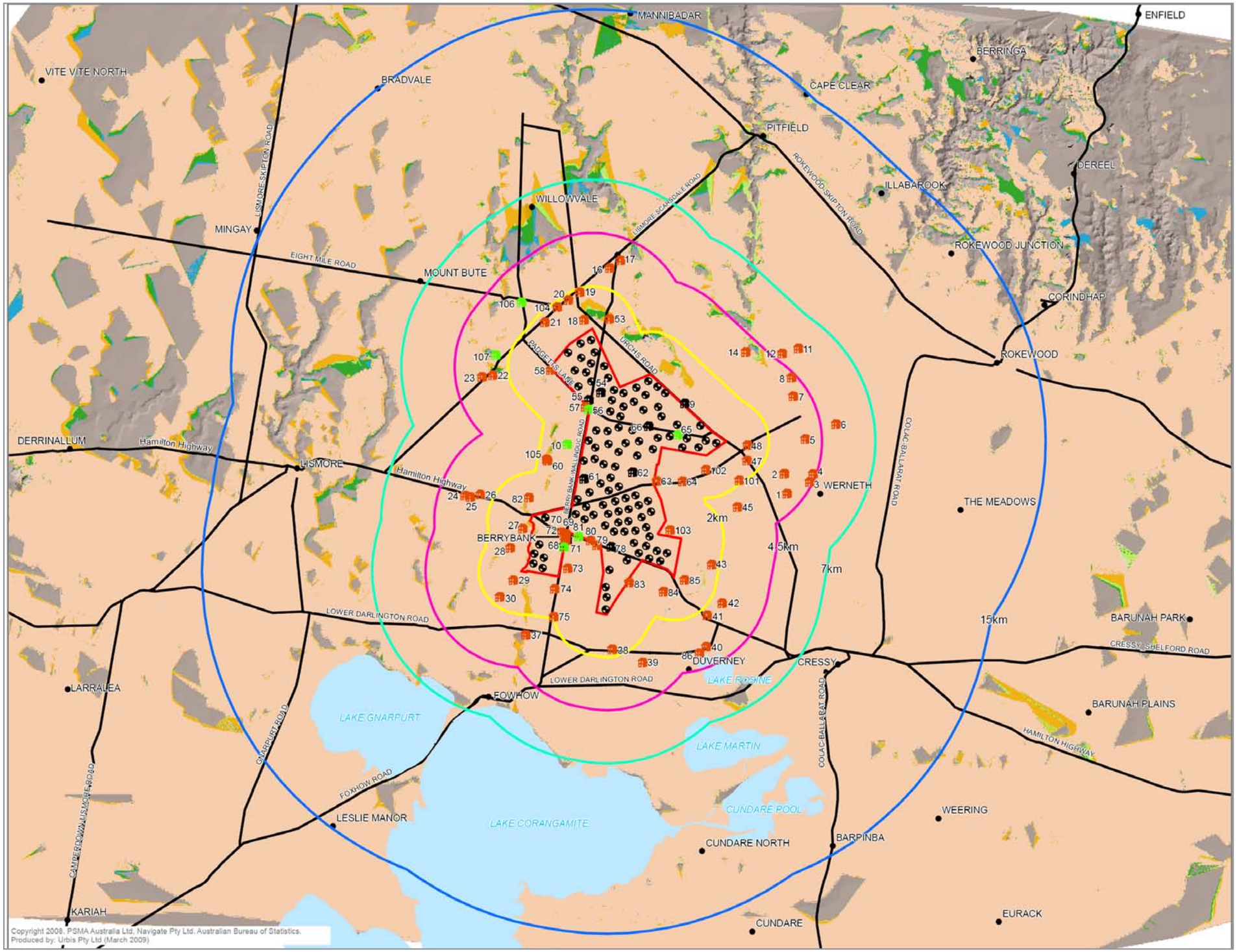
Viewpoint	**Viewshed**	**Horizontal Distance from Viewer - to closest turbline**	**Horizontal Angle**	**Horizontal Potential Visual Prominence**	**Vertical Angle**	**Vertical Potential Prominence**
Viewpoint 1 Rokewood	Regional	12.5km	30°	Potentially Noticeable	<1° Many views screened by vegetation.	Potentially Noticeable
Viewpoint 2 Lismore	Regional	9.5km	50°	Potentially Dominant	1° Many views screened by vegetation and topography.	Potentially Noticeable
Viewpoint 3 Cressy	Regional	8km	63°	Potentially Dominant	1° Many views screened by vegetation.	Potentially Noticeable
Viewpoint 4 Foxhow	Sub-Regional	6km	30°	Potentially Noticeable	2°	Potentially Noticeable
Viewpoint 5 Residence 8	Sub-Regional	4.6km	55°	Potentially Dominant	2°	Potentially Noticeable
Viewpoint 6 Residence 23	Sub-Regional	4km	90°	Potentially Dominant	2.5°	Potentially Noticeable
Viewpoint 7 Residence 17 (Church)	Sub-Regional	3.7km	50°	Potentially Dominant	2.5°	Potentially Noticeable
Viewpoint 8 Residence 26	Sub-Regional	3.4km	114°	Potentially Dominant	2.5°	Potentially Noticeable
Viewpoint 9 Residence 45	Sub-Regional	3.2km	115°	Potentially Dominant	2.5°	Potentially Noticeable
Viewpoint10 Residence 41	Sub-Regional	3.4km	88°	Potentially Dominant	2.5°	Potentially Noticeable

Viewpoint 11 Residence 20	Sub-Regional	2.1km	50°	Potentially Dominant	4°	Potentially Dominant
Viewpoint 12 Residence 47	Local	1.6km	95°	Potentially Dominant	4.5°	Potentially Dominant
Viewpoint13 Residence 105	Local	1.6km	180°	Potentially Dominant	5°	Potentially Dominant
Viewpoint14 Residence 38	Local	1.8km	75°	Potentially Dominant	5°	Potentially Dominant
Viewpoint 15 Residence 55	Local	1km	120°	Potentially Dominant	3.5°	Potentially Dominant
Viewpoint 16 Residence 85	Local	1.4km	120°	Potentially Dominant	7.5°	Potentially Dominant
Viewpoint 17 Residence 63	Local	1km	242°	Potentially Dominant	7.5°	Potentially Dominant
Viewpoint 18 Residence 83	Local	1km	200°	Potentially Dominant	7.5°	Potentially Dominant
Viewpoint 19 Residence 28	Local	1.1km	95°	Potentially Dominant	7.5°	Potentially Dominant
Viewpoint 20 Berrybank	Local	1km	295°	Potentially Dominant	8°	Potentially Dominant
Viewpoint 21 Residence 18	Local	1km	73°	Potentially Dominant	8°	Potentially Dominant
Viewpoint 22 Residence 74	Local	1.1km	235°	Potentially Dominant	8°	Potentially Dominant
Viewpoint 23 Residence 57	Local	1km	185°	Potentially Dominant	8°	Potentially Dominant

The report found that;

– *The near Sub Regional zone, up to 4.5 km from a turbine, is generally the visual catchment in which the level of visual impact starts to diminish for the most sensitive of land use types and user groups.*

This includes approximately 136 residents (4 people per household have been assumed which is regarded as conservative) and 1000 vehicles per day using Hamilton Highway. The report identified a variety of viewpoints within and surrounding the site for which photomontages have been prepared and the degree of visual impact estimated. The visual modification level has been determined through a combination of quantitative assessment of occupied field of view and qualitative assessment of visual compatibility with the setting. This includes rural residences, Hamilton Highway, the rail line, tourist route and Gnarput Chain of Ponds Creek (as covered by an Environmental Significance Overlay). **Table 11** summarises the views from a range of typical viewpoints.



Turbine Visibility Zone (Blade Tip 131m)

- 81 - 100
- 61 - 80
- 41 - 60
- 21 - 40
- 1 - 20
- Not Visible
- Proposed Area of Development
- Waterbody
- Turbine Locations
- House No Agreement
- House Under Agreement
- House Uninhabitable
- Towns
- Roads
- Railway

N

Scale 1:170,000 when printed at A3

0 2.5 5 10

Kilometres

Figure 16 – Turbine Visibility Zone

Source: Urbis

Table 11 – Summary of Visual Impact

Viewing Location	Sensitivity	Visual Modification Level	Visual Impact
Local Setting 0 – 2 km			
Rural Residences (x 34)	H	H	H
Township - Berrybank	H	H	H
Rural Residences – Agreement Landowners (x8)	L	H	M
Local Roads	L	M – H	M
Hamilton Highway	H	M - H	H
Freight Rail Line	L	L	L
Rural Land Uses	L	L	L
Gnarput Chain of Ponds Creek	L	L	L
Sub Regional Setting 2 – 7 km			
Hamilton Highway	L - M	L - M	L - M
Tourist Route	L - M	L - M	L - M
Rural Residences	M - H	L - H	L - H
Township – Dulveney, Foxhow, Gnarkeet	M - H	L - M	L - M
Freight Rail Line	L	L	L
Local Roads	L	L - M	L - M
Rural Land Uses	L	L	L
Gnarput Chain of Ponds Creek	L	L	L
Regional Setting > 7km			
Rural Residences	L	L	L
Hamilton Highway	L	L	L
Local Roads	L	L	L
Rural Land Uses	L	L	L
(H = High, M = Moderate, L = Low)			

In relation to cumulative impacts the report found that in some isolated locations it may be possible to see more than one wind farm, however they are unlikely to be within the same viewshed.

In relation to the proposed potential overland connection to the transmission line the report found that the visual impact will be limited by the fact that it would be offset by the existing road network and generally compatible with the existing roadside landscape of the setting.

The report further found that;

– *The use of pole-like structures, albeit at a larger scale, should the powerline be located above ground, are consistent with elements found within many rural settings and will, therefore, have a minimal level of visual impact.*

Impacts of Night Lighting

The report considered the effects of the proposed fifty-two (52) night lights recommended by Ambidji group to maintain aircraft safety (refer to **Chapter 10)**.

The visual impacts of night lighting are difficult to determine. The Berrybank area is defined as an *Environmental Zone E 1 – Intrinsically Dark Landscape.*

The report found that;

- *direct views to the navigational lighting will be often obscured from view by vegetation surrounding rural residences.*
- *on nights when there is low cloud or mist, reflection off the cloud droplets may occur.*
- *Blade illumination is quite faint and generally only apparent to observers from locations closer than 1km.*
- *Within the regional setting, for a number of sensitive locations such as rural residences and the Hamilton Highway, visible lighting is most likely to appear as gentle points of light.*
- *The exact impact or acceptability of night lighting is difficult to define as it is dependant on individual perceptions and sensitivities as well as the presence of existing light at the viewing source and the effectiveness of shielding as well as the power of the lights.*
- *as there are a number of dispersed light sources in the regional setting, the blinking lights will most likely result in a low to moderate level of visual intrusion to sensitive viewpoints in the local and sub-regional setting.*

In terms of the overall visual impact of the wind farm the report found that;

- *The project, as proposed, will change the landscape of the setting at the local, sub regional and, to a lesser extent, the regional level.*
- *As mentioned in the assessment process previously, the landscape character of the setting is already highly modified by past activities.*
- *Many of the homesteads in the area have a dense band of vegetation surrounding an intimate and secluded home yard. The effect of this, in a number of cases, has been to effectively contain the view shed from the house and surrounding yard itself, blocking more distant views.*

7.4 Mitigation

One of the options available for mitigation of visual impacts to residences is through screen planting. To achieve effective screening the screen planting should be placed between the viewing location and the source of intrusion, and the closer to the viewing location the more effective the screening (within practicality). Screen planting with native vegetation has been extensively employed in circumstances where it can be of assistance in shielding views (refer to **Figure 6 – Vegetation Plan)**. The scale and nature of this planting is dependant on negotiations with nearby landowners.

A number of amelioration options are available to assist in reducing the visual impacts of infrastructure. These are outlined below;

- *Use the local groupings of vegetation to minimise visibility of access and service tracks from key vantage points. Avoid aligning large sections of tracks in straight lines.*
- *Site service and access roads so that cut and fill are minimised and ensure soils are protected from erosion and slippage.*
- *Consolidate roads and reduce the need for clearance of large areas of ground cover vegetation for roads. Allow grass to regrow over any areas of disturbance.*

- *Use of low-profile and unobtrusive building designs to minimise the urbanised appearance or industrial character of sites located in rural or remote areas.*
- *Use traditional rural building styles of the area in the construction of the substations and other above ground structures.*
- *Underground all power lines within the site and integrate equipment wherever possible.*
- *Provide screen planting to the perimeter of substation, maintenance and control compounds.*

There are also a number of recommendations in relation to turbine characteristics. These include recommendations of colour, limits to advertising, paint types and limits to night lighting.

Where appropriate, the recommendations made to mitigate the visual impact of the proposed wind farm have been employed, and will continue to be employed during the detailed design of the project.

UNION FENOSA WIND AUSTRALIA

Berrybank Wind Farm
Chapter 8:

NOISE

8 Noise

8.1 Introduction

A report on the potential noise impacts of the development was undertaken by Marshall Day Acoustics Pty Ltd. This report can be found at **Appendix 7.** The objective of the report was to predict the likely noise levels at various sensitive locations based on the six (6) turbines under consideration and the proposed site plan.

The six turbines under consideration include;

- Vestas V90
- Vestas V100
- Nordex N100
- Siemens SWT-101
- RePower MW92
- Mitsubishi MWT-95

The assessment is in accordance with the requirements of New Zealand Standard NZS6808:1998 – Acoustics – The assessment and measurement of sound from wind turbine generators (NZS6808:1998), as required by Victorian state policy.

8.2 Methodology

As is usual in wind farms, the standard employed by Marshall Day Acoustics in undertaking their assessment was that;

- *The noise level from a wind turbine generator or wind farm at a residential site should not exceed the background noise level (LA95) by more than 5dBA or a level of 40dBA LA95, whichever is greater.*

To establish background noise levels, monitoring was undertaken throughout March and April 2009 at eleven (11) residential properties in the vicinity of the proposed site.

In order to predict noise emissions more accurately the octave band spectrum of the proposed turbine together with the appropriate air absorption coefficient for each octave band in accordance with ISO9613 Acoustics – Attenuation of sound during propagation outdoors – *Part 1: Calculation of the absorption of sound by the atmosphere* (1993) (ISO9613-1:1993) has been used.

8.3 Results

The report investigated the sound profiles of all models under consideration (refer to **Figure 17a - Sound power level profiles** and **Figure 17b - Octave bank Power Level Strata.**

The results are shown below in table form.

Table 12– Predicted noise levels

Vestas V90	Compliance with both the 24 hour and night-time NZS6808:1998 noise limits is achieved at all non-stakeholder properties. Wind turbines exceed the 24 hour and night time noise limits at two (2) stakeholder properties (Houses 65 and 76). However, these properties are currently uninhabitable.
Vestas V100	Compliance with both the 24 hour and night-time NZS6808:1998 noise limits is achieved at all non-stakeholder properties. Noise predictions using Vestas V100 wind turbines exceed both the 24 hour and nighttime

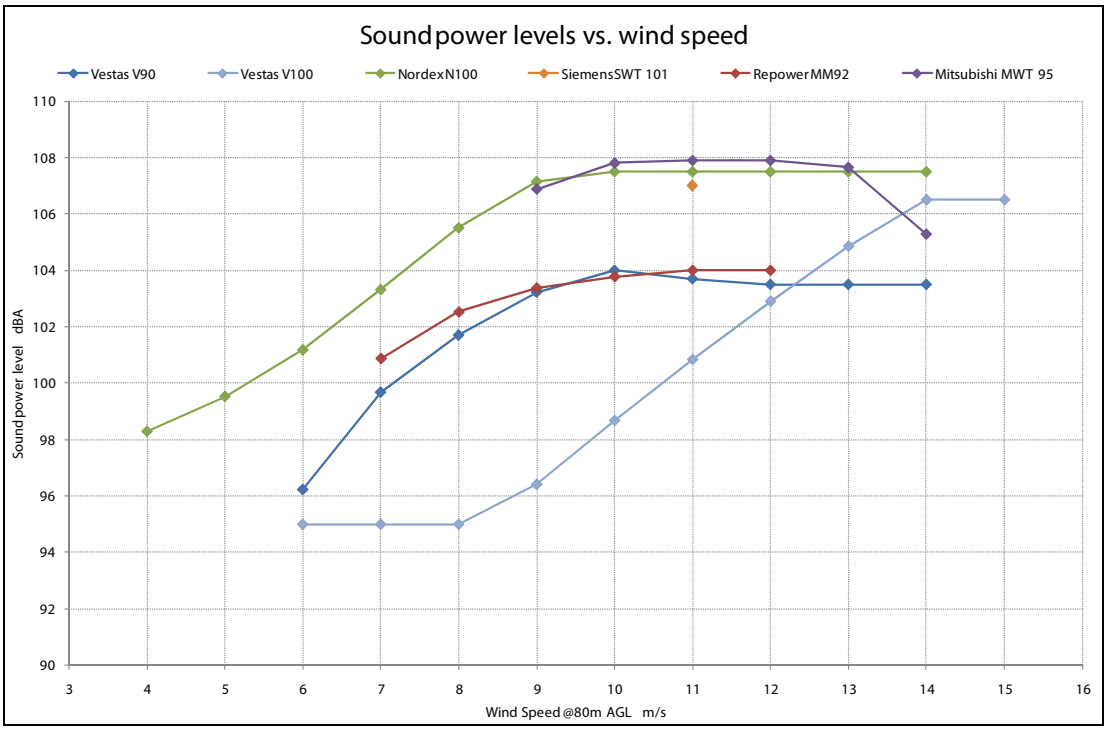


Figure 17a - Sound power level profiles.

Source: Marshall Day Acoustics

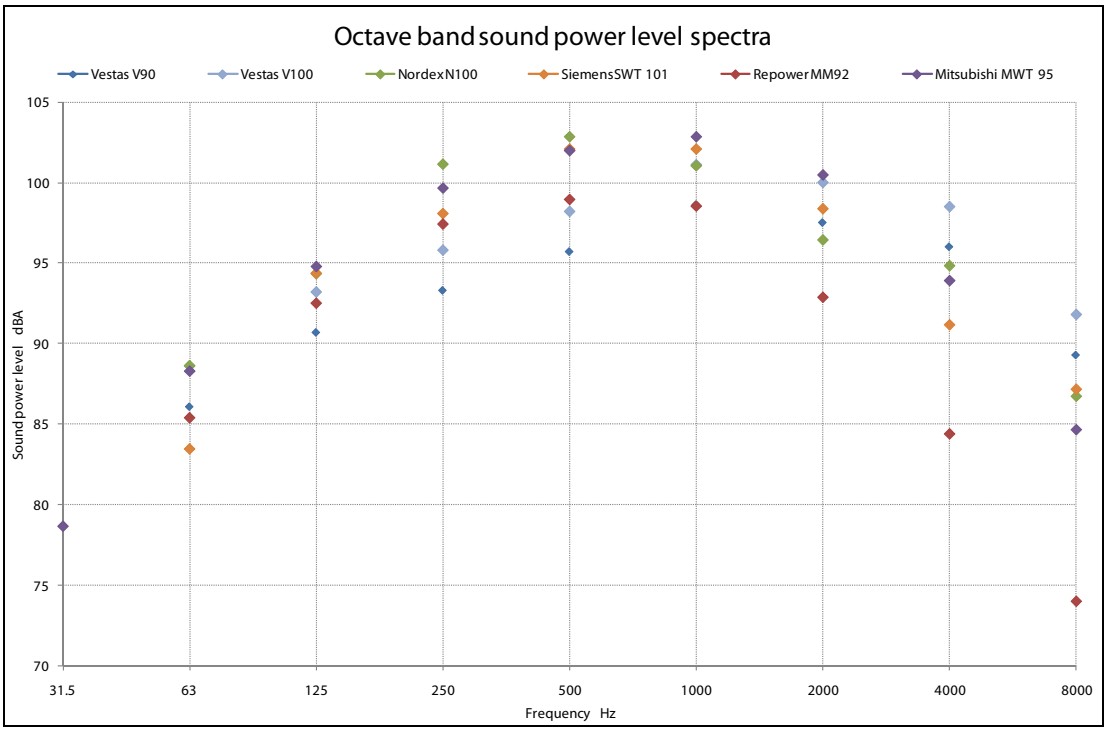


Figure 17b - Octave band sound power level spectra.

Source: Marshall Day Acoustics

	NZS6808:1998 noise limits at three (3) stakeholder properties (Houses 65, 66 and 76). Two (2) of these properties are currently uninhabitable (Houses 65 and 76).
Nordex N100	Compliance with the 24 hour NZS6808:1998 noise limits are exceeded at: – *Six (6) of the twenty-two (22) non-stakeholder properties* – *Eight (8) of the thirteen (13) stakeholder properties, including two (2) which are currently uninhabitable.*
Siemens SWT-101	Compliance with the 24 hour NZS6808:1998 noise limits is achieved at all non-stakeholder properties and nine (9) of the thirteen (13) stakeholder properties. The NZS6808:1998 night-time noise limits are exceeded at: – *Five (5) of the twenty-two (22) non-stakeholder properties.* – *Six (6) of the thirteen (13) stakeholder properties, including two (2) which are currently uninhabitable.*
RePower MW92	Compliance with both the 24 hour and night-time NZS6808:1998 noise limits is exceeded at: – *Two (2) of the twenty-two (22) non-stakeholder properties (Houses 63 and 103).* – *Four (4) stakeholder properties, including two (2) which are currently uninhabitable.*
Mitsubishi MWT-95	Compliance with the 24 hour NZS6808:1998 noise limits are exceeded at: – *Two (2) of the twenty-two (22) non-stakeholder properties* – *Six (6) of the thirteen (13) stakeholder properties, including two (2) which are currently uninhabitable.* The NZS6808:1998 night-time noise limits are exceeded at: – *Twelve (12) of the twenty-two (22) non-stakeholder properties, including one (1) which is currently uninhabitable* – *Seven (7) of the thirteen (13) stakeholder properties, including three (3) which are currently uninhabitable.*

A summary of these findings is presented below. Refer to **Table 13- Summary of compliance with 24 hour noise limits** and **Table 14– Summary of compliance with night time limits**

Table 13- Summary of compliance with 24 hour noise limits

Number of properties where the 24 hour noise limits are exceeded

Model	Non stakeholder (out of 19)	Uninhabitable non stakeholder (out of 3)	Stakeholder (out of 9)	Uninhabitable stakeholder (out of 4)
Vestas V90	-	-	-	2
Vestas V100	-	-	1	2
Nordex N100	6	-	6	2
Siemens SWT- 101	-	-	2	2
Repower MM92	2	-	2	2
Mitsubishi MWT-95	2	-	4	2

Table 14 - Summary of compliance with night time limits

Number of properties where the night-time noise limits are exceeded

Model	Non stakeholder (out of 19)	Uninhabitable non stakeholder (out of 3)	Stakeholder (out of 9)	Uninhabitable stakeholder (out of 4)
Vestas V90	-	-	-	2
Vestas V100	-	-	2*	2
Nordex N100	12	1	6	3
Siemens SWT- 101	5	-	4	2
Repower MM92	2	-	2	2
Mitsubishi MWT-95	11	-	4	3

* = Marginal exceedance at one (1) of the two (2) stakeholder properties

From this, the report concluded;

– *Comparison of the predicted noise levels, using Vestas V90 turbines, and the noise limits indicates that all twenty-two (22) assessed non-stakeholders' residential properties will comply with both the 24 hour and night-time NZS6808:1998 noise limits.*

The Vestas 100 predicted noise levels also achieve compliance with the noise criteria for both the 24-hour and night time *NZS6808:1998* noise limits.

NZS6808:1998 24 hour and night-time noise limits are likely to be achieved using the remaining five (5) selected wind turbine models at all properties in the vicinity of the Berrybank Wind Farm if an appropriate noise management plan is implemented.

8.4 Mitigation

Mitigation options involve operating the turbines in low noise mode during certain wind conditions, and mirco-siting to increase buffers.

When the turbine model is known, a noise management plan will be undertaken to ensure that if the selected turbine does not comply under the predictive noise modelling, mitigation would be undertaken so that standards are met.

The model conditions for wind farms (DPCD, 2009) contains a condition that requires the preparation of a post-construction noise monitoring program. It reads that;

- *An independent post-construction noise monitoring program must be commissioned by the proponent within 2 months from the commissioning of the first turbine and continue for 12 months after the commissioning of the last turbine, to the satisfaction of the Minister for Planning. The independent expert must have qualifications and experience in acoustic measurement and analysis of wind turbine noise to the satisfaction of the Minister for Planning. The program must be carried out in consultation with the EPA and in accordance with New Zealand Standard 6808:1998 as varied by Condition insert above. The operator under this permit must pay the reasonable costs of the monitoring program.*

This condition has been applied to other wind farm projects. It is expected that this will be used as the basis for a similar condition that may be applied to any planning permit issued in relation to this project.

UNION FENOSA WIND AUSTRALIA

Berrybank Wind Farm
Chapter 9:

FLORA AND FAUNA

9 Flora and Fauna

9.1 Introduction

A report on the potential flora and fauna impacts of the development was undertaken by Brett Lane and Associates Pty Ltd. This report can be found at **Appendix 4.**

This report follows a preliminary flora and fauna assessment, undertaken in 2007 which included a review of existing DSE flora and fauna databases and *Environmental Protection and Biodiversity Conservation* (EPBC) *Act 1999* Protected Matters Search Tool, and an inspection of the site. This was undertaken to determine if there were any significant flora and fauna issues associated with the development and to assess specifically the implications for the project arising from relevant legislative frameworks.

This study also included a Level 2 Risk Assessment of the proposal on the Brolga, to ascertain whether the proposal is likely to pose a significant impact on the species.

This subsequent report includes data on flora surveys unable to take place at in the initial phases including;

- Spring threatened flora surveys and native vegetation mapping; and
- A flocking season survey of the brolga;
- Further detailed breeding season surveys of the Brolga; and
- An autumn bat survey (2009)

9.2 Methodology

Brett Lane and Associates based their investigation on the following sources;

- An EPBC Act Protected Matters Report was generated using the on-line search function on the federal Department of Environment, Water, Heritage and the Arts website (DEWHA 2008). This was used to identify matters of national environmental significance that are known from, or have the potential to occur in, the region within 15 kilometres of the proposed wind farm.
- Historical and current Ecological Vegetation Class (EVC) mapping was reviewed, including the Corangamite (7521), Skipton (7522), Colac (7621) and Ballarat (7622) 1:100,000 Biomaps and the Biodiversity Interactive Mapping webpage of the DSE.
- Data was reviewed on the occurrence of flora, and specifically rare and threatened flora, from the Viridans Flora Information System (FIS), a database administered by the DSE.
- Data was reviewed on the occurrence of vertebrate fauna, including all records of rare and threatened fauna from the Viridans Victorian Fauna Database (also known as the Atlas of Victorian Wildlife (AVW), a database administered by the DSE (also mapped on the 1:100,000 Biomaps referred to above).
- Data on bird occurrences were reviewed from the Birds Australia New Atlas of Australian Birds, covering the period 1998 to the present.
- Wetland data for the study area was obtained from 1:50,000 topographic maps of the region.

The field investigations included flora and fauna field assessments in September 07, early October 2007 and mid-October 2008. This included a survey by vehicle and accessible areas potentially supporting native vegetation were assessed on foot using appropriate recording techniques.

The fauna field survey (11th and 14th September 2007) was undertaken during mostly fine and cool weather conditions and a number of techniques were used to detect fauna species inhabiting the study area.

To provide additional information on the status, distribution and possible breeding of the Brolga on wetlands in the vicinity of the proposed Berrybank Wind Farm, targeted field surveys were undertaken on three separate occasions.

9.3 Results

Based on the field investigations and desktop reviews the report found that because the study area is almost entirely cleared and cropping and grazing is the predominant agricultural activity;

– *The likelihood of threatened flora or fauna species occurring in the study area is considered to be low.*

The study found that the remaining vegetation was mainly restricted to the site boundaries and within the road reserve. This vegetation;

– *varies from low to high quality and contains two threatened species, Spiny Rice-flower and Trailing Hop-bush. A number of other threatened flora species also have the potential to occur within these roadside areas, or along the Chain of Ponds Creek: Adamson's Blown-grass, Button Wrinklewort, Clover Glycine, Curly Sedge, Fragrant Leek-orchid, Hairy Tails, Large-fruit Fireweed, Maroon Leek-orchid, Small Milkwort, Swamp Fireweed and White Sunray.*

The majority of the remnant roadside patches are classed as Western (Basalt) Plains Grassland Community or Western Basalt Plains (River Red Gum) Grassy Woodland Floristic Community, both of which are listed as threatened under the state's *Flora and Fauna Guarantee* (FFG) *Act 1988*. These patches are also classified as Natural Temperate Grassland of the Victorian Volcanic Plain, an ecological community listed as Critically Endangered under the EPBC Act. The applicable Ecological Vegetation Class is Plains Grassland (EVC 132).

The report found that of the track – road crossovers to provide access from public roads onto the wind farm site only two of the seventeen crossovers will result in native vegetation loss (0.08 hectares).

Some of the options for connection to the 220kv power line involve locating approximately 15 power poles within roadside native vegetation. This results in the removal of 0.024 hectares of Plains Grassland.

The report states;

– *The area of vegetation proposed to be removed totals 0.11 hectares. To meet the principles of the framework, removed native vegetation will need to be appropriately offset.*

– *All other crossovers have been chosen with the 'avoid' and 'minimise' principles of the state Native Vegetation Management Framework in mind.*

The desktop review and site investigations found potential habitat for several listed threatened fauna species in the region and the likelihood of occurrence on the site has been assessed.

The report found that;

– *The majority of these threatened species are unlikely to occur in the study area due to a lack of suitable habitat or to habitat not being extensive enough to support a significant population.*

Species for which suitable habitat exists are presented in the table below.

Table 15: Threatened fauna with potential habitat at the proposed Berrybank wind farm

Common Name	Scientific Name	EPBC	DSE	FFG
Birds				
Australasian Shoveler	Anas rhynchotis		VU	
Brolga	Grus rubicunda		VU	L
Cape Barren Goose	Cereopsis novaehollandiae		NT	
Glossy Ibis	Plegadis falcinellus		NT	
Great Egret	Egretta alba		VU	L
Gull-billed Tern	Sterna nilotica		EN	L
Hardhead	Aythya australis		VU	
Latham's Snipe	Gallinago hardwickii		NT	
Whiskered Tern	Chlidonias hybridus		NT	
Reptiles				
Striped Legless Lizard	Delma impar	VU	EN	L
Frogs				
Growling Grass Frog	Litoria raniformis	VU	EN	L
Other fauna				
Golden Sun Moth	Synemon plana	CR	E	L

Notes:

EPBC = Listed under the EPBC Act; DSE = Listed on DSE advisory list (DSE 2007c); FFG – Listed under the FFG Act; L = Listed under the FFG Act; CR= Critically endangered; EN = Endangered; VU = Vulnerable; NT = Low risk, near threatened; and M = Migratory.

Of the three nationally threatened species the Striped Legless Lizard and the Golden Sun Moth, may inhabit areas of roadside vegetation and the Growling Grass Frog, another nationally threatened species, has the potential to occur within the wind farm site.

The report notes that in relation to the Growling Grass Frog;

- *wetland habitats on the site are limited in extent, lack suitable fringing vegetation and are not linked to nearby areas where the species occurs.*
- *Therefore the probability that it occurs in the study area is considered to be low.*

The Brolga has the potential to occur in the study area based on wider regional records. The report found that;

- *Historical records of the Brolga, together with a targeted breeding season survey within 20 km of the wind farm indicated that there is a low probability of significant numbers of Brolgas occurring on or near the wind farm on a regular basis.*

- *No flocking sites occur nearby.*
- *Risks to the Brolga from the project are considered to be low.*

The report concluded that;

- *Potential flora and fauna issues do not represent significant constraints to the future development of the wind farm.*

The report also cited anecdotal evidence of a wedge tailed eagle nest being located on site although none was found during the on-site investigations.

The turbines themselves can have an affect on bird and bat mortality. The report identifies the following conditions where sites that have had collision problems:

- *Sites with large raptors occurring regularly within the wind farm at the same height as the turbine blades. In Australia, the main species that would fall into this category would be Wedge-tailed Eagle and Nankeen Kestrel.*
- *Sites with very high densities of other birds flying at rotor height. These could include seabird breeding colonies and feeding concentrations, and wetlands (including coastal sites) with large waterfowl concentrations, and significant migration flyways (mainly a northern hemisphere phenomenon).*

Nine species of bats were recorded utilising the wind farm site. Species were common, secure, and none was listed as threatened either nationally or at the state level.

A bird utilisation survey and a level two risk assessment for the Brolga was conducted and found;

- *That common farmland species dominate the avifauna of the site. No threatened species were found.*
- *A Level Two risk assessment for the Brolga, and in particular a targeted breeding season survey of the region within 20 km of the wind farm, was initiated. This located three Brolga pairs (none breeding) between 14 and 20 kilometres from the wind farm site. This is well beyond the distance at which direct or indirect impacts on this species would be expected from a wind farm.*

9.4 Mitigation

The report highlights the need to ensure minimal native vegetation loss and disruption to habitat arising out of the proposal, specifically;

- *Currently, only two of the seventeen crossover points involve the removal of roadside native vegetation. Initial layout plans should be assessed before finalisation to ensure micro-siting takes this matter into consideration. (Note that this may occur after a planning permit is issued, given the limited extent of native vegetation).*

Offset planting will be undertaken in accordance with the Victorian Native Vegetation Framework to replace the small amount of unavoidable vegetation loss.

The flora and report also recommended that any runoff into waterways from works sites should be controlled using sediment and erosion control methods during construction and operation of the wind farm. Measures to avoid this impact will be found in the Environmental Management Plan prepared as part of a condition on any permit issued in relation this proposal.

UNION FENOSA WIND AUSTRALIA

Berrybank Wind Farm
Chapter 10:

AVIATION

10 Aviation

10.1 Introduction

A report has been commissioned by UFWA to assess the aeronautical and obstacle lighting impacts arising from the Berrybank Wind Farm proposal. The full report undertaken by Ambidji Group Pty Ltd (Ambidji) appears as **Appendix 8**.

Under Civil Aviation Safety Authority (CASA) regulations, structures in excess of 110m are regarded as 'tall structures'. As the maximum building envelope for the turbines under consideration is 131m the wind energy facility proposed will be classified as a 'Tall Structure' under the regulations. Accordingly, night lighting is recommended to be used at the proposed Berrybank Wind Farm to reduce the potential hazard to aircraft operations.

10.2 Methodology

Evaluation of the potential aeronautical impact and obstacle marking and lighting has been undertaken in accordance with relevant safety regulations. As the wind farm is located in Victoria, this aeronautical evaluation has also considered the Victorian government policy guidelines applicable to the establishment of wind farms.

The aeronautical impact assessment does not directly assess any visual impacts arising out of the necessary provision of night lighting, however does include some mitigation options for consideration **(Refer Section 10.4).** The landscape impact is separately assessed in **Chapter 7 – Visual Impacts.**

The obstacle marking and lighting assessment was conducted in accordance with the recently withdrawn guideline document - *Obstacle Marking and Lighting of Wind Farms* **(CASA Advisory Circular AC139-18(0)).** Although the document has been withdrawn by CASA for review purposes, it has been used for the purposes of risk mitigation for the proposed wind farm, as recommended by CASA. The assessment also considered:

- The location of the proposed site in relation to Obstacle Limitation Surfaces;
- Existing air routes;
- Consideration of low flying military operations in the area;
- Minimum requirements for clearance of obstacles by an aircraft that has suffered a failure of a critical engine during take-off;
- A preliminary assessment of potential impacts on navigational aids and air traffic control radar coverage.

10.3 Results

The report found the following distances to local airports.

Table 16 - Distances to local airports

Airfield	Approximate Distance to Wind Farm	Direction from Wind Farm	OLS/PANS OPS
Ballarat	55km	025 Deg True	Yes
Kurweeton (Derrunallum)	30km	255 Deg True	No
Lismore	12km	300 Deg True	No
Rokewood	15km	070 Deg True	No
Yarrowee Navigation Aids	27km	040 Deg True	PANS OPS

The highest turbine at the windfarm will be approximately 335M (1100ft) Australian Height Datum at the rotor tip, allowing for the height above sea level of the surrounding terrain. The report found that large wind turbines are sufficiently conspicuous due to their shape and size, provided the colour of the turbine is of a contrasting colour to the background. The off white colour proposed for the wind turbine is considered to be adequate for day time visibility.

The report found that the proposed wind farm will not penetrate any Obstacle Limitation Surfaces (OLS) surfaces. The report further found that proposed wind farm will not penetrate any Procedure for Air Navigation Services (PANS OPS) surface. The relatively low calculated maximum height (335m) ensures that the PANS OPS surfaces at Ballarat airfield are unaffected. Additional findings include that the proposed wind farm;

- *will not have an impact on nearby designated air routes;*
- *will not have an impact on local aviation activities; and*
- *will require notification to the Civil Aviation Safety Authority (CASA) under Reporting of Tall Structure requirements.'*

It is further noted in the report that the proposed wind farm is outside the clearance zones associated with Air Traffic Control radar facilities and aviation navigation aids. The report also notes that the proposed wind farm will not have an impact on contingency procedures and engine inoperative flight paths due to sufficient distance from airfields.

Where turbines exceed 110m above ground level CASA recommends obstruction lighting and marking to reduce the hazard to aviation unless the circumstances at a particular wind farm are very unusual.

The report states in relation to the particular circumstances at Berrybank that;

- *Because of this general aviation and military activity in the vicinity and the "tall structure" classification, an obstacle lighting plan for the Berrybank development will be required for consideration and approval by CASA.*

As a result of the aviation advice, and the recommendations of the CASA guidelines, it is proposed to night light 52 of the 100 turbines (refer to **Figure 11 – Indicative Obstacle Lighting**).

10.4 Mitigation

The proposed obstacle lighting layout will meet the CASA objectives of:

- *defining the "general definition and extent of the objects" for each cluster or linear array;*
- *the requirement for an "interval between obstacle lighted turbines not exceeding 900m" for each cluster or linear array ; and*
- *lighting the most prominent (highest for the terrain) turbine in each cluster or linear array.*

Visual impacts can be minimized by restricting the downward component of light to either, or both, of the following:

- *Such that no more than 5% of the nominal intensity is emitted at or below 5° below the horizontal*
- *Such that no light is emitted at or below 10° below the horizontal.*

Other mitigation measures include vegetation screen planting, as detailed in **Chapter 7.** The wind farm will include the night lighting that complies with these specifications and the proposed screen planting will assist in mitigating the visual impacts.

UNION FENOSA WIND AUSTRALIA

Berrybank Wind Farm
Chapter 11:

TRANSPORT

11 Transport

11.1 Introduction

A report has been commissioned by UFWA to assess the transport related impacts arising from the Berrybank Wind farm. The full report undertaken by Aecom Pty Ltd appears as **Appendix 3.** Whilst this section will address the general transport network impacts, refer to **Chapter 3** for detailed discussion of the proposal in relation to access to the site.

The report identifies and considers the traffic impact both during the construction and operational phase of the project. It will also discuss likely upgrades required to improve conditions of the access routes to the site.

11.2 Methods

In order to establish the conditions and likely requirements for upgrades arising out of the proposal a site investigation was undertaken in late 2008. Detailed observations were recorded during the inspection together and photographs taken to supplement the observations. These are included in **Appendix 3.**

The report reviewed and included;

- *existing available traffic volumes on the road network and road condition information obtained from VicRoads, Warrnambool City Council and Corangamite Shire,*
- *a drive through survey of selected public roads in the vicinity; and,*
- *an assessment of the likely traffic volumes generated by the construction, operation and decommissioning phases of the wind farm.*

11.3 Results

In order to ascertain likely effects the report has assumed a 12 – 14 month construction phase, working approximately 300 days of the year with 3,500 trucks required in total. The report assumes that the up to 240 construction staff vehicles would enter the site in the morning and leave the site in the afternoon.

There are three main intersections which will be impacted upon by the proposal. The first of these is the intersection of Hamilton Highway and Berrybank-Wallinduc Road. In relation to this access point the report found;

- *that this road may be required to provide access for 90% of the facility;*
- *approximately 218 vehicles in the peak period will access the site through this point, with approximately 153 vehicles travelling from/to the west and 65 vehicles travelling from/to the east;*
- *On average vehicles would be delayed less than one second while attempting to exit Berrybank-Wallinduc Road onto Hamilton Highway. This delay is considered insignificant.*

The second of these is the intersection of Hamilton Highway and Foxhow-Berrybank Road. In relation to this access point the report found;

- *that this road may be required to provide access for 5% of the facility;*
- *approximately 12 vehicles in the peak period will access the site through this point, with approximately 8 vehicles travelling from/to the west and 4 vehicles travelling from/to the east;*
- *On average, vehicles would be delayed less than one second while attempting to exit Foxhow-Berrybank Road onto Hamilton Highway. Again this delay is considered insignificant.*

The second of these is the intersection of Hamilton Highway and Doyles Road. In relation to this access point the report found;

- *It is estimated that this road may be required to provide access for 5% of the facility;*
- *approximately 12 vehicles in the peak period will access the site through this point, with approximately 8 vehicles travelling from/to the west and 4 vehicles travelling from/to the east.*
- *On average, vehicles would be delayed less than one second while attempting to exit Doyles Road onto Hamilton Highway. Again this delay is considered insignificant.*

Whilst there will be some impact to local roads, current volumes are presently very low in all cases and will be upgraded where relevant to support the proposal. In order to use the local road networks for access to the site the following upgrades will be undertaken.

Table 17 - Proposed Road Upgrades

Road	Existing AADT	Expected AADT	Seated Width	Upgrade Required	Extent of upgrade works
Berrybank – Walinduc Rd	64	64+436 =500	3.6m	Yes	Widening the existing pavement from 3.6m to 6.2m with 1.5m unsealed shoulders between the Hamilton Highway and the main site entry immediately north of the Berrybank-Werneth road.
Foxhow-Berrybank Rd	51	51+24 =75	3.6m*	Yes	Establish a consistent 2.0m shoulder (0.5 sealed, 1.5m unsealed) between the Hamilton Highway ad site entry)
Doyles Rd	Not Available	>24	3.0m Unsealed	Yes	Widen and seal the existing traffic lane (from 3.0m to 3.5m) and establish a consistent 2.0m shoulder (0.5m sealed, 1.5m unsealed) between the Hamilton Highway) and site entry.

* 6.5m (two lanes) reduces to 3.6m at ~3km from intersection with Hamilton Hwy

These upgrades will provide for safe and direct access to the wind farm, but also create improved road conditions which provide tangible benefit to the wider community.

11.4 Mitigation

In order to ensure safety and reduce the impact of the development on the local road network no over-dimension or large trucks associated with the construction will operate on Hamilton Highway during the school bus hours of 7.30am and 8.50am, and between 3.20pm and 4.30pm on school days.

Another mitigation option to reduce hazard and ensure minimal disruption to the normal traffic flows is available to the proponent and is recommended by the traffic impact assessment report is;

- *Provision of traffic controllers on Hamilton Highway to help assist large trucks egressing the site, and prevent possible collisions between traffic on Hamilton Highway and large site vehicles.*
- *Advance warning signs should be placed on each approach, 200 metres from the access road with "Prepare to stop" warnings when traffic controllers are present.*

UNION FENOSA WIND AUSTRALIA

Berrybank Wind Farm
Chapter 12:

TELECOMMUNICATIONS

12 Telecommunications

12.1 Introduction

A report has been commissioned by UFWA in order to assess any impacts to telecommunications arising from the proposed Berrybank Wind Farm. The full report undertaken by Garrad Hassan appears as **Appendix 9**.

The report notes;

– *In general VHF and UHF frequency band radio signals, and digital voice based technologies such as GSM and CDMA mobile, are essentially unaffected by a wind farm development. This includes land mobile repeaters, radio, the audio component of analogue television, and mobile phones.*

The report outlines the two principal methods of transmitting information being *'broadcast (generally described as point to area), and microwave links (generally described as point to point).*'

The report identifies the potential for wind farms to interfere with analogue television broadcast signals and microwave signals. This is because transmissions of domestic television are achieved via analogue broadcast signals which are susceptible to interference, whereas line of sight connections for data, voice and video use microwave links which are less susceptible. The report further states that '*the interference mechanisms are different for each of these, and hence, there are different ways to avoid interference*.'

The model conditions for wind farms (DPCD, 2009) contains condition relating to television and radio reception and interference. It reads that;

1. *A pre-construction survey must be carried out to the satisfaction of the Minister for Planning to determine television and radio reception strength at selected locations within 5kms of any wind turbine including non-stakeholder dwellings. The location of such monitoring is to be determined to the satisfaction of the Minister for Planning by an independent television and radio monitoring specialist appointed by the operator under this permit.*

   Note: For the purpose of this condition, a non-stakeholder means the land holder of an abutting property without a contract in respect of the installation of associated wind turbines on that person's property.

2. *If, following commencement of the operation of the wind energy facility, a complaint is received regarding the wind energy facility having an adverse effect on television or radio reception at the site of any dwelling in the area which existed at the date of the pre-construction survey, a post-construction survey must be carried out at the dwelling.*

3. *If the post-construction survey establishes any increase in interference to reception as a result of the wind energy facility operations, the wind energy facility operator must undertake measures to mitigate the interference and return the affected reception to pre-construction quality at the cost of the wind energy facility operator and to the satisfaction of the Minister for Planning.*

This condition has been applied to other wind farm projects. It is expected that this will be used as the basis for a similar condition that may be applied to any planning permit issued in relation to this project.

12.2 Methodology

Garrad Hassan has assessed the likely impact of the proposed development on telecommunications. The assessment undertaken included identifying the telecommunications towers located within 50-100 km of the proposed wind farm and investigating the telecommunication licenses attached to these towers.

An image of the Australian Communications and Media Authority (ACMA) database was analysed in order to ascertain likely interference. A review of the ACMA database

for other licences with transmission frequencies in the Ultra High Frequency (UHF) band or higher was conducted.

12.3 Results

An analysis of the vicinity found 128 radio-communication towers within approximately 50 km of the Berrybank Wind Farm. The report found that the closest link to the site is approximately 3 km to the northwest of the site. At this distance interference to microwave links is not expected.

In relation to point-to-multipoint stations the report found;

– *The nearest point-to-multipoint stations are located on Mt Porndon near Lake Corangamite, approximately 35 km to the southwest of the Berrybank site. These stations are operated by Telstra. The next closest stations are located on Mt Leura, west of Camperdown and approximately 40 km southwest of the site. These stations are operated by Westvic Broadband. It is not expected that stations at this distance from the site will be servicing customers in the vicinity of the site, and therefore inference to these signals is unlikely to be an issue.*

The report states;

– *For broadcast signals large scale interference can generally be avoided by placing the wind turbines distant from the broadcast tower.*

The nearest television broadcast tower is approximately 25 km from the proposed Berrybank wind farm site, therefore no large scale interference to television signals are expected.

The analysis indicates there are 33 houses in the vicinity of the Berrybank site which may experience interference to analogue television signals. As analogue television is scheduled to be phased out during 2011 (the approximate timing of construction of the project if approved) interruption to television reception if apparent is likely to be short lived. Digital television is unaffected by wind turbines.

12.4 Mitigation

The report highlights the amelioration options for households that in the unlikely event that television reception is affected;

1. *Pointing the householder's TV antenna directly towards their existing transmitter;*
2. *Tuning householder's antenna into alternative sources of the same or suitable TV signal, however a review of proximate TV broadcast towers indicates this may not be an option in the region around the Berrybank site;*
3. *The installation of more directional and/or higher gain antenna at the affected residence;*
4. *Relocating the antenna to a less affected position;*
5. *The installation of a digital set top box (and UHF antenna if required). Lookout Hill would be the primary source;*
6. *The installation of cable/satellite TV at the affected residences;*
7. *Installation of a TV relay station.*

Conditions of any permit issued would necessarily require the proponent of the wind farm to undertake these amelioration options on behalf of the householder at the proponent's cost in the unlikely event of interference.

UNION FENOSA WIND AUSTRALIA

Berrybank Wind Farm
Chapter 13:

FIRE

13 Fire

13.1 Introduction

A wind farm in a rural area, as with any large scale development, can increase the potential risk of fire to nearby people and property. This includes fire caused by the generators themselves, and also impacts on the generators caused by fire sparked elsewhere.

This chapter draws on previous research to describe and detail the potential risk and outlines a range of mitigation measures designed to reduce the risk.

The potential risk to third party persons and property depends on a number of factors, including the inherent flammability of the turbine generators, the landscape in which the turbines sit, and the ability of local fire services to respond to any incident.

As a result of increased wind farm development in Victoria, The Country Fire Authority (CFA, 2007) has extensively studied the potential for wind farms to cause fire, and the possible mitigation measures to reduce the potential risk.

13.2 Degree of Risk

The CFA found that modern wind turbines incorporate the highest level of quality and safety standards (Country Fire Authority (CFA) 2007). Despite this, 'the risk of fire always exists when electronics and flammable oils and hydraulic fluids exist in the same enclosure' (CFA 2007). The risk of fire can be associated with: malfunctioning turbine bearings, inadequate crankcases lubrication, cable damage during rotation, electrical shorting or arcing occurring in transmission and distribution facilities; wildfire entering the site (CFA 2007).

The CFA states that the impact of wind farm activities on fire is less of an issue in comparison to normal power generation sites, as power transmission is located within the turbine towers and underground to the transformers (CFA 2007). The CFA considers that 'while there cannot be any guarantee… the potential for fire or wind turbines is inherently low' (CFA 2007).

The Clean Energy Council believes that the risk of fire at wind farms is 'very low; both fire damage to wind turbine generators and fire caused by the generators themselves' (AusWind 2007). This is because of the following factors:

- *The flammable components are located high above the ground*
- *There is normally no vegetation around the base of the turbine towers*
- *High-voltage connections are underground*
- *Access tracks act as firebreaks and provide fire fighting access*
- *Lightning protection devices are installed on every wind turbine*
- *Dedicated monitoring and control systems shut down the wind turbines when the threshold temperatures of critical components are reached (AusWind 2007).*

The Clean Energy Council also considers the risk of fire caused by lightning strike to the turbines as unlikely with modern day manufacturing. The turbines are 'equipped with comprehensive lightning protection systems, which transfer the high voltages and currents to the ground, without affecting turbine operations' (AusWind 2007). The turbine blades 'usually have internal lightning conductor rods running all the way to the blade tips' (AusWind 2007).

Considering the Panel Reports on windfarm applications in Victoria, the risk of fire caused by windfarm activities is considered low.

The planning panel for the McArthur wind farm in 2006 reported that 'CFA is of the opinion that the risk of wildfire resulting from the wind farm operations is not unduly greater than that resulting from other agricultural and industrial practices which operate within the country area'. Furthermore, the risk of fire is considered to be in fact

minimised by wind farm developments and their associated permit conditions because they introduce more intensive fire planning (Mt Mercer 2006 Panel Report).

13.3 Raised Bed Cropping

As with any development, wind farm planning must involve identifying potential fire hazards unique to the area. Notably, the evolving farming practice of 'raised bed cropping' is practiced in the Berrybank area and within the subject site.

Raised bed cropping has been recognized as a fire hazard by the South Australian Country Fire Service (CFS) (2004). Raised bed cropping involves 'raising growing beds to allow drainage channels for water run off', at heights above natural ground level of between 50mm and 300mm (CFS 2004). When the raised beds are at the higher end of this range, they can pose a danger for fire vehicle because variation in terrain makes them difficult to cross.

It is recognised that in the event that a vehicle travelling along the bed experiences a change in fire direction, no easy escape route is available, as it is very difficult to cross the beds' (CFS 2004).

13.4 Mitigation

Raised bed cropping is an evolving agricultural practise with varying geographical spread across the state and, as such, the formal policy response of the CFA has yet to be determined.

The point of difference between a typical raised cropping paddock (as described above as a hazard by the CFS) and one that contains a wind farm is that the later will have high quality formed access tracks to all turbines, usually from two directions. These access tracks dissect the cropping beds and will allow efficient and safe movement by fire trucks to and from a turbine in the unlikely event of a fire.

The model conditions for wind farms (DPCD, 2009) contains a condition that requires the preparation of a Wildfire Prevention and Emergency Response Plan. It reads that;

- *'The preparation of a wildfire prevention and emergency response plan prepared in consultation with and to the satisfaction of the Country Fire Authority, the Department of Sustainability and Environment, and specify name Shire. This plan must include:*
- *(i) criteria for the provision of static water supply tanks solely for fire fighting purposes, including minimum capacities, appropriate connections and signage,*
- *(ii) procedures for vegetation management, fuel control and the provision of fire fighting equipment during declared fire danger periods;*
- *(iii) minimum standards for access roads and tracks to allow access for fire fighting vehicles including criteria for access to static water supply tanks for fire fighting vehicles;*
- *(iv)the facilitation by the operator, within 3 months after the commencement of the operation of the wind energy facility, of a familiarisation visit to the site and explanation of emergency services procedures for the Country Fire Authority, Rural Ambulance Victoria, Council's Municipal Emergency Management Committee and Victoria Police;*
- *(v) subsequent familiarisation sessions for new personnel of those organisations on a regular basis and/or as required; and*
- *(vi)if requested, training of authority personnel in relation to suppression of wind energy facility fires.*
- *For the purpose of this condition, consultation with the CFA must include CFA at headquarters level, the CFA Regional Office and the local volunteer fire brigade.*

A similar condition has been applied to other wind farm projects. It is expected that this will be used as the basis for a similar condition that may be applied to any planning permit issued in relation to this project.

UFWA will prepare a wildfire prevention and emergency response plan in accordance with the above condition which will consider the unique constraints posed by raised bed cropping in the Berrybank region, and the specific risk of fire.

UNION FENOSA WIND AUSTRALIA

Berrybank Wind Farm
Chapter 14:

SHADOW FLICKER

14 Shadow Flicker

14.1 Introduction

A report has been commissioned by UFWA in order to assess any shadow flicker impacts arising from the proposed Berrybank wind farm. The full report undertaken by Garrad Hassan appears as **Appendix 10**.

The report outlines the following in relation to shadow flicker;

– *'Shadow flicker may occur under certain combinations of geographical position and time of day, when the sun passes behind the rotating blades of a wind turbine and casts a moving shadow over neighbouring areas. When viewed from a stationary position the moving shadows cause periodic flickering of the light from the sun, giving rise to the phenomenon of 'shadow flicker'.*

The report then outlines the key factors which affect the incidence of shadow flicker (likelihood and duration);

– *Direction of the property relative to the turbine.*

– *Distance from turbine. (The further the observer is from the turbine, the less pronounced the effect would be);*

– *Wind direction. The shape of the shadow will be determined by the position of the sun relative to the blades (which will be rotated to face the wind);*

– *Turbine height and rotor diameter;*

– *Time of year and day (the height of the sun in the sky);*

– *Weather conditions (cloud cover reduces the risk of shadow flicker)*

The report notes that shadow flicker effects are particularly noticeable inside dwellings or other buildings where windows face either west or east into the setting or rising sun.

14.2 Methodology

Garrad Hassan outlines the methodology utilised in assessing the impact of the proposed Berrybank wind farm as follows;

– *'The number of hours of shadow flicker experienced annually at a given location can be calculated using a geometrical model which incorporates the sun path, topographic variation over the wind farm site and wind turbine details such as rotor diameter and hub height.'*

The report further suggests that this method assumes;

– *'There are clear skies every day of the year;*

– *The turbines are always rotating;*

– *The sun can be represented as a single point;*

– *The blades of the turbines are always perpendicular to the direction of the line of sight from the specified location to the sun.*

– *The sun is modelled as a point source.'*

The impact of reduction of shadow flicker due to cloud cover has not been applied to the shadow flicker duration results, and therefore the results can be regarded as conservative.

Shadow flicker has been calculated at 2m above the ground in order to simulate ground floor windows. Whilst it is generally accepted that shadow flicker does not exist at distances above 10 rotor diameters from a wind turbine, a slightly more conservative estimate using 1km has been employed in this instance.

An assessment of the possible reduction in shadow flicker duration due to turbine orientation has also been conducted.

Guidelines published in Victoria indicate a maximum acceptable limit of 30 hours per year of shadow flicker for dwellings. Shadow flicker assessments were conducted for a number of locations as outlined in the report at **Appendix 10.**

14.3 Results

Significantly, the analysis found that;

– *no off-site dwellings are likely to experience any shadow flicker.*

Whilst no offsite dwellings are likely to experience shadow flicker six on-site dwellings may, with three of these potentially experiencing greater than 30 hours (*Victorian Wind Energy Guideline Standard*) (refer to **Figure 18 – Maximum theoretical annual shadow flicker** and **Table 18 - Theoretical maximum and turbine orientation adjusted annual shadow flicker durations**).

Table 18 - Theoretical maximum and turbine orientation adjusted annual shadow flicker durations

				Expected Shadow Flicker		
Receptor ID[1]	**Easting [m]**	**Northing [m]**	**Information**	**Longest Theoretical Day [min]**	**Theoretical Max [hr/yr]**	**Turbine Orientation Adjusted [hr/yr]**
House 54	720176	5800321	Licence Agreement	38	23	14
House 61	719390	5796269	Licence Agreement	30	21	14
House 62	721670	5796577	Licence Agreement	29	14	9
House 65	723797	5796577	Licence Agreement	109	182	119
House 66	722414	5798736	Licence Agreement	35	58	38
House 76	722703	5792293	Licence Agreement	125	298	194

Of these three only one house is habitable and the results of the analysis indicate that this is the least affected of the three.

The report found in relation to this dwelling (66) that it;

– *"has an estimated shadow flicker duration of 38 hours per annum. This result is still likely to be conservative as cloud cover, reduced turbine dimensions, and the screening effect of vegetation have not been considered. If appropriate vegetation is planted to screen these turbines it is likely that less than 30 hours of shadow flicker per annum will be experienced"*

The report also considered the potential of shadow flicker to road uses and concluded;

– *the effects of shadow flicker to road users, while passing the Berrybank Wind Farm, will not be significant.*

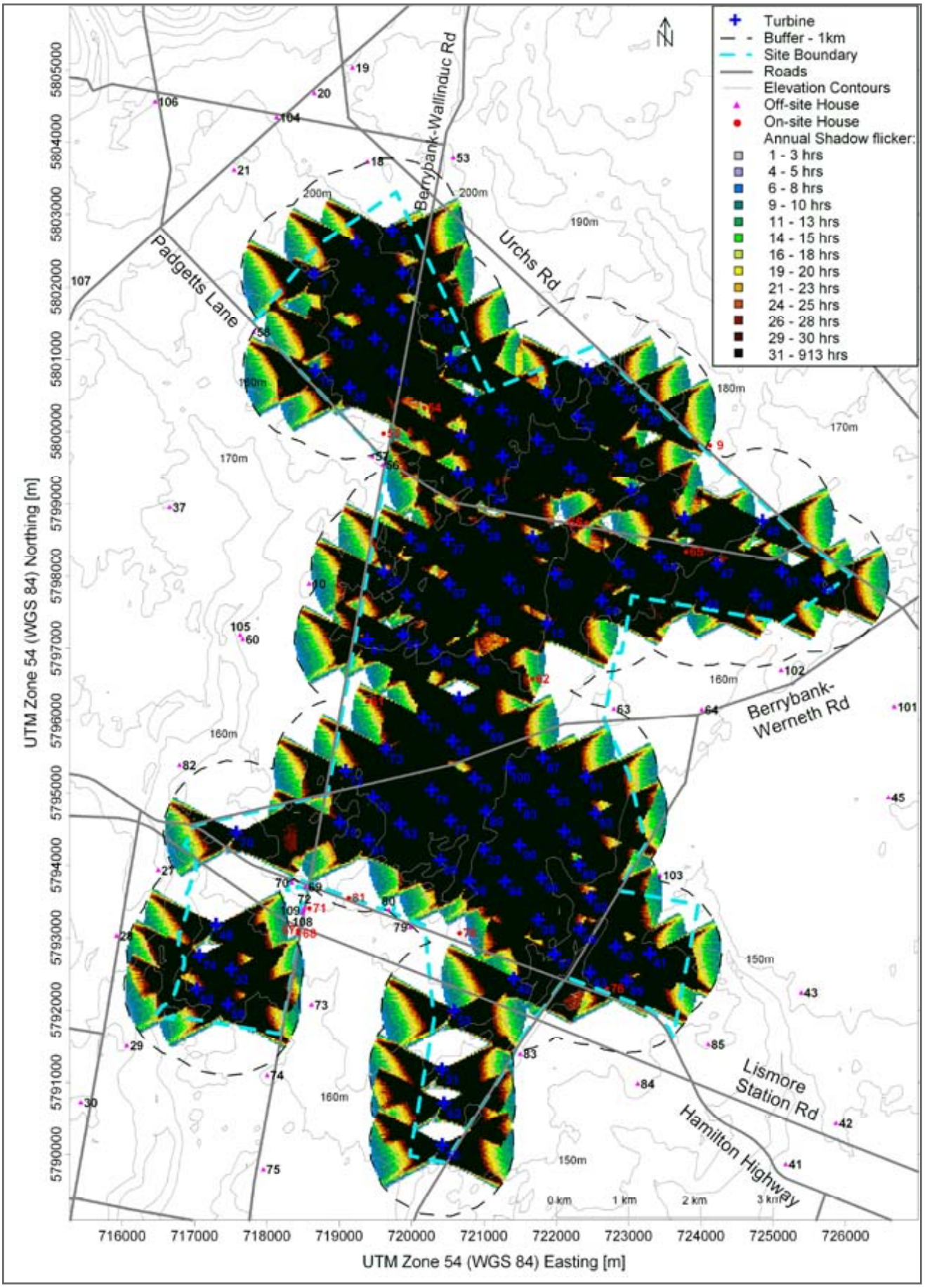


Figure 18 – Maximum theoretical annual shadow flicker

Source: Garrad Hassan Pacific Pty Ltd

14.4 Mitigation

The report suggested that because no shadow flicker was expected off-site that mitigation to non-participating land holders is neither warranted or necessary.

Several options are available for mitigation of on-site dwellings based on the owners discretion. These are as follows;

- *Screen the turbine causing flicker from the house location via vegetation. In order to limit the size of screening to realistic levels, the screening would likely have to be installed relatively close to the house location; and would still need to block the view of the turbine from affected windows.*
- *Simply drawing the curtains at the times that flicker occurs.*
- *Move the turbine causing flicker. Often small movements of turbine locations can result in significant reductions in flicker. This option may result in a reduction in energy output from the wind farm, or other additional cost.*
- *Stop the turbine at times flicker would otherwise occur.*

To reduce the impact of shadow flicker at house 66, vegetation screening will be employed for the dwelling at the owner discretion and at the proponents cost.

UNION FENOSA WIND AUSTRALIA

Berrybank Wind Farm
Chapter 15:

HERITAGE

15 Heritage

15.1 Introduction

A report has been commissioned by UFWA in order to assess Aboriginal and Cultural Heritage issues arising from the proposed wind farm. The full report undertaken by Tardis Enterprises appears as **Appendix 11**. This report follows a 2007 report that was undertaken to inform the EES referral process.

The report outlines the results of a desktop cultural heritage investigation of the proposed wind farm in relation to Aboriginal and historic cultural heritage and the potential impact of the proposed activity on Aboriginal and historic cultural heritage values. The assessment also outlines recommendations for mitigation of potential impact to guide use and development at the site.

15.2 Methods

The assessment was conducted in two parts;

- *Field reconnaissance; and,*
- *Desktop assessment.*

The field reconnaissance included a brief field review on October 31, 2007 which consisted of a 'windscreen' survey where all roads/tracks within and adjacent to the activity area were accessed.

The report states;

- *This level of survey is designed to identify areas of archaeological potential only and is an appropriate level of investigation for this stage of the development. During the survey, initial assessments were made of any areas that may contain archaeological potential.*

The desktop assessment reviewed historical databases and legislation to ascertain the level of potential for archaeological and historical value within the proposed wind farm site and to establish a statutory process for further work under the legislative framework.

15.3 Results

The findings of the report are outlined below;

- *Six regional and one small-scale Aboriginal cultural heritage investigations and only one regional historic investigation have been undertaken within 10km of the present activity area investigation;*
- *Of these, five included all or part of the present activity area, though none included ground surface survey of the present activity area; and,*
- *No previously recorded Aboriginal or historic sites were identified during this desktop assessment.*

The results of this study indicate the following archaeological potential within the activity area.

Table 19 – Archaeological Potential

Heritage Type	Potential Deposits	Level of Potential
Aboriginal	Small numbers if previously disturbed low-density (<10) stone artefact scatters throughout the activity area. Low to moderate density (n. 1-100) stone artefact scatters within 200m of current and previous water course/drainage lines, hill crests and flood plain perimeter. Elevated locations that offered a dry campsite, adjacent to former wetlands/water sources are the most likely landform for detection of lithic material.	Moderate-High
Historic	Small numbers of previously disturbed artefacts throughout the activity area. Artefacts associated with identified historic structures (i.e. Berrybank township).	Moderate-High

Refer to **Figure 19 – Areas of Archaeological Sensitivity or Potential**

Refer to **Figure 20 - AAV Aboriginal Cultural Heritage Sensitive Areas Map**

The report notes that the proposed wind farm has avoided areas of cultural heritage sensitivity as defined under the *Aboriginal Heritage Regulations 2007*, and that a mandatory Cultural Heritage Management Plan is not required.

The report found that small (n <10) scatters of stone artefacts are the most probable cultural remains within the activity area, and but these provide little scientific information and require minimal management.

The report did find that the areas of higher archaeological potential (refer **Figure 18**) should be further investigated if they are to be impacted on as a result of the proposal.

Under condition of the *Aboriginal Heritage Act 2006*, if a site is to be impacted by development, comprehensive salvage would be required. Salvage of archaeological sites is done using a controlled hand method, and includes extensive analysis post field work.

When the desktop was conducted the Maar Aboriginal Corporation had an application before the Heritage Council for Registered Aboriginal Party Status. This application has since been withdrawn and a further application lodged under Kuuyung Maar Aboriginal Corporation.

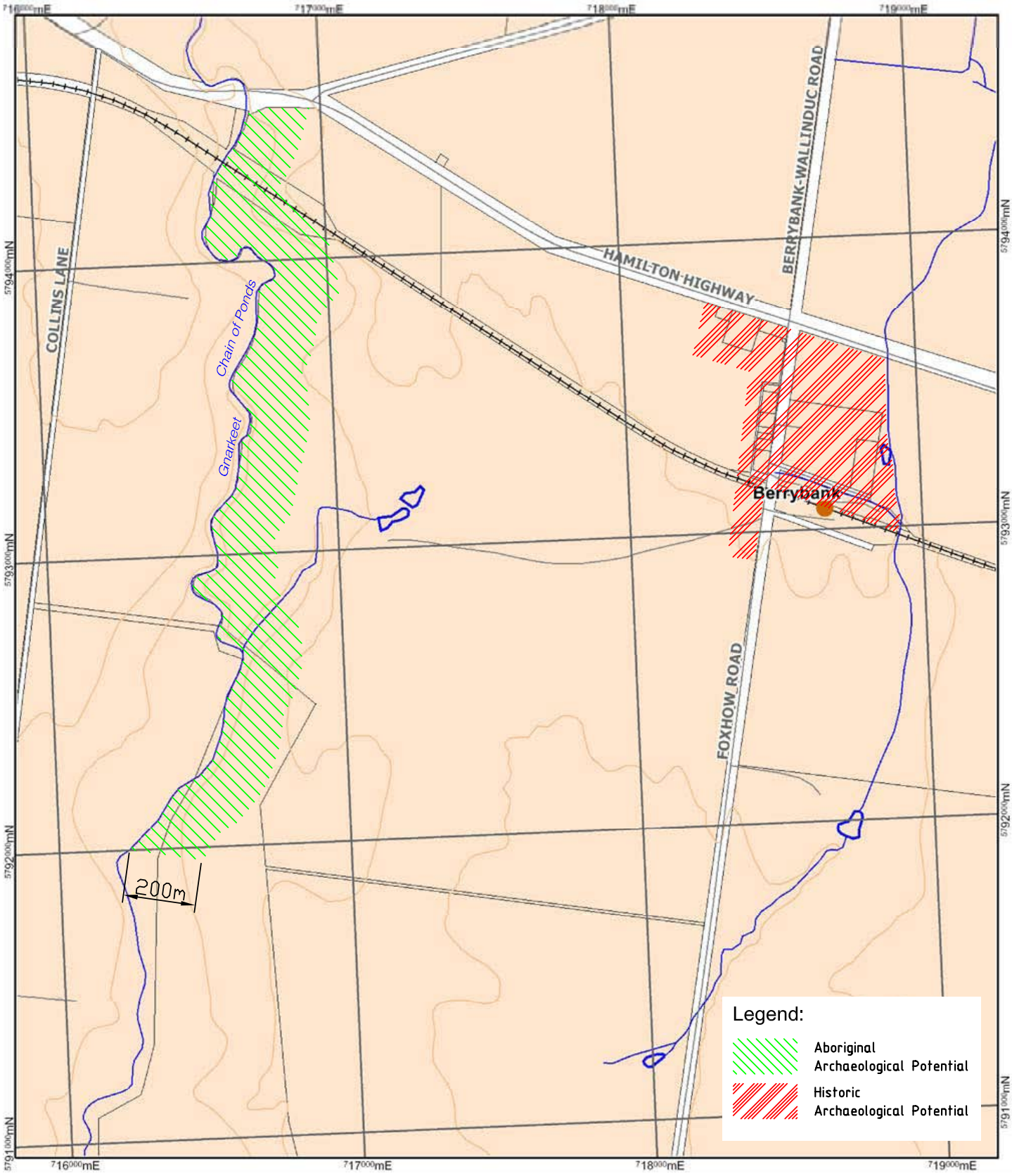


Figure 19 – Areas of Archaeological Sensitivity or Potential

Source: Victorian Department of Primary Industries

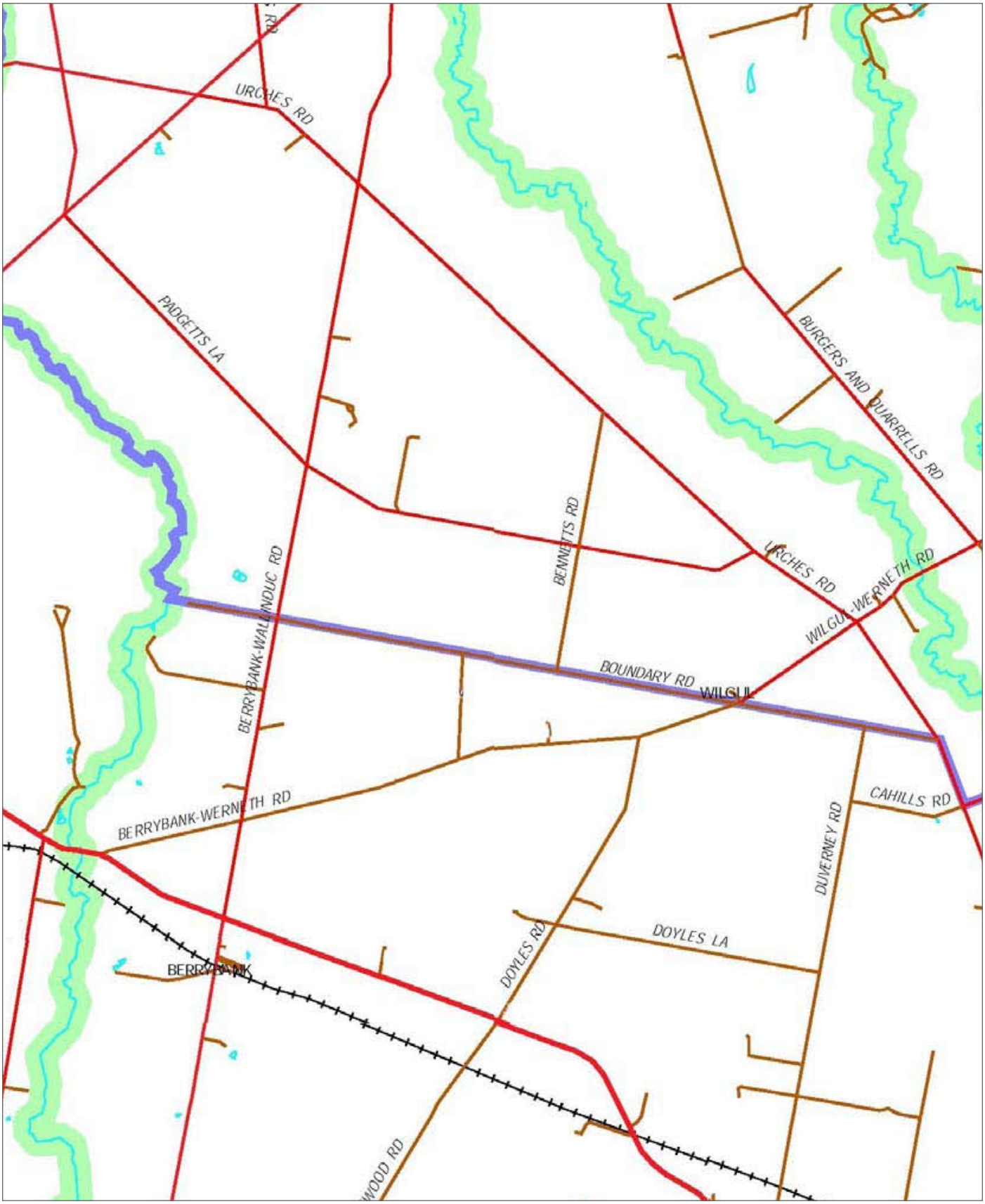


Figure 20 - AAV Aboriginal Cultural Heritage Sensitive Areas Map

Source: Aboriginal Affairs Victoria

15.4 Mitigation

The report recommends the following actions in order to preserve areas of potential archaeological significance and amelioration of potential impacts;

- *As no wind turbines or other infrastructure are within culturally sensitive areas a mandatory CHMP will not be required;*
- *A voluntary CHMP is recommended;*
- *further comprehensive ground surface survey of all locations to be directly impacted within the activity area by wind farm construction is undertaken to identify potential historic heritage sites that may be impacted by the proposed wind farm*
- *All historic structures should be excluded from development impact.*