

Traffic Impact Assessment Berrybank Wind Farm

Union Fenosa Wind Australia

25 May 2009

Berrybank Wind Farm

Prepared for
Union Fenosa Wind Australia

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1.0 Introduction

Union Fenosa Wind Australia (UFWA) propose to use and develop the site in Berrybank for a wind energy facility (wind farm) for the generation and transmission of electricity from wind generators, together with associated buildings and works, including access tracks, power grid facilities and investigative works. This represents an on site estimated financial investment of \$484m.

The proposed development consists of up to 100 turbines of up to 131m height (including a blade length of 49m and hub height of 80m) with a control facility and substation. Access roads will also be constructed, connecting the turbines together.

This report considers the traffic impact of the proposed development during construction and the facilities operation. This report has been prepared to identify the preferred access routes to the site, the condition of the existing roads, identify potential access points into the wind farm site and recommend potential road improvements to the surrounding road network.

This report contains the following:

- Chapter 2 – A review of existing conditions at the site.
- Chapter 3 – Details of the proposed routes for transportation of construction materials to the site.
- Chapter 4 – Details of the proposed access routes into the site from the arterial road network.
- Chapter 5 – Assessment of anticipated traffic impacts generated throughout the life of the wind farm.
- Chapter 6 – Discussion of restrictions and approvals likely to be necessary during the construction phase.
- Chapter 7 – Discussion of mitigating measures
- Chapter 8 – Conclusions

The report is based on the 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.

2.0 Location and Land Use

The Berrybank Wind Farm is located north of Berrybank and in between two rural towns, Lismore and Duverney, and is situated within the Shires of Corangamite and Golden Plains. The site extends either side of the Hamilton Highway, approximately 110 km inland of the coastline (north-west of Apollo Bay) and 70 km south-west of Ballarat. Figure 2.1 shows the extent of the Berrybank Wind Farm.

UFWA has license agreement with the various land owners as there are many pieces of land with seven different property land owners of the 5,034 hectares. The current land use is agricultural, primarily livestock grazing with a number of residential properties. The current zone identified by the Corangamite Shire Planning Scheme and the Golden Plains Planning Scheme is 'Farming'.

The topography of the site is generally rolling with a typical elevation of 170-200m AHD and there is largely no natural vegetation due to clearing. There is an intermittent water course running through the site but none are protected by Ramsar or Nationally Important Wetlands.

Figure 2.1 Berrybank Wind Farm Location



3.0 Transport Route

The major arterial road running through the site is the Hamilton Highway which is under the care and management of VicRoads. Construction of Berrybank Wind Farm will involve transportation of both raw construction materials and individual turbine components to site. Raw construction material deliveries will most likely come from Geelong and will access site from the east via Hamilton Highway.

The individual turbine components are most likely to be transported from Portland. The main focus with respect to Over Dimensional (OD) loads therefore, is on the route from Portland to the site. The proposed access route utilises "A" and "B" class roads designated under the VicRoads hierarchy of roads classification and arterial roads under the Moyne Shire and Warrnambool City road classifications. VicRoads is also the Authority responsible for managing the arterial road network in Moyne Shire and Warrnambool City.

Potential transport routes to the site from Portland and Geelong were researched using VicRoads *B-doubles & Higher Mass Limits Trucks (May 2004)* publication as well as via telephone conversations with VicRoads South Western Region officers based in Warrnambool and with Warrnambool City Council.

3.1 Portland to Site

Construction vehicles that are transporting the turbine parts to the site will primarily use the Princes Highway from Portland until they reach Warrnambool. As the start of Hopkins Highway is not an approved B-double route, trucks will travel north along Warrnambool-Caramut Road until Bridge Road and then travel east until Hopkins Highway. From this point they will travel north-east along Hopkins Highway until Mortlake and then they will travel east along Hamilton Highway to the site. Figure 3.1 shows the route between Portland and the wind farm.

Figure 3.1 Route between Portland and the wind farms



3.2 Geelong to Site

Construction vehicles that are transporting raw materials (i.e. cement or sand) to the site will primarily use the Hamilton Highway from Geelong until they reach the site. As the section of Hamilton Highway named Deviation Road is not an approved B-double route, trucks will travel west along Church Street, then south along McCurdy Road and then south-west along Hyland Road until it meets the Hamilton Highway. Vehicles will travel west along Hamilton Highway until they reach the site. Figure 3.2 shows the route between Geelong and the wind farm.

Figure 3.2 Route between Geelong and the wind farms



3.3 Road Classification and Condition

The above mentioned roads are all approved Over Dimensional routes. In addition the Princess Highway has been used for the transport of tower sections, blades and nacelles to the Wind Farms at Codrington and Yambuk. It is assumed that as these roads are existing Over Dimensional routes they will be in satisfactory condition for the transportation of construction materials and as a result they have not been inspected and are not expected to require any maintenance during the construction of the wind farm.

Princes Highway

The Princes Highway (A1) is an A Class road under the VicRoads hierarchy of roads classification and as such comprises 3.5 metres traffic lanes with 2.5m sealed shoulders. VicRoads ensure A Class roads provide consistent high standard driving conditions, and line marking that is easily visible in all weather conditions.

Warrnambool-Caramut Road

Warrnambool-Caramut Road (C174) is a C Class road within Warrnambool City's arterial network and is under the authority of VicRoads. C class roads are two lane sealed roads with shoulders. Consultation with VicRoads South West Regional Office has confirmed that Warrnambool-Caramut Road is a B-double approved route.

Bridge Road

Bridge Road is classified as a "main road" on the border of Moyne Shire and Warrnambool City's arterial network and is under the authority of VicRoads. Consultation with VicRoads South West Regional Office has confirmed that Bridge Road is a B-double approved route.

Hopkins Highway

Hopkins Highway (B120) is a B Class road under the VicRoads hierarchy of roads classification. B Class roads are sealed roads, wide enough for two traffic lines, with good centre line and edge line marking, shoulders, and a high standard of guidepost delineation.

Hamilton Highway

Hamilton Highway (B140) is also a B Class road under the VicRoads hierarchy of roads classification.

Church Street/ McCurdy Road/ Hyland Road

Church Street, McCurdy Road, Hyland Road are all local roads within the City of greater Geelong. These roads are approved Over Dimensional routes as outlined in VicRoads *B-doubles & Higher Mass Limits Trucks (May 2004)* publication. However it should be noted that B-Doubles are prohibited in Church Street between Vines Road and Midland Highway on Schooldays between 8:30 - 9:30am and 3:30 - 5:30pm.

4.0 Access Route

4.1 Access Considerations

As previously mentioned the major arterial road running through the site is the Hamilton Highway which is under the care and management of VicRoads. All other roads within and surrounding the site are local roads under the care and management of Corangamite and Golden Plains Shire.

The existing condition of the potential access roads was determined by a visual assessment of the roads within and surrounding the site. The inspection involved a visual drive through to observe the pavement condition of the potential access roads combined with on-foot inspections to measure traffic lane widths and shoulders at significant intersections. The site inspection considered the following:

- Sight distances achievable along intersection roads,
- Horizontal and vertical alignment of the road,
- Width of the road reservation, and
- Presence of roadside vegetation.

4.2 Site Investigation

The alignment of Hamilton Highway in the vicinity of the sight is generally straight and very flat. For rural roads with a speed limit of 100km/h (design speed of 110km/h) and grade 2% or less, AUSTROADS *Guide to Traffic Engineering Practice – Part 5 – Intersections at Grade* specifies an Approach Stopping Distance (ASD) of 210 meters and a Safe Intersection Sight Distance (SISD) of 290 meters. Accordingly most potential intersection locations easily achieved the minimum site distance of 290m.

The potential access locations examined during the visual inspection are highlighted in Figure 4.1 and a summary of the results are presented in Table 4.1. Detailed observations recorded during the inspection together with photographs taken to supplement the observations are provided in Appendix A and B.

Figure 4.1 Potential access roads inspected on site visit

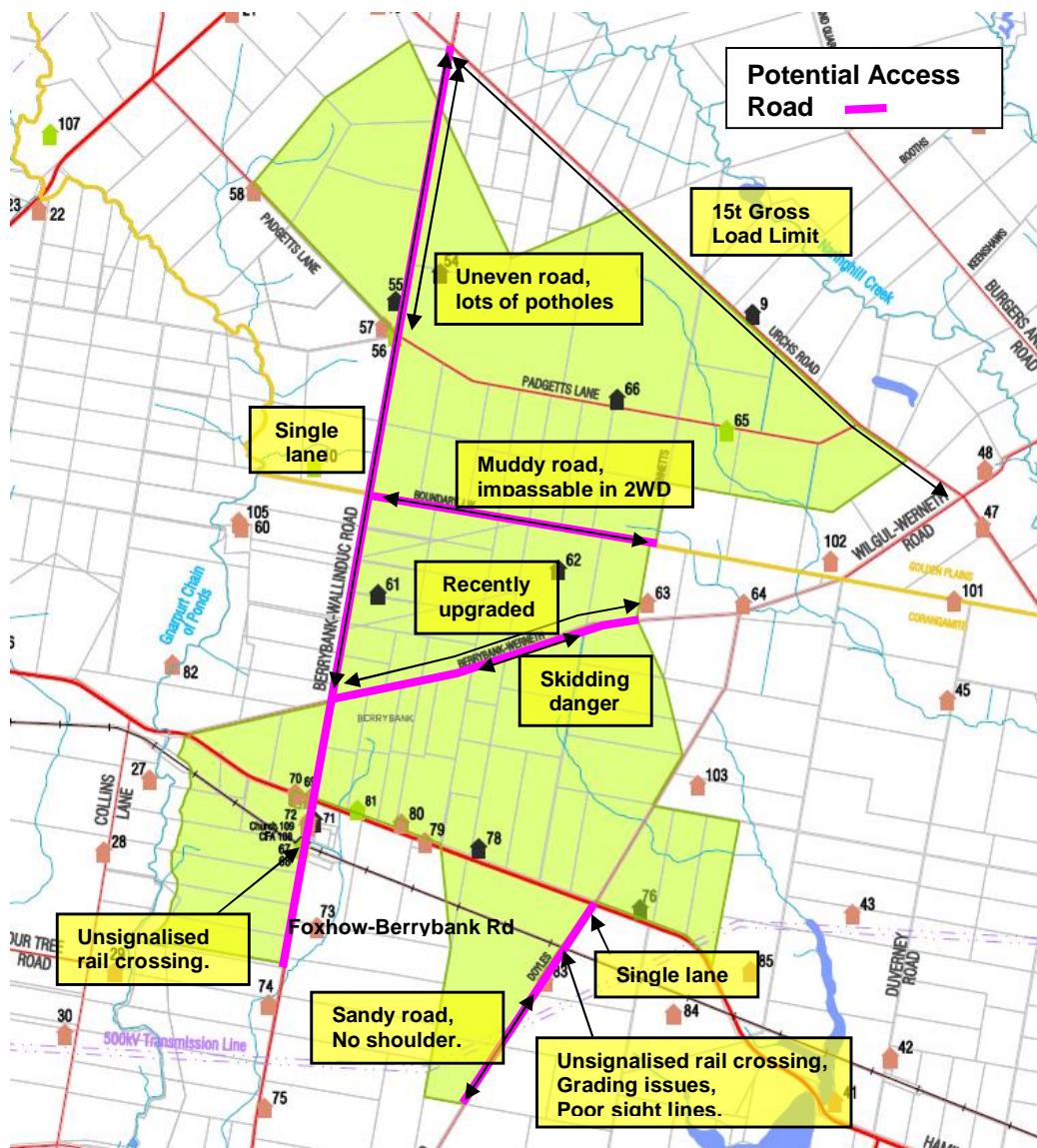


Table 4.1 Potential Access Locations

Road	Intersecting Road	Discussion
ACCESS TO NORTHERN SECTION OF SITE		
Berrybank-Wallinduc Rd	Hamilton Hwy	<ul style="list-style-type: none"> Sight distance is 290m minimum in both directions. No vegetation needs to be removed. Sealed road with gravel shoulder. At the intersection there are single lanes in both directions for both roads. Currently under 'stop control'. Truck stopping bay just west of intersection.

Berrybank-Werneth Rd	Berrybank-Wallinduc Rd	<ul style="list-style-type: none"> • Required sight distance achieved in both directions. • No vegetation needs to be removed. • Sealed road with gravel shoulder. • At the intersection Berrybank-Werneth Rd has single lanes in both directions; Berrybank-Wallinduc has only 1 lane. • Currently under 'give-way control'. • Road is part of the Australian Governments 'Roads to Recovery' program. • A segment of road, 2.3km-3km from the intersection, has warnings of 'skidding danger' and has an extra layer of gravel. • Access not as central to site as Boundary Rd.
Boundary Rd	Berrybank-Wallinduc Rd	<ul style="list-style-type: none"> • Required sight distance achieved in both directions. • No vegetation needs to be removed. • Unsealed road, no shoulder. • At the intersection Boundary Rd has single lanes in both directions; Berrybank-Wallinduc has only 1 lane. • Currently not under 'give-way' or 'stop' control'. • Observed conditions on this road were observed to be poor. The road is likely to be suitable for 4WD vehicles.

ACCESS TO SOUTHERN SECTION OF SITE

Foxhow-Berrybank Rd	Hamilton Hwy	<ul style="list-style-type: none"> • Sight distance is 290m minimum in both directions. • No vegetation needs to be removed. • Sealed road with gravel shoulder. • At the intersection there are single lanes in both directions for both roads. • Currently under 'stop control'. • Truck stopping bay just west of intersection. • Railway crossing ~ 500m from intersection is unsignalised.
Doyles Rd	Hamilton Hwy	<ul style="list-style-type: none"> • Sight distance is 290m minimum in both directions. • No vegetation needs to be removed. • Unsealed road and shoulder. • At the intersection Hamilton Hwy has single lanes in both directions; Doyles Rd has only 1 lane. • Currently under 'give-way control'. • Railway crossing ~ 600m from intersection is unsignalised and would be difficult for trucks to cross as it is raised.

4.3 Recommended Access Points

In considering the above locations, the preference for access into the Berrybank wind farm is as follows:

4.3.1 Access to northern section of site

Berrybank-Wallinduc Rd could provide the main access into the wind farm off Hamilton Highway. Berrybank-Werneth Rd is the preferred access off Berrybank-Wallinduc Rd. Although Boundary Road is closer to the main body of the wind farm, Berrybank-Werneth Rd is wider, in far better condition and has a safe intersection at Berrybank-Wallinduc Rd.

4.3.2 Access to southern section of site

Both Foxhow-Berrybank Rd and Doyles Rd are recommended for access into the site south of Hamilton Highway. Both access roads are required as the southern portion of the site is in two separate locations.

4.3.3 Rail crossings within the site

The railway crossing on Doyles Rd is raised approximately one meter above the road, the current grade leading up to the crossing would be difficult for large construction vehicles to travel. It is recommended that the crossing is levelling out with crushed rock. No new rail crossings should be proposed as part of this development as this would be against State Government guidelines.

4.3.4 Local road crossings within the site

It is recommended that internal access roads are positioned such that they cross the existing local roads at as close to a 90 degree angle to improve safety for vehicles exiting the site. All access points should provide adequate site distance (290 meters). This may require the removal of some vegetation. Consideration should also be given to minimising the amount of dirt/mud carried onto the existing road network by vehicles exiting the wind farm development. Where necessary, crushed rock should be placed on the approach to the exits to reduce the amount of dirt/mud carried onto the surrounding roads.

4.4 Existing Traffic Volumes and Road Classifications

The designated class and Annual Average Daily Traffic (AADT) currently experienced on each of the proposed access roads, as well as on Hamilton Highway, are presented in Table 4.2. Traffic volumes were provided by Corangamite Shire.

Table 4.2 Average Annual Daily Traffic, sourced from VicRoads and Corangamite Shire

Road	Authority	Class	AADT (2-way)	% Trucks
Hamilton Hwy	VicRoads	B Class Rd	1305*	18
Berrybank-Wallinduc Rd	Corangamite Shire	4C- Access Rd	64	14
Berrybank-Werneth Rd	Corangamite Shire	4C- Access Rd	12	4
Foxhow-Berrybank Rd	Corangamite Shire	4B- Link Rd	51	9
Doyles Rd	Corangamite Shire	4C- Access Rd	Not available	-

*651 eastbound and 654 westbound

4.5 Accident History

An analysis of accident data on the VicRoads' CrashStats database provided the number of casualty accidents for all roads in the vicinity of the site. The analysis revealed that there were three casualty accidents within the vicinity of the Berrybank site in the years between 2003 and 2007. These were:

- At Hamilton Highway and Berrybank-Wallinduc Road – One car travelling south crossed traffic and hit eastbound semi trailer causing a fatal type accident (all three occupants of the car were killed).
- On the Hamilton Highway between McLeans Road and Collins Lane – Motorcyclist leaving the carriageway on a corner.
- On the Hamilton Highway between Kings Road and Urches Road – Vehicle leaving the carriageway on a corner.

The most serious accident occurred when vehicles were on Berrybank-Wallinduc Road wanting to cross Hamilton Highway and into Foxhow-Berrybank Road but didn't give way to traffic travelling on Hamilton Highway.

VicRoads have recently upgraded the intersection to a 'Staggered T' configuration. Foxhow-Berrybank Rd and Berrybank-Wallinduc Rd are now misaligned in order that drivers are aware of the intersection and are forced to slow to an appropriate speed to continue through the intersection.

Berrybank-Wallinduc Road and Foxhow-Berrybank Roads are both under stop control. As illustrated in figures Figure 4.2, visibility between vehicles in Berrybank-Wallinduc Road and Hamilton Highway is completely unobstructed and Hamilton Highway is at grade in the proximity of the intersection. As a precautionary measure it is suggested that signage be installed on Hamilton Highway, prior to the intersection, advising of trucks frequently entering/exiting side road so that drivers are aware that construction vehicles may be pulling out in front of them.

Figure 4.2 Hamilton Hwy intersection with Fowhow Rd/ Berrybank-Wallinduc Rd



5.0 Traffic Impacts

Traffic generated by the site will mainly be construction vehicles delivering materials, and construction workers. It is assumed that the construction phase of the project may take up 18 months. When the turbines come into operation traffic generation is anticipated to be minimal.

5.1 Construction Phase

A large amount of traffic will be generated by the construction of the 100 turbine wind farm. The general construction activities involved are likely to include will include:

- Construction of the internal access tracks to the wind turbine locations,
- Stripping and stockpiling of topsoil,
- Foundation investigations at the wind turbine locations,
- Excavation and construction of the foundations and hardstands for the wind turbines,
- Excavation and construction of the operations building and switchyard,
- Erection of the wind turbines towers, nacelles and rotor blades,
- Installation of underground cabling, and
- The reinstatement of the site.

The access tracks will be retained for the life of the Berrybank Wind Farm and will be used primarily for inspection and maintenance of the turbines. They will be constructed using mainly local materials sourced on site or from Geelong.

It is anticipated that the tower foundations will consist of large reinforced concrete spread footings. The material removed from the excavation is expected to be utilised within the site, in forming hardstand areas and in reinstating access tracks and other areas after construction. It is assumed that the concrete will be mixed on site and the sand, cement, aggregate and water as well as the reinforcement will be delivered to the site from Geelong via the Hamilton Highway.

It is assumed that the individual components of the wind turbines will be transported to site from Portland. It is expected that the towers and blades will be delivered in four sections transported on extended articulated trucks. A heavy-duty articulated truck could deliver the generators and nacelle assemblies.

5.1.1 Traffic Generation

All the construction activities will require employees to travel each day to and from the site. It is expected that there will be on average 70 to 130 workers on site during most of the construction period. Union Fenosa estimates construction workforce numbers to increase to a maximum of 240 full time equivalent posts at the peak of construction. Construction is expected to commence in the 4th quarter of 2010 and the timeline for the commencement of Wind Farm operations (post construction) is expected to be late in the 4th quarter of 2011.

The number of construction trucks to the site is estimated to be approximately 3,500 as outlined in Table 5.1. These estimates are based on 100 turbines being constructed and is considered the worst case scenario. It also assumes that there is a batching plant on-site.

Table 5.1 Construction related vehicles visiting the site

Material	No. of Construction Trucks
Tower Sections	400
Nacelles	100
Blades	400
Hubs/cables/controllers	100
Sand and aggregate	1900
Cement	250
Water tankers	350
TOTAL	3500

To determine the impacts for the worst case scenario, it has been assumed that approximately 3500 trucks are required during the construction phase. If 100 turbines are constructed over the period of 12 - 14 months (working approximately 300 days of the year or 350 days over 14 months), on average there will be approximately eleven trucks accessing the site a day. This will generate twenty two truck movements throughout the day, which would be spread across an eight hour day.

As stated above construction workers will peak at approximately 240 staff on site at any point in time. Once again, to analyse the worst case, it has been assumed that each worker will travel in their own vehicle to the site. This will generate 240 vehicles accessing the site in the morning, and 240 leaving the site in the afternoon.

It has been assumed that two trucks would access the site in the morning (delivering materials for the start of the day) and that 240 construction staff vehicles will all enter the site during the same hour. It has also been assumed that two trucks would leave the site in the afternoon during the same hour as the construction staff. These assumptions would give the following peak period traffic generations:

- AM Peak – 242 vehicles entering site (240 cars plus 2 trucks), and 2 exiting (2 trucks)
- PM Peak – 242 vehicles exiting site (240 cars plus 2 trucks), and 2 entering (2 trucks)

Following the completion of the construction phase, the ongoing operational and maintenance workforce for the Berrybank Wind Farm and Substation will number up to 25 staff.

5.1.2 Traffic Distribution

Based on proximity to the site, it has been assumed that a majority of construction workers will travel from Lismore, however some may travel from towns to the south of the site such as Colac or Camperdown. Workers may also be sourced from major townships further afield such as Geelong and Warrnambool. Table 5.2 shows the towns from which the construction workers are assumed to be travelling from.

Table 5.2 Construction workers origins

Town Name	% of Workers	No. of Vehicles
Lismore	40	96
Colac	20	48
Camperdown	20	48
Geelong	10	24
Warrnambool	10	24

Workers from Lismore, Camperdown and Warrnambool are expected to access site from the west, while Colac and Geelong workers would access site from the east.

Trucks bringing materials to the site would most likely travel from Geelong and access site from the east. However, larger materials such as the turbine heads would most likely be shipped to Portland and trucked to site from the west.

The traffic impacts of the construction traffic will be concentrated at the Hamilton Highway/Berrybank-Wallinduc Road, Hamilton Highway/Doyles Road and Hamilton Highway/Foxhow-Berrybank Road intersections. These impacts are assessed in the following section. Beyond this intersection, traffic movement numbers are dissipated as traffic spreads to the surrounding road network, and hence all other traffic impacts are considered negligible.

Hamilton Highway/Berrybank-Wallinduc Road

The turbines north of Hamilton Highway are expected be accessed via Berrybank-Wallinduc Road. It is estimated 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.

Utilising Figure 4.2 from AUSTROADS *Guide to Traffic Engineering Practice – Part 5 – Intersections at Grade*, it is possible to determine that Hamilton Highway is able to absorb an additional 1500 vehicles per hour. This is significantly higher than the additional 218 vehicles that this access point will generate.

Using Figure 4.3(a) the delays for vehicles exiting the site are able to be determined. 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.

Hamilton Highway/Foxhow-Berrybank Road

Half of the turbines south of Hamilton Highway are expected be accessed via Foxhow-Berrybank Road. 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.

Utilising Figure 4.2 from AUSTROADS *Guide to Traffic Engineering Practice – Part 5 – Intersections at Grade*, it is possible to determine that Hamilton Highway is able to absorb an additional 1500 vehicles per hour. This is significantly higher than the additional 12 vehicles that this access point will generate.

Using Figure 4.3(a) the delays for vehicles exiting the site are able to be determined. 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.

Hamilton Highway/Doyles Road

Half of the turbines south of Hamilton Highway are expected be accessed via Doyles Road. 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.

Utilising Figure 4.2 from AUSTROADS *Guide to Traffic Engineering Practice – Part 5 – Intersections at Grade*, it is possible to determine that Hamilton Highway is able to absorb an additional 1500 vehicles per hour. This is significantly higher than the additional 12 vehicles that this access point will generate.

Using Figure 4.3(a) the delays for vehicles exiting the site are able to be determined. 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.

5.1.3 Proposed Access Road Upgrades

The truck and vehicle traffic generated by the construction of the Berrybank Wind Farm will result in an increase in the average daily traffic volumes on the surrounding road network over the construction period. To be able to identify if an upgrade (widening of the road) of the surrounding network is required reference is made to AUSTROADS and VicRoads Standards. The relevant information from these standards is summarised in Table 5.3.

Table 5.3 AUSTROADS and VicRoads Geometric Standards, Guidelines

Guidelines	AADT	Traffic Lane Width (m)	Shoulder Width (m)	Shoulder Seal Width (m)
AUSTROADS	1 - 150	1 x 3.5	2.0	0.5
AUSTROADS	150 – 500	2 x 3.1	1.5	0.5
AUSTROADS	500 - 1000	2 x 3.1/3.5	1.5	0.5
VicRoads	51 - 150	1 x 4.0	1.5	N/A
VicRoads	< 1,500	2 x 3.1	1.5	0

The expected Average Annual Daily Traffic (AADT) for the surrounding road network consist of the existing total traffic movements recorded by VicRoads and the Shire of Corangamite combined with the predicted traffic volumes generated during construction. The expected AADT are presented in Table 5.4. Expected AADT volumes are compared to the requirements of Table 5.3 in order to determine if upgrades are required on the individual roads within the surrounding network. To determine the expected AADT it is assumed that all the traffic generated by the construction of the site will use Hamilton Highway and that the other surrounding roads feeding onto Hamilton Highway may see temporary increases in traffic volumes during parts of the construction period of up to 50 per cent of that traffic volume.

Table 5.4 Proposed Upgrades to roads between each site access and The Hamilton Highway

Road	Existing AADT	Expected AADT	Sealed Width	Upgrade Required	Extent of upgrade works
Berrybank-Wallinduc Rd	64	64+436 =500	3.6m	Yes	Widening the existing pavement from 3.6m to 6.2 m 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 (0.5m sealed, 1.5m unsealed) between the Hamilton Highway and 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

There are number of locations where the proposed site access tracks cross the existing local roads. It is recommended that these locations be sealed to minimise the impact on the existing road conditions. The sealed section of these roads should extend approximately 10m in either direction from the access points to reduce potholing and rutting near the crossing points.

These suggested road construction upgrades would be necessary to meet standards described in Table 5.3.

5.2 Operational Phase

The operational phase of the Berrybank Wind Farm is not expected to generate significant volumes of traffic with movements expected to be minimal and normally comprise only service vehicles carrying personnel undertaking general maintenance on the site. The number of permanent staff on site is not expected to exceed 25 people and therefore no further measures would be required to manage this traffic.

5.3 Decommissioning Phase

Traffic volumes during the decommissioning phase of the wind farm is likely to be significantly less than that experienced during the construction phase as the access tracks will be in operation.

6.0 Restrictions & Approvals

UFWA will ensure that they and their sub-contractors comply with all permitting requirements related to the movement of construction vehicles on public roads surrounding the Berrybank Wind Farm site.

6.1 OD Vehicle Permits

Over Dimensional Load permits will be required for the transportation of the:

- Tower sections,
- Blades,
- Nacelles, and
- Large cranes used for the erection of these components.

The loads will require pilot and escort vehicles. The number is dependent upon the load length or width as outlined in the Pilot and Escort Vehicle Graph, Figure 6.1, contained in VicRoads Publication *Additional Permit Conditions*. The hours of movement outside built up areas are also contained within the publication and are summarised in Table 6.1, however, additional restrictions may be included within the permit issued by VicRoads.

Figure 6.1 Vicroads Pilot and Escort Vehicle Graph

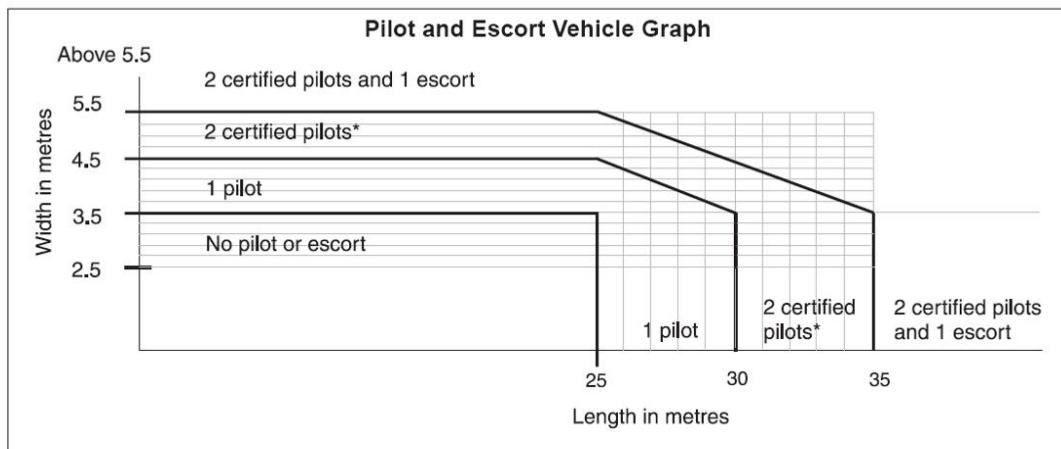


Table 6.1 VicRoads specified Class 1 Vehicle travel times restrictions in rural areas

Vehicle Dimensions	Travel time restrictions
Up to 3.1m wide and/or 22.0m long	At all times
Up to 3.5m wide and/or 25.0m long	Sunrise-sunset
Over 3.5m wide and/or 25.0m long	Sunrise-sunset

An individual Over-dimensional (OD) permit is not required from VicRoads if the length of the vehicle is less than 25m and the width is less than 3.1m (*Road Safety (Vehicles) Regulations 1999, Schedule 1*). To minimise the impact of transporting construction materials to the site, OD vehicles should travel at night if possible. If the vehicle is longer than 22m and is travelling at night, it must be accompanied by a pilot vehicle. VicRoads may require the presence of their own escort vehicles in addition to the pilot vehicles.

6.2 Load Limits

The transport of the materials used for the construction of the access roads, concrete foundations and the tower fabrication will be subject to the Victorian Statutory Load Limits set out in Part 4 of the Road Safety (Vehicles) Regulations 1999.

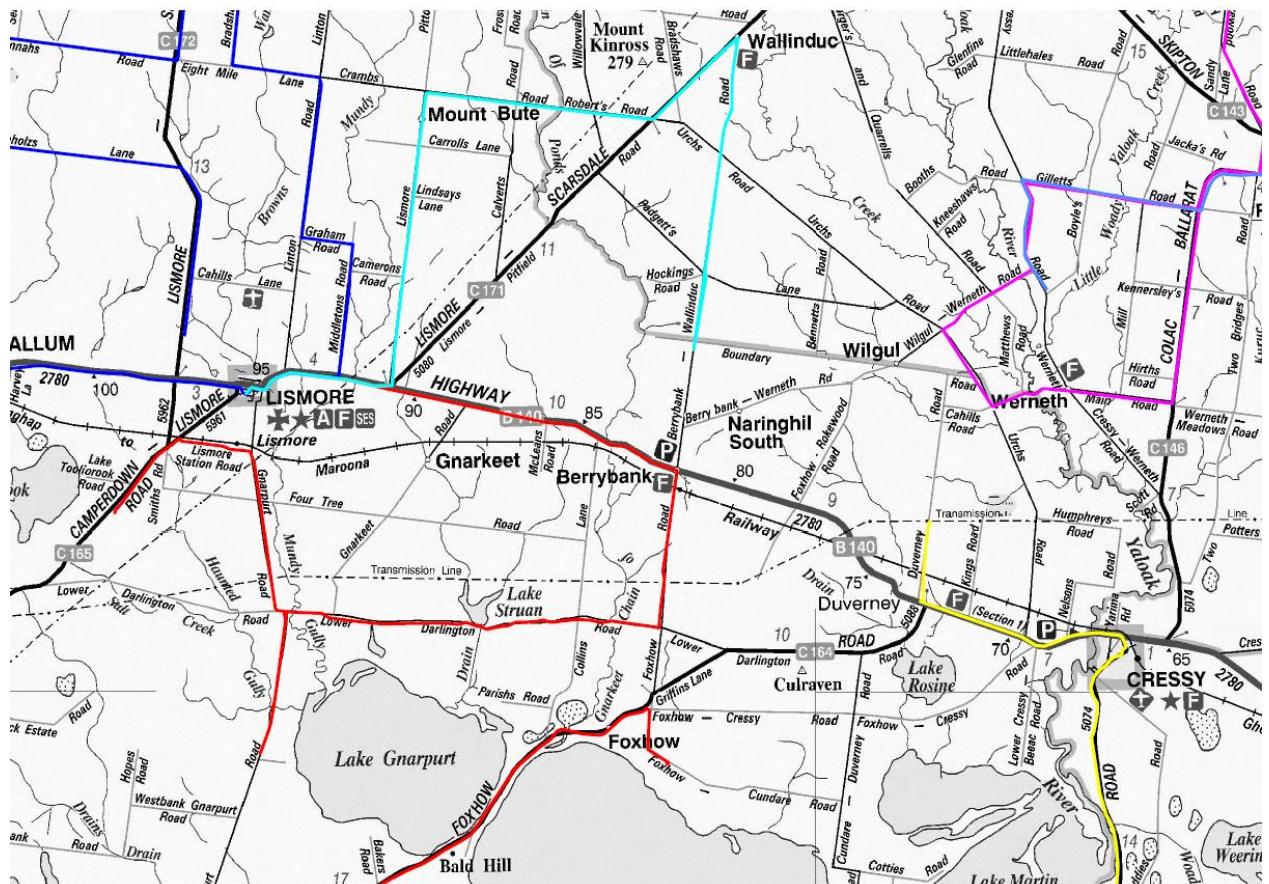
No restrictions on the movements of legal loads in this area have been specified by VicRoads or the Corangamite Shire Council. (No proposed movements are expected to adversely impact the Golden Plains Shire highway network). VicRoads have confirmed that the bridges on both Warrnambool-Caramut Road and Bridge Road have no specified load limits.

6.3 School Bus Routes

No public transport operates within the vicinity of the site, however a school bus routes operates along the Hamilton Highway and surrounding area. The school bus service operates on school days only between 7.30am and 8.50am, and between 3.20pm and 4.30pm, for the duration of the school year.

The Department of Transport (DoT) operate seven different services within a 20km radius of the Berrybank Wind Farm site. These routes service Lismore Primary School, Rokewood Primary School, Derrinallum College, Camperdown College, Colac College and Ballarat College. Figure 6.2 illustrates these seven DoT managed bus routes, a number of which utilise Hamilton Highway as well as Foxhow-Berrybank Road and Berrybank-Wallinduc Road.

Figure 6.2 Department of Transport School Bus Routes operating within a 20km radius of the site



Additionally, the Department of Transport have advised that some of the colleges may run additional services dependant on the location of students attending the school at throughout the year. As such, it is difficult to determine precisely when school buses will be travelling within the vicinity of the site during the school bus operating hours.

To help reduce the impact of the development on the local road network no over-dimension or large trucks associated with the construction should 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.

6.4 Rehabilitation of Public Roads used as Access Routes

The condition of the public roads to be used for the delivery of raw and fabricated materials should be established prior to commencement of works and then regularly monitored during the period of the works. The road and intersection conditions should be established by the use of field surveys and joint site inspections with Corangamite and VicRoads Officers with agreed intervention levels struck. When required, rehabilitation of the pavement and/or edges of seal, shoulders and verges will be carried out. At the completion of the works the access roads should be in the same or superior condition than at the commencement of the works.

7.0 Recommendations

To help reduce the impact of the development on the local road network, some considerations should be noted:

- No over-dimension or large trucks associated with the construction should 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;
- 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;
- Transport large over-dimensioned materials overnight to reduce impacts on road network (conditional on VicRoads approval).

8.0 Conclusion

This assessment of the traffic issues for the construction of the wind farm at Berrybank has concluded the following:

- The site will generate a maximum demand of approximately 240 staff vehicles and 11 trucks per day, which would be approximately 242 trips in the peak hours.
- The main access points off Hamilton Highway at the intersections with Berrybank-Wallinduc Road, Foxhow-Berrybank Road and Doyles Road will provide no issues for the facility.
- The four access roads to the site Berrybank-Wallinduc Road, Foxhow-Berrybank Road, Doyles Road and Berrybank-Werneth Road all require upgrade works to meet AUSTROADS and VicRoads Geometric Standards.
- Hamilton Highway is able to absorb approximately 1500 vehicles in the peak hour, which is significantly higher than the peak traffic generated by the site;
- Vehicles departing the site are expected to experience delays of less than one second;
- Department of Transport requests that over-dimensional vehicles travelling to site along Hamilton Highway operate outside of school bus hours.
- Over-dimensional vehicles used to transport materials to site will require OD permit from VicRoads.

Provided the recommendations contained within this report are implemented, there are no traffic related reasons why a planning permit for the Berrybank Wind Farm should not be issued.

Appendix A Inspection Records



Appendix A Inspection Records

Chainage	Comments
DOYLES ROAD	
0km	<ul style="list-style-type: none"> Unsealed gravel road with sand shoulder 3m wide single carriageway, 2.25m shoulders Shoulder muddy at intersection Clear sight lines with very little vegetation
0.4km	<ul style="list-style-type: none"> Road narrows to 2.7m wide, 1.4m shoulders
0.6km	<ul style="list-style-type: none"> Rail Crossing – no boom gates, unsignalised Grading issues at crossing / poor sightlines
1.4km	<ul style="list-style-type: none"> Very sandy 5m wide carriageway, no shoulder
FOXHOW-BERRYBANK ROAD	
0km	<ul style="list-style-type: none"> Sealed road with unsealed shoulder 27.6m wide (~13.8m each) two lane road Traffic island separates lanes Former petrol station complex west of intersection Clear sight lines with very little vegetation
0.05km	<ul style="list-style-type: none"> Sealed road with unsealed shoulder 6.5m wide (3.25m each) two lane road
0.5km	<ul style="list-style-type: none"> Rail Crossing – no boom gates, unsignalised Flat grade / good sightline
2.9km	<ul style="list-style-type: none"> Single carriageway, wide gravel shoulder
BERRYBANK-WALLINDUC ROAD	
0km	<ul style="list-style-type: none"> Sealed road with sealed shoulder 32.5m wide (~16.25m each) two lane road Traffic island separates lanes Truck stop bay to the left of the intersection Clear sight lines with very little vegetation Significant curve to the east allows easy left turn into road
0.02km	<ul style="list-style-type: none"> Sealed road with sealed shoulder 32.5m wide (~16.25m each) two lane road
0.1km	<ul style="list-style-type: none"> Sealed road with unsealed shoulder 3.6m wide single lane road
1.5km	<ul style="list-style-type: none"> Sealed road with unsealed shoulder T intersection with Berrybank-Werneth Road Clear sight lines with very little vegetation 3.7m wide single carriageway
3.5km	<ul style="list-style-type: none"> Sealed road with no shoulder (low grass up to carriageway) Very flat, good visibility
4.2km	<ul style="list-style-type: none"> Intersection with Boundary Rd to the east and private farm access road to the west Sealed road with unsealed shoulder 3.8m wide single carriageway
4.5km	<ul style="list-style-type: none"> Orange gravel shoulder

Chainage	Comments
4.5km	<ul style="list-style-type: none"> Intersection with Padgetts Rd to the east and west Padgetts Rd under give way control Sealed road with unsealed shoulder 3.6m wide single carriageway south of intersection, 3.8m wide single carriageway south of intersection
7.3km	<ul style="list-style-type: none"> Sealed road with unsealed shoulder Large number of potholes on edges of road Rough driving conditions
9.5km	<ul style="list-style-type: none"> Intersection with Urches Rd to the east and west Urches Rd is signed 15t Gross Load Limit
BOUNDARY ROAD	
0km	<ul style="list-style-type: none"> Unsealed single carriageway road with no shoulder Clear sight lines with very little vegetation Very muddy
0.2km	<ul style="list-style-type: none"> Very muddy uneven road with large puddles Large puddles, unpassable for 2WD vehicle Tall grass close to road Quite narrow carriageway
BERRYBANK-WERNETH ROAD	
0km	<ul style="list-style-type: none"> Unsealed road with no shoulder 38.9m wide (~10m each) two lane road Grass traffic island separates lanes Compacted sand and gravel, good driving conditions Clear sight lines with very little vegetation Part of Roads to Recovery Project
0.05km	<ul style="list-style-type: none"> Unsealed road with no shoulder 7.2m wide single carriageway Raised carriageway with good drainage channels either side Straight
2.3km – 3km	<ul style="list-style-type: none"> Signs warning of skidding danger 3.8mm wide single carriageway 700m boggy section built up with larger brown gravel Road then returns to normal condition and alignment

Appendix B Inspection Photos



Appendix B Inspection Photos

DOYLES ROAD	
	
Doyles Rd/Hamilton Hwy intersection	Hamilton Hwy west of intersection
	
Doyles Rd approaching intersection	Doyles Rd
	Doyles Rd – sandy road surface adjacent to south east boarder of the site

FOXHOW-BERRYBANK ROAD

	
Foxhow-Berrybank Rd/Hamilton Hwy intersection	Foxhow-Berrybank Rd approaching intersection
	
Hamilton Hwy west of intersection	Foxhow-Berrybank Rd
	
Foxhow-Berrybank Rd approaching railway crossing	Foxhow-Berrybank Rd – wide shoulder close to south boarder of the site

BERRYBANK-WALLINDUC ROAD

	
Berrybank-Wallinduc Rd/Hamilton Hwy intersection (looking north)	Berrybank-Wallinduc Rd/Hamilton Hwy intersection (looking south, LHT lane)
	
Berrybank-Wallinduc Rd/Hamilton Hwy intersection (looking south)	Berrybank-Wallinduc Rd merge of two lanes after Hamilton Hwy intersection
	
Berrybank-Wallinduc Rd/Berrybank-Werneth Rd intersection (looking north)	Berrybank-Wallinduc Rd (narrow coarse orange gravel shoulder)

	
Berrybank-Wallinduc Rd/Padgetts Rd intersection (looking north)	

BOUNDARY ROAD	
	
Berrybank-Wallinduc Rd/Boundary Rd intersection (looking north)	Berrybank-Wallinduc Rd/Boundary Rd intersection (looking east)
	
Boundary Rd (muddy, long grass on shoulder)	Boundary Rd (large puddles, muddy, long grass on shoulder)

BERRYBANK-WERNETH ROAD

	
Berrybank-Wallinduc Rd/Berrybank-Werneth Rd intersection (looking north)	Berrybank-Wallinduc Rd/Berrybank-Werneth Rd intersection (looking east)
	
Berrybank-Werneth Rd	Berrybank-Werneth Rd, extra gravel layer in skidding danger section