



TRAFFIC MANAGEMENT & SAFETY CONSULTANTS

10 Haig Street Belmont NSW 2280
PH. (02) 4945 5688
Fax (02) 4945 5686
Mob. 0418 419 190
E-mail: tp.keating@hunterlink.net.au

TRAFFIC ASSESSMENT REPORT

PROPOSED WIND FARM

CAPITAL WIND FARM II, LAKE GEORGE

September-October 2010

Monteath & Powys (for The Client)

Palerang Council Local Government Area

Prepared by
Terry Keating
Director
TPK & Associates Pty Ltd

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TRAFFIC ASSESSMENT

SECTION 1 - INTRODUCTION

1.1. – The Project

TPK & Associates Pty Ltd (TPK) were invited by Monteath & Powys (for The Applicant) to join their project team in preparation of a traffic report for the extension of an existing Wind Farm. The Wind Farm location is:

Capital Wind Farm II, Lake George (See Appendix A)

1.2. – Task Description

The assessment and report focuses on the following objectives: -

- Traffic generations (both light & heavy vehicles) on traffic routes during both the construction and operational periods.
- Assess the impacts of the additional traffic in terms of route and intersection capacity.
- Assess the need for road network upgrade to manage this additional traffic impact.
- Assess the need for traffic control measures
- Assess the site access roads and connectivity to the public road network.

This assessment report is a supplement to the Development Application documentation for the project.

1.3. – Project Representative

Mr. Terry Keating, Director, TPK & Associates Pty Ltd undertook the evaluation and preparation of the report. He has over 40 years experience in the road safety and traffic management profession, including the assessment of traffic generating developments.

1.4. – References

The assessment and report have been provided as an outcome of reference to:

- Roads & Traffic Authority (RTA) Guide to Traffic Generating Developments
- Austroads Part 5 Intersections at Grade
- Austroads Part 2 Roadway Capacity
- Project Plans as provided by Monteath & Powys

SECTION 2 – PROJECT BACKGROUND

Capital Wind Farm II project is the proposed provision of additional turbines in an existing wind farm precinct. See Appendix E of this report for Site Layout.

The existing Capital wind Farm I was established during 2008 and from a road safety and traffic management assessment perspective processes and initiatives undertaken during both the construction and operational phases are valuable precedents for this assessment.

Connell Wagner prepared a Traffic and Transport Issues Assessment Report in 2005 as a part of the Environmental Assessment for the Capital Wind Farm I project. Section 8 of that report outlines the Mitigation Measures recommended as an outcome of the assessment; a copy is provided in Appendix B of this report.

Consultation with relevant road authorities as recommended was completed and the Capital Wind Farm Construction Compliance Report indicates all requirements and works had been carried out to comply with the outcomes of that consultation process.

The use of public roads during the construction phase had two aspects:

1. On the broader scale transport from major centres (Ports, Production Centres or Capital Cities) was via the main Federal or State Routes; where oversize/overmass loads required permits and escort vehicles to be obtained for travel approval.
2. Closer to the site those main routes converged on Goulburn; Goulburn being the optimum link to the local Capital Wind Farm site or alternate option off the Federal Highway at Collector. See Appendix C for haulage routes plan.

The operational phase was not assessed as a significant traffic generator as only small daily volumes of local traffic were reported.

TPK has researched Capital Wind Farm I documentation reporting on both the Construction and Operational phase and found no evidence of traffic management issues to suggest that the recommendations and initiatives implemented for Capital Wind Farm I were unsuccessful.

SECTION 3 – PROJECT OVERVIEW

The DGR's for Capital Wind Farm II with respect to Transport and Traffic are provided in Appendix D of this report.

The Locality Plan for the proposed Turbines is provided in Appendix E.

3.1 – Land Use

The assessment considers a development proposal for:

- 53 x S88 2.1 MW wind turbines (constructed in 4 sections)
- 2 concrete batching plants will be set up on site
- All road-base/quarry material will be sourced on site

3.2 – Traffic Generations – Construction & Operation (Aligned to Appendix D, DGR's requirement Transport & Traffic, arrow point 1)

The RTA Guide to Traffic Generating developments provides typical rate for traffic generating developments; for this project reference to the document is not relevant in terms of calculating potential trip numbers.

The potential project life traffic generations for the Construction Phase of the project are provided in Table 1 on the following page.

Section 4 of this report will translate that overall traffic generation base into daily impacts.

TABLE 1 – PROJECTS POTENTIAL TRAFFIC GENERATIONS, CONSTRUCTION PHASE

External Site Trips, Capital II

Aspect	Trips			Assumptions
	Cars	Trucks	RAV	
1. Workers				
Wind Farm Workers	5600			Workers located in Goulburn, Queenbeyan, Tarago and Bungendore, all go to site office off Collector road to commence work
Substation Workers	2400			Workers located in Goulburn, Queenbeyan, Tarago and Bungendore, all go to substation off Bungendore road to commence work
Trips between substation and wind farm	1000			Travelling collector road and bungendore road throughout the day
2. Site establishment/disestablishment	20	20		
3. Civil Works Deliveries				
WTG Foundation concrete materials		440		Assume gravity foundations, onsite batching
WTG foundation reinforcing		50		Assume gravity foundations
Road material import		30		Assume generally materials won on site only capping stone imported
Drainage structures		4		
Water trucks		4		Assume water trucks remain onsite for entire project with water sourced from onsite
Revegetation	10	6		Including grass seeding materials, topsoil, trees
4. Turbine Component Deliveries				Deliveries to site are RAV, return trips are standard truck configurations
Embedments	Note	55	55	Note: RAV trips will be accompanied by escorts as per permit
Tower Sections	Note	165	165	Note: RAV trips will be accompanied by escorts as per permit
Blades	Note	165	165	Assume 1 blade per vehicle Note: RAV trips will be accompanied by escorts as per permit
Hubs	Note	55	55	Note: RAV trips will be accompanied by escorts as per permit
Nacelles	Note	55	55	Note: RAV trips will be accompanied by escorts as per permit
Miscellaneous	50	400		Includes ducting, entry stairs, bottom cabinet mounts, tower bolts, tower cables, tower platforms, lifts, met masts, cranes
5. Substation				
Miscellaneous	6	10		Including earthing, capacitor banks etc
Foundations		20		Concrete sourced from external supply as batch plant
6. Electrical Works				
Overhead line		14		Including insulators etc, and machinery 10km overhead lines
Transmission poles			6	400m pole spacing, 10km
Underground cable		80		Including trenching machinery, 20km of underground
Optic Fibre		10		20km of OF
Bedding sand and backfill material		20		20km of trenching

NOTE: a trip is defined as one way

For the Operational Phase wind farms are designed to operate automatically and have small staff components for monitoring and maintenance; the expanded wind farm due to this project will generate minimal increase on the current operation staff (around 8 persons) at Capital Wind Farm I.

The trips generated by this small staff level have no impact on the road network.

SECTION 4 – ROAD NETWORK ASSESSMENT

4.1 – Overview

The review of documentation prepared for Capital Wind Farm I undertaken for this assessment indicates that with the implementation of the Capital Wind Farm I agreed improvements or initiatives to manage that Transport and Traffic it is reasonable to expect traffic conditions would be acceptable to manage the traffic demands associated with Capital Wind Farm II.

For the current proposal in the Construction Phase:

- Staff will generally arrive for a 6.45 am toolbox meeting.
- A workforce maximum of up to 90 on any one day.
- Staff car pool therefore the worst case peak hour in trips would be 35 vehicles in the hour 6-7am.
- 10 truck movements would be the maximum trip number in the peak period.
- Return staff trips each day vary with site needs such that the volumes of the am peak are not reached in any pm peak period.
- Trips in the period between peaks will fluctuate with site demand but not exceed 20 trips in any hour

The projected peak volumes will in the main utilise routes and intersections with low existing volumes; the quantum of hourly increase due to this project at any one location will not be of a demand level that route or intersection capacity will be subjected to an adverse impact.

The other traffic generation is the oversize/overmass movements that are subject to the permit conditions but typically would:

- Commence travel before daybreak from the Port of Kembla and then wait in a lay-by on the highway just out of Goulburn.
- The travel to site is in the early daylight before school hours.

For this assessment TPK undertook selected review of the local road network links between Goulburn and the Wind Farm site to reaffirm traffic conditions.

The following discusses TPK's assessment of this project as an outcome of:

- Review of Capital Wind Farm I documentation
- Evaluation of the local road network.

4.2 – Route Capacity (Aligned to Appendix D, DGR's requirement Transport & Traffic, arrow point 3)

The potential hourly traffic generation during either the construction or operational phase will not be significant in terms of intersection or route capacity. The key findings of the assessment in this regard were:

1. The main Federal and State route links to Goulburn from remote locations manage significant traffic volumes through urban precincts where platoon management and available capacity will manage the minimal hourly increase generated by this project as a result of haulage trips.
2. On those routes any oversize/over-mass transport vehicles associated with this project will be controlled in terms of travel times by the conditions of obtained permits; this could require travel outside the urban weekday business peaks.
3. The road network between Goulburn and Capital Wind Farm site currently has traffic demands that generate AADT's less than 5,000vpd. Austroads Guide to Roadway Capacity provides for confidence in the assumption of satisfactory roadway capacity on the routes between Goulburn and the Capital Wind Farm sites; the extract below is a table that relates AADT to Level of Service with Level of Service A-C acceptable.

Table 3.9 Maximum AADTs for Various Levels of Service and Types of Terrain on Two-Lane Two-Way Rural Roads					
K factor ^a	Level of Service				
	A	B	C	D	E
Level Terrain					
0.10	2,400	4,800	7,900	13,500	22,900
0.11	2,200	4,400	7,200	12,200	20,800
0.12	2,000	4,000	6,600	11,200	19,000
0.13	1,900	3,700	6,100	10,400	17,600
0.14	1,700	3,400	5,700	9,600	16,300
0.15	1,600	3,200	5,300	9,000	15,200
Rolling Terrain					
0.10	1,100	2,800	5,200	8,000	14,800
0.11	1,000	2,500	4,700	7,200	13,500
0.12	900	2,300	4,400	6,600	12,300
0.13	900	2,100	4,000	6,100	11,400
0.14	800	2,000	3,700	5,700	10,600
0.15	700	1,800	3,500	5,300	9,900
Mountainous Terrain					
0.10	500	1,300	2,400	3,700	8,100
0.11	400	1,200	2,200	3,400	7,300
0.12	400	1,100	2,000	3,100	6,700
0.13	400	1,000	1,800	2,900	6,200
0.14	300	900	1,700	2,700	5,800
0.15	300	900	1,600	2,500	5,400
<p>a. K is the ratio of the design hour volume to the annual average daily traffic.</p> <p>b. All values rounded to the nearest 100 vehicles per day. Assumed conditions include 60/40 directional split, 14 percent trucks, 4 percent buses. Percentages of length with no overtaking for level, rolling and mountainous terrain of 20, 40 and 60 have been assumed.</p>					

The terrain for all the assessed routes were in the Level to Rolling Terrain range and it can be seen that acceptable Levels of Service existing for all those routes.

4.3 – Public Road Review (Aligned to Appendix D, DGR's requirement Transport & Traffic, arrow point 2 & 4)

The City of Goulburn has two Hume Highway access interchanges; the northern interchange affords access to the preferred route to link to Braidwood Road as:

- The route has greater acceptability for large vehicle turn paths.
- Less impact on residential precincts

For oversize/over-mass permits the suitability of the turn paths at critical intersections will need to be assessed by the transport company as it is a key to the adopted route.

The preferred haulage routes outside Goulburn urban area, shown on Appendix C have been reviewed; the factors relevant to traffic assessment are indicated in the following pages.

Braidwood Road

1. The route is a State Road MR79 (See Photo 1).
2. Standard traffic facilities for this rural road environment including centreline, edgeline and guideposts are provided.
3. RTA Traffic Volume Data records and sample counts taken during site appraisals suggest an AADT under 4,000vpd.
4. Bridge decks on the route are 6 to 7m wide.
5. School Zone in 100kph Zone at Tirranna.
6. Stop sign control approaching Sloane Street, Goulburn.

PHOTO 1 – TYPICAL ROAD CONDITIONS BRIADWOOD ROAD



TPK's assessment did not disclose any major road safety issues with this route; any period generating significant volumes of construction traffic needs to consider avoidance of School Zone/School Bus operating periods.

Bungendore Road

1. The route is rural local road classification that provides a traffic link function for the area.
2. The route presents a similar road environment to Braidwood Road only slightly more undulating.
3. AADT is estimated at less than 3,000vpd based on traffic demand during site observations.
4. Tarago railway level crossing has flashing light control but no boom gates.
5. Collector Road has inadequate advance warning; due to the road environment on approach the turn-off could easily be missed.

TPK's assessment did not disclose any major road safety issues with this route; the two matters worthy of consideration are:

- *Any period generating significant volumes of construction traffic needs to consider avoidance of School Zone/School Bus operating periods.*
- *Consideration of advance warning signposting for the Collector Road turn-off.*

Collector Road

1. The route is a rural local road classification that manages local traffic.
2. The route is sealed with roadmarking provide until the Woodlawn Bioreactor turn-off; the route reverts to an unmarked sealed carriageway at that point. (See Photos 2 & 3 next page)
3. AADT is estimated at less than 1500vpd based on traffic demand during site observations.
4. The location of the T-Junction warning sign approaching Taylors Creek Road could be improved.
5. There is gravel accumulated in the confines of the intersection of Collector & Taylors Creek Roads; this could contribute to loss of traction. (See Photo 4)
6. The undergrowth around the intersection requires maintenance to ensure the required Sight Distances are available.

TPK's assessment disclosed no major road safety issues along the route; matters worthy of consideration are:

- *Any period generating significant volumes of construction traffic needs to consider avoidance of School Zone/School Bus operating periods.*
- *Review the location of the advance warning signposting for the Taylors Creek Road turn-off.*
- *Sweep loose gravel away for the intersection confines.*
- *Ensure undergrowth is maintained to provide required sight distances.*

PHOTO 2 – COLLECTOR ROAD JUST AFTER BUNGENDORE ROAD (ROADMARKING TO BE REPLACED
DUE TO RESEAL)



PHOTO 3 – COLLECTOR ROAD AFTER WOODLAWN BIOREACTOR



PHOTO 4 – ACCUMULATED GRAVEL INTERSECTION OF COLLECTOR & TAYLORS CREEK ROADS



Taylor's Creek Road – Western Leg Road

1. The route is an unsealed rural local road providing access to a small rural community and Capital Wind Farm. (See Photos 5 & 6)
2. AADT is estimated at less than 500vpd based on traffic demand during site observations.
3. Causeways are present along the route; some sealed carriageway sections provided in front of homesteads as dust abatement.
4. Taylor's Creek & Western Leg Roads intersection is sealed but accumulated gravel in the centre of the intersection could contribute to loss of traction.
5. Sign at Taylor's Creek & Western Leg Roads intersection restricts Wind Farm heavy vehicle traffic from using Taylor's Creek Road south of Western Leg Road to Bungendore Road.

TPK's assessment disclosed no major road safety issues along the route; matters worthy of consideration are:

- *Any period generating significant volumes of construction traffic needs to consider avoidance of School Zone/School Bus operating periods.*
- *Sweep loose gravel away for the Taylor's Creek and Western Leg Roads intersection confines.*
- *Review the restricted use of Taylor's Creek Road south of Western Leg Road.*

PHOTO 5 – WESTERN LEG ROAD



PHOTO 6 – ACCESS TO CAPITAL WIND FARM



Specifically considering the DGR's Requirements

The assessment for the DGR's requirements has considered:-

- Traffic generations (both light & heavy vehicles) on traffic routes during both the construction and operational periods.
 - *Provided in Section 3 of this report*
- Assess the impacts of the additional traffic in terms of route and intersection capacity.
 - *The potential increase in traffic demands are small and clearly will not impact on the road network for the immediate environs as hourly traffic volumes are not approaching any capacity concerns. For the wider road network in transportation from remote ports or cities control of travel time through permits or conditions of consent will ensure impact is minimised.*
- Assess the need for road network upgrade to manage this additional traffic impact.
 - *The potential traffic increases for Capital Wind Farm II are not in excess of that that associated with Capital Wind Farm I. Given the mitigation measures required for Capital Wind farm I have been completed and there has been no significant growth in AADT on the haulage routes then this assessment has concluded that improvements required are restricted to maintenance issues or improved signposting.*
- Assess the need for traffic control measures.
 - *The traffic control measures recommended are:*
 - *Comply to the requirements of issued permits*
 - *Implement Community Notifications for the Construction Phase*
 - *Implement identified maintenance needs to remove loose gravel at intersections and remove undergrowth to ensure required sight distances.*
 - *Provide recommended improvements to signposting.*
- Assess the site access roads and connectivity to the public road network.
 - *The potential traffic increases for Capital Wind Farm II are considerably less than that associated with Capital Wind Farm I. The access roads and connections to the public road network provided for Capital Wind farm I will be utilised for Capital Wind Farm II; there were no road safety or traffic management issues recorded for Capital wind Farm I hence this assessment has concluded the existing infrastructure will be acceptable in terms of connectivity to the public road network and that any extension to the current site roads required for this project should be provided at the same standard.*

SECTION 5 – SUMMATION

The assessment by TPK & Associates has concluded that:

1. The expansion of Capital Wind Farm amenity will not have an adverse impact on the road network during the Construction Phase.
2. The staff increase associated with the expansion of Capital wind Farm for the Operation Phase is small and will not impact on the road network.
3. The permit conditions imposed on overmass/oversize haulage trips will ensure the impact in terms of capacity and road safety on the road network are minimised.
4. The need for mitigation initiatives set out in Section 4 are focused on:
 - Consideration of School Bus Routes and School Zones.
 - Improved signposting.
 - Correction to road hazards such as loose material in intersections.
 - Correction and maintenance for intersection sight distance

Prepared by

T Keating

Mr. T Keating
Director, TPK & Associates

APPENDIX A

Locality Aerial

LOCALITY AERIAL



APPENDIX B

CONNELL WAGNER 2005, SECTION 8

8. Mitigation Measures

A number of measures will be incorporated during the construction and operation of the wind farm to ensure that transport and traffic impacts arising out of the development are minimised. These measures will be incorporated into a Traffic Management Plan for the project and shall be developed in consultation with the local Councils to ensure that applicable safety standards are achieved.

The access routes for large vehicles have been selected to minimise impacts on local road users and local road safety. The Traffic Management Plan will include measures to control access arrangements by RAVs and heavy vehicles on Taylors Creek Road so that they predominantly use the road in a one-way direction from north to south (with the exception of vehicles exiting the Grose Hill Group).

An important mitigation measure during the construction period will be the implementation of a community information and awareness program. Prior to construction commencing and during the construction period a program shall be initiated to ensure the local residents are fully aware of the construction activities with particular regard being given to construction traffic using local roads to access the various sections of the site. This program will include press releases in the local newspapers and newsletters and individual letter drops to residents along the access routes to the site. Regular project updates will be made and the use of specific updates shall be reviewed during the construction phase on an ongoing basis.

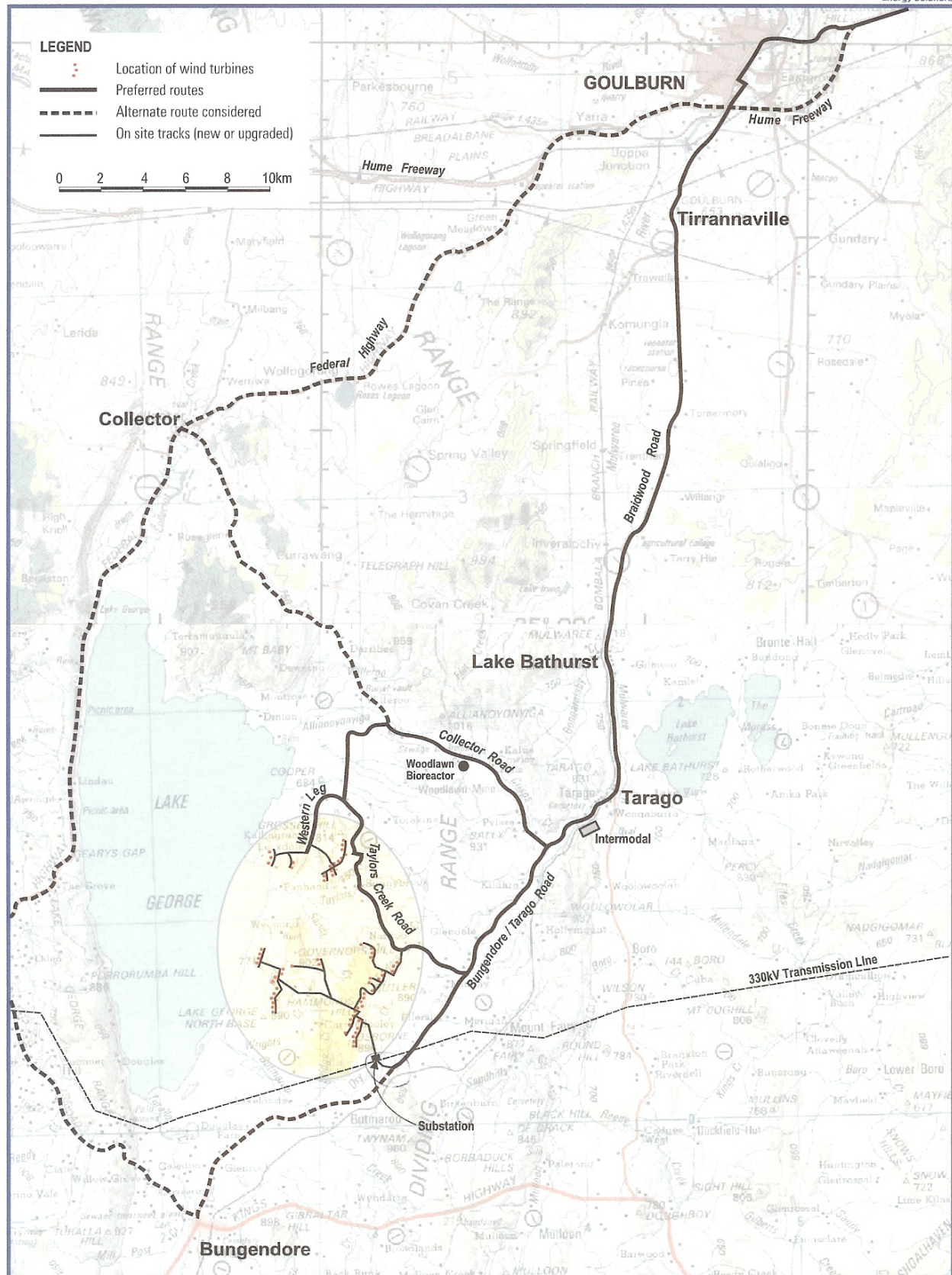
General signposting of the access roads with appropriate heavy vehicle and construction warning signs shall also be undertaken in consultation with local authorities. Specific warning signs will be located adjacent to the entrance to the individual sites to warn existing road users of entering and exiting traffic. The use of day warning notices where signs are activated on a specific day to warn local road users of construction activities will also be considered.

Particular attention can be given to traffic control and warning signs where the geometry of the road dictates that a potential safety issue exists. On-site access will be restricted to defined tracks to ensure minimal environmental impact.

Further mitigation measures will include the following :

- Improvements to access roads as required and in consultation with the Council. Improvements may include widening of sections of road, alteration to road alignments, provision of passing areas / lanes, etc.
- Provision of traffic control personnel where large vehicles are required to execute difficult or potentially unsafe manoeuvres.
- Concurrence with permit requirements for oversize and overmass vehicles including the use of escort vehicles as required.
- Restrictions on the timing of some large equipment and materials deliveries to site to mitigate specific impacts. In particular the following measures will be adopted:
 - restriction of traffic movements to avoid RAVs passing schools at Goulburn, Tirranaville and Tarago during the school zone periods and to avoid RAVs on Taylors Creek Road during school bus operating hours,
 - local deliveries to the site during daylight hours only to mitigate safety problems on local roads and to reduce disturbance for residences near to the access roads.
- Confirmation of access track routes in proximity to environmentally sensitive areas to be guided by relevant specialists.
- Establishment of an inspection and maintenance program for the local road access network to ensure condition of roads are maintained in safe state.
- Maintenance program for on-site access tracks to ensure safe access.
- Implementation of a pro-active erosion and sediment control plan for on-site roads and laydown areas.

APPENDIX C
Haulage Routes



APPENDIX D
DGR's Requirements

for species targeted;

- specifically address impacts to connectivity and biodiversity corridors and to riparian and/ or instream habitat in the case of disturbance of waterways. In addition, impact of the project on birds and bats from blade strikes, low air pressure zones at the blade tips (barotrauma), and alteration to movement patterns resulting from the turbines must be assessed, including demonstration of how the project has been sited to avoid and/ or minimise such impacts;
- include details of how flora and fauna impacts would be managed during construction and operation including adaptive management and maintenance protocols; and
- include measures to avoid, mitigate or offset impacts consistent with "improve or maintain" principles. Sufficient details must be provided to demonstrate the availability of viable and achievable options to offset the impacts of the project and to secure these measures in perpetuity.

- **Indigenous Heritage** - the EA must include an assessment of the potential impact of the project components on indigenous heritage values (archaeological and cultural). The EA must demonstrate effective consultation with indigenous stakeholders during the assessment and in developing mitigation options (including the final recommended measures) consistent with *Guidelines for Aboriginal Cultural Impact Assessment and Community Consultation* (DEC, July 2005).
- **Traffic and Transport** – the EA must assess the construction and operational traffic impacts of the project including:
 - details of traffic volumes (both light and heavy vehicles) and transport routes (including site access) during construction and operation;
 - assess the potential traffic impacts of the project on road network function (including intersection level of service) and safety;
 - assess the capacity of the existing road network to accommodate the type and volume of traffic generated by the project (including over-dimensional traffic) during construction and operation, including full details of any required upgrades to roads, bridges, site access provisions or other road features;
 - details of measures to mitigate and/or manage potential impacts, including construction traffic control, road dilapidation surveys and measures to control soil erosion and dust generated by traffic volumes; and
 - details of access roads within the site including how these would connect to the existing road network and ongoing operational maintenance.
- **Hazard/Risks**– the EA must include an assessment of the potential impacts on aviation safety including the need for aviation hazard lighting considering nearby aerodromes and aircraft landing areas, defined air traffic routes, aircraft operating heights, radar interference, communication systems, and navigation aids. Aerodromes within 30km of the turbines should be identified and impacts on obstacle limitation surfaces addressed. In addition, the EA must assess the impact of the turbines on the safe and efficient aerial application of agricultural fertilisers and pesticides in the vicinity of the turbines and transmission line. Possible effects on telecommunications systems must be identified. Potential hazards and risks associated with electric and magnetic fields and bushfires must also be assessed.
- **Water Quality and Hydrology** – The EA must identify and assess the availability of construction water sources for the project including details of their statutory (licensing) context. Where the project involves crossing or works close to significant waterways, the EA must identify likely impacts to the waterways and measures to minimise hydrological, water quality, aquatic and riparian impacts. The EA must identify design principles for any project components located on flood prone land and consider the potential for exacerbating soil salinity.
- **General Environmental Risk Analysis** – notwithstanding the above key assessment requirements, the EA must include an environmental risk analysis to identify potential environmental impacts associated with the project, proposed

APPENDIX E

Wind Farm Site Layout

