# ATTACHMENT 12 TRAFFIC IMPACT STUDY

# TRAFFIC IMPACT STUDY



PROPOSED WIND FARM AT CONROYS GAP

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Prepared for Taurus Energy March 2006

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# 1 INTRODUCTION

### 1.1 General

Bega Duo Designs was commissioned by NGH Environmental to complete the Traffic Impact Study for the proposal of a wind farm at Conroys Gap. This report has been prepared with an aim of conforming to the *Guide to Traffic Generating Developments* as recommended by the NSW Roads and Traffic Authority. The report provides a preliminary technical appraisal of the traffic and safety implications arising from the wind farm project and develops measures for minimising traffic impacts.

The report covers the construction phase and subsequent operation but does not include any future de-commissioning or re-commissioning phases.

The proposed wind farm is located along a section of the Black Range approximately 18 kilometres due west of Yass. The site is between Conroys Gap on the Hume Highway and a point approximately 11 kilometres south on Black Range towards Burrinjuck Dam. The road distance south from Yass via the Hume Highway and Paynes Road is 25 kilometres to the commencement of the access tracks. The site is located on Figure 1.1.

The proposal includes up to 16 wind towers, a substation, a control and facilities building and electrical transmission lines. The exact location of the wind turbines has not been determined.

The approximate locations assumed for the purposes of this study are shown on Figure 1.2. It is proposed to erect the wind towers generally in three groups. The largest group of up to 11 towers is located along the Black Range north of "Linbrook". (Linbrook is the property at the end of Paynes road at the base of Black Range). The second group of up to four is located south of "Linbrook" closer to Black Range Rd. The third group of up to four is located south east of Black Range Rd. near the 330 Kv power lines approximately 1 kilometre south of "Ferndale".

The exact locations are not critical for the purposes of this report as most of the towers are greater than 2 kilometres from the Hume Highway or Burrinjuck Road and therefore visual related impacts on major traffic routes will be minimal.

The two groups of towers within one kilometre of Black Range Road may have a visual effect on that road. Minor variations in their location are unlikely to affect the outcomes of this study.



Figure 1-1 Location of the proposed Conroys Gap Wind Farm



Figure 1-2 Approximate location of the wind towers and access routes

## 1.2 Key Issues and Objectives

The issues outlined in Table 2.1 of the Roads & Traffic Authority's *Guide To Traffic Generating Developments* are included in the study. Additional issues have been included because of the unique nature of the development. These include visual effects and the structural condition of the existing road surfaces as observed at the site.

#### Key Issues

- Existing road hierarchy and proposals for improvement
- Impact on road safety
- o Impact on traffic noise
- o Traffic counts
- Traffic volumes and trends
- Existing Parking and demand
- o Traffic Generation
- Safety and efficiency of internal roads
- Impact on Intersections and surrounding developments
- o Safety and Efficiency of access between the site and adjacent road networks

## 1.3 Methodology

- Base information was collected from the "Project Application" documents which have been submitted to the Department of Planning (7 December 2005).
- Existing mapping was used to identify features during the site inspection.
- All roads were measured at the site and inventories and photographs taken.
- Approximate traffic count information was obtained from observations on the site and RTA published data.
- o Intersections were measured and/or photographed on the site.
- Discussions were held with representatives from NGH Environmental, Taurus Energy, Yass Valley Council and Roads and Traffic Authority.
- Research was carried on the effects of "shadow flicker" and methods for determining the range of the effect.

## 2 PROPOSED DEVELOPMENT

#### 2.1 Site Description

The site is generally open grazing land with some patches of native bushland. There are some existing fences and access tracks.

The Black Range rises approximately 220 metres above the surrounding landscape and runs in an approximately north to south direction. There is a communications tower currently on the site near the northern section and electricity transmission lines near the southern section of the site.

#### 2.2 Site Access

Existing and proposed access is via the Hume Highway to Paynes Road (21 kilometres south west of Yass and 80 kilometres north east of Gundagai). Paynes road provides access to "Linbrook" which is approximately 4 kilometres from the Hume Highway junction (see Figure 2.1 photograph of Paynes Road).

Proposed access tracks will cross Black Range Road near "Ferndale" to provide access to the southern group of towers.

Paynes road is a council maintained road for a distance of 3.88 kilometres from the Hume Highway and provides access to a rock quarry at 1.3 kilometres from the Hume Highway. The remaining gravel section of the road provides access to the property "Linbrook" (see Figure 1.1).

Black Range Road could provide access to some of the southern turbine sites. The distance to Yass from the proposed track intersection is approximately 20 kilometres compared to approximately 27 kilometres via access tracks, Paynes Road and Hume Highway. The travel times to Yass via the two alternatives are expected to be similar because of the difference in allowable travel speeds. Black Range Road is a low speed gravel and bitumen road.



Figure 2-1 Paynes Road

### 2.3 Future Road Proposals

The Hume Highway was recently completely reconstructed to provide two lanes in each direction plus overtaking lanes and has sufficient capacity for many years at current growth rates.

Yass Valley Council has no future proposals for Paynes Road. Funding is available for some repair work on Black Range Road (Gerard Coffey (Assets Manager Yass Valley Shire Council) pers. comm. 6 Mar 2006).

# **3 EXISTING TRAFFIC CONDITIONS**

## 3.1 General

Traffic safety is dependant on many variables such as driver behaviour and weather conditions. This section of the report examines the physical constraints as observed on an inspection of the roads carried out in January 2006. This work included observations of traffic volumes. The inspection was carried out from Yass via Hume Highway to Paynes Road and on to "Linbrook". This is the route that is identified as the site access in the Project Application documents (Sec. 3.3.3)

Burrinjuck Road, Sutton Grange Road and Black Range Road were also inspected

### 3.2 Hume Highway

The Hume Highway is dual carriageway with two lanes in each direction and a design travel speed of 110 km/h. The lanes are separated by a vegetated median approximately 20 metres wide. All major intersections are grade separated and other junctions have auxiliary lanes to ensure that through traffic has minimum interruption from turning vehicles.

As the Bogo rock Quarry on Paynes Road at Paynes was operational during the reconstruction of the Hume Highway, auxiliary lanes have been provided at the junction (see Figures 3.1, 3.2 & 3.3).

Safe intersection sight distances for 110 kilometres per hour are available from all legs of the junction.

The approach from the north west is a long descending grade from Conroys Gap. The sight distance for vehicles departing from Paynes Road is restricted to the north west by an overhanging tree (see Figure 3.4)



Figure 3-1 Hume Highway southbound looking towards Gundagai.



Figure 3-2 Hume Highway northbound looking towards Yass.



Figure 3-3 Hume Highway northbound looking towards Gundagai.



Figure 3-4 Hume Highway showing an overhanging tree.

## 3.3 Paynes Road

A bitumen sealed road 6.0 metres wide connects the Hume Highway Junction to the cattle grid at the entry to the Quarry. The responsibility for the road as far as the quarry is determined by an agreement between the quarry owners and Yass Valley Council. The length of the sealed section is 1.32 kilometres.

The surface of the bitumen road is deformed at several locations causing the bitumen to crack and potholes to form (see Figure 3.5).

Figure 3-5 Failing bitumen on Paynes road.



From the cattle grid at the end of seal Paynes road has a gravel surface of 4 to 5 metres in width which reduces in width and condition as it approaches the cattle grid at "Linbrook".(see Figure 3.6) The total length of the road to the stock grid at "Linbrook" is 3.88 kilometres (1.32 sealed, 2.56 gravel).



#### Figure 3-6 Paynes Road near "Linbrook"

The gravel section has a depth of pavement in some locations whilst the remainder of the road appears to be formed on the natural surface. This surface appears to be sound in dry conditions.

The largest culvert at 2.6 kilometres from the Hume Highway (see Figure 3.7) is a corrugated metal structure which has been damaged by corrosion in the invert and may have insufficient earth cover to resist heavy loads. There are two barrels of 1500mm and 900mm diameter forming the culvert.

Figure 3-7 Culvert on Paynes Road.



The road reserve is not fenced and is provided with five stock grids between the Hume Highway and "Linbrook". Most of the grids appear to be in good condition but may not be designed for heavy loads.

### 3.4 Black Range Road

Black Range Road intersects with Yass Valley Way approximately 2 kilometres west of Yass. The distances quoted in this section of the study on Black Range Road are measured from the junction of Yass Valley Way.

Black Range Road provides access to properties along the route from Yass and very few vehicles travel beyond 18km from Yass as the remaining properties gain access from Burrinjuck Road.

The standard of road provided reflects the number of property owners requiring access and the road deteriorates to a 20 kilometre per hour standard beyond 18 kilometres from Yass.(Figure 3.8)



#### Figure 3-8 Black Range Road at approximately 20 kilometres from Yass.

Black Range Road is sealed from Yass for a distance of approximately 6.0 kilometres with another sealed section between 8.4 kilometres and 11.9 kilometres from Yass. The remaining 8.6 kilometres is a gravel surface of varying standard. The alignment and grading would be in the range of 40 to 60 kilometres per hour design speed. There are three narrow bridges on the 18 kilometre section from Yass to the entrance to "Ferndale" (see Figure 3.9).



Figure 3-9 Narrow Bridge on Black Range Road at 12.5 kilometres from Yass

## 3.5 Existing Traffic Volumes

Traffic observations were made on 19th of January 2006. The traffic numbers were observed during a school holiday period and may have increased when the school term commenced. It is considered unlikely that the increase in traffic will be significant in the determination of the traffic impacts for this development. Traffic volumes were obtained for the Hume Highway from the Roads and Traffic Authority. The Hume Highway in the Conroys Gap Area has an average annual daily traffic count of 12900 vehicles per day (2003 RTA Counter) This equates to 1935 vehicles per hour in the peak hour (two directions).

Paynes Road provides access to two dwellings and the "Bogo" quarry.

The number of trucks to and from the quarry is irregular depending on the length of haul and size of the construction project. The quarry manager estimates the range to be between four and twenty trucks per day.

Observations on Black Range Road near the proposed wind farm location showed that no traffic used the route over a two hour period on 31/12/05.

# 4 FACTORS RELATING TO TRAFFIC GENERATION

## 4.1 Traffic Generation General

For the purposes of this section of the report it is assumed that the likely access route for the majority of traffic will be as indicated in the "Project Application Report" ie: Hume Highway from Gundagai or Yass and Paynes Road (refer to Figure 1.1).

It is proposed that the wind farm will operate unattended. The site will be accessed regularly for maintenance. Each turbine requires around 8 days of maintenance per year and this is scheduled for each turbine so that one crew can arrange maintenance for all turbines. This equates to having a maintenance crew on site for around 120-150 days per annum. Traffic Generation therefore will be at the maximum during construction and ongoing generation from maintenance operations will be minor.

The maximum volume is expected during the concrete pouring phase. Each footing may contain up to 250 cubic metres of concrete to be poured over an eight hour period. This results in a rate of up to 12 mixer truck movements per hour (to and from the site). It is probable that a concrete batching plant will be located on or near the construction site.

## 4.2 Construction Program

The following major activities are expected to take place in sequence over a six to nine month period:

- Civil works for upgrading of access roads and establishment of site office.
- Civil works for construction of internal tracks, excavation for footings and trenching for cables.
- Establishment and operation of a concrete batching plant and pouring of footings.
- Transportation to site and installation of wind turbines.
- Construction of substation, lines ,cables and facilities building
- Restoration of site and completion of on site buildings.

## 4.3 Working Hours

Normal construction industry working hours are assumed for the purposes of this report, as specified in the EPA Environmental Noise Control Manual (7am-6pm Mon-Fri, 7am or 8am – 1pm Sat). EPA Guidelines will apply for noise emissions from construction works.

#### 4.4 Assumed Design Traffic Volumes

As most of the work will be carried out by specialised crews consisting of less than 10 workers it is assumed that the maximum volume of vehicles entering the proposed development will be 10 vehicles per hour from any direction during the peak hour. During the concrete pouring phase an additional 12 concrete trucks movements per hour can be included. The total volume of traffic in each weight category during the construction phase has been estimated in Table 4.1 below. Note that some of these activities may overlap.

	Number of traffic movements (one way)				
Activities	Approximate time period (weeks)	Light vehicles	Heavy vehicles	Oversize and overweight vehicles	
Civil works including trenching for cables	6	600	800		
Establish batch plant (if required) and pour footings	4	400	550		
Installation of turbines	4	400	200	230	
Construction of substation, cables and facilities building	8	800	300	2	
Restoration of site and completion of buildings	6	300	200		
Totals		2500	2050	232	

### Table 4.1 Total predicted traffic movement on roads to the site (one way movements)

## 4.5 Design Vehicles

The design vehicle for the construction of intersections and design of parking and turning areas generally will be the "Austroads" Single Unit Truck/Bus 12.2m long. Provision will be made on site at an area for the turning of semi trailers.

There is a requirement to transport turbine blades to the site, which could be up to 46 metres long. These will be transported on purpose designed steerable trailers making up to 45 trips to the site. This may be less as, depending on the manufacturer, blades are either carried one, two or three to a truck. These vehicles will be capable of negotiating small radius curves provided that areas free of obstructions are available on the inside of curves. It is also proposed to transport tower sections of up to 30 metres long weighing up to 36 tonnes (estimated as approximately 80 trips to transport all turbines).

The remaining wind tower components are up to 10 metres long weighing up to 75 tonnes. These loads would be transported as platform loads with trailers up to 4.2 metres wide to spread the load (estimated as 40 trips).

It is assumed that most of the heavy and oversized deliveries will take place over eight weeks, at a rate of 4 vehicles per day.

Design of access roads and junctions will need to allow for widths of up to 4.2 metres and weights complying with Roads and Traffic Authority maximum loading.

## 4.6 Traffic Circulation and Parking

Level areas will be provided around the site of each turbine for the safe operation of large cranes. These areas will provide turning opportunities for delivery vehicles. Four wheel drive vehicles may be able to access the main ridgeline via the internal access roads.

# 5 TRAFFIC IMPACTS

## 5.1 Safety Considerations

The following safety issues have been considered:

- Risk of collisions
- o Traffic noise
- Shadow flicker from Turbines
- Risk of collision due to fog
- o Driver distraction
- Obstruction by long loads
- o Wet weather
- Road surface deterioration
- Structural failure of bridges and culverts

The impacts of these issues are discussed for key locations, below.

#### 5.2 Traffic Impacts at Key Locations

#### 5.2.1 Hume Highway

The wind-towers are sufficient distance from the Hume Highway (2 to 3 kilometres minimum – refer to Figure 5.1) to ensure that motorists are not distracted by the construction activities or subject to 'shadow flicker'. Shadow flicker is considered to have an impact up to 500 metres diminishing towards 1000 metres from the wind tower site (refer section 5.2.3)

The junction with Paynes Road is constructed to a standard which is considered to be sufficient for an increase of traffic of up to 20 vehicles per day.

The manoeuvring of long wide loads will introduce additional high-speed manoeuvres by motorists on the Hume Highway.

#### Safeguards

An increase in the number of potential vehicle conflicts will have an impact on the safety of a junction generally. The conflict would be minimised by providing safe intersection sight distance compatible with travel speed. In fog conditions on the Hume Highway safe travel speeds are often exceeded and the potential impacts of additional vehicle movements are multiplied. To address this issue, the following safeguards are recommended:

- The roadside vegetation should be cleared on the verge of the Hume Highway on the southbound carriageway northeast of Paynes Road to increase the intersection sight distance.
- The Roads and Traffic Authority are generally not in favour of speed restrictions on the Hume Highway because of the loss in efficiency of the route. The use of speed controls for specific short-term activities would be included in a traffic control plan.
- Traffic Control plans and oversize vehicle permits will be required to be prepared and submitted to the Roads and Traffic Authority for all the operations of oversize and overweight vehicles.



Figure 5-1 Diagram showing areas potentially influence by Shadow Flicker

### 5.2.2 Paynes Road

Because of the potentially large increase in the number of vehicles using this route there are many impacts to be considered. The volumes are likely to increase from several vehicles to over 100 per day during concrete pouring operations. The low standard of horizontal and vertical alignment will assist in controlling speed on many sections of the road thereby reducing the severity of any collisions. The larger vehicles will occupy the full width of the roadway beyond the quarry gate increasing the chance of "head on" collisions. The road reserve is not fenced and an increase in traffic will increase the chance of collisions with stock. There will be an increase in traffic noise and dust nuisance for property owners.

The failing pavement sections on the sealed length will rapidly deteriorate under heavy loads.

The gravel road surface will deteriorate and potholes will form under the increased traffic loads particularly during wet weather when water ponds in drains and potholes. Structural damage may occur to some of the culverts and the stock grids. The location of trees and other roadside objects have the potential of obstructing the passage of long wide loads. Lack of roadside delineation may impact traffic safety during periods of poor visibility.

#### Safeguards

- The pavement, drainage structures and stock grids on Paynes Road require inspection and probable upgrading. The existing narrow pavement requires widening at specific locations to permit opposing traffic to pass safely. The decision to provide a seal needs to be balanced against the cost of maintenance on the gravel surface. Also to be considered is the cost of dust suppression and sediment control. The environmental impacts of this work should also be considered.
- There are no speed restrictions on Paynes Road and excessive speed will increase the impacts of additional traffic. A speed limit should be placed on the road at least for the period of construction. The speed restriction would be included in the traffic management plans to be submitted to the Yass Council.
- The clearances to objects on the inside of curves need to be checked to ensure the safe passage of long loads up to 45 metres (turbine blades).
- Traffic Control Plans and Oversize Vehicle Permits will be required to be prepared and submitted to the Roads and Traffic Authority for all the operations of over size and over weight vehicles.

#### 5.2.3 Black Range Road

A construction track will access Black Range Road near 'Ferndale' (approximately 20 kilometres from Yass).

Travel times to this point from Yass on Black Range Road will be similar to the Hume Highway and Paynes Road route. Some traffic may prefer to use the Black Range route, particularly to access the wind tower sites to the south.

A significant increase in traffic is possible. For the period of construction the relatively low number of existing users of Black Range Road could be exposed to a much greater risk of collision.

Shadow flicker may have an impact on traffic safety. Information from the Danish Wind Industry Association suggests that this effect diminishes beyond 500 metres from the wind tower site and is not noticed beyond 1000 metres. The effect is only present when the sun is directly behind the

wind turbines. The diagram (Fig. 5.2) demonstrates the location of the perceived effects in relation to the location of Black Range Road. The normal cone of vision for a vehicle travelling at 40km/hr has been shown at the critical points (40km/hr is the estimated 85<sup>th</sup> percentile speed for this section of road). The diagram demonstrates that road users within 1000 metres of the roadside towers may be looking in a direction which will expose them to shadow flicker. These effects may be experienced for brief periods by southbound vehicles during the late afternoon. The diagram has not taken into account the roadside vegetation (see photograph Figure 3.8) and other obstructions which will reduce the "flicker" effects by masking the view of the towers at many locations.

### Safeguards

- A traffic management plan will be required for the intersection of the construction track with Black Range Road to ensure the safe crossing of construction vehicles.
- Black Range Road is an historic route with many deficiencies in alignment and grading which would impact on traffic safety if volumes were to increase significantly. Previous planning for the Conroys Gap wind farm has identified the Hume Highway and Paynes Road as the access route. A procedure will need to be established to ensure that all construction and related traffic are aware of the preferred route. Monitoring of the traffic volumes travelling on Black Range road may be necessary in consultation with Yass Valley Council,
- The effects of 'shadow flicker' should be monitored from Black Range Road to determine the degree of impact on southbound motorists.





#### 5.3 General Safeguards

The aforementioned safeguards have not been discussed in any detail with road authorities or property owners and are presented for further discussion and assessment. The decision on the extent and standard of road improvements to be provided will be subjective and related to the economies of construction for short term use. Additional general safeguards are outlined below.

• Traffic Control Plans and Oversize Vehicle Permits.

Traffic Control Plans and Oversize Vehicle Permits will be required to be prepared and submitted to the Roads and Traffic Authority for all the operations of over size and over weight vehicles on all the public roads involved in the transport of materials to the site.

• Monitoring of Traffic Impacts

A procedure should be established to monitor the traffic impacts during construction, such as noise, dust nuisance and travel times and work methods modified to reduce the impacts.

#### • Maintenance During Construction

Regular scheduled maintenance of gravel pavements such as grading, dust suppression and drainage control should take place during the construction period.

• Timing of Works

Traffic Impacts can be significantly reduced by the scheduling of high impact movements to account for varying traffic flows on the Hume Highway. These movements if possible should be scheduled to periods when heavy fogs are unlikely.

# 6 CONCLUSION

The traffic impacts outlined in this study should be discussed with Yass Valley Council and the Roads and Traffic Authority.

Adoption of all the measures for minimising traffic impacts outlined in this report should reduce the risk of traffic accidents to an acceptable level and minimise structural and environmental damage.

## 7 REFERENCES

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