

3.6 Telecommunications impacts

**Telecommunications impacts of the proposed
Gullen Range Wind Farm**

March 2008

Telecommunications impacts

This report was researched and prepared by Anthony Micallef BE (Electrical), EPURON Pty Ltd.

Executive Summary

The objective of this chapter is to investigate the potential impacts of the Gullen Range wind farm on existing telecommunications services in the vicinity of the proposal and to propose appropriate mitigation strategies for any impacts identified.

Telecommunication services, including television, radio, mobile phone services and other radio communication services occur in proximity to population centres and often utilise the ridgelines that provide optimum locations for wind turbines. As with any large structure, wind turbines have the potential to cause interference with such electromagnetic signals.

In general VHF and UHF frequency band radio signals, and digital voice based technologies such as GSM and CDMA mobile, are essentially unaffected by wind turbines. This includes land mobile repeaters, radio, the audio component of analogue television and mobile phones.¹

Following a review of the radio communication services near the wind farm site, the nature of potential interference and consultation with the service providers, it is considered that the wind farm would have minimal effect on telecommunications services. Mitigation strategies are proposed to ensure any impacts can be managed and mitigated.

Glossary of technical terms

VHF	Very High Frequency
UHF	Ultra High Frequency
EMI	Electromagnetic Interference
VHF Channels	TV Channels 0 to 12 (45 - 230 MHz)
UHF Channels	TV Channels 28 - 46 (526 - 820 MHz)
Band 111	VHF TV Channels 5A - 12
Fresnel Clearance	Clearance to obstructions from the ray line on a radio path which does not produce any additional loss above free space loss
FM	Frequency Modulation
MF	Medium Frequency
LF	Low Frequency
GSM	Global Systems Mobiles
CDMA	Code Division Multiple Access cellular mobile system
ITU	International Telecommunications Union
ABA	Australian Broadcasting Authority
ACMA	Australian Communications & Media Authority
CB Radio	Citizens Band Radio

¹ <http://www.dungog.nsw.gov.au/files/2142/File/GreenpowerEMIAnalysisIssue.pdf>

Existing environment

A review of telecommunication technologies that are in use within the area surrounding the proposed Gullen Range wind farm has identified the following:

- TV and radio broadcasting
- Mobile phone services provided by telecommunication companies
- Radio communication systems, including point to point links, licensed by the Australian Communications and Media Authority (ACMA)
- Other radio links including mobile radio and CB radio; and
- Aircraft navigation systems

Electromagnetic Interference (EMI) has the potential to cause degradation or total loss of signal strength and may cause poor TV reception and/or “ghosting” effects. EMI may also result in a reduction in the coverage of mobile phone, radio and aircraft navigation communications in certain instances. There are three principal mechanisms by which wind turbines may cause EMI: reflection or scattering, diffraction and near field effects.²

Reflection or scattering

When a signal sent between a transmitter and receiver becomes obstructed by an object located within the path of a signal, reflection and/or scattering may occur. If the rotating blade of a wind turbine receives a primary transmitted signal, a scattered time delayed (or out of phase) signal may be produced and transmitted to the receiver. The out of phase signal will be distorted in relation to the primary signal, causing EMI.³

Diffraction

In some instances when an object is located in the path of a signal wave front, the object can both reflect and absorb the signal. This phenomenon is commonly referred to as diffraction.⁴

Near field effects

Wind turbines may cause interference to radio signals due to the electromagnetic fields emitted by the generator and the switching components within the turbine nacelle. This is referred to as a near field effect.⁵

Due to advances in technology and compliance with the Electromagnetic Emission Standard, EN 61000-6-4 (AS/NZ 4251.2:1999) *Emission standard for industrial environments*, the wind turbines proposed for the project will not cause active EMI due to near field effects.

² D. F. Bacon, A Proposed Method for Establishing an Exclusion Zone around a Terrestrial Fixed Link outside of which a Wind Turbine will cause Negligible Degradation of the Radio Link, Radiocommunications Agency UK Report Ver 1.1, 28 Oct 2002

³ URS Woodlawn Wind Farm Environmental Impact Statement 2004

⁴ *Ibid.*

⁵ *Ibid.*

The level of EMI produced by a wind turbine due to reflection or scattering, diffraction and near field effects is dependant on a number of factors, including placement of the wind turbine in relation to the signal path/s; the signal frequency; the characteristics / composition of the wind turbines rotor blades; the receiver characteristics; and the propagation characteristics of the radio wave in the local atmospheric conditions.⁶

While the site proposed for the development of the wind farm is a rural area, a number of communications links and broadcast networks are present in the surrounding region.

As with any large structure, there may be circumstances where wind turbines can cause disruption to the electromagnetic signals used in a variety of commonly used radar, navigation and telecommunications services. The following approach was adopted to identify the impact of the proposal on telecommunications:

- Identify license holders within a 25km radius of the proposed wind farm site, and point-to-point links in the vicinity of the site, using information provided on the ACMA RADCOM database;
- Provide written notification of the proposal and seek comments from each license holder identified via the ACMA RADCOM database within a 25km radius of the site;
- Record and review all responses received to identify any issues raised by license holders;
- Discuss issues raised with relevant license holder with the aim to resolve or identify mitigation options;
- Carry out an assessment of the “Fresnel zone” associated with each fixed point-to-point communications link in the vicinity of the site;
- Determine appropriate exclusion zones for proposed turbine layout based on Fresnel zone calculations and advice from license holders;
- Confirm that all turbines (including blades) are located outside the exclusion zone;
- Determine appropriate additional mitigation measures which may be required.

Impact assessment

The possible impact of the proposed wind farm on the four most common communications services has been investigated separately. These services are television and radio broadcast services, mobile phone services, radio communication services and aircraft navigation services.

All impacts would be confined to the *operational phase* of the wind farm. Various measures are available to help mitigate potential impacts and are discussed below.

Television and radio broadcast services

Summary of existing services and facilities

The ACMA RADCOM database lists the following broadcasters for television and radio, under postcodes 2580, 2581 and 2583.

⁶ *Ibid.*

Television broadcasting: ABC, CBN, CTC, SBS and WIN.

Radio broadcasting: 2ABCFM, 2ABCN, 2ABCRR, 2GN, 2JJJ, 2RN, 2SNO.

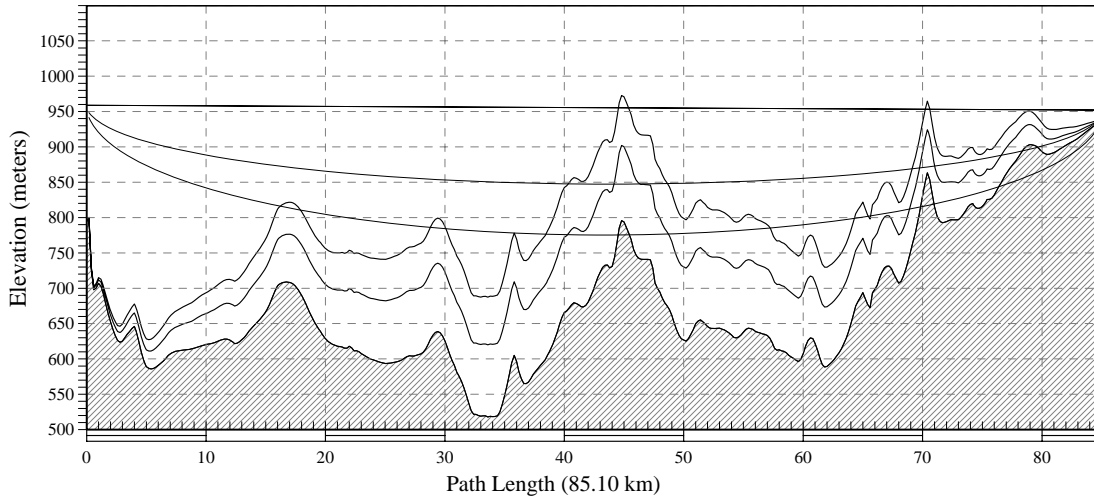
Canberra (Black Mountain) is the nearest TV transmission source for the locality of the proposed Gullen Range wind farm and is located approximately 85km S/SW of the site. There are local repeater stations at Mount Gray (Goulburn) and Braidwood, but these serve small localised areas in the proximity of the repeater station. Details of the Canberra television channels are provided in the table below.

Canberra television channel details⁷

Broadcaster	Channel	Band	Frequency (MHz)
Capital (CTC)	7	VHF	182.25
ABC	9	VHF	196.25
SBS	28	UHF	527.25
WIN	31	UHF	548.25
Prime (CBN)	34	UHF	569.25

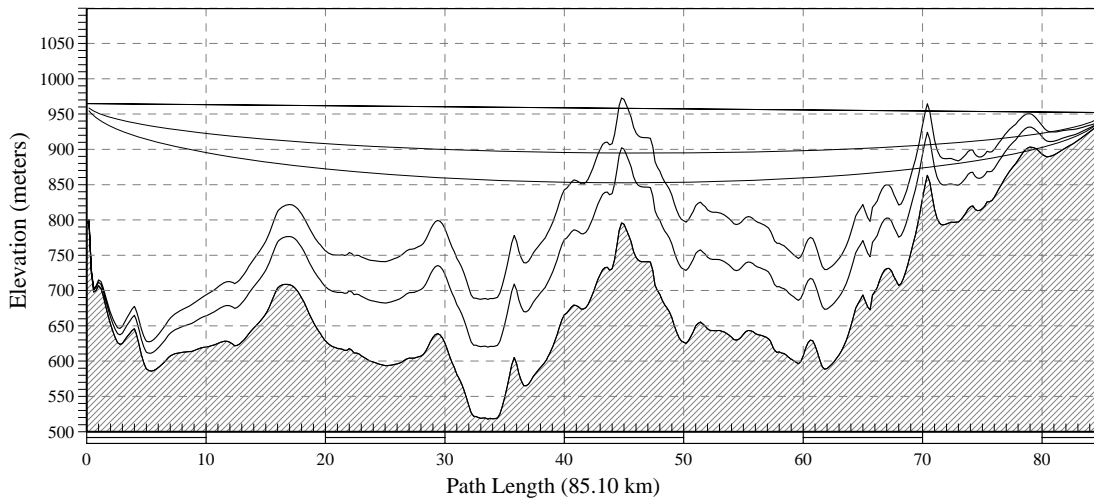
⁷ Crookwell II Wind Farm – Environmental Impact Statement - URS

Path profiles from Black Mountain, TV⁸
Transmitting station, Canberra



Black Mountain Latitude 035 16 31.42 S Longitude 149 05 51.95 E Azimuth 21.77 deg Elevation 795 m ASL Antenna CL 164.0 m AGL	Frequency = 196.0 MHz K = 1.33, 0.80 %F1 = 60.00, 100.00 Lawrence Derrick & Assoc.	Stain Springs Latitude 034 33 45.01 S Longitude 149 26 29.89 E Azimuth 201.57 deg Elevation 942 m ASL Antenna CL 10.0 m AGL
--	---	---

BLACK MOUNTAIN VHF TV TO	Date 07-04-103
"STAIN SPRINGS" BANNISTER	blkmt_ss.pl3



Black Mountain Latitude 035 16 31.42 S Longitude 149 05 51.95 E Azimuth 21.77 deg Elevation 795 m ASL Antenna CL 170.0 m AGL	Frequency = 570.0 MHz K = 1.33, 0.80 %F1 = 60.00, 100.00 Lawrence Derrick & Assoc.	Stain Springs Latitude 034 33 45.01 S Longitude 149 26 29.89 E Azimuth 201.57 deg Elevation 942 m ASL Antenna CL 10.0 m AGL
--	---	---

BLACK MOUNTAIN UHF TV TO	Date 07-04-103
"STAIN SPRINGS" BANNISTER	blkmt_ss.pl3

⁸ Lawrence Derrick & Associates Bannister Wind Farm – Investigation of possible impacts on broadcasting and Radio communication Services September 2003

Television broadcasting

Local residents in the Crookwell area generally view TV from national main stations ABC9 and SBS28 and commercial stations WIN31, CTC7, CBN34, located at Black Mountain, Canberra. The observation from a field visit was that almost all residents in the wind farm area have vertically polarised VHF antenna arrays and horizontally polarised UHF antennas facing the Canberra direction. Antennas were mounted at rooftop levels and not on high masts/towers. The area is about 85km from Black Mountain and is therefore in the fringe area of the station. Path profiles from Black Mountain to a typical Bannister location, representative of the wind farm site, for both VHF and UHF frequencies are as shown above.

The path profiles indicate that the path will be obstructed for a percentage of the time and therefore the TV signals will fade. 12km further north at Crookwell observations of domestic antenna installations indicated that as well as from Canberra, television reception was being obtained by some residents from the Orange and Wollongong main stations. Although there was little evidence of Bannister residents using the Orange and Wollongong stations, it may be possible to receive them with higher antenna installations should it be necessary in the event of degraded Canberra TV reception.⁹

A local low power TV translator station established at Wades Hill near Crookwell also provides national TV coverage for the Crookwell town area. Although the few Bannister residents who were asked considered that their TV reception was good, the signals would at times be expected to fade, because of the distance to Black Mountain, causing lower quality pictures.¹⁰

Digital TV channels allocated to Black Mountain are CTC 6, ABC 9A, WIN 11, CBN 12 and SBS 30.¹¹

Interference and impact analysis

Television Interference (TVI) is dependent on a range of factors including environmental factors (topography, direct signal strength, transmitter type, and receiver type) and wind farm design factors (turbine elevation, rotor size and orientation, speed of rotation, blade material and pitch). TVI caused by the operation of wind turbines is characterised by video distortion, while the audio component of the signal is not affected.¹² Due to the variability of local conditions and the characteristics of antennae used in particular installations, there is a degree of uncertainty regarding predicted levels of interference.

The level of TVI can be influenced by a number of factors including:

- Where the receiver is located, relative to the TV transmitter and the wind farm;
- The frequency of the transmitted TV signal;
- Whether there are any other tall structures in the vicinity of the receiver;

⁹ Lawrence Derrick & Associates Bannister Wind Farm – Investigation of possible impacts on broadcasting and Radio communication Services September 2003

¹⁰ Lawrence Derrick & Associates Bannister Wind Farm – Investigation of possible impacts on broadcasting and Radio communication Services September 2003

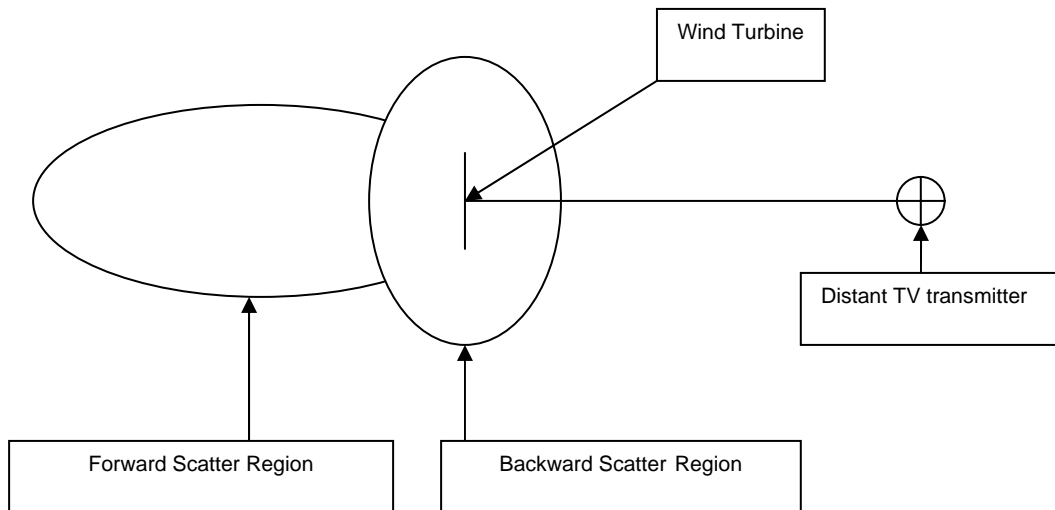
¹¹ *Ibid.*

¹² David E Spera, Wind Turbine Technology, Chapter 9 ASME Press 1994

- The direction of the rotor blades and blade material;
- The nature of the receiving aerial e.g. design, height, directionality, power.

In general, the potential for interference at receiver locations can increase with distance of the receiver from the transmitter, as signal strength decreases with increasing distance from the source. As such, a wind farm in an area of already poor signal strength may potentially have a greater impact on reception than the same wind farm in an area of relatively strong signal strength. In addition, reception in the vicinity of the wind farm can vary with the degree of topographic obstruction of the signal.

A wind turbine has the potential to scatter analogue television waves both forward and back. Forward scatter will only occur if a wind turbine is located approximately between the dwelling and the broadcast site. The forward scatter region is as shown in the figure below, and generally does not extend further than 5 km for the worst combination of factors. Interference may extend beyond 5 km if the dwellings are screened from the broadcast tower, but do have line-of-sight to the wind turbines. The effect of the forward scatter is to potentially cause the brightness of the television picture to vary with the rotation of each blade. Modern television sets usually incorporate Automatic Gain Compensators (AGC) which act to lessen or eliminate variations in picture gain or brightness.¹³



Schematic diagram of potential analogue television signal interference zones around a wind turbine¹⁴

The zone of potential interference for a wind farm is the resultant total of the effects from the individual turbines. The International Telecommunications Union Recommendation ITU-R BT.805 states that impacts beyond 5 kilometres are unlikely.¹⁵

¹³ <http://www.dungog.nsw.gov.au/files/2142/File/GreenpowerEMIAnalysisIssue.pdf>

¹⁴ Reproduced from the Connell Wagner PPI Gunning Wind Farm Environmental Impact Statement - Chapter 11.

¹⁵ Crookwell II Wind Farm – Environmental Impact Statement - URS

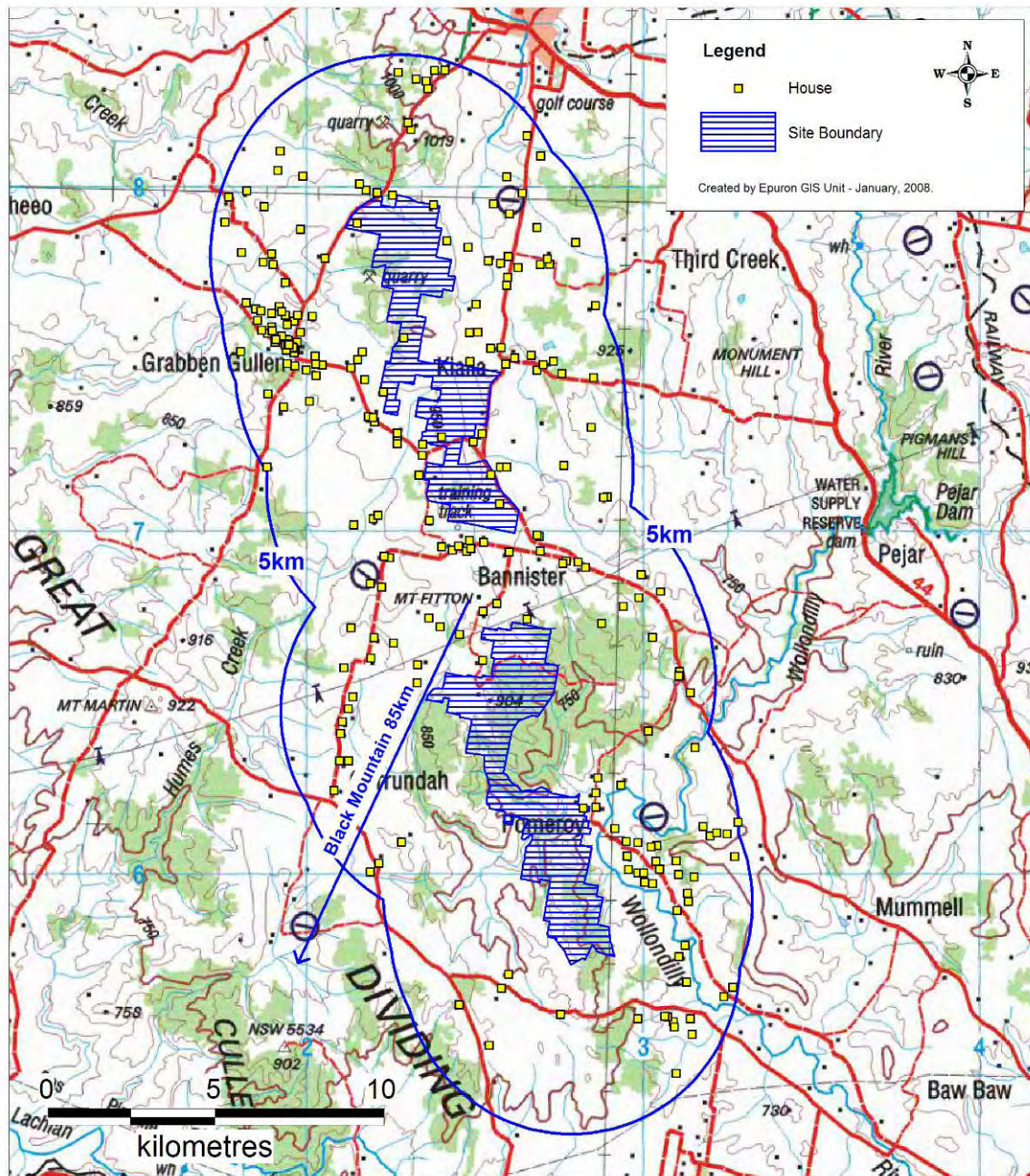
It also indicates that interference may extend beyond 5km where the receiver location is shielded from the direct signal, but in direct line-of-sight to the turbine. The form of interference, if experienced, will depend on the relative positions of the wind farm, the transmitting station and the receiver.

Television interference can take the form of either a “ghost” image that pulsates horizontally at the “blade pass” frequency or a fluctuation in picture brightness, also at the “blade pass” frequency.¹⁶

There are approximately 248 houses within a 5km radius of the proposed wind farm. The location of the wind farm with respect to the Black Mountain communications tower can be seen in the following diagram.

¹⁶ Connell Wagner Delta Electricity Gunning Environmental Impact Statement 2004

House and television tower locations



It is difficult to assess the likely impact on these specific house locations and once the wind farm is operational it is possible that television reception could be affected at some of these locations unless some form of mitigation is introduced. However, houses further than 5km from the site are unlikely to be affected.

Mitigation measures

In the design of the project, the proponent will carry out the following mitigation measures to help minimise TVI:

- Use of primarily non-metallic turbine blades;
- Use wherever practical of equipment complying with the Electromagnetic Emission Standard, AS/NZS 4251.2:1999;

Once the wind farm is operational, the proponent will offer to undertake a monitoring program of houses within 5km of the wind farm to determine any loss in television signal strength if requested by the owners. In the event that TVI is experienced by existing receivers in the vicinity of the wind farm, the source and nature of the interference will be investigated by the proponent.

Should investigations determine that the cause of the interference can be reasonably attributable to the wind farm; the proponent will put in place mitigation measures at each of the affected receivers in consultation and agreement with the landowners.

Specific mitigation measures may include:

- Modification to, or replacement of receiving antenna;
- Provision of a land line between the effected receiver and an antenna located in an area of favourable reception;
- Improvement of the existing antenna system;
- Installation of a digital set top box or,
- In the event that interference cannot be overcome by other means, negotiating an arrangement for the installation and maintenance of a satellite receiving antenna at the proponents cost.

Satellite Pay Television

Some homesteads in the Bannister area had satellite pay TV service antenna installations. Unless a particular subscriber's antenna reception direction and elevation is aligned with a turbine, no impacts on TV reception are likely.¹⁷

Radio broadcasting

The level of radio broadcast interference experienced can be influenced by a variety of variables including:

- Abnormal weather conditions;
- Multi-path distortion (reception of a signal directly from a transmitter and also a reflected signal from hills, structures etc.);
- Overloading (occurs when an FM receiver receives too strong a signal);
- Electrical interference from household appliances etc;

FM sound broadcasting

Low power national FM stations on 107.7 & 106.9MHz are listed on the Wades Hill TV site at Crookwell. National, community and commercial services on 101.5, 102.3, 105.5,

¹⁷ Lawrence Derrick & Associates Bannister Wind Farm – Investigation of possible impacts on broadcasting and Radio communication Services September 2003

104.7, 98.3, 99.1, 92.7, 91.9, 91.1, 106.3 and 103.9MHz are located on Black Mountain.¹⁸¹⁹

MF sound broadcasting

Wind farm effects on MF radio are highly unlikely and therefore the stations serving the area have not been listed.²⁰

Mobile phone services

Existing services and facilities

This section covers CDMA, GSM and Telstra 3G services (high frequency communications links used for mobile transmission networks are discussed in the next section: Radio Communication Services).

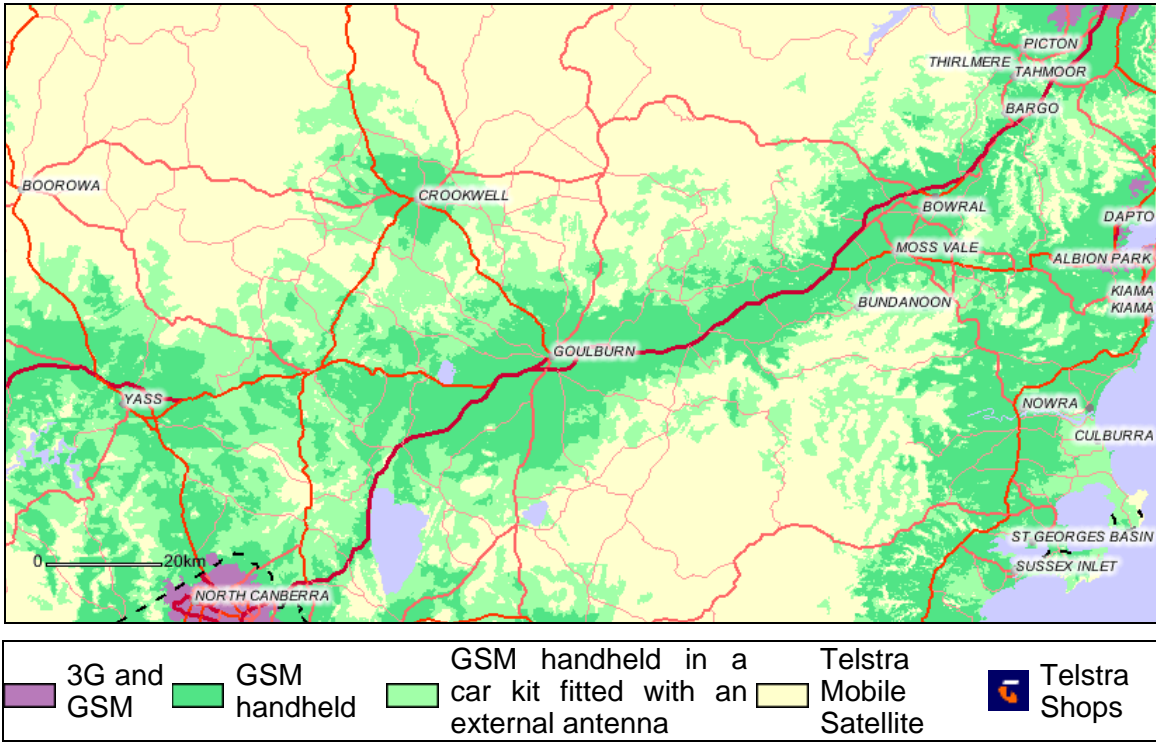
Figures below show the existing local mobile phone coverage from the three providers (Source: company websites)

¹⁸ Lawrence Derrick & Associates Bannister Wind Farm – Investigation of possible impacts on broadcasting and Radio communication Services September 2003

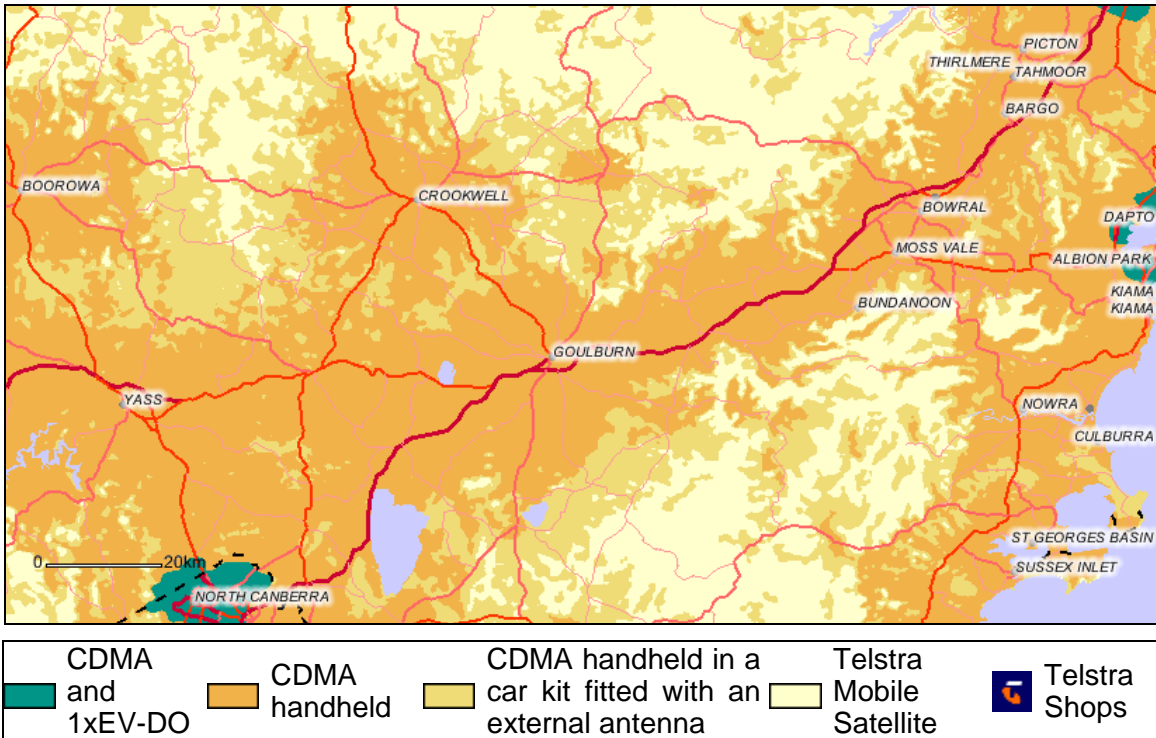
¹⁹ <http://www.ausradiostations.com/fmact.html> and <http://www.ausradiostations.com/fmns.html>

²⁰ *Ibid*

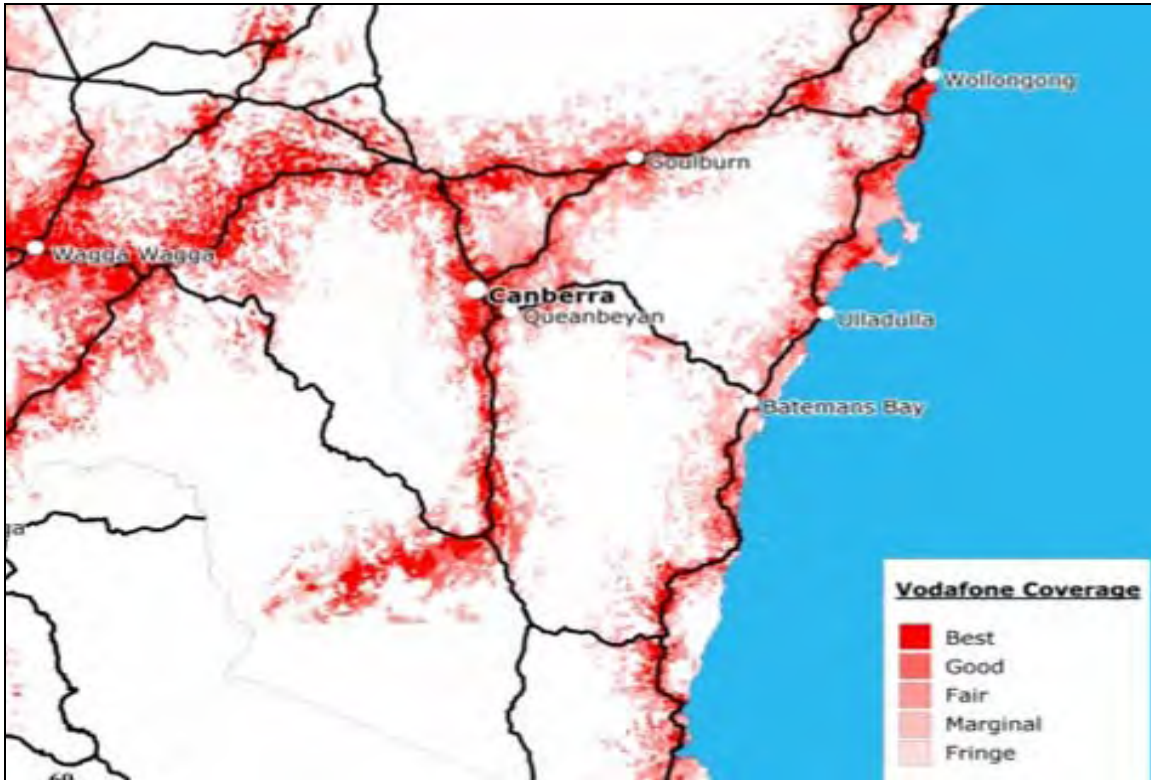
Telstra 3G and GSM Coverage



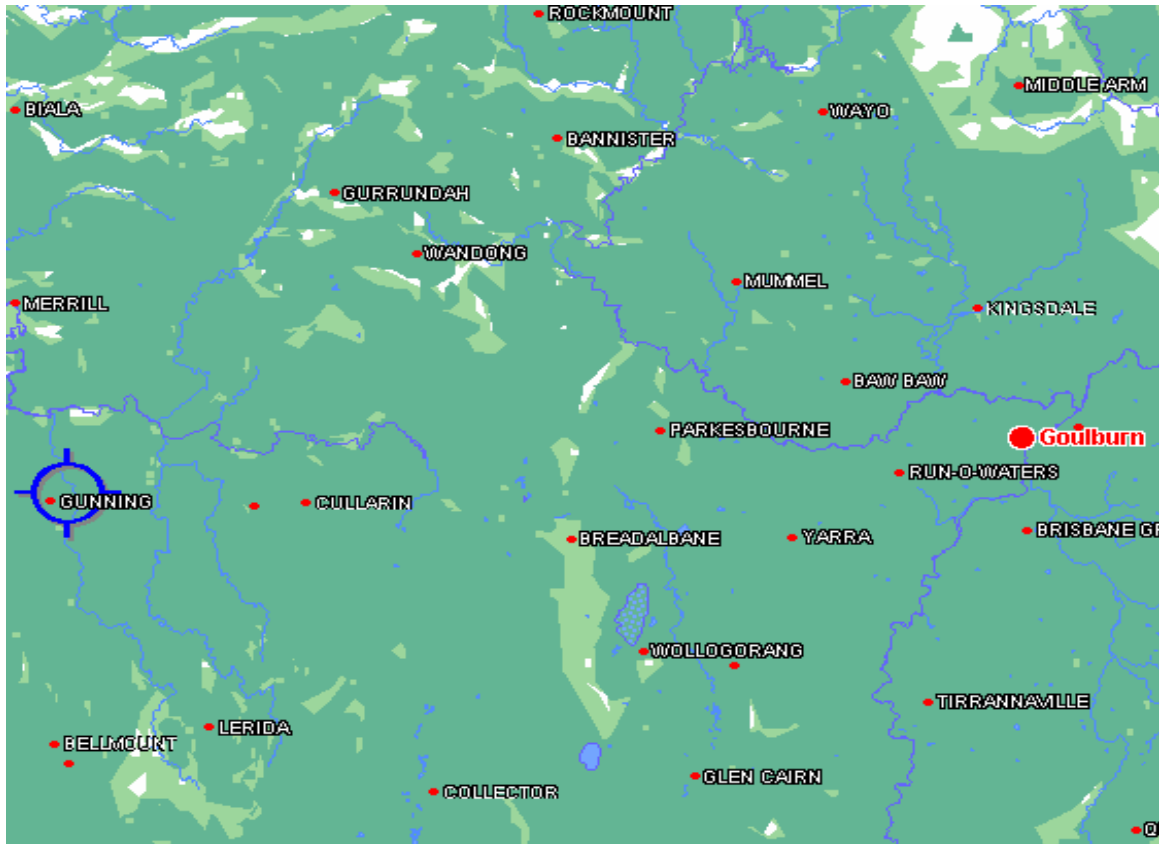
Telstra CDMA Coverage



Vodafone GSM Coverage



Optus GSM Coverage



LEGEND

- On Street Coverage
- Car Kit coverage
- Future Coverage
- Wifi Hotspot

Wireless Broadband

Wirefree provide a wireless broadband service to the local Crookwell area that operates at a frequency similar to mobile phone networks (900MHz). One Wirefree transmitter is located on the wind farm site. From studies in other areas (Mahinerangi, NZ)²¹ it is concluded that the minimum separation between wind turbines and mobile broadband transmitters is approximately 240m. EPURON appreciates the importance of this service to the local community and commits to work with Wirefree to avoid any impact on the service.

Interference and Impact Analysis

A mobile phone network consists of a system of adjoining zones called 'cells', which vary in size with a radius of 2-10 km. Each cell has its own base station that sends and

²¹ Mahinerangi Wind Farm Compatibility with radio services April 2007 - Kordia

receives radio signals throughout its specified zone. Mobile phone antennas need to be mounted clear of surrounding obstructions such as buildings to reduce 'dead spots' and allow the base station to effectively cover its intended cells.²²

Mitigation measures

No GSM/CDMA mobile services are registered at sites in the close vicinity of the wind farm. The Telstra mobile service from Wades Hill, Crookwell is too distant to be affected by the wind turbines²³ Telstra plans to shut down its CDMA network in April 2008.²⁴

No additional mitigation measures are required.

Radio communication services

Existing services and facilities

The ACMA issues radio communications licenses in accordance with Part 3.5 of the Commonwealth *Radiocommunications Act 1992*. The ACMA issues licenses to use specific segments of the radio broadcasting frequency spectrum for different purposes and maintains a register (the ACMA RADCOM Database) of all the licenses issued.

The register allows the ACMA to create a 'density' classification of areas across Australia as high, medium or low depending on the number of licenses in operation in a particular area.

According to the ACMA RADCOM Database, the area in the vicinity of the proposed wind farm is classified as a "Low Density Area" and license holders operate a range of radio communications services, primarily fixed link microwave communication and mobile communication systems within a 25km radius of the proposed wind farm. Multiple license holders use some sites, while sole users employ others.

The organisations identified as operating radio communication licences (including fixed link communications) within 25km of the wind farm were consulted. Each was asked to provide independent comments / advice on the possibility of the wind farm development interfering with their communications links.

Radio communication license holders within 25km

ACMA Licence Holder	ACMA Site ID No.
Australian Broadcasting Corporation	151047
Ambulance Service of NSW	9538
Commissioner of Police NSW Police Force	9538
Country Energy	9538, 36143, 36148
Gunning Shire Council	34919
NSW Fire Brigades	9538, 34790

²² URS Crookwell II Wind Farm Environmental Impact Statement ,

²³ Lawrence Derrick & Associates Bannister Wind Farm – Investigation of possible impacts on broadcasting and Radio communication Services September 2003

²⁴ <http://www.telstra.com.au/cdmaupgrade/index.htm>

NSW Rural Fire Service	9538, 34919
NSW State Emergency Service	9538, 9541, 51379
Optus Mobile Pty Ltd	100756
Singtel Optus Pty Ltd	135332
Telstra Corporation Ltd	9536, 9540, 100756, 37299
Upper Lachlan Council	9538, 34919, 41454

Interference and impact analysis

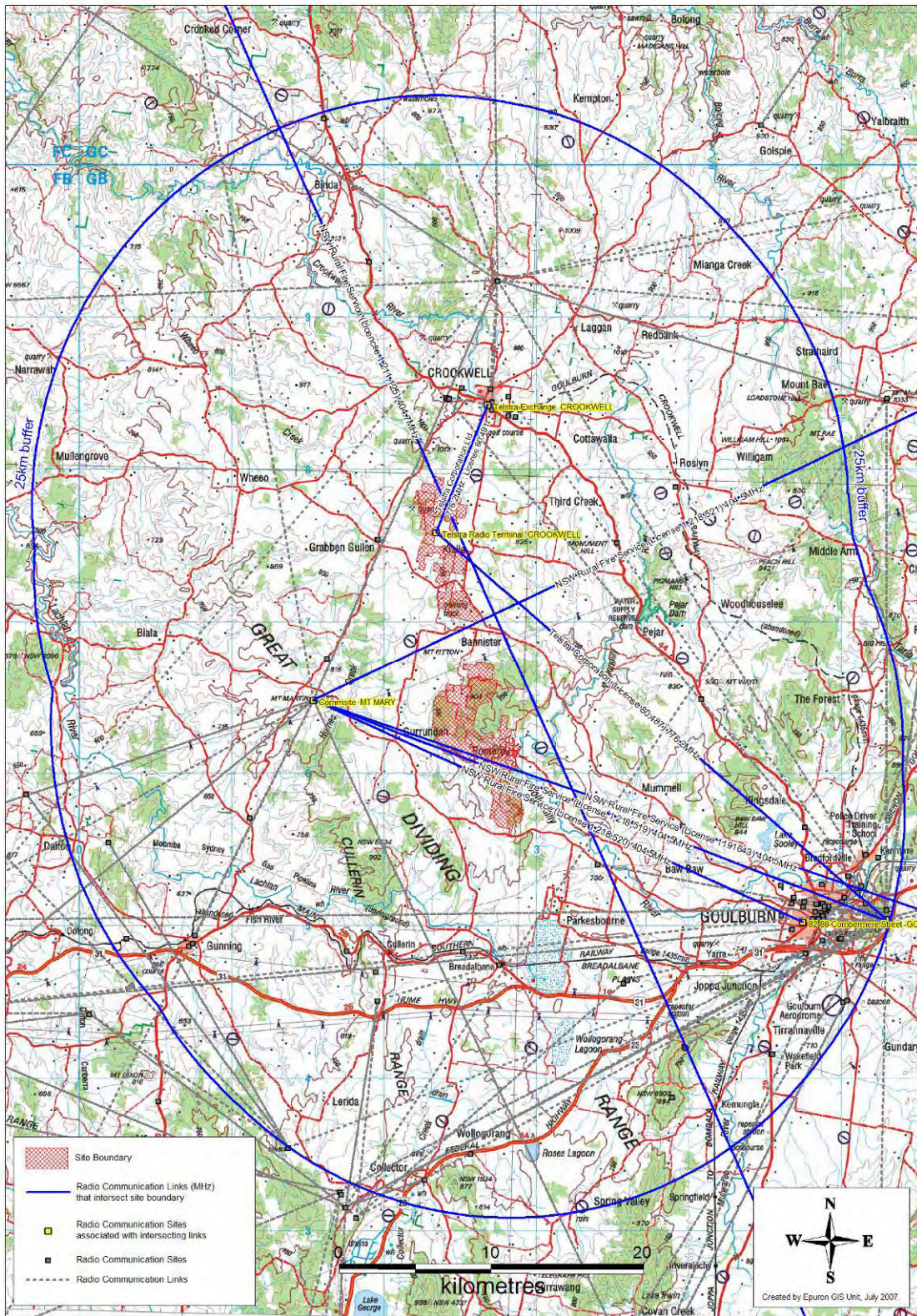
A fixed link radio transmission is a point-to-point transmission path typically between two elevated topographical features. The transmission path may become compromised if a wind farm is located within the direct line of sight or what is known as the Fresnel zone around the line-of-sight between the sending and receiving antennae.

The potential impact zone will vary with the distance between the transmitter and receiver, frequency of transmission and the location of any particular point along its path. Communications are only likely to be affected if a wind farm is in the line-of-sight between two sending and receiving antennae or within a zone of the line-of-sight of these antennae.

Where the potential exists for interference to line-of-sight links, an obstruction analysis can be undertaken to ensure that no part of a wind turbine assembly will enter the Fresnel zone of the microwave link. The maximum extent of the Fresnel zone occurs at the midpoint along the path of the microwave link.

EPURON identified and mapped the point-to-point communication links in the vicinity of the proposed wind farm site to establish the line-of-sight path. The map below provides details of the locations of fixed microwave links around the Gullen Range site (prepared by EPURON based on data contained in the ACMA RADCOM Database).

Radio communication links



In order to ensure that no obstruction to transmission paths occurs, calculations of the 2nd Fresnel zone of the point-to-point communications links in proximity to the site were undertaken.

It is suggested that beyond the 2nd Fresnel zone, the power of a scattered signal from a structure such as a wind turbine would be small enough such that it would not result in significant interference at the receiver.²⁵

At the time of writing, seven point-to-point communications links were identified as crossing the site.

A link between “Comm Site 12km SE of Bigga Snowy Mountain” and “Fire Tower Mt Budawang”, (License No. 1211125) operated by the NSW Rural Fire Service, is shown as passing across the site. This link operates at 404.7MHz. (This link has since been removed from the ACMA website. Mr Roman Rybak of the NSW Rural Fire Service confirmed on 12-9-07 that the link no longer exists and that there are no plans to use the path between Lagan Trig and Budawang in the foreseeable future).

A link between “Commsite Mt Mary” and “Goulburn Mulwaree Council Site Bannaby Road, Bannaby Hill”, (License No. 1218521) operated by the NSW Rural Fire Service, passes across the site. This link operates at 404.35MHz.

A link between “Commsite Mt Mary” and “SRA Site Mt Gray”, (License No. 1218519) operated by the NSW Rural Fire Service, passes across the site. This link operates in the UHF band at 404.35MHz.

A link between “Commsite Mt Mary” and “82-88 Combermere Street Goulburn”, (License No. 1218520) operated by the NSW Rural Fire Service, passes across the site. This link operates at 404.35MHz.

A link between “Commsite Mt Mary” and “Commsite 11km SW of Marulan, Mt Marulan”, (License No. 1191643) operated by the NSW Rural Fire Service, passes across the site. This link operates at 404.35MHz.

A link between “Telstra Radio Terminal Crookwell” and “Telstra Site Mt Gray” (License No. 80487) operated by Telstra Corporation Ltd, passes across the site. This link operates at 7.762 GHz.

A link between “Telstra Radio Terminal Crookwell” and “Telstra Exchange Crookwell”, (License No. 80491) operated by Telstra Corporation Ltd, passes across the site. This link operates at 7.762GHz.

In order to determine whether a radio link could be affected by the wind turbines, EPURON defined an ‘exclusion zone’ beyond which the level of interference will not disrupt the radio link, based on the concept of the Fresnel zone, as previously described.

Additional radio communication licenses

EPURON previously contacted all organisations identified as operating radio communication licences (including fixed link communications) within 25km of the nearby Cullerin wind farm proposal. Each license holder was asked to provide independent comments / advice on the possibility of the wind farm development interfering with their

²⁵ D. F. Bacon, A Proposed Method for Establishing an Exclusion Zone around a Terrestrial Fixed Link outside of which a Wind Turbine will cause Negligible Degradation of the Radio Link, Radiocommunications Agency UK Report Ver 1.1, 28 Oct 2002

communications links. At that time, no organisation within the 25km radius raised concerns. Optus, Vodafone and Telstra provided general guidelines to assist in the planning of wind farms.

In response to these enquiries, Optus Mobile noted:

"Provided wind turbines are located well outside the 2nd Fresnel zone of the point to point microwave links, no interference to communications is expected"
(pers. comm. Mr. Trong Ho, Optus Mobile)²⁶

Vodafone noted:

"Clearance criteria is the same for all carriers. Please use the same criteria as proposed by Optus"
(pers. comm. Mr. Ganesh Ganeswaran, Senior Engineer / Transmission, AAP Communications Services 22/11/05)²⁷

Telstra noted:

"Provided wind turbines are greater than 100m away from Mobile tower (or in the case of directional panel antennae) not in direct line of sight for panel antennas, wind turbines will have minimal effect on existing coverage."
(pers. comm. Mr. Ivan D'Amico, Area Team Manager (Country) - NSW&ACT, Telstra Services, Wireless Access Solutions, Mobile Coverage Delivery)²⁸

These suggestions have been incorporated into the planning of the Gullen Range proposal.

Other radio communication

Two-way mobile

A small number of mobile bases exist in the area surrounding the wind farm site, including at Crookwell. These bases potentially provide cover to mobiles in a 360 degree arc from their bases. No significant impact from the wind farm on base coverage beyond normal mobile operational performance is predicted in view of the geographic separation between the base antennas and the turbine structures. Of course a mobile unit communicating with a base station when the mobile is located within metres of the wind turbine structures (or indeed near any large building, silo, tower etc) may experience some very local performance change, however moving a short distance would restore performance to normal.²⁹

CB radio

CB radios are not individually licensed, the equipment being subject to class licensing only. Therefore, no records of location or operators of CB radios exist, and the channels are shared without any right of protection from interference. No impact from the wind farm is predicted except perhaps for very local effects to portable or mobile units in the

²⁶ Taurus Energy - Cullerin Range Wind Farm Environmental Assessment Report 2006

²⁷ *Ibid.*

²⁸ *Ibid.*

²⁹ Lawrence Derrick & Associates Bannister Wind Farm – Investigation of possible impacts on broadcasting and Radio communication Services September 2003

immediate vicinity of the turbines which could be avoided by a small location change of the unit.³⁰

Mitigation measures

As a result of the exclusion zones established in planning the wind farm, no significant impacts will occur to existing point-to-point links and therefore no mitigation will be required. In the event that any issues with additional license links are identified as a result of the wind farm, whether prior to or post construction, EPURON will consult with the operator and undertake appropriate remedial measures, which may include:

- Modifications to or relocation of the existing antennae;
- Installation of a directional antennae; and/or
- Installation of an amplifier to boost the signal.

Aircraft navigation systems

Existing services and facilities

The closest airports to the proposed wind farm site are Canberra and Goulburn. There is one radar installation in the vicinity of Canberra airport, namely Mt Majura. A secondary radar installation is located at Mt Bobbara.

Interference and impact analysis

EPURON has consulted with the Civil Aviation Safety Authority (CASA), Airservices Australia and the Department of Defence in relation to the proposal.

Due to the height of the turbines (>110m), the Civil Aviation Safety Authority recommends that obstacle lighting be provided as per section 5.5 of Advisory Circular 139-18(0) - *Obstacle Marking and Lighting of Wind Farms*.

A review of the proposal was undertaken by Airservices Australia and it was determined that the wind farm site was sufficiently away from the Airservices Australia transmission link path so as not to be an issue.

The nearest Airservices Australia Radio Site is 30 km away at Mt McAlister to the northeast. No wind turbine impact on this site is predicted.³¹ Airservices Australia confirmed that they do not have any objection to the proposal.

A review of the proposal was undertaken by the Department of Defence. No objection to the proposal was made. Mr. Gary Lee of the Department of Defence mentioned that the closest military radar to the site was the HMAS Albatross, near Nowra which approximately 90 -100 km away from the site and so should not be an issue.

Mitigation measures

Obstacle lighting will be provided if required by CASA. No other mitigation measures are required.

³⁰ *Ibid.*

³¹ *Ibid.*

Conclusion

Interference to MF and FM sound broadcasting is not expected.

The NSW Rural Fire Service (RFS) identified three RFS UHF communications links crossing the southern part of the site, which may be affected by interference due to the placement of the wind turbines. These links are identified by license numbers 1191643, 1218519 & 1218520.

A meeting was held with RFS (Mr. Roman Rybak and Mr. Paul Kirk) in September 2007 to discuss the issue with multiple radio links crossing the wind farm site. It was proposed that a dedicated east-west corridor across the site would provide the greatest benefits for both organisations. Accordingly a single microwave link (1xE1 HSB or equivalent) between Mt Mary and Mt Gray (Goulburn) would replace the three existing UHF links from Mt Mary to Goulburn and thus resolve any current and future conflicts between the wind farm and communications links.

It was agreed that RFS would undertake the preliminary design work necessary for the new communications link and provide EPURON with the required frequency and exclusion zone around the new link along, with an estimated cost for the link hardware required and installation. RFS subsequently requested a 60m corridor and EPURON has made provisions for a 100m corridor for the RFS links from Mt Martin to Mt Gray.

EPURON commits to cover the reasonable cost of the microwave link engineering, supply and installation / provision of a new steel tower at Mt Martin. The costing of the microwave link is provided in the RFS letter of 22 January 2008. The work would be undertaken by existing RFS or RFS approved contractors.

Thus, conflicts between the point to point radio systems and the wind turbines are expected to be avoided with appropriate clearances being established. Also, mobile radio and other radio communication services in the area are not expected to be impacted by the wind farm or its operation.

VHF TV reception at dwellings within about 1 km of the wind farm turbines and with antennas having turbines located with +/- 25 degrees angle of their reception direction will have some probability of noticeable "ghosting" at times. For UHF TV time variant ghosting may be evident out to about 2 km for turbines located +/- 20 degrees from the reception direction.

Digital TV is not susceptible to visible "ghosting" degradation. Any impact of reflections from the turbines would be a minor reduction of coverage at the limit of the service area.

For any confirmed wind farm interference problems where TV antenna system improvements are unsuccessful, the use of the digital TV services in the area may be the best solution, requiring the provision of a digital set top converter.

Overseas experience indicates that electrical interference from wind farm generators and controls is not a problem with established and reputable wind turbine manufacturers and therefore no electrical noise measurements are warranted.

Correspondence :

EPURON

POWER FOR PORTFOLIOS

EPURON PTY LTD
Suite 104, 349 Pacific Hwy,
NORTH SYDNEY, NSW 2060
Ph 02 9922 7771
Fax 02 9922 6645

Mr. Bruce McDonald
Manager, Operational Communications
Rural Fire Service
15 Carter St,
Homebush Bay, NSW 2127

4 September 2007

**Re: RFS communication links in the vicinity of the
Gullen Range Wind Farm**

Dear Mr. McDonald,

Thank you very much for the opportunity to meet with members of your team, Messrs. Kirk and Rybak, on Tuesday to discuss our proposed Gullen Range wind farm in the context of the existing RFS radio links that cross the area.

Please understand that we appreciate the importance of these communication links to RFS operations and want to ensure that the communications network remains effective and secure. We also appreciate the constructive suggestions from your team to develop a solution that minimises potential conflicts between our project and your communication links.

As discussed during the meeting:

Mt Mary → Goulburn Links

- It is proposed that a single microwave link (1xE1 HSB) between Mt Mary and Mt Grey (Goulburn) will replace the existing three UHF links from Mt Mary to Goulburn.
- RFS will undertake preliminary design work (at their cost) for the new link and provide EPURON the required frequency and exclusion zone around the new link along with an estimated cost for the link hardware and installation.
- EPURON confirms the commitment to cover the cost of the microwave link engineering, supply and installation should the proposed Gullen wind project proceed. The work would be undertaken by existing RFS or RFS approved contractors.

- It is expected that a new steel tower will be required at Mt Mary to support the new microwave dish as the existing wooden pole is unlikely to be structurally adequate for a microwave dish. Based on our discussion, the expectation is that this is a 30m tower or similar.
- Should the Gullen Range wind project proceed, EPURON confirms that it will cover the cost of the supply and installation of a new steel tower at Mt Mary, to replace the existing facility. Our understanding, based on our discussion, is that existing RFS contractors or RFS approved contractors would undertake the works.

Mt Mary → Red Ground Link

- The existing UHF link between Mt Mary and Red Ground passes approximately 1km from turbines at a distance of 14.5km from Mt Mary. This is near the limit of possible interference from wind turbines on the radio link.
- EPURON confirms that it will take the necessary corrective action should there be interference experienced on the link following the installation of turbines. It is contemplated that a new high gain antenna, such as a gridpack installed on the new steel tower, may be a suitable solution.

We would appreciate confirmation of your agreement to these points.

On this basis, we will proceed with our project planning taking into account the exclusion zone around the new microwave link to Goulburn and we will include the agreed points in this letter into our Statement of Commitments submitted to the Department of Planning. These will ultimately become conditions of the Development Consent, if the project is approved.

Please don't hesitate to contact me on 9922 7771 if you would like to clarify or discuss any of this in greater detail.

Sincerely,

SIMON DAVEY
PROJECT MANAGER

All communications to be addressed to:

Headquarters
NSW Rural Fire Service
Locked Mail Bag 17
GRANVILLE NSW 2142

Telephone: (02) 8741 5555
e-mail: roman.rybak@rfs.nsw.gov.au

Headquarters
NSW Rural Fire Service
15 Carter Street
HOMEBUSH BAY NSW 2127

Facsimile: (02) 8741 5550



Simon Davey
Epuron Pty Ltd
Suite 104, 349 Pacific Hwy
NORTH SYDNEY, NSW, 2060

Your Ref:
Our Ref: MOC 08 003
OCF / 0201

22 January 2008

Dear Mr Davey

RE: RFS COMMUNICATION LINKS IN THE VICINITY OF THE GULLEN RANGE WIND FARM

With reference to your earlier correspondence of 4 September 2007 under the above heading following our meeting with your colleagues and yourself.

This is to confirm in-principle, RFS's agreement to the points outlined in your correspondence to retain effective and secure communications between Mt Mary and Goulburn as well as between Mt Mary and the Red Ground radio site without adversely affecting the installation of the Gullen Range Wind Farm.

Mt Mary to Goulburn

We have carried out some preliminary investigation and design work for these systems and have had discussions with two microwave system suppliers, Kordia and Wave1. Preliminary quotes were obtained from these suppliers and we can now advise reasonably accurate costs for installing these links.

Initial discussions with the suppliers were for a 2 hop microwave system, incorporating a passive repeater at Mt Gray. Although such a configuration is technically feasible and operationally desirable, ACMA licensing conditions preclude this arrangement. The supplier's alternative solution was to quote for a 2 hop system using an active repeater at Mt Gray. However, we prefer to retain the existing Mt Gray to Goulburn hop since it would not be affected by the proposed Wind Farm and only install microwave across the Mt Mary to Mt Gray portion.

Based on the quotations provided to us to date, the cost of an unprotected 8GHz microwave link between Mt Mary and Mt Gray will be of the order of \$70K, including multiplexing equipment. I understand that Epuron will arrange to erect a 30m tower at Mt Mary of sufficient strength to accommodate the required parabolic dish as well as

the other antennas currently mounted on the existing wooden pole and cover the cost of transferring the services to the new tower.

Note that the owners of the Mt Gray tower will probably require a stress check to confirm that the solid dish will not exceed the towers wind loading capabilities. In addition, recent legislation requires a site radiation folder to be prepared or updated for all radio sites. The approximate cost of a tower stress check is of the order of \$2K to \$3K and an update to a site radiation folder would be about \$1K.

Total cost of this component is estimated at around \$95K, not including the 30m tower and its erection.

Mt Mary to Red Ground

According to our desktop assessment, this link may be only marginally affected by wind turbines. We feel that the best course of action for this link is to closely monitor its performance during the construction and commissioning of the turbines. If the link's performance deteriorates during the period of the turbine's construction, steps will be taken to upgrade the existing yagi antennas with high gain Gridpaks to minimise the effects of multipath reflections. In the remote possibility that the Gridpaks do not alleviate the problem and it is felt by the users that the interference is unacceptable, consideration will need to be given to replacing this hop with 8GHz microwave as well.

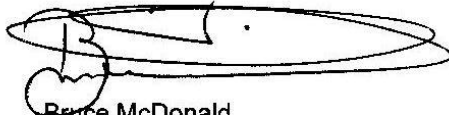
As mentioned for the Mt Gray tower, the Red Ground tower will probably require a stress check if larger antennas need to be installed.

The cost of Gridpak antennas and associated stress checks would be of the order of \$12K, however tower strengthening at Red Ground could be a significant additional cost if this were to proceed.

Note that the Mt Mary radio site is owned by Goulburn Council. The RFS can negotiate with Council in regard to the necessary approvals and agreements if this project does proceed.

I trust that this response is adequate for you to progress your planning.

Yours sincerely



Bruce McDonald
Manager,
Operational Communications

From: Cremer Rachel [mailto:Rachel.Cremer@BroadcastAustralia.com.au]
Sent: Friday, 12 October 2007 2:37 PM
To: Anthony Micallef
Cc: Freer Peter; Bilanenko Basil; Whelband Phillippa
Subject: Gullen Range Wind Farm (between Goulburn & Crookwell, NSW)

Dear Anthony

I refer to your correspondence dated 20 June 2007 regarding the proposed Gullen Range Wind Farm. Apologies for the delay in responding.

Broadcast Australia (BA) builds and operates broadcast sites for the transmission of services for SBS and ABC Television and Radio. Our closest site to this proposed wind farm is at Wades Hill, near Crookwell (approx 8kms from proposed Kialla wind farm) which transmits services of ABC Television, ABC Local Radio and ABC Radio National.

Wind farms have been known to cause ghosting to analogue television reception, caused by the turbine blades reflecting the signal in the reception area.

Our engineers have looked at the proposal and are of the view that the development is not likely to impact on the television (or radio) audience in the area for the following reasons:

1. Distance between wind farm and broadcast site – past case studies have indicated that broadcasts 5 kms or more from wind farms should be safe from interference issues.
2. The TV antenna is orientated towards Crookwell which is due east from Wades Hill. The proposed wind farm is due south, therefore very little power will be directed towards the wind farm and hence interference due to reflections or attenuation from the rotating blades is highly unlikely.

However BA is unable to *guarantee* that the development would have no impact on transmissions and we therefore recommend that Epuron engage an engineering consultancy firm to undertake a detailed study.

Thank you for notifying us of this proposal and please keep us informed of progress. Please contact me if you have any queries or wish to discuss the above.

With regards
Rachel

Rachel Cremer
Property Co-ordinator
Broadcast Australia Pty Ltd
t: 02 6256 8020
f: 02 6256 8041
e: rachel.cremer@broadcastaustralia.com.au
w: www.broadcastaustralia.com.au

From: Roman Rybak [mailto:Roman.Rybak@rfs.nsw.gov.au]
Sent: Wednesday, 12 September 2007 11:05 AM
To: Anthony Micallef
Subject: RE: Radio Communications - RFS links in Goulburn area
Sensitivity: Confidential

Hi Anthony,

I checked licence 1211125 and as you suggest, it no longer exists. I should also advise that there are no plans to use this path between Laggan Trig and Budawang in the foreseeable future.

Kind regards,
Roman

From: Roman Rybak [mailto:Roman.Rybak@rfs.nsw.gov.au]
Sent: Friday, 8 June 2007 12:14 PM
To: Anthony Micallef
Cc: Bruce McDonald
Subject: RE: Radio Communications - RFS links in Goulburn area

Hi Anthony,

I have finally completed this piece of work for you. The attached map gives an approximate idea of the exclusion zones around the radio paths to avoid when you locate your turbines.

Note that there is an additional radio path which did not show on the map which you originally sent me, i.e., Mt Mary to Mt Marulan (11km SW of Marulan). This is a new radio system which has only just been entered into the ACMA database.

The exclusion zones are 1km wide, extending 15km from Mt Mary along each of the radio paths. Beyond 15km, the diameter of the exclusion zone drops to 300m around the centreline of the radio path.

Also note that the zones indicated on the map are worst case and there will be no problems provided they are kept clear. Due to the many variables involved it was too time consuming to plot the exclusion zones accurately on a per path basis so this more general approach was adopted. If you do propose to erect a wind turbine within the indicated exclusion zones, a more accurate assessment can be made of its effect once we are provided with information on its proposed position.

I trust this information is adequate and does not provide too onerous a restriction on your planning.

If you have any further queries, please contact me on any of the numbers below.

Kind regards,

Roman Rybak
NSW Rural Fire Service
Operational Communications
Phone: 02 8741 5259
Mobile: 0427 403 579
E-mail: roman.rybak@rfs.nsw.gov.au

From: david.morton@countryenergy.com.au
Sent: Wednesday, 27 June 2007 5:09 PM
To: Anthony Micallef
Cc: Steve.Allan@CountryEnergy.com.au; Matthew.Coman@countryenergy.com.au
Subject: Country Energy re:EPURON - GULLEN RANGE WIND FARM NSW.tif alias

Anthony,

We have reviewed your letter referring to the proposed windfarm at Gullen Range. Country Energy does not have any objection to you proceeding as outlined.

Kind Regards

Dave Morton
IS Infrastructure Design Manager
Responsible for design and development of IS Infrastructure systems Country Energy
Phone: 0265898441
Mobile: 0419401314
Email: david.morton@countryenergy.com.au

From: MORGAN, Simon [<mailto:SMorgan@ambulance.nsw.gov.au>]
Sent: Wednesday, 4 July 2007 11:56 AM
To: Anthony Micallef
Subject: RE: Gullen Range Wind Farm

Thanks Anthony,
I don't see any problems with the wind farm proposal.
Thankyou for providing this extra information.
regards

Simon Morgan
A/Telecommunications Manager
Ambulance Service of NSW
Ph: 02 9320 7833
Fax: 02 9320 7801
Email (wk): smorgan@ambulance.nsw.gov.au

From: Jayantha Wickramasinghe [mailto:Jayantha.Wickramasinghe@optus.com.au]
Sent: Wednesday, 11 July 2007 4:14 PM
To: Anthony Micallef
Cc: Simon Davey
Subject: FW: Gullen Range Wind Farm
Sensitivity: Confidential

Dear Anthony
The proposed wind farm will have no impact on Optus microwave links if the proposed wind turbine locations are as shown in the attachment.

Regards
Jayantha

Jayantha Wickramasinghe | Technical Specialist | GSM / 3G / Radio Transmission Planning | Optus Networks | t: +61 2 934 20353 | m: +61 411 526 668

My new details from 03/08/2007 | t: +61 (2) 808 20353 | visit us at 1 Lyonpark Road, Macquarie Park NSW 2113

Dear Anthony

Please see the advice below from the SES Tait Electronics Project Manager in relation to the likely non-impact of the Gullen Range Wind Farm on the NSW SES radio communications services.

My apologies for the delay in sending this information to you.

Best Regards

Nevenka

Nevenka Payne
Administrative Officer (Communications)
State Emergency Service
6-8 Regent Street
WOLLONGONG NSW 2500

Bus Ph: (02) 4224 2267
Fax: (02) 4226 2167
Email: Nevenka.Payne@ses.nsw.gov.au

-----Original Message-----

From: Mark Pilkington [mailto:mark.pilkington@tait.com.au]
Sent: Thursday, 19 July 2007 3:14 PM
To: Patrick Clague
Cc: Nevenka Payne; Paul Ludvik
Subject: Gullen Range Wind Farm

G'day Pat
I've had a look at the various NSW SES linking assignments and UHF repeater assignments in the area surrounding the proposed Epuron windfarm to be located about 25kms NW of Goulburn.

The the proposed windfarm turbine location does not intersect with any NSW SES radio point to point link path. The closest NSW SES link path is the UHF link between Laggan Trig (Redground) and Mt Muntoonen. This link path is about 7kms west of the windfarm. Refer to the "Proposed Windfarm area.pdf".

My research into windfarm EMI indicates that unless a windfarm is located within the 'near field' or immediate vicinity of the UHF radio site (for example less than a kilometre or two) then there will be negligible affect on the general coverage of a UHF base station.

As for localised degraded mobile coverage, if you look at the 2 attached coverage plots (Redground and Muntoonen) you will notice the the proposed windfarm is located on the edge of the 'good' coverage range of both the Muntoonen and Redground repeaters. Radio coverage in the area around the proposed windfarm location may currently be slightly "noisy" there anyway due to being in the fringe coverage of the repeaters. So where there may possibly, if at all, be any radio interference issues to mobile coverage would be in that immediate locality of the windfarm around Kialla, Bannister, Pommeroy and Mummell (depending on where the final location of the windfarm is).

So to summarize, other than possibly the vicinity of the proposed windfarm itself, it is unlikely that the wind generators will have any marked affect on NSW SES PMR radio communications.

Regards
Mark

Mark Pilkington - Project Manager
Tait Electronics
186 Granite Street Geebung QLD 4017
Ph 07 3865 7799 Fax 07 3865 7990
Email mark.pilkington@tait.com.au
Web www.taitworld.com

From: LEONARDI, FRANK [mailto:FRANK.LEONARDI@casa.gov.au]
Sent: Tuesday, 24 July 2007 4:56 PM
To: Anthony Micallef
Cc: Simon Davey; Andrew Durran; Martin Poole; SULLIVAN, BYRON
Subject: RE: Gullen Range Wind Farm - Obstacle Lighting [SEC=UNCLASSIFIED]

Anthony

I refer to your e-mail of 23 July 2007 in which you sought clarification in respect of the provision of obstacle lighting on wind farms. Byron Sullivan is our electrical engineer and he has carriage of assessing proposed wind farm developments in respect of obstacle lighting requirements. Unfortunately Byron is on sick leave this week so I shall attempt to answer your questions.

Some clarification on the process established under the CASA regulations in respect of Obstacles and Hazards:

Outside the obstacle limitation surface extending around an aerodrome, i.e. **not in the vicinity of an aerodrome**, under Civil Aviation Safety Regulation (CASR) 139.365 the proponent of a building or structure, the top of which is 110m or more above ground level, must inform CASA of its proposed height and location.

Under CASR 139.370 CASA may determine that the building or structure will be a hazardous object because of its location, height or lack of marking and or lighting. When such a determination is made, a hazard determination notice will be given to the person who proposes to construct the building or structure and the authority that approves the construction.

If CASA determines the building or structure to be a hazard to air navigation the hazard may be removed or minimised if the building or structure is removed, reduced in height or made conspicuous by use of obstacle marking and or lighting. CASA would not encourage the removal of a building or structure unless it was seriously detrimental to the safety of aviation. In respect of wind turbines on a fine day they are generally conspicuous to aircraft pilots by their size and no marking or lighting is required. At night or during low visibility conditions the normal way of reducing the hazard of the wind turbine to pilots is by providing obstacle lighting which meets the standards for the lighting of wind turbines set out in Advisory Circular AC 139 -18(0).

Your proposal is to construct an 84 turbine wind farm, approximately 25km NW of Goulburn with each turbine having a maximum blade tip height of 126m above ground level. Firstly it is to be notified to CASA, which you have done. Given the proposed location is close to populated areas such as Goulburn and there is the likelihood of established aviation activity and air routes over the proposed site the wind farm would be determined to be a hazard unless obstacle lighting is provided.

I hope this has been helpful to you. Please do not hesitate to contact me if you have further questions or require further information.

Regards

Frank Leonardi

Aerodrome Engineer (Civil)
Airways and Aerodromes Branch
Air Transport Operations Group
Civil Aviation Safety Authority
Canberra Central Office

ph/fax direct: 02 6217 1740/1500
ph national: 131 757
e-mail: frank.leonardi@casa.gov.au

From: Doherty, Joe [mailto:Joseph.Doherty@AirservicesAustralia.com]
Sent: Monday, 6 August 2007 5:17 PM
To: Anthony Micallef
Cc: Spinks, Denise
Subject: Gullen Range Wind Farm proposal

Anthony

I refer to your request for Airservices assessment of the proposed Gullen Range Wind Farm located approximately 25km NW of Goulburn, NSW

In assessing this proposal we note that the choice of turbine model could take the overall height of the blade tip to 130m and that the coordinates for the site boundary reflect the "general area" of interest for turbine placement.

The proposed wind farm will not have an impact on instrument approaches or Minimum Sector Altitudes provided the highest (blade tip) point is below 3700ft (1130m).

Once the turbine locations have been identified, any turbines expected to have an overall blade tip elevation of greater than 1130m on the proposed site will need to be assessed separately. Precise coordinates and elevations AHD will be needed for this assessment.

The wind farm will not impact on Precision/Non-Precision Nav Aids, HF/VHF Comms, Cables, Radar or Satellite/Links.

Regards

JOE DOHERTY

Senior Advisor

Airport Relations

joseph.doherty@airservicesaustralia.com

—

Ph +61 2 6268 5101

Fax +61 2 6268 5688

www.airservicesaustralia.com

From: Roman Rybak [mailto:Roman.Rybak@rfs.nsw.gov.au]
Sent: Tuesday, 7 August 2007 2:17 PM
To: Anthony Micallef
Subject: RE: Radio Communications - RFS links in Goulburn area
Sensitivity: Confidential

Hi Anthony,

I have completed the evaluation of the preliminary turbine layout and the results are attached. If you refer to the spreadsheet, the turbines which would interfere with the existing radio paths are highlighted in red. All others should be OK.

Kind regards,

Roman Rybak
NSW Rural Fire Service
Operational Communications
Phone: 02 8741 5259
Mobile: 0427 403 579
E-mail: roman.rybak@rfs.nsw.gov.au

Hi Anthony,

Sorry that this information has taken time I have been out of action for the past 3 months. Anyway, it appears that there would be no interference with any Police communications for the proposed windfarm.

Thanks

Darron McRae
Wireless Technology (OCIC)
Level 4, Sydney Police Centre
151-241 Goulburn St,
Surry Hills. NSW. 2010.
(02) 9265-4518

-----Michael Butzek/9534520/Staff/NSWPolice wrote: -----

To: Darron Mcrae/28216/Staff/NSWPolice@NSWPolice
From: Michael Butzek/9534520/Staff/NSWPolice
Date: 08/14/2007 02:35PM
cc: Graeme Jackson/9334124/Staff/NSWPolice@NSWPolice, Geoffrey Dunn/30388/Staff/NSWPolice@NSWPolice
Subject: Re: Fw: Gullen Range Wind Farm

Hi Darron,

The sites proposed by Epuron for a windfarm do not lie in the path of any current or future radio links. The closest turbine would appear to be approximately 12km from our site at Redground so I would not anticipate any type of interference to the police base equipment.

Regards,

Michael Butzek
Senior Technical Officer
Warilla Radio Network Services
NSW Police Force
Ph: 02 4255 6202
e/n: 80202
email: butz1mic@police.nsw.gov.au

-----Darron Mcrae/28216/Staff/NSWPolice wrote: -----

To: Michael Butzek/9534520/Staff/NSWPolice@NSWPolice
From: Darron Mcrae/28216/Staff/NSWPolice
Date: 14/08/2007 8:56
cc: Graeme Jackson/9334124/Staff/NSWPolice@NSWPolice
Subject: Fw: Gullen Range Wind Farm

Michael/Graeme,

Hello to you both and how is it in the land of milk and honey?

Anyway, could you please provide a comment on the suitability for a windfarm located approx. 25km NW of Goulburn.
(See attached map of the Gullen Range).

I have spoken to Ian YULE in regards to this proposal and he is of the opinion that it would not have any affect upon our communications.

Thankyou

Darron McRae
Wireless Technology (OCIC)
Sydney Police Centre
(02) 9265-4518
E/N 54518