

Flyers Creek

WIND FARM

Environmental Assessment

CHAPTER 14 Telecommunications



14. Telecommunication Issues

This chapter of the Environmental Assessment describes the potential telecommunications impacts that have been considered for the construction and operations stages of the project and the measures proposed to mitigate the potential impacts. Appendix H provides details of the specialist investigation of the relevant matters prepared by Lawrence Derrick and Associates Pty Ltd (LDA).

14.1 Introduction

As with other large structures, wind turbines have the potential to interfere with radio frequency signals by scattering the signal due to both forward or backward reflections or by physically obstructing these signals. The services that could theoretically be affected by wind turbines include aircraft navigation systems, radio signals, television signals, satellite signals and microwave links.

Although complex, the potential for Electromagnetic Interference (EMI) impact of wind turbine generators upon telecommunications links has been studied over many years and is generally well understood. In the case of broadcast analogue television signals, due to the nature of the transmitted signal, the variability of local conditions and the characteristics of the aerials used in particular installations; there is a degree of uncertainty regarding predicted levels of interference. However, the mitigation measures in such situations are relatively simple and inexpensive to implement.

The placement of structures within the path of point-to-point services may also result in interference. However, this can be easily avoided by positioning of wind turbines with adequate clearances from the transmission paths. The potential for interference, to each of the above mentioned communication systems, as a result of the proposed wind farm development, is described in the following sections. Where applicable, potential mitigation options are identified which have been incorporated, or will be undertaken, to address any impacts arising from the development.

The proposed wind farm development site is located within a rural area about 25 kilometres south of the City of Orange and about 14 kilometres west of Blayney. Mt Canobolas is about 15 kilometres to the northwest of the site and at an elevation of 1,397 metres has several large communications towers and associated facilities that are able to serve a very wide area (Plates 14.1 and 14.2). In addition, the City of Orange, Orange Airport, Cadia Mine Site and Blayney all have a range of licensed radio communications sites. Elsewhere, licensed radio communications facilities are more broadly scattered along the major transport routes and more elevated locations. An Optus communications tower (fixed link dishes and mobile phone antennae) is located within the project area near Hope Hill (referred to as Burnt Yards) at the southern end of the potential wind farm site (Plate 14.3).

The following sections review the various forms of telecommunications for the locality and the potential impacts on the services.

14.2 Radar

Wind turbines can potentially impact upon radar systems. The project site is located approximately 13 kilometres to the south west of the Orange aerodrome which does not use instrument landings. Airservices Australia does have a communications facility on Mt Canobolas.

Details of the project have been sent to Airservices Australia and comments sought on any concerns that Airservices Australia may have in relation to the development of the wind farm project in respect of aviation issues including radar. AirServices Australia undertook an assessment of the potential impacts and advised that the proposed wind farm will not impact the technical performance of precision/Non-precision Nav Aids, HF/VHF Comms, A-SMGCS, Radar, PRM or Satellite/Links.



Plate 14.1 – Mt Canobolas (Orange) TransGrid and Airservices facilities



Plate 14.2 – Mt Canobolas (Orange) TV and other communication facilities

14.3 Radio reception

The Australian Communications and Media Authority (ACMA) issues apparatus licences under the Radiocommunications Act 1992 and is the federal government authority responsible for regulation and management of the radio communications spectrum. It was formed in July 2005 by the merging of Australian Broadcasting Authority (ABA) and the Australian Communications Authority (ACA).

ACMA authorises licensees to operate radio communications devices such as transmitters and receivers. In effect, they are licences to use specific segments of the radiofrequency spectrum for particular purposes. A system of apparatus licence types are used to apply common licence conditions and fee structures to categories of radio communications service.

Parts of Australia have been defined as High, Medium or Low density with respect to radio communications. The Flyers Creek Wind Farm is within an area classed as a Low Density Geographic Location.

A review of the ACMA's web-site for an area within 25 kilometres of the centre of the wind farm site indicated that there are 126 sites that are registered on the website for one or more radio communication licences as indicated in Figure 14.1 below.

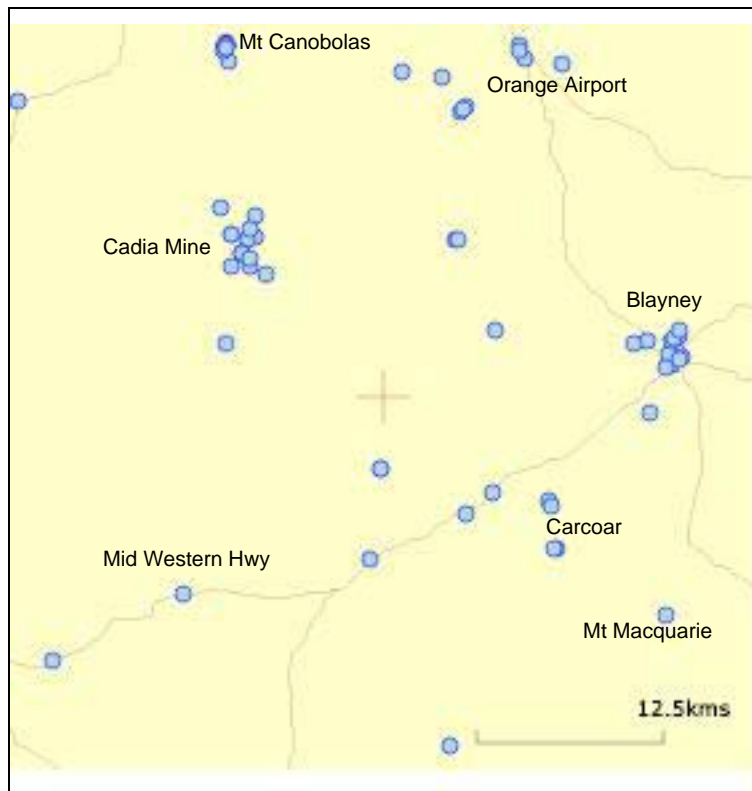


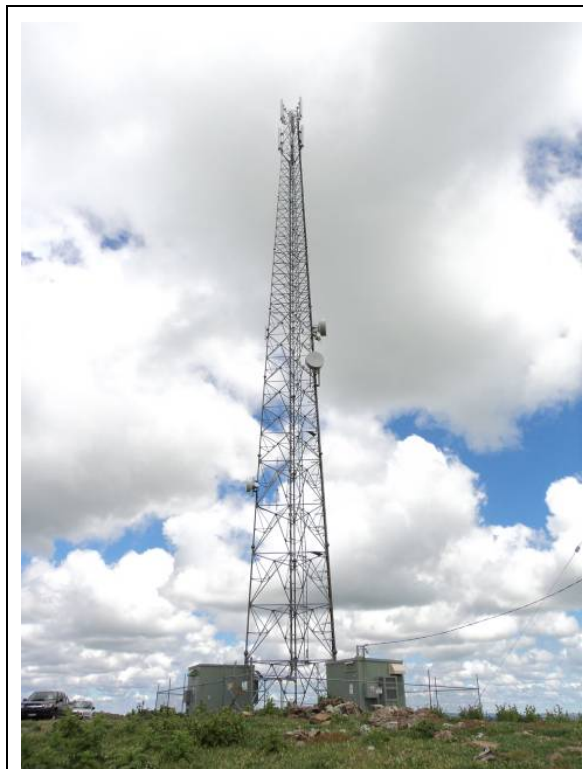
Figure 14.1 – Review of licensed radio-communications sites within vicinity of project area

The licences are held by a variety of organisations including local councils, Roads and Traffic Authority, NSW Fire Brigades, TransGrid, Country Energy, St John Ambulance Australia, NSW Police, Telstra, Optus, Vodafone and various other local radio users. Many apparatus licences are classified as 'land mobile' licences and enable communications between base stations and land mobile (vehicle based) stations. There is a radio communications facility located on Hope Hill at the southern end of the site about 250 metres north of Turbine site 36.

The facility on Hope Hill (Site ID 134718 and 204434) (Plate 14.3) is owned and operated by Crown Castle on behalf of Optus and also includes other services on behalf of Telstra. From the examination of recent photographs of the tower, it is believed that sites 134718 and 204434, which have different coordinates, are in fact the same tower. The different locations in the ACMA database may be explained due to the different grid reference systems used by organizations reporting details to ACMA.

There are undoubtedly many residents who access various radio broadcasts on a regular basis. In addition, there are a number of locations that have licences to operate radio frequency transmitters. These are irregularly distributed through the region at various distances from the project site.

Overseas and recent local experience indicates that radio reception and the audio component of television reception are unlikely to be affected by operating wind farms as discussed in detail in Appendix H. In regard to the Blayney Wind Farm that was commissioned in 2000, testing of radio reception for Blayney Council and RFS signals in the area around the operational wind farm showed that radio reception was not affected at the locations tested. The locations tested included situations where the radio signal transmission path passed through the operating wind farm.



**Plate 14.3 – Optus (Crown Castle) Burnt Yards
repeater station located on Hope Hill - 2010**

14.4 Mobile phone and microwave communications


Mobile phone services (public telecommunications services) are provided by the establishment of base stations to provide services in a cell around the individual station. These services are also linked to the wider communications network by point-to-point microwave links. The Hope Hill Tower within the wind farm project area is an example of these types of facilities.

14.4.1 Mobile phone services

Mobile phone coverage is available in much of the Blayney Shire but may be patchy further away from town centres and the main highways and where topography limits coverage. During site investigations for the Environmental Assessment, mobile phone coverage was observed to be available for elevated locations in the project area and most areas surrounding the site though signal strength did vary from place to place. Advice obtained from mobile phone service providers indicates that mobile phone services in these rural areas are mainly focussed on the main transport routes such as the Mid Western Highway. Transmission of mobile phone signals will not be significantly affected by the operating wind farm as discussed in Appendix H. However, any deterioration of service that occurs following installation would be investigated and in the very unlikely event the deterioration was identified as being due to the wind farm operation, the proponent would take steps to rectify the effect.

14.4.2 Point-to-point communications services

Microwave signals are used for inter and intra-regional point to point transmission paths that typically occur between elevated topographic features. The communications have the potential to be affected if part of a single wind turbine is in line of sight between two microwave stations, or within an impact zone, often referred to in terms of the Fresnel Zone. The width of this zone varies with the distance between the transmitter and receiver, the frequency of transmission and the location of a particular point along the microwave path. The maximum extent of the Fresnel (interference) zone occurs at the



mid-point along the path of the microwave link. Where a wind farm installation may obstruct microwave transmission, an obstruction analysis can be undertaken to ensure that no part of a wind turbine assembly will enter the 1st Fresnel Zone of the existing microwave path as has been done in this case.

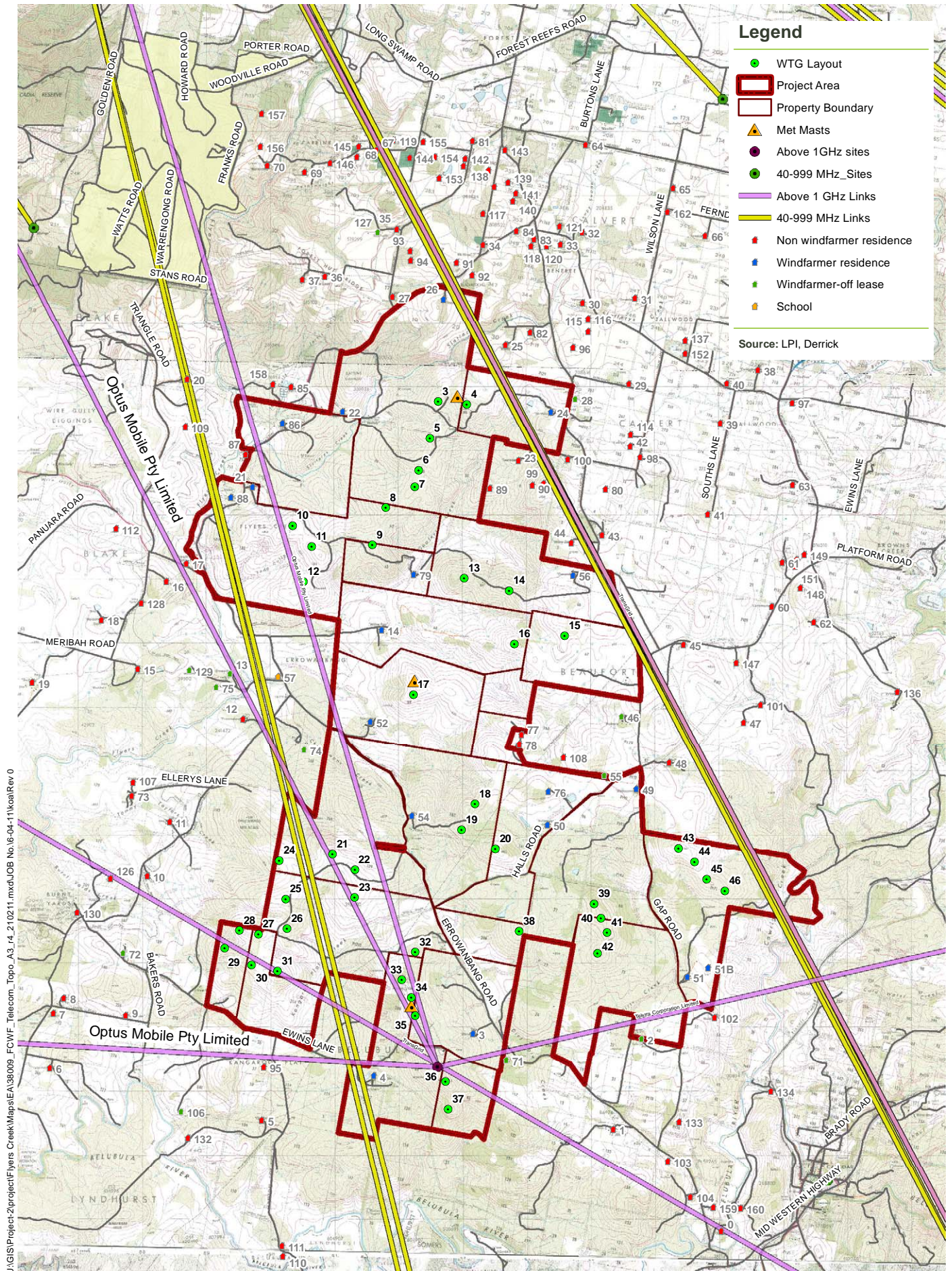
Point-to-point radio communication services in proximity to the proposed wind farm layout include:

- The Hope Hill repeater station that provides links between similar facilities at Mt Canobolas, Errol to the south of Blayney, and Cadia Mine to the west of Hope Hill. The directions of the transmission pathways for the communications facility on Hope Hill are shown on Figure 14.2. A newly registered link between Hope Hill and Cadia Mine Site required small adjustments to turbine sites 21, 23, 34, 35 to maintain adequate clearances to avoid interference.
- There is also a TransGrid link path (Mt Macquarie to Mt Coonambro) that passes close to the Burnt Yard facility and close to proposed Turbines 29, 30 and 31. The study appearing as Appendix H confirms that these turbines have sufficient clearance from the link path. While Turbine 31 appears in Figure 14.2 to be in the direct path of this communication link, the clearance, in this instance, is a vertical clearance as described in Appendix H.

The potential for interference to the above point-to-point services as a result of the wind farm installation has been assessed by LDA and, where necessary, the proposed turbine sites have been adjusted to provide adequate setback and clearances to avoid interference to the services. The details of the various link paths relative to the wind farm and respective turbine sites are provided below.

- the location of the two link paths that are generally aligned east-west are clear of the wind farm site which means that the potential for interference is avoided
- the link path between Mt Canobolas and Hope Hill (Burnt Yards Station) passes through the proposed turbine array, with sufficient clearance from the area swept by any of the turbine blades. Turbine sites 34 and 35 are the closest sites to this link path; however, they were sited to ensure clearances are adequate.
- the newly registered link (recently licensed but still to be installed) passes close to several proposed turbine sites. Turbine sites 21, 23, 34 and 35 have been adjusted to ensure adequate clearance from the new link path.

The paths of the communications links in the vicinity of the wind farm are shown in Figure 14.2. In all cases the proposed layout has sufficient clearances from the point to point communication paths to avoid interference as discussed in Appendix H. The detailed micro-siting for the placement of specific turbines will need to consider the potential for interference to ensure that communications are not adversely impacted. In undertaking this assessment, the proponent will liaise with the operator of the relevant service to ensure that the correct location details are used for the existing services to establish clearances from the link paths.



14.5 Television Reception

14.5.1 Nature and extent of potential interference to television signals

The rotating blades of a wind turbine can cause interference to the visual portion of an analogue television signal and in rare cases may mean that there is no viewable image. The extent of the zone of interference around a wind farm is limited and can be calculated using techniques derived from various scientific literature and an outline of the approach is provided below.

However, it is important to keep in mind, as pointed out in Appendix H, that analogue television signal transmission is scheduled to end in the wind farm district in June, 2012, before the earliest date that the wind farm is likely to be constructed, let alone be operational. Therefore, the discussion of potential effects to analogue television reception below is very likely to be hypothetical.

The zone of interference to analogue television signals for a single wind turbine is primarily an elongated zone extending from the turbine structure in the direction away from the transmitter (forward interference zone) and a zone of shorter but wider extent on the transmitter side (backward interference zone). The general shape of the zone of interference from an individual turbine is shown in Figure 14.2. The zone of potential interference for a wind farm is the resultant total of the interference effects from all of the turbines.

The International Telecommunications Union Recommendation ITU-R BT.805 states that impacts beyond five kilometres are unlikely. However, it also indicates that interference may extend beyond five kilometres where the receiver location is shielded from the direct signal, but in direct line-of-sight to the turbine. In such cases the reception even without any wind farm interference is likely to be poor.

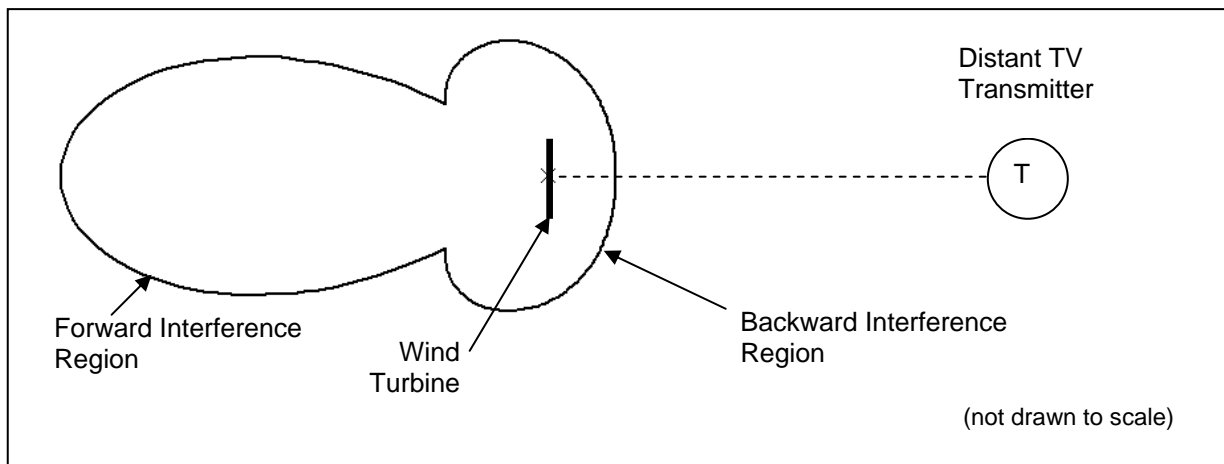


Figure 14.3 – Schematic Diagram of Television Signal Interference Zones around a Wind Turbine

The form of the 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. In the case of the Flyers Creek Wind Farm the “blade pass” frequency would be about 0.75 cycles per second. If significant interference occurred the reception could suffer and the picture will not always be viewable.

14.5.2 Television services at the Flyers Creek Wind Farm locality

Table 14.1 shows the location of the transmitters of television signals that may have potential to be received at various locations around the wind farm site. The wind farm site is close to Mt Canobolas and due to the proximity, elevation of transmitters and signal strength, the risk of interference will be less than for locations that have a weak signal.

Table 14.1 – Source of television signals with potential for reception near the wind farm

Television Transmission Source	Power (Watts)	Distance from the wind farm (km)	Areas relative to the wind farm that may have reception from the source
Mt Canobolas	100 – 400	20	Antennae are above 1,400m elevation
Satellite based services	Appear to be used widely in many rural areas and are not subject to the topographic screening that affects land based transmission signals. Due to proximity to Mt Canobolas most rural residents would be able to receive normal broadcast services without the need to access Satellite services.		

Mt Canobolas: The closest transmitter of television programs is at Mt Canobolas located about 20 kilometres north-west of the wind farm site. Transmission from Mt Canobolas is at high power 400 watts and serves a wide area including the area immediately surrounding the wind farm.

Satellite based television services are also received at various locations throughout the area. These services may either be used where local services are not able to be received or may be accessed as additional program content to complement local services. They are not subject to the same topographic screening that can affect the land based TV transmissions. Due to the distance of residences from the wind farm it is very unlikely that satellite based television services would be subject to interference due to the wind farm's operation.

14.5.3 Reception at residences surrounding the wind farm

As mentioned above the 'free to air' services that are able to be received in the vicinity of the wind farm are sourced from Mt Canobolas.

The extent of the forward interference zone is greater than the backward interference zone and for the Mt Canobolas signals the forward interference zone could extend south of wind turbine locations for varying distances depending on factors affecting extent of interference for a particular location. Where current reception of Mt Canobolas signals is poor and not viewable then the wind farm impact on television reception is irrelevant for such locations. However, where reception is currently viewable at receiver locations on the southern side of the wind farm, there may be potential for interference depending on the location of the receiver relative to the wind farm.

There are few residences on the immediate southern side of the wind farm site and as such forward interference to signals from the Mt Canobolas direction is unlikely to be a significant problem for the area to the south of the wind farm.

Consultation at some of the rural residences surrounding the wind farm site tends to confirm the good reception with the arrangement of the transmitter and the local topography.

The directions of potential forward interference zones for television transmission from Mt Canobolas are shown in Figure 14.1.

In general, with analogue transmissions the potential for interference can increase with distance from the transmitter. In addition, reception in the vicinity of the wind farm can vary with the degree of topographic obstruction of the signal.

Previous experience at the Crookwell Wind Farm showed that interference to signals from Black Mountain in Canberra was encountered for one neighbouring property about three kilometres to the north-east of the wind farm. However, the Crookwell Wind Farm is more than 90 kilometres from Black Mountain, so there would be greater potential for interference there than around the Flyers Creek project which is much closer to the television transmitter.

At residences where impacts on television reception do occur, measures can be easily implemented to overcome the problems as outlined in Section 14.6.

14.5.4 Identification of receiver locations with potential for interference

A review of the residences surrounding the Flyers Creek Wind Farm indicates that few locations will have potential for interference to analogue television reception. Signal strength monitoring for channels potentially present at the wind farm locality has not been undertaken, but could be undertaken prior to construction, if warranted. However, as previously mentioned, there would be little reason to do so as analogue television signal transmission is scheduled to end well before the wind farm would be operational and the replacement digital services have much less potential for interference as discussed in Appendix H.

Further assessments of TV reception at potentially affected residences can be undertaken after commissioning of the wind farm to identify the need for any remedial actions if analogue television services are still applicable and where interference is occurring.

14.6 Mitigation measures

The following mitigation measures are proposed in respect of potential impacts of the installed wind farm on existing communication services in the vicinity of the wind farm.

- Prior to construction Flyers Creek Wind Farm Pty Ltd will ensure that the final turbine layout is assessed in terms of their potential impact on fixed path radio links and the communications facility on Hope Hill. The design will ensure that these services are not disrupted or degraded. Where necessary, the relevant communication service operator will be contacted to confirm operational details. In particular, the siting of turbines will be undertaken with regard to the fixed path links passing through the wind farm site.
- Due to the possibility of interference to analogue television signals once the wind farm is operational, it is proposed that where analogue services are still in use that Flyers Creek Wind Farm investigate the status of television reception at residences immediately surrounding the wind farm following its commissioning.
- In the event that interference occurs as a result of the wind farm operation, then Flyers Creek Wind Farm Pty Ltd will rectify any interference that has been caused by the project development.
- Rectification of reception could initially include modifications to, or replacement of the aerials being used at the proponent's expense.
- In the event that the initial measures to rectify television reception are not satisfactory, other measures which could restore reception to the standard which existed prior to construction of the wind farm could include:
 - the installation and maintenance of a parasitic antenna system;
 - provision of a land line between the affected receiver and an antenna located in an area of favourable reception; or
 - in the event of interference to local channels not being able to be satisfactorily overcome by other means, negotiating an arrangement for the installation and maintenance of a satellite receiving antenna.

The above measures provide a suite of options by which any interference can be successfully addressed to mitigate its impact.