



FreeTV
Australia

**Submission by
Free TV Australia Limited**

Australian Communications & Media
Authority

Strategies for Wireless Access Services
Spectrum Access Options

Spectrum Planning Discussion Paper
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EXECUTIVE SUMMARY

- ACMA has a statutory duty to maximise the overall public benefit from use of scarce spectrum resources.
- ACMA has substantial further work to do before it will be in a position to assess whether overall public benefit requires the re-location of broadcasters from the 2.5GHz band in favour of WAS.
- The current consultation by Ofcom on use of the 2.5GHz band in the UK demonstrates the depth of research, analysis and consultation which Ofcom considers necessary to discharge its statutory duty and to support a proposal for change of spectrum use.
- It is pre-mature for this Options Paper to be seeking detailed comment from stakeholders regarding re-structuring and licensing of the 2.5GHz band for WAS uses.
- ACMA has not effectively demonstrated how much spectrum is needed for WAS or where and when spectrum is required.
- ACMA has not explored all available spectrum options for WAS. There are a number of re-farming options and other available spectrum which has been identified for mobile services including IMT-2000. All of these options should be explored before ACMA considers re-locating incumbent spectrum users such as broadcasters from the 2.5GHz band.
- ACMA has not identified alternative spectrum which can support broadcasters' uses. ACMA has not addressed broadcasters' concerns that the 2.0 and 2.2 GHz bands proposed for ENG use are not suitable due to the requirements of existing services operating in those bands.
- There is still a great deal of work to be done at an international level before spectrum needs for new WAS technologies and applications are standardized.
- It is premature to suggest that allocation of the 2.5GHz band to WAS in Australia will offer economies of scale, lower equipment costs, international roaming of devices and universal connectivity.



Introduction

Free TV represents all of Australia's commercial free to air television broadcasters. We have a number of comments to make in response to ACMA's Spectrum Planning Discussion Paper SPP10/06 *Strategies for Wireless Access Services – Spectrum Access Options* released in December 2006 (**Options Paper**). The Options Paper follows an earlier Spectrum Planning Discussion Paper SPP 1/06 *Strategies for Wireless Access Services* (**April 2006 Discussion Paper**) to which Free TV responded in May 2006 (**May 2006 Response**).

The April 2006 Discussion Paper sought comment from stakeholders to guide development by ACMA of short, medium and long-term strategies to support the development and deployment of wireless access services (**WAS**). It identified a number of candidate bands for possible allocation to WAS. These bands included the 2500-2690MHz (**2.5GHz band**), which is currently licensed to Networks Seven, Nine and Ten (and the Australian Broadcasting Corporation (**ABC**)) and is used to produce program material outside the studio, including live news and current affairs and sport and other events (often referred to as **ENG, OB and EFP** uses).

Free TV's May 2006 Response raised a number of issues of serious concern to its members regarding the possibility of re-location of broadcasters in favour of allocation of the 2.5GHz band to WAS. Of critical concern is that no alternative spectrum has been identified that can meet the existing requirements that support broadcasting uses. The bands proposed by ACMA (the 2025-2110 (**2.0GHz**) and 2200-2300 (**2.2GHz**) bands) are not suitable due to the requirements of other services in those bands and because they do not provide sufficient contiguous spectrum. The reasons supporting this conclusion were set out in Section 4 of our May 2006 Response.

No further discussion has taken place between ACMA and Free TV or its members since the May 2006 Response. However the current Options Paper seeks detailed comment from stakeholders on segmentation and licensing of the 2.5GHz band for WAS uses. Two of the 6 'segmentation options' presented by the Options Paper 'require clearance of the whole band and do not provide any specific arrangements for incumbent users'. Options 3 & 4 provide a mere 28MHz to be shared among all ENG users, whilst Options 5 & 6 provide 48MHz to be shared among ENG users.

Broadcasters (including the ABC) are currently licensed to use 190MHz in the 2.5GHz band and have recently invested over \$20 million in capital expenditure to continue operating in smaller channel assignments which became effective in April 2005.¹ The 'segmentation options' would severely impact on broadcasting use of the band and fail to recognise the importance of adjacent channel assignments for broadcasting uses. These issues are discussed in section 4.

¹ Broadcasters were required to operate in smaller channels to allow ACMA to allocate spectrum below 2500MHz for radio local area networks and other industrial, scientific and medical applications. From April 2005, the channelling arrangements in the 2.5GHz band were reduced from 28MHz wide channels to 23.5MHz channels. The overall band was reduced from 2463.5-2690 MHz down to 2500-2690 MHz.



In relation to alternative spectrum options for broadcasters' uses and in response to the concerns raised by Free TV concerning the suitability of the 2.0 and 2.2 GHz bands, the Options Paper merely states: "*In the event this band is made available to WAS, ACMA believes that alternative spectrum arrangements exist that would suitably accommodate ENG requirements. In addition, should this band be released for WAS, ACMA would continue to engage with the television broadcasting industry with a view to developing arrangements that support ongoing ENG operation.*" The concerns raised in our May 2006 Response remain applicable and are yet to be addressed by ACMA.

Broadcasters have been discussing planning in the 2.5GHz band with the (then) ACA since 2000 (when a number of spectrum bands including the 2.5GHz band were designated as IMT-2000 expansion bands). At that time the ACA undertook to examine the long term spectrum options for ENG. To date no viable alternative spectrum for ENG purposes has been identified. Broadcasters are not comforted by ACMA's assurance that 'should the band be released for WAS', it will continue to engage with broadcasters '*with a view to developing arrangements that support ongoing ENG operation*' (emphasis added).

ACMA appears to be contemplating a process whereby it might make a recommendation to the Minister for re-location of broadcasters in favour of allocating the 2.5GHz band to WAS, before settling viable and reasonable alternative spectrum arrangements for broadcasters.

Free TV is very concerned by this suggestion. Use of spectrum for ENG and OB underpins a large number of programs provided free of charge to all Australians. Restrictions on the amount of spectrum available to broadcasters would severely impact their ability to cover live news and emergency events and sporting and other outdoor events.

If viable alternative spectrum were to be identified, re-location of broadcasters would require them to source new equipment and deploy infrastructure able to operate in a different spectrum band. It is likely that such equipment would need to be commissioned and a long waiting period may apply before such equipment is available for purchase. Broadcasters had to commission new equipment to operate in smaller channel bands less than 2 years ago. This process took close to 4 years.

Moreover, ACMA has a statutory duty to maximise the overall public benefit from use of scarce spectrum resources.² It is not possible for ACMA to weigh the public benefits served by competing spectrum uses, if alternative spectrum options have not been identified for the incumbent service.

It is pre-mature for this Options Paper to be seeking detailed comment from stakeholders regarding re-structuring and licensing of the 2.5GHz band. ACMA has substantial further work to do before it will be in a position to assess whether overall public benefit requires the re-location of broadcasters in favour of WAS. The current consultation by Ofcom on use of the 2.5GHz band in the UK demonstrates the depth of research, analysis and consultation which Ofcom considers necessary to support a proposal for change of spectrum use.

² The leading object of the *Radiocommunications Act* requires ACMA "to maximise by ensuring the efficient allocation and use of the spectrum the overall public benefit derived from using the radiofrequency spectrum": section 3.



ACMA's Options Paper does not effectively demonstrate:

- how much spectrum is needed for WAS;
- where spectrum is needed (rural, regional or metropolitan areas);
- when spectrum is needed (short, medium or long term);
- whether all spectrum options have been considered;
- whether suitable alternative spectrum exists for broadcasting uses; or
- whether re-location of broadcasters from the 2.5GHz band in favour of allocation to WAS is in the public interest.

In these circumstances, Free TV is not in a position to address the detailed restructuring and licensing questions posed by the Options Paper. Rather, we submit that ACMA needs to undertake further work to address the following topics detailed in this submission:

Section 1: Developing a spectrum strategy for WAS – necessary work.

Section 2: Demand for spectrum for WAS.

Section 3: Spectrum options for WAS.

Section 4: Possible allocation of the 2.5GHz band to WAS – impact on broadcasters.

Section 5: Alternative spectrum for broadcasting uses.

Section 6: Concerns regarding other candidate bands.

1 Developing a spectrum strategy for WAS

Free TV supports the development of long-term strategies for planning of spectrum to support a range of services and uses, including WAS and ENG. Long term strategies are needed to provide market stability for investment decisions by industry and for ongoing business planning.

Because spectrum is a scarce public resource, spectrum planning necessarily involves a fine balancing of competing uses and opportunity costs. It is crucial that spectrum planning is based on sound analysis of demand for spectrum and of public benefit in the proposed spectrum use. A decision to change an existing use of spectrum will result in major financial implications for an existing spectrum user, and the potential loss of capacity and quality of an existing service.

The leading object of the *Radiocommunications Act* requires ACMA “to maximise by ensuring the efficient allocation and use of the spectrum, the overall public benefit derived from using the radiofrequency spectrum.”³ In our May 2006 Response we argued that ACMA would need to conduct a range of evidence based assessments before it could develop a spectrum strategy for WAS which fulfils this statutory duty.

These assessments include:

- **Demand analysis:** understanding which technologies are standardised; the time-frame for deployment of services; the likely short, medium and long-term demand for those services in the Australian market; and the needs in different geographical areas of Australia (urban, urban-fringe, regional and rural areas).
- **Spectrum options:** evaluating the extent to which demand may be satisfied from use of existing spectrum assignments; whether compatible frequency management plans can be developed to accommodate new spectrum assignments in available spectrum; and whether existing spectrum assignments can be re-used or converted to satisfy demand for new services.
- **Public benefit:** ACMA should only consider re-location of existing services if further spectrum is required after all these options are exhausted. Any consideration of re-location needs to be the subject of extensive consultation to balance the public benefits served by the competing spectrum uses and the impacts of re-assignment on the incumbent licensee. Relevant considerations would include the impact of re-assignment on the availability, quality and diversity of the existing service as well as re-assignment and business disruption costs.

The Options Paper does not comment in any detail, or at all, on many of these issues.

In stark contrast, the current consultation by Ofcom on use of the 2.5GHz band (and two other bands) in the UK has been ongoing since 2003 and has involved detailed market and technical research commissioned by Ofcom from specialist consultants.

³ Section 3.



This work is detailed in the third consultation document released by Ofcom in December 2006.⁴

In summary, it has involved:

- **Market analysis:** Interviews with stakeholders to make an assessment of the potential uses that might be made of the available bands. These stakeholders included existing program making and special events (**PMSE**) users [this includes ENG OB and EFP uses], potential operators for mobile telephony, broadband wireless and mobile multimedia services; equipment manufacturers, users of adjacent spectrum, industry groups and other interested parties.
- **Technical analysis:** Detailed assessment of the relevant technical conditions for using candidate technologies in available bands.
- **Economic analysis:** Modelling of the potential economic value that could be released through use of the available bands. This involved detailed consideration of the underlying business cases for participation in an auction process.

This work has taken two years to complete. The work forms the basis for the proposals in the December 2006 consultation document. The independent technical studies have also been made available. The consultation document alone totals 297 pages and demonstrates the depth of research, analysis and consultation which Ofcom considers necessary to perform its statutory duty to further the interests of citizens and consumers by (amongst other things) securing 'the optimal use for ... spectrum'.⁵

2 Spectrum demand for WAS

One of the stated key purposes of the Options Paper is to "give an overview of demand for WAS and the estimated future spectrum required to support it." The Paper acknowledges that estimating future requirements for WAS is a complex task. However, there is no discussion of any demand analysis that ACMA may have undertaken. The Paper states that there is unmet demand for WAS, but does not provide any analysis of *how much* spectrum is required, or *where* and *when* spectrum is required.

The very 'Brief Overview of WAS' is only one page, and simply states that "submissions to the February paper indicated that there is significant unmet demand". These submissions were received from "WAS operators, equipment manufacturers and suppliers and WAS interest groups and forums".

Unlike the detailed independent market research commissioned by Ofcom, ACMA's analysis of demand for WAS appears to rely on a 'show of hands' by proponents with a common interest in securing spectrum for WAS uses. This is not an appropriate

⁴ Ofcom, *Award of available spectrum: 2500-2690MHz, 2010-2025 MHz and 2290-2300 MHz*, 11 December 2006, at 2.19-2.27. This document consults on Ofcom's proposals for the grant of wireless telegraphy licences to use these spectrum bands and for the method of award. It follows two earlier consultation documents in January 2005 and July 2005.

⁵ Communications Act 2003 (UK) sections 3(1) and (2).



basis for spectrum planning decisions which have enormous commercial and financial implications for incumbent service providers.

The Options Paper proceeds to indicate that the most likely outcome of the WAS spectrum planning process is a recommendation for the re-location of broadcasters from the 2.5GHz band in favour of allocation to WAS technologies. Yet, the evidence presented in the Options Paper to support the need for further spectrum for WAS is that 23 of the 47 submissions (less than 50%) received by ACMA “*indicated there is unmet demand for spectrum to support WAS*”. The only other ‘evidence’ provided by the Options Paper in favour of allocation of further spectrum to WAS is a short bullet point list of ‘demand drivers’ for WAS.

Broadcasters are very concerned by the suggestion that they could be forced to share or vacate the 2.5GHz band on the basis of a head count of submitters that have expressed interest in securing access to further spectrum for WAS for their own commercial purposes.

It is crucial that ACMA conduct a thorough analysis of demand issues to ensure that overall public benefit supports the allocation of further spectrum for WAS. Any proposal to re-locate existing spectrum users must be based on sound analysis of likely demand (how much, when and where) to avoid a situation where spectrum is cleared at huge cost and disruption to incumbent licensees, only to remain largely unused many years later. This was the experience of broadcasters who vacated parts of the 1.8 and 2GHz bands at the request of the ACA in 2000 to allow allocation to low earth orbit satellites for mobile telephony.⁶ To date, this spectrum has remained largely vacant.⁷

Furthermore, ACMA should not assume that demand for spectrum by prospective WAS operators is evidence of demand for WAS services by consumers. A large amount of spectrum has been allocated to 3G mobile technologies, but to date take-up of 3G services is estimated at only 8% of Australian mobile users.⁸

Some telecommunications companies who spent millions of dollars on mobile spectrum have since gone bankrupt and/or abandoned their network plans. Much of this spectrum remains un-used as shown in the table below:

⁶ These bands (1980-2110 and 2170-2200MHz) were used by regional television broadcasters across Australia for microwave links to transmit feeds from studios to transmitters and translators.

⁷ Licensing records for the 1980-2110 band show just 5 active point-to-point licences in this spectrum. There is one ‘space receive’ record for a company called Gatecom Australia Pty Ltd. This company appears to have been de-registered in 1985. Licensing records for the 2170-2200 band shows just two records for this spectrum, one point-point for Broadcast Australia and another space licence for Gatecom Pty Ltd.

⁸ Australian Communications & Media Authority, *Communications Report 2005-2006*, at page 132.



Band	Operator	Outcome	Allocated spectrum (metro)	Utilised spectrum (metro)
850 MHz	AAPT	Acquired spectrum at auction in all major areas other than Sydney and Melbourne. Did not roll out network.	20 MHz paired	10 MHz paired
	Hutchison	Acquired spectrum at auction in Sydney and Melbourne. Operated a CDMA network for 5 years. Network closed in 2006.		
900 MHz	Telstra/ Optus/ Vodafone	GSM spectrum stapled to carrier licence	25 MHz paired	24.6 MHz paired
1800 MHz	Hutchison	Acquired spectrum at auction in all major population centres. Has never deployed network.	75 MHz paired	45 MHz paired
	One.Tel	Acquired spectrum at auction in all major population centres. Business failed. Liquidator unable to sell spectrum for public mobile radio applications. Spectrum acquired for use by NSW State Rail Authority at about one tenth of the half billion dollars paid at auction.		
1900 MHz	Telstra	Acquired unpaired spectrum at auction and has not deployed network.	20 MHz unpaired	5 MHz unpaired
	Optus	Acquired unpaired spectrum at auction and has not deployed network.		
	Vodafone	Acquired unpaired spectrum at auction and has not deployed network.		
2 GHz	3G Investments Australia	Acquired 3G spectrum at auction in major population centres and has not deployed network.	60 MHz paired	45 MHz paired
	none	Spectrum was not allocated at auction for Darwin and Hobart.		
TOTAL			380 MHz unpaired	254.6 MHz unpaired⁹
Percentage			100%	67%

⁹ Counts Hutchison as 10 MHz paired in each capital city. This approximates their actual assignment, which is spread across the capital cities as follows: 10MHz in Adelaide, Perth and Brisbane, 15MHz in Sydney and Brisbane. No assignment in Darwin or Hobart.

2.1 How much spectrum is needed?

The Paper states: *“Respondents generally answered that enough spectrum is needed to support a business model and plan an efficient network ... Suggested amounts of spectrum to cater for WAS in the short term ranged from 5MHz to 120 MHz per operator ... one respondent provided a long-term estimate of 280MHz per operator, for a competitive market of three operators equating to an additional 840MHz of spectrum.”*

ACMA does not offer any analysis or express any view in the Paper regarding how much spectrum is needed for WAS technologies. However, ACMA recently inserted text into an Australian delegation brief for the World Radio Conference Preparatory meeting in February 2007 which stated that *“Australian estimates suggest an **additional** 400MHz of broadband spectrum will be needed in the next 5 years (i.e. before 2012). Some estimates suggest an **additional** 800 – 1000 MHz will be needed by 2020”* [original emphasis].

It is reasonable to expect that estimates put to the ITU-R which purport to represent Australia’s views regarding demand for spectrum for WAS uses would be based on market and demand analysis conducted by ACMA. If this is the case, it would be useful for ACMA to identify the analysis that has been undertaken so that it can receive input from stakeholders as part of the current consultation process.

ACMA must critically examine estimates from prospective WAS operators to ensure they are reasonable. There is no incentive for prospective WAS operators to provide ACMA with an estimate of spectrum need which is less than their best case scenario. However, any additional spectrum for WAS will impose heavy burdens on incumbent service providers who will have to share or vacate spectrum in the bands chosen.

ACMA appears to have relied on an estimate by Telstra of 280MHz per operator, for a competitive market of three operators equating to an additional 840MHz of spectrum. This estimate is based on a study by Telstra submitted confidentially to ACMA. Only a high level summary of Telstra’s methodology and conclusions have been made available. Stakeholders have not been given an opportunity to review or comment on the assumptions and calculations made in the study. Free TV is concerned that ACMA appears to have relied on a study submitted on this basis, particularly given Telstra’s strong commercial and strategic interest in securing access to spectrum for WAS uses.

If ACMA is proposing to rely on Telstra’s estimate, it is important that the basis for the estimate is made available for stakeholder review. Spectrum estimates being developed in ITU-R forums have been the subject of much debate, including by key stakeholders within Australian regulatory forums. In addition New Zealand has demonstrated through its contributions to Working Party 8F considerable criticism of the methodologies developed in the ITU-R for spectrum estimates for IMT-2000 and systems beyond IMT-2000.

Deployment of wireless services in Australia is much more expensive than in the US and the UK because our small population is spread across a large

geographical area. It is unlikely that three operators will all deploy expensive radio base station infrastructure. It is far more likely that there will be infrastructure sharing arrangements put in place to achieve economies of scale. Infrastructure sharing arrangements can result in shared spectrum use and thus under-use of spectrum allocations.

Some of the other estimates in submissions received by ACMA also appear to be based on a desire to reduce infrastructure costs, rather than on spectrum congestion in already available bands. Some regional operators have publicly stated that they are seeking spectrum in the WAS candidate bands because the cost of infrastructure in these bands is cheaper than in the already allocated bands. Further spectrum should not be allocated in an area unless existing spectrum allocations are congested and demand for further services in that area is unmet.

ACMA must also consider whether demand for WAS services will be satisfied by existing spectrum allocations. In particular, whether:

- spectrum already allocated to WAS technologies will satisfy demand for WAS services when those services are deployed. Spectrum licensees such as Austar and Unwired have indicated plans to deploy services;
- spectrum allocated to ageing technologies such as 2G mobile can be re-farmed for WAS uses;
- spectrum which ACMA has ‘flagged’ for 3G expansion will be used to provide the same services that WAS proponents are seeking to implement.

These issues are considered in more detail in section 3 below.

2.2 Where is spectrum required?

It is important to understand where spectrum is required: that is, which geographical areas of Australia (rural, regional, metropolitan areas) have unmet demand for WAS. Little detail is provided in the Paper which simply states that there is “*demand for regional area networks and networks providing Australia-wide coverage. A number of enterprises have already established city-wide networks, and the number of networks in regional towns continues to grow*”.

2.2.1 Regional areas

ACMA contends that there is unmet demand for 1900 – 1920 MHz spectrum in regional areas. However, this spectrum was apparatus licensed with a “use it or lose it” provision. It is not clear that there will be unmet demand for WAS services when the current apparatus licensees have rolled out their proposed services. To the extent that the licensees do not deploy infrastructure, the spectrum can be resumed and allocated to other prospective WAS providers.

Amongst the WAS ‘demand drivers’ listed in the Paper, are “*pro-active policies by government providing funding for projects*” and “*limited access to*”

high rate data services in regional and remote areas.” The Paper goes on to note that “*several respondents requested that more WAS spectrum be made available immediately, particularly in regional and rural areas.*”

The amount of spectrum allocated to WAS must take into account that many of the business proposals that have attracted Government funding under HiBIS have not yet been rolled out. Further, both HiBIS and the replacement Broadband Connect program is not limited to wireless access infrastructure, and some demand may be satisfied by other industry participants who will roll-out competing fixed or satellite-based infrastructure.

2.2.2 Metropolitan areas

Free TV submits that there is no evidence of any need for further WAS spectrum in metropolitan areas.

Currently, only one quarter of the 1900 – 1920 MHz allocated for broadband wireless access in metropolitan areas is actually used for the delivery of services.

As outlined in section 2 above, there is 55MHz of paired spectrum and 15MHz of unpaired spectrum in the 850 MHz, 1800 MHz, 1900 MHz and 2 GHz bands in metropolitan areas that is licensed to mobile applications but has not been used. In a regulatory environment which permits and encourages spectrum trading, it is reasonable to expect that unused spectrum will be traded if there is significant unmet demand for WAS in metropolitan areas.

Finally, ACMA should take into account that much of the demand for broadband access in metropolitan and other medium-high density population areas is likely to be facilitated by cable/fibre technologies.

2.3 When is spectrum required?

The Paper notes only that “*several respondents requested that more WAS spectrum be made available immediately, particularly in regional and rural areas.*” No further information is provided on when spectrum is required.

However, the Paper does indicate timing for possible allocations of spectrum to WAS. Candidate bands have been grouped according to their availability for possible allocation in the *short term* (within 12 months), *medium term* (two to four years) and *long term* (four to ten years).

It is not clear what information these timeframes are based on. Further, ACMA’s medium and long-term timeframes are four to six years ahead of the timetable being discussed internationally for IMT and IMT-Advanced within the ITU-R, which is focusing on meeting likely demand for further allocations in 2015 – 2020.

It would be helpful to understand the demand assumptions on which ACMA has based its timetable. It is important that ACMA does not overestimate both the magnitude and timing of spectrum demand for WAS services when considering re-location of incumbent licensees.

3 Spectrum options for WAS

ACMA can not evaluate all spectrum options for WAS until demand for WAS has been analysed. In particular, ACMA needs to understand which WAS technologies are most likely to require spectrum, and also needs to understand the bandwidth and other technical characteristics required to support those technologies.

Only then will ACMA be in a position to evaluate:

- the extent to which demand will be satisfied from use of existing spectrum assignments;
- whether other spectrum assigned to mobile telephony uses can be re-used or converted to satisfy demand for WAS technologies; and
- whether compatible frequency management plans can be developed to accommodate new spectrum assignments in available spectrum.

This was the approach argued by Free TV in its May 2006 Response. It mirrors the approach taken by Ofcom which commissioned research to understand the WAS technologies most likely to require further spectrum, and then studied the technical conditions for using those technologies. This work was used to analyse the technical conditions for co-existence of potential services in available bands with other services operating either in adjacent bands or at the same frequencies.¹⁰

It appears ACMA has not undertaken any similar market research or technical analysis. As a result, it is not possible to establish whether all spectrum options have been considered. Free TV continues to strongly argue that ACMA should not consider re-location of existing services unless the spectrum options listed above have been exhausted.

Each of these options is dealt with in turn below.

3.1 Existing spectrum assignments

Additional spectrum should only be allocated to WAS where there is unmet demand for further services. There are large amounts of spectrum already allocated in Australia to WAS technologies. Below 6GHz, there is already 700MHz of spectrum allocated to WAS (specifically BWA) at 1.9, 2.3, and 3.4GHz and class licensed bands at 900MHz, 2.4 and 5.6GHz.

A number of these allocations are not yet utilised or fully utilised, including allocations in the 2.3 and 3.4GHz bands. The wireless access that has been deployed in the 2.3 and 3.4 GHz bands is limited to Unwired in Sydney and Melbourne and Austar in Wagga Wagga and Tamworth. Again, this spectrum is tradeable and it would be reasonable to expect that if there is significant unmet demand for WAS, further services will be deployed or a market will develop for spectrum trading.

There are a large number of other spectrum allocations for mobile telephony in Australia. The spectrum allocated is substantially larger than is available in

¹⁰ Ofcom, *Award of available spectrum: 2500-2690MHz, 2010-2025 MHz and 2290-2300 MHz*, 11 December 2006, at 2.22-2.23.



any European or North American country. Australia is one of the few countries in the world where there is mobile spectrum allocated at both 850 and 900 MHz and where full allocations are available at 1800 MHz and the 2 GHz IMT-2000 band.

The amount of spectrum available for public cellular radio applications is:

Band	Allocation
850 MHz	20 MHz paired
900 MHz	25 MHz paired
1800 MHz	75 MHz paired
2 GHz	20 MHz unpaired
2 GHz	60 MHz paired
TOTAL	380 MHz

That is, almost 33% of all spectrum between 825MHz and 1980MHz is available for mobile use.

Some of these allocations remain unused particularly in regional areas. For example, considerable portions of the spectrum assigned to 2G (1800MHz and some 800MHz) and 3G mobile services (2GHz paired and unpaired) remain un-used particularly in regional areas. This spectrum should be identified for re-farming. Further re-farming candidates are considered in 3.2 below.

The Options Paper rejects the 1920-1980 and 2110-2150GHz bands previously identified as a medium term candidates for WAS. These bands are currently used for 3G telecommunications services. ACMA has expressed the view that they should not be made available for WAS at present because they may be needed for future expansion of 3G services in regional and remote areas. It is not clear why ACMA is making a distinction between 3G services and WAS because so-called 3G technologies such as W-CDMA with HSDPA, are likely to deliver the same services that WAS proponents such as WiMAX are seeking to implement.

3.2 Spectrum re-use and re-farming

The transition of second generation mobile phone technology to third generation and beyond will allow spectrum re-farming.

Telstra has already successfully re-farmed 850MHz spectrum previously used for CDMA services for its NextG network.

Free TV suggests that the following spectrum should be considered for re-farming for WAS.

- **890-915 paired with 935-960 MHz:** this is currently licensed Australia-wide to mobile telephony and is being used to provide GSM 900 services. ACMA should be alert to an opportunity to re-plan these bands as 3G services gain momentum and GSM 900 services decline.
- **1427– 1452 and 1492 - 1525 MHz:** this is currently licensed to Telstra's Digital Radio Concentrator System (DRCS), point-to-point links and some broadband wireless access systems. Telstra's national 3G 850MHz network is claimed to have 98% population coverage. South eastern Australia (from Fraser Island to Echuca and all of Victoria) and south Western Australia encompasses the majority of Australian regional populated areas. These areas contain only 17 DRCS hub sites which should all be de-commissioned in line with Telstra management's aim of reducing technology platforms and replacing these services with a 3G-based telephony service. This would allow considerable scope for re-stacking other fixed links in these regional areas to free up spectrum to expand broadband wireless access systems.
- **1880 – 1900 MHz:** This band is allocated for cordless telephony (DECT) services and is potentially suitable for sharing with WAS services provided these services operate in a spread spectrum manner below the DECT sensitivity threshold. ACMA does not appear to have considered this band despite suggesting unmet demand in adjacent bands.
- **1960-1980 paired with 2150-2170 MHz:** These sub-bands are spectrum licensed in regional and remote areas but the spectrum appears to be unused.
- **2170-2200 MHz:** this sub-band is allocated for Mobile-Satellite in the Australian Radio Spectrum Plan, together with Fixed and Mobile. The public register records a single 30MHz Australia wide assignment, but the extent of actual use of this spectrum is not clear. The band also accommodates the remnants of the 2GHz fixed service band in rural and remote areas. The register indicates about 230 systems still licensed in this spectrum, although the number of systems still in service is likely to be much less than this.
- **3400-3700 MHz:** A search of the public records register indicates that most of the fixed point to point systems licensed in this band are 'legacy' narrow bandwidth Telstra systems. It is unlikely these are heavily used and this band should be targeted for re-farming.

3.3 Other spectrum options

3.3.1 Other spectrum bands identified for IMT-2000

There are a number of spectrum bands which have been identified for IMT-2000 by the ITU, but which were not nominated as candidate bands for WAS. Free TV submits that a number of these bands appear to have available spectrum and should be considered for WAS, including the following sub-bands.

- **410-430 MHz:** a search of assignment records recorded in the public register indicates that this spectrum is under-utilised beyond Sydney and Melbourne.
- **2010-2025 MHz:** this band is identified for mobile and fixed services and has been declared for spectrum licensing in specified metropolitan and regional areas. As yet no spectrum licenses have been issued.
- **3492.5 – 3542.5 MHz:** unless this sub-band is used for ‘classified purposes’ which are not recorded in the register, this comprises 50MHz of spectrum which appears to be largely unused.
- **3575-3710 MHz:** parts of this band also appear to be under-utilised.
- **4400-4990 MHz:** The register shows just 60 fixed point-point links licensed in this 590MHz of spectrum, and as such, the band appears to be largely un-used. We note however that the band carries a Defence ‘embargo’ and it is not possible to assess the extent of the Defence usage.

3.3.2 Other candidate bands

The Options Paper rejects a number of the candidate bands previously identified for WAS, including the following bands:

Medium term candidates

- **1725-1785 and 1820-1880 MHz:** The reason given for rejection of these bands is that only equipment suppliers, not service providers, showed interest in these bands. It is not clear why the views of equipment suppliers do not carry great weight. This does not seem to be a very convincing reason to reject use of these bands for WAS, especially given the Paper acknowledges that “*the bands can be used by GSM technologies, which would provide an established and internationally harmonised equipment source.*” The Paper also indicates that there is a *possible need* to support “future expansion of GSM 1800 services in regional and remote areas”. These spectrum licenses expire in 2013 and this spectrum should be identified for long-term re-planning for 3G WAS uses at that time.

- **1920-1960 and 2110-2150 MHz:** The same reason is given for rejection of these bands, although again it is acknowledged that *“the bands can be used for 3G technologies, which would provide an established and internationally harmonised equipment source”*. It is also indicated that there is a possible need to support future expansion of existing 3G services. It is not clear why ACMA is distinguishing between 3G and WAS given that many of the same types of services are likely to be provided by 3G and WAS technologies.

There is no reason why space research services located in the 2110 – 2120MHz sub-band cannot be protected allowing the remainder of the band to be allocated for 3G and WAS technologies.

- **2025-2110 and 2200-2300 MHz:** These bands have been rejected for WAS, on the basis of requirements of the space services operating in the 2.0GHz band and Defence use of the 2.2GHz. Free TV agrees that Defence uses of the 2.2GHz band mean that it is not a suitable candidate for sharing with WAS or ENG. Sharing with space services in *metropolitan areas* of the 2.0GHz band is also unlikely to be viable for WAS or ENG.

However, there is no reason why WAS could not operate in the 2.0GHz band in regional and remote areas as proposed by ACMA in the April 2006 Discussion Paper. ACMA appears to have rejected this on the basis that *“these bands have not been targeted internationally for WAS, and there is no indication that these bands are being used by any country for the provision of WAS”*. Although on its face value this reasoning may appear to be persuasive, it does not justify rejection of the band for WAS for two reasons.

First, although the 2.0GHz band has not been adopted as a core WAS band, a number of jurisdictions including Australia have allocated the nearby 2.3GHz band to WAS technologies. WiMAX technologies are focussing on the 2.3GHz band (and 3.4GHz band) for initial deployment of WiMAX certified products. Wireless access systems such as WiMAX can tune across wide frequency ranges. If the 2.0GHz band was promoted as available for WAS in Australia, it would be relatively simple for receiver equipment design to include this frequency range.

Further, much of the demand for WAS in regional and remote areas is localised. That is, WAS infrastructure in regional and remote areas is based on network design surrounding large regional centres and towns, and is planned to service local demand for mobile services within the perimeter of that location. Provided equipment is available for use in the band (which is highly likely, see

above), it is of no consequence that other countries with much denser populations have chosen to use other bands.

ACMA's proposal to re-locate ENG to these bands is problematic for a number of reasons. This is discussed in section 4 below.

Long term candidates

- **820-960 MHz:** this band is identified globally for IMT-2000 and is allocated for mobile services on a primary basis in the Australian Radiofrequency Spectrum Plan. Despite this, ACMA has rejected the band as a long term candidate for WAS on the basis that the benefit to be gained is not justified by the effect on incumbent services. It is not clear how or why ACMA has come to this conclusion, or whether the same considerations were applied to the 2.5GHz band.

3.3.3 Spectrum above 5GHz

ACMA has not nominated any candidate bands above 5GHz. Yet, ITU Working Party 8F has recognised that many nomadic applications of IMT 2000 Advanced technologies do not require spectrum below 6GHz and has been working to identify higher bands for such applications. Already a number of WAS technologies and services including ETSI IEEE 802.16 and the Wireless HiperMAN and ETSI Hiper Access projects are considering higher frequency bands, including the 5.8GHz band, for some applications.

4 Possible allocation of the 2.5GHz band to WAS

The Options Paper expresses the view that the 2.5GHz band "*is a suitable candidate band for WAS Australia-wide and could be made available in the medium term*". The Paper proceeds to seek detailed comment from stakeholders on restructuring and licensing in the band to accommodate WAS. It also seeks information on the implications (costs) for ENG applications if the band is made available (in whole or part) to WAS applications.

Free TV submits that there needs to be evidence of international standardisation, in determining whether the overall public benefit is maximised by assignment of spectrum to WAS.

Further, ACMA should not consider re-assigning established services until the spectrum options outlined in section 3 are exhausted. Any consideration of re-assignment needs to be subject to rigorous consultation and analysis to balance the public uses served by the WAS and broadcasting uses, and the impact of re-location on broadcasters.

Of course, this assumes that suitable alternative spectrum has been identified for broadcasting uses. It has not. This is discussed further in section 5 below.

4.1 Standardisation issues

One of the key reasons stated in the Options Paper supporting allocation of the 2.5GHz band to WAS, is the “*global identification of the band for WAS, in particular IMT-2000 and WiMAX.*” Amongst other things, this is said to support economies of scale and lower equipment costs, facilitate international roaming of devices and meet community expectations of universal connectivity.

Free TV submits that there is a lot of work still to be done before spectrum for WAS is standardised and these benefits can be realised. It is not clear that the 2.5GHz band will offer these benefits.

The 2.5GHz band is one of the bands for which WiMAX is developing profiles for equipment certification and interoperability testing of WiMAX products. However, in Australia, the bands where WiMAX applications have been focussed are the 2.3 and 3.4GHz bands. Austar and Unwired are licensed in these bands and have flagged their intention to roll out WiMAX applications.

In Europe, the 2.5GHz band has been identified as a 3G extension band, but there has been no attempt to designate it for use as IMT-2000 Advanced. This suggests that it may not be used for WiMAX or other WAS services in Europe as the approach identified by Ofcom is that the mobile variant of WiMAX (IEEE802.16e) would be adopted as an IMT-2000 Advanced technology.

Countries around the world are using or intend to use the 2.5GHz band for a range of technology uses including TVOB, ENG, 3G mobile, MMDS, WiMAX, next generation mobile, wireless broadband, IMT-2000 and UMTS.¹¹ Although a number of these technologies fall under the broad WAS umbrella adopted by ACMA, they are not necessarily compatible technologies. That is, they do not interoperate nor has sharing criteria for these applications and technologies been identified and agreed.

Therefore, it does not simply follow that allocation of the 2.5GHz band specifically to WAS in Australia will enable WAS operators and the public to benefit from economies of scale, lower equipment costs, international roaming of devices and universal connectivity.

The range of uses intended for the 2.5GHz band does not provide any evidence of specific standardisation to any one technology. Rather, it indicates that that any spectrum standardisation for particular WAS technologies is some time away.

4.2 Re-structuring options

Each of the re-structuring options presented in the Paper would severely restrict the amount of spectrum available for ENG, OB and EFP operations and potentially introduce interference to ENG and OB operations.

¹¹ See Appendix B to the April 2006 Discussion Paper.

In general terms, reduced spectrum would result in restrictions on:

- the ability of broadcasters to cover “live” news events (press conferences, emergencies and all other breaking news stories of public interest);
- the ability to cover sporting events, live entertainment and other outdoor events;
- choice in coverage for events that use mobile video link applications (for example, wireless camera applications such as ‘stump-cam’, ‘race-cam’ and fly-cam’);
- production of program material outside studios for a range of program genres, for example, current affairs, lifestyle, travel, gardening and other programs; and
- coverage of outside events, including sport, in high-definition.

Bandwidth requirements for major events already exceed the current available bandwidth, and broadcasters’ requirements are increasing with:

- a growing demand by the public for live news and event programming, live sport and Australian and local content;
- production of outside events such as sport in high definition. For high definition links, the current channeling of 23.5/24MHz will carry one HD camera link in a channel. Any major HD multi-camera OB event will require frequency sharing between broadcasters;
- the trend toward widescreen, plasma and other new flat-screen technologies which provide large and finer-resolution television screens. This means that the quality of the transmitted picture has become critical, which places greater requirements on bandwidth at each stage of the program production chain, particularly the camera-related and link-related spectrum required for ENG, OB and EFP activities; and
- Occupational Health and Safety requirements which often require the use of wireless cameras in areas accessible by the public. Thus a single ENG feed becomes a two-hop path from camera to vehicle and vehicle to ENG collection point.

Each of the segmentation options presented by ACMA is addressed below with specific examples of the limited operations which would be possible in the bandwidths proposed.

Options 1 & 2 exclude broadcasters completely, so there would be no ENG, OB or EFP operations possible for any broadcaster.

Options 3 & 4 propose to provide 4x7MHz channels (28MHz in total) for broadcasting uses. This bandwidth would only allow the following applications:

- one HD camera in any area for any purpose (whether for ENG, OB or EFP) to the exclusion of all other broadcasters in that area;
- two SD cameras in any area for any purpose to the exclusion of all other broadcasters in that area. For example, only two broadcasters could cover a news event in SD;
- only one news event in any area, for example the Sydney CBD, could be covered at any one time; and
- even in SD the vision quality would be compromised (as the channeling is proposed to reduce from 8MHz to 7MHz).

Currently each commercial broadcaster and the ABC have simultaneous live coverage of events for news bulletins which would not be possible under these options.

Options 5 & 6 propose to provide 6x8MHz channels (48MHz). This bandwidth would allow two HD and three SD cameras in any area for any purpose, to the exclusion of all other broadcasters.

The options also overlook the importance of adjacent channel allocations for broadcasting uses. The allocation of contiguous bandwidth in the 2.5GHz band minimises the spectrum assignment required by each broadcaster because broadcasters can co-ordinate and share channels to meet the bandwidth requirements of individual ENG and OB operations. A number of large events, such as the Bathurst 1000 motor race, the Melbourne Cup, the Sydney to Hobart yacht race and others could not be covered unless broadcasters have a large contiguous spectrum allocation.

A lack of available spectrum for broadcasting uses will adversely affect all Australians who currently receive program content gathered by broadcasters using the 2.5GHz band free of charge. This content:

- **fulfils a number of important broadcasting policy objectives.** These include coverage of matters of public interest and local significance, free coverage of events supported by the anti-siphoning list, minimum quotas of Australian content, simulcast of programs in analogue and standard definition and a minimum quota of high definition programs; and
- **has wide audience appeal.** Our earlier submission provided a list of top 50 programs shown on metropolitan networks, regional networks and pay television compiled from survey data for the first 40 weeks of 2005. Of the top 50 programs, 35 shown on metropolitan networks, 29 shown on regional networks and all 50 programs on the pay television top program list were produced using wireless cameras or links operating in the 2.5GHz band;



- **underpins a range of subscription content packages.** Sport and news content gathered using the 2.5GHz band forms the basis for content provided by pay television channel providers Sky News¹² and Fox Sports¹³; mobile telecommunications carriers providing streamed sports and news content to mobile devices and internet sites¹⁴; and a range of developing subscription business models based on delivery of content to mobile devices, such as iPods and mobile television.

These benefits will be compromised if not enough spectrum is available for broadcasting uses.

4.3 Cost implications

ACMA has sought information regarding the costs for ENG applications if part or all of the 2.5GHz band is allocated to WAS. If viable alternative spectrum were to be identified, re-location of broadcasters would require them to source new equipment and deploy infrastructure able to operate in a different spectrum band. It is likely that such equipment would need to be commissioned and a long waiting period may apply before such equipment is available for purchase. Broadcasters had to commission new equipment to operate in smaller channel bands less than 2 years ago. This process took close to 4 years.

Given that alternative and contiguous spectrum has not been identified for broadcasting uses, it is not possible for broadcasters to estimate the costs that would be incurred. It is also difficult to quantify the impact on broadcasters and the overall public benefit if ENG, OB and other such services are reduced in scope or cannot be provided.

5 Alternative spectrum for broadcasting uses

The Options Paper states that “ACMA currently believes that [the 2.0 and 2.2GHz bands] may be suitable for accommodating displaced ENG services should they be required to relocate at some stage.” The Paper does not address the concerns raised by Free TV in our May 2006 Response concerning the suitability of these bands.

Even if it was assumed that these bands could accommodate ENG, neither band is able to accommodate contiguous channel allocations of the size necessary to support broadcasters’ uses. The importance of contiguous bandwidth for ENG and OB purposes was discussed in section 4 above.

¹² Live ENG feeds are provided by Channels Seven and Nine to Sky News for use on a 24x7 basis.

¹³ See note 9.

¹⁴ Hutchison provided live vision of the 2005/6 Australian summer cricket tests to mobile phone subscribers. Telstra produces and operates football website www.afl.com.au which allows Telstra customers to access some of the more popular offerings on the site, such as video streaming of highlights from AFL matches.

5.1 2.0GHz band

The April 2006 Discussion Paper cited ITU-R Recommendation SA 1154 in support of its proposal for sharing of this band by space services and ENG.

Free TV's May 2006 Response reviewed the Recommendation and noted that the studies referred to in the recommendation were undertaken in 1985 and that they examined the probability of analog FM ENG systems interfering with spacecraft and earth station receivers. Based on the studies, the Recommendation defines aggregate interference limits for sharing with low density systems.

The Recommendation is not applicable to ENG in Australia for two key reasons:

- use of ENG has increased significantly since 1985 (that is the ENG usage which formed the basis for the probability calculations in the study has now increased significantly; and
- the operational characteristics of analogue FM ENG systems are not compatible with the digital ENG systems used by Australian television broadcasters.

Free TV provided detailed analysis of the application of the interference limits prescribed by the Recommendation to the Australian environment. In very simple terms, the analysis showed that an individual broadcaster operating ENG vehicles in Brisbane, Sydney and Melbourne for a 30 minute evening news bulletin, would exceed the prescribed aggregate interference level by 20 times.

The Options Paper does not comment on this analysis. The Paper rejects the band for WAS *“due to the potential affect on use of the bands by the space operation and research services”*. In relation to ENG, it simply states that *“these bands are being used for ENG in other countries, which shows that sharing with space services is possible; this is also supported by submissions received from incumbent space services operators.”*

In countries where ENG and space services share this band, ENG operates under different technical and operational conditions. It is likely that space operators who provided submissions to ACMA also relied on the co-existence in other countries and on the ITU-R recommendation cited by ACMA in the December 2006 Discussion Paper.

Free TV remains concerned that sharing between Australian ENG operations and space services in this band would result in substantial mutual interference unsuitable for the viable operation of both services. Detailed technical studies need to be undertaken before there is any further discussion of the relocation of ENG to this band.

5.2 2.2GHz band

The Options Paper notes that the Department of Defence has opposed use of this band for both ENG and WAS due to the Aeronautical Mobile Telemetry system operating in the band. These Defence services operate at many locations across Australia including in several capital cities. Free TV argued that there was no realistic basis for sharing between ENG and Defence in this band because broadcasters would have to consult with Defence before each and every ENG deployment, and because ENG receivers in major capital cities would be subject to random interference from Defence.

The immediate and unplanned nature of ENG operations does not allow for a sharing arrangement that would require consultation with Defence before each and every ENG deployment.

Again, the Paper does not address these issues. ACMA simply asserts that the band may be suitable for ENG services should they be required to relocate.

Broadcasters are concerned that ACMA appears to be contemplating a recommendation to clear broadcasters from the 2.5GHz band, without having undertaken sufficient analysis or addressed broadcasters' concerns regarding appropriate alternative and contiguous spectrum for broadcasting uses.

6 Other candidate bands

Our May 2006 Response commented on two other candidate bands of interest to broadcasters: the 520-820 MHz (UHF broadcasting services bands), and the 3575-3710 (Extended C-band).

Our earlier comments are still applicable. Free TV is concerned that:

- **Extended C-Band:** further study is necessary to ensure that earth stations will be able to be protected from interference by WAS. The band is used extensively around the world by satellite operators. Broadcasters rely on satellites in this band to receive video feeds typically containing news and current affairs content from overseas broadcasters and content providers.
- **UHF Bands:** Decisions on spectrum use after analogue switch-off need to take into account a range of issues including the following.
 - Studies to understand the extent to which mobile services can co-exist with broadcasting services in the BSBs.
 - Appropriate planning to ensure the reception of broadcasting services are protected from interference.
 - Spectrum needs for further channel planning of digital television. It is likely that digital television coverage gaps will exist in a range of locations that will require further channel planning. Coverage issues will not be able to be fully assessed until digital signals are being transmitted at full-power after analogue switch-off.



- Spectrum needs for digital conversion of black spot and self-help installations.
- Flow-on effects for secondary users of the BSBs, particularly users of wireless microphones and related equipment and users of medical telemetry equipment, all of which use the unassigned television channels available in the relevant location.

Television broadcasters have already cleared Band I of the BSBs. The 45-70MHz sub-band is already identified for Fixed and Mobile applications in Regions 2 and 3. ACMA should consider proposing use of this band for WAS, given its excellent propagation characteristics.