Mobile broadband strategy—

The ACMA’s spectrum management strategy to address the growth in mobile broadband capacity

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# Introduction

Mobile broadband services deliver substantial economic and societal benefits to the Australian economy and community. The growth in demand for mobile broadband capacity is ongoing and is likely to lead to continuing pressures for additional spectrum, although the extent and timing of these needs cannot be predicted with any certainty. There is also a continuing need for spectrum for many other services. The development of spectrum management arrangements that support the growth in mobile broadband capacity must therefore continue to be balanced with the ongoing requirements for other uses of the spectrum.

This paper articulates the ACMA’s spectrum management strategy on mobile broadband-related matters in response to the ongoing growth in demand for mobile broadband capacity. It aims to provide continued transparency and (to the extent possible) certainty on this issue. Transparency and certainty are particularly important, given the substantial impact of mobile broadband spectrum issues on spectrum users and the wider Australian public.

A key aspect of the ACMA’s work is to encourage and enable spectrum to move to its highest value use or uses. The ACMA acknowledges that the highest value use of spectrum will vary between different frequency bands and locations. The ACMA also acknowledges that the value of a particular use may have a social as well as a monetary aspect (that is, it cannot always be left to markets to determine but may require value judgements). The ACMA has chosen to focus this strategy on a particular use—mobile broadband—because demand for spectrum for this use has been the major driver for changes in highest value use across a wide range of bands for many years now, with many national administrations world-wide currently planning on the basis that this is likely to continue. Moreover, these changes have often affected bands that are already used by other services. However, it should be recognised that such changes in highest value use typically take time to eventuate and are liable only to affect a small number of bands at any given time.

# Mobile broadband strategies

The ACMA has developed a set of strategies to address the growth in demand for mobile broadband capacity. A key part of these strategies is the articulation of a spectrum management process for the release of additional spectrum for mobile broadband.

Consistent with the Act and the [Principles for Spectrum Management](http://www.acma.gov.au/~/media/Spectrum%20Transformation%20and%20Government/Report/Word%20Document/Principles%20for%20spectrum%20management.DOC) (the Principles), these strategies are intended to guide the ACMA in its actions. While many of these strategies have been implicit in actions taken up to this point and/or otherwise adopted in the *Towards 2020 paper*, they are stated here to provide stakeholders with increased clarity on the ACMA’s approach to managing mobile broadband-related spectrum management issues.

These strategies are outlined below and subsequently discussed in greater detail:

1. Encouraging a holistic approach to addressing the outcome of mobile broadband capacity growth that balances the available inputs of spectrum, technology and network infrastructure/topology.
2. Articulation of a transparent spectrum management process for identifying potential future spectrum options for mobile broadband. This includes the identification of a pool of potential spectrum options at varying stages of consideration. This will provide the ACMA with capacity to react to demand requirements on a contingency basis if, and when, needed, and when the evidence suggests that mobile broadband is, or is becoming, the highest value use of a particular band.
3. Where possible, utilisation of the often long lead-times to assist in reducing the effect on incumbents arising from re-farming of spectrum to mobile broadband.
4. Exploration and, where appropriate, the adoption of opportunities for greater sharing between mobile broadband services and other services.
5. Engagement in international deliberations to influence the development of domestically suitable internationally harmonised spectrum options.

The ACMA expects the tools and processes with which it manages the spectrum to be improved by changes to Australia’s spectrum policy and management framework as a result of the implementation of the recommendations of the Spectrum Review. To that end, the ACMA expects to review the strategies for addressing the growth in mobile broadband capacity following the implementation of the recommendations of the Spectrum Review. The current strategies below reference the existing legislative framework. These aspects will be revised following the implementation of the recommendations of the Spectrum Review.

## Strategy 1: Holistic approach to mobile broadband capacity growth

The ACMA will adopt a holistic approach to addressing mobile broadband capacity growth that seeks the balanced use of available mechanisms for delivering capacity growth. The ACMA will focus on the desired outcome—that is, delivery of mobile broadband services enabled by mobile broadband capacity—with provision of spectrum being one of several inputs to delivering this outcome.

As mandated in the object of the Act, the ACMA must manage the radiofrequency spectrum to ‘encourage the use of efficient radiocommunication technologies so that a wide range of services of an adequate quality can be provided’.[[1]](#footnote-1) Use of more spectrally efficient technologies is one of the three general options mobile network operators have when it comes to meeting capacity requirements, with the others being acquiring additional spectrum and deploying additional sites (including potential use of new network topologies).

In considering re-farming of spectrum for mobile broadband, the ACMA will take into account the uptake of spectrally efficient technologies, as well as network infrastructure and topology deployments in efforts to deliver greater mobile broadband capacity using currently available spectrum.

When considering the level of interest in, or demand for, spectrum, the ACMA will consider the extent to which access to additional spectrum will reduce the costs of the relevant industry—this is one key incremental benefit of spectrum reform.[[2]](#footnote-2) If that sector’s users have unused spectrum for example, then the reasons for this will be taken into account as part of any assessment. It is important for the ACMA to understand these potential incremental benefits in order to know whether spectrum use change may be net beneficial.

## Strategy 2: Transparent spectrum management planning process

The ACMA has not identified, as part of its mobile broadband strategy, specific quantitative metrics or targets for the amount of spectrum that is required for mobile broadband services over time. The models used in these estimates are highly sensitive to inputs and variables, which are difficult to accurately predict too far into the future. This makes long-term estimates useful as a guide for trend analysis, rather than for determining specific spectrum targets.

Importantly, quantitative estimates provide no insight into the frequency band required and do not capture other important qualitative aspects. These aspects include properties such as the desired characteristics of the spectrum (for example, whether high or low band spectrum is appropriate), international spectrum harmonisation and technology standardisation factors. Instead, the ACMA will not concentrate its efforts solely on quantity but also quality, and rather than focus on arbitrary and simplistic targets, seek to provide the right spectrum at the right time to address the growth in demand for mobile broadband capacity.

In lieu of quantitative metrics, and as a measure to provide transparency and greater certainty to all spectrum holders, the ACMA has adopted a strategy that identifies a process for the consideration of potential bands for re-allocation to mobile broadband. This includes a criteria-based assessment for when bands should (or should not) progress along the various stages of the process. In concert with this process, the ACMA will identify a range of bands at varying stages of consideration for potential re-farming for mobile broadband.

The intention of this strategy is to develop a contingency plan by identifying a pool of potential spectrum options available for mobile broadband at various stages in the process. While progression through the stages will typically be linear, different stages may be able to be compressed, so that a band is accelerated through the process if appropriate. In line with Principle 4 of the Principles—to the extent possible, promote both certainty and flexibility—this will provide the ACMA with the ability to be agile and flexible. It will also enable the ACMA to respond in a timely manner to demand requirements if and when decisions are made that the highest value use of a band warrants re-farming for mobile broadband, rather than speculating on future demand. This will provide transparency to all stakeholders, including incumbents who will have a clear understanding of what steps are to be taken and what issues are to be considered in potentially re-farming. It will also provide certainty to the mobile broadband industry as to what spectrum may become available and under what broad conditions.

Importantly, such a strategy acknowledges the long lead-times often associated with re-farming spectrum by ensuring that long-term work continues on potential future options, even if in the near term there may not be a need for additional spectrum releases.

## Stages and considerations for band re-farming

The process of replanning a band can be broken down into three broad stages. These three stages could be applied to any band replanning exercise. However, they are detailed here as general guidance on the process to be adopted in the context of repurposing a band for mobile broadband services.

The stages of replanning are outlined in Table 2.[[3]](#footnote-3) The ACMA intends to use the ACMA’s [Five-year spectrum outlook](http://www.acma.gov.au/Industry/Spectrum/Spectrum-projects/5-Year-Spectrum-Outlook/five-year-spectrum-outlook-2015-19) (FYSO), or another publication as appropriate in line with the implementation of the recommendations of the Spectrum Review, as a tool to keep stakeholders informed on the suite of mobile broadband spectrum planning projects. As discussed, frequency bands identified for monitoring, as well as those frequency bands in the later stages of the process for consideration of additional spectrum for mobile broadband services, will be noted in the FYSO.

As outlined, once a frequency band moves into the initial investigation phase and beyond, the ACMA will release discussion papers and engage with stakeholders in the usual fashion.

It is important to note that the replanning process identified here is relevant to the domestic consideration of spectrum for mobile broadband only. Australia will continue to be able to engage with international bodies such as the ITU and APT on frequency bands at any stage of the process (as detailed in Strategy 5), even in the monitoring stage. Positions on individual bands or WRC agenda items will be developed with stakeholders via the usual international preparatory process.

1. Stages of the process for consideration of additional spectrum for mobile broadband services

| Stage | | Description |
| --- | --- | --- |
| Monitoring | | ‘Business-as-usual’ **monitoring** of international and domestic mobile broadband spectrum trends. |
| Initial investigation | | Initial investigation and scoping of potential **options** for domestic re-farming of a band, informed by preliminary technical assessment.  If initial scoping and technical assessment shows potential, **preliminary assessment of highest value use** of the spectrum is undertaken. |
| Preliminary replanning | | Identification of replanning/re-farming **proposals** (including mechanisms to address incumbent issues) informed by detailed technical sharing studies and analysis of ongoing incumbent spectrum needs. A **comprehensive assessment of the highest value use or uses** of the band is undertaken. |
| Re-farming | | **Decisions** made on preferred re-farming proposal. |
| Re-farming sub-stage a | Replanning | Detailed band/channel replanning undertaken to support the change in the use of the spectrum to mobile broadband. Where possible, long-term transition arrangements are put in place, allowing incumbents to transition **voluntarily** over time (incumbents **retain their rights** during the replanning stage in accordance with the Act). In this scenario, a change of spectrum use commences at this stage, with final implementation concluded in the *allocation sub-stage* via an allocation of spectrum to specific mobile broadband users.  However, in some cases it may be appropriate for spectrum already available for mobile broadband to be replanned in order to better support new mobile broadband technologies. In this scenario, a change of use of spectrum and subsequent allocation may not be necessary. In such cases, the *allocation* sub-stage is not required and the process would stop here. |
| Re-farming sub-stage b | Allocation (to mobile broadband users) | Development of final technical framework and allocation instruments/tools for near-term re-farming. Incumbents are **obliged** to transition to new arrangements or cease operations in specified time frame (incumbents **rights are varied and/or removed** in accordance with the Act). Mobile broadband users are given the opportunity to acquire and use re-farmed spectrum. |

### Monitoring

Initial consideration of additional spectrum bands for mobile broadband begins with the ACMA’s business-as-usual monitoring of international and domestic mobile broadband spectrum trends. In this stage, the ACMA would maintain awareness of trends and interest in potential bands for mobile broadband.

In this stage, there would be no direct action required by stakeholders. However, there is an opportunity for stakeholders to keep the ACMA appraised of developments and issues in various bands (either advocating or opposing potential use of mobile broadband services in the band). These bands would be noted within the FYSO, or another publication as appropriate in line with the implementation of the recommendations of the Spectrum Review. The ACMA may also choose to apply an Advisory Note to incumbent licences to advise them that the band is being monitored for possible future use by mobile broadband services.

Criteria for progressing from the monitoring stage to the initial investigation stage

In forming a judgement as to whether a band should progress to the next stage in the process, the ACMA will take into account a range of factors, including:

* the level of interest or investigation of the band nationally or internationally for mobile broadband services
* incumbent use of the spectrum, including whether there is any strong reason why the band is fundamentally unsuitable or otherwise not viable for mobile broadband
* technology standardisation developments (for example, progress within the 3GPP)

international spectrum harmonisation considerations, such as whether the band is under investigation by the ITU or APT, or in overseas jurisdictions.

### Initial investigation

If and when the analysis in the monitoring stage indicates that a frequency band shows some potential for future re-farming for mobile broadband, the band can progress to the initial investigation stage.

The initial investigation will involve scoping of potential planning options for domestic re-farming of a band informed by preliminary technical assessment. Typically, these planning options would be consulted on in a discussion paper.

If the initial scoping and technical assessment shows potential, a preliminary assessment of the highest value use of the spectrum will be undertaken. While it is envisaged that at this stage the assessment would be mainly qualitative, quantitative elements could be included. This will be informed by information collected in the consultation process. It will include consideration of issues such as relocation or retuning costs for incumbent users and any detrimental effects to service delivery that a change in use of the band may cause. It should be noted that the highest value use may vary across different geographical areas. For example, the highest value use may be mobile broadband services in metropolitan and regional areas but may be the incumbent service in remote areas. Assessments of highest value use are discussed further below.

In this stage, there would again be no action required by stakeholders. However, there is an opportunity for stakeholders to inform the ACMA about their views and the effects of different options on incumbent and potential new services so the costs and benefits can be accurately gauged and considered. During the *initial investigation* stage, a spectrum embargo would be considered to ensure that the status of a band remains stable for the duration of the planning process.[[4]](#footnote-4)

Criteria for progressing from the initial investigation stage to the preliminary replanning stage

In forming a judgement as to whether a band should progress from the *initial investigation* stage to the *preliminary replanning* stage in the process, the ACMA’s decision will be informed by the results of the preliminary assessment of highest value use.

### Preliminary replanning

This stage will involve identification of proposals (including mechanisms to address incumbent issues) informed by detailed technical studies and analysis of ongoing incumbent spectrum needs. Responses to the consultation process undertaken in the *initial investigation* stage, including preferred planning options and approaches to accommodating incumbent services, will be used to inform this analysis. Once developed, these proposals will be consulted on in a discussion paper.

As part of the *preliminary replanning* stage, a comprehensive assessment of the highest value use of the spectrum will be undertaken. While not all costs and benefits are easy to quantify, the quantitative value of costs and benefits will be determined to the extent possible at this stage. The assessment of the highest value use will be informed by information collected during both the consultation processes in the *initial investigation* stage and the *preliminary replanning* stage, including information on any relocation or retuning costs of incumbent users and any detrimental effects to service delivery changes described in the proposals may cause. Assessments of highest value use are discussed further below.

The immediate effect on stakeholders in the *preliminary replanning* stage is unlikely to be greater than in the *initial investigation* stage. However, there is again an opportunity for stakeholders to inform the ACMA about the effects of different options on incumbent and potential new services so the costs and benefits can be accurately gauged and considered. In this stage, transition plans and associated timeframes will start to be discussed so stakeholders will have increased clarity on the timeframes for potential changes.

Criteria for progressing from preliminary replanning stage to the re-farming stage

In forming a judgement as to whether a band should progress from the *preliminary replanning* stage to the *re-farming* stage in the process, the ACMA’s decision will be informed by the results of the comprehensive assessment of highest value use.

### Re-farming

In re-farming, the ACMA takes decisions and actions to effect the change in use of the spectrum from its current use to mobile broadband.

There are two potential sub-stages of re-farming that could be pursued: replanning and allocation. In general, replanning and allocation would occur sequentially as part of the re-farming stage where the use of the band is transitioned to mobile broadband from another, pre-existing use. However, it is possible that a band is already being used for mobile broadband and therefore re-farming between uses is not required. In this case, however, it may be desirable for the planning/licensing arrangements already in place to be revised and updated to better support changes in mobile broadband technology.

The two sub-stages of re-farming are outlined below:

* *Sub-stage a: Replanning*—Detailed band/channel replanning would be undertaken by the ACMA with long-term transition arrangements and no immediate allocation of spectrum to mobile broadband users. This would allow affected incumbents to migrate to new arrangements voluntarily over a longer time frame. Under the replanning sub-stage, incumbents retain their rights for the short to medium term.

However, in some cases it may be appropriate for spectrum already available for mobile broadband to be replanned in order to better support new mobile broadband technologies. In this scenario, a change of use of spectrum and subsequent allocation may not be necessary. In such cases, the *allocation* sub-stage is not required and the process would stop here.

* *Sub-stage b: Allocation*—Final technical framework and allocation instruments/tools are developed for the near-term re-farming of spectrum to mobile broadband and allocation of licences to mobile broadband users. Incumbents would be obligated to transition to new arrangements or cease operations in a comparatively short time frame. At this sub-stage, incumbents’ rights are varied and/or removed, in accordance with the Act.

The ACMA normally uses a price based allocation (an auction) when demand for spectrum is greater than supply. The ACMA also normally allocates spectrum licences for wide area, high value type spectrum uses such as mobile broadband. In this scenario, re-allocation of a band from apparatus to spectrum licensing is usually utilised and requires a spectrum re-allocation declaration (section 153B).

The *re-farming* stage is where incumbent users are affected. However, the timeframes for transition, and therefore the timing between replanning and allocation, will vary depending on circumstances.

Assessments of highest value use

As part of the *initial investigation* and the *preliminary replanning* stages of the process for consideration of additional spectrum for mobile broadband services, assessments of highest value use are set to be undertaken. As outlined above, the ACMA uses a total welfare standard as its overarching framework when assessing the optimal approach to individual spectrum management issues. As such, in considering the highest value use for a given spectrum band, the ACMA considers the impact that a change in use would have on all parties in the economy. Importantly, this will include not only an assessment of those costs and benefits that can be readily quantified monetarily, but also those costs/benefits that are more intangible and may be harder to quantify.

Therefore, when considering the potential change of use of spectrum to mobile broadband, the ACMA is likely to include an assessment of:

1. The incremental costs imposed on firms providing services using the spectrum that is to be refarmed. Technical constraints may even prevent the service currently provided by incumbents on that spectrum from being provided.
2. The increase in the price of service provided by incumbent spectrum users. This will depend on :

* whether the prices rise or consumers incur incremental costs in accessing the service or substitute services via an alternative platform
* whether other platforms can provide the same services or services that are regarded by consumers as very close substitutes.

In some cases, the repurposing of a frequency band may render incumbent services unviable.

1. The increase in producer surplus for producers providing new services using the repurposed spectrum.
2. The increase in consumer surplus if it enables:

* new valuable services to be rolled out in Australia or reduces the cost of those services being brought to market, or increases competition in the provision of services
* consumers to capture the benefits of global economies of scale in the production of equipment for utilisation in the bands
* consumers to reap the benefits of global roaming that is possible in part because of international standardisation.

1. The wider costs and benefits, including those that are more intangible and may be harder to quantify.

This approach is being increasingly adopted internationally. An example is the cost-benefit analysis of changing the use of the 700 MHz band to mobile services conducted by Ofcom, published on 28 May 2014.[[5]](#footnote-5) A framework for conducting cost-benefit analysis to contribute to assessments of highest value use will be released for input from stakeholders later in 2016.

## Strategy 3: Utilising the often long lead-times to reduce effect on incumbents

The identification and release of spectrum for mobile broadband services is usually a long-term process, which can occur over the space of a decade. The ACMA acknowledges, and will continue to make use of, the often long lead-times for spectrum identification and release. The ACMA will endeavour to provide extended time frames for the transition of incumbents and implementation of new arrangements, where possible.

This will include performing the ground work for identification and release of spectrum early to reduce the time required to re-farm spectrum and therefore increase flexibility and agility to make spectrum available for mobile broadband if and when required. This will include development of alternatives for incumbent services to enable early and long-term transition to reduce the effect on these services, and provider greater investment certainty by allowing equipment changes or replacement due to re-farming to be more closely aligned with normal business cycles.

## Strategy 4: Exploring opportunities for increased spectrum sharing

Spectrum sharing is at the heart of spectrum management and a key tool in maximising the utility achieved through use of the spectrum resource. Spectrum sharing is consistently advocated by the ACMA as outlined in Principle 4 of the Principles.

However, given the nature of mobile broadband services, sharing has traditionally been limited to the establishment of co-existence arrangements between mobile broadband and other services at geographic and spectral boundaries. In effect, in a specific geography and frequency band, mobile broadband has been provided exclusive access to the spectrum.

So far, this form of exclusive spectrum access for mobile broadband, with sharing limited to geographic and spectral boundaries, has been deemed appropriate both in Australia and around the world. This is because of the complexity and compromises inherent in ubiquitous services, such as mobile broadband sharing with other services in the same spectrum space.

Emerging technologies and regulatory approaches (such as licensed shared access (LSA), authorised shared access (ASA)[[6]](#footnote-6), licence assisted access (LAA) and LTE in unlicensed spectrum (LTE-U)[[7]](#footnote-7)) may, however, offer new opportunities for more finessed forms of sharing between mobile broadband and other spectrum uses in the same spectrum space. In line with Principle 5 of the Principles—to balance the cost of interference and the benefits of greater spectrum utilisation—these new techniques will, however, need to be carefully assessed to determine if the increased spectrum utility delivered by this type of sharing is on balance worth the resulting cost, complexity and compromises.

The ACMA will therefore continue to investigate, and pursue where practical, opportunities for new and innovative forms of spectrum sharing to both provide greater flexibility of spectrum access to mobile broadband and reduce or remove impacts on existing spectrum users.

## Strategy 5: Influencing international spectrum harmonisation

International mobile broadband technology standardisation and spectrum harmonisation enable economies of scale (providing both cheaper devices and a larger choice in devices for both network operators and consumers) and international roaming benefits. The ACMA considers these outcomes to be beneficial and able to be influenced.

Section 3 of the Act states that it is a goal of the management of the radiofrequency spectrum to promote Australia’s interests concerning international agreements, treaties and conventions relating to radiocommunications or the radiofrequency spectrum.

The ACMA will therefore continue to facilitate Australia’s participation in regional and international fora including the ITU-R and the APT. The ACMA will seek to influence decisions made in relation to the identification of spectrum bands for mobile broadband (that is, IMT) and associated technical and regulatory arrangements supporting the co-existence of mobile broadband with other services. For relatively small radiocommunications markets like Australia, the value of a frequency band is closely linked to the international device ecology—that is, the availability of a wide range of devices, including lower cost options.

In doing this, the ACMA can promote options that are viable for possible implementation in Australia. While a wide range of IMT identification options (not all of which would necessarily be adopted in Australia) is generally desirable, a balance must be pursued so that the benefits of international harmonisation are not diluted by too many options being identified.

In this regard, it is important to note that an IMT identification, while often desirable, does not mandate use of that band in Australia; nor is it prerequisite for a band’s use for mobile broadband in Australia. In other words, the ACMA will take account of a band’s IMT status in its domestic deliberations, but the presence or absence of an IMT identification does not dictate its use in Australia one way or another.

In addition, deliberations on the identification of spectrum for IMT must also consider the impacts such an identification may have on other spectrum uses and users. This is because while an IMT identification does provide flexibility and opportunities for the mobile broadband sector, it can also increase uncertainty for existing uses and users or create possible co-existence issues that need to be considered and addressed. Collectively, this leads the ACMA to believe that, as always, a balanced approach that considers both the costs and benefits of supporting IMT identification is appropriate.

1. Paragraph 3 (d) of the [Act](http://www.comlaw.gov.au/Series/C2004A04465). [↑](#footnote-ref-1)
2. The ACMA is also able to use market data to inform spectrum demand, but this is not always available for the spectrum in question. [↑](#footnote-ref-2)
3. Under the Act, the minister and the government have a policy-making role that is independent of the ACMA. [↑](#footnote-ref-3)
4. More information on spectrum embargoes is available on the [ACMA website](http://www.acma.gov.au/Industry/Spectrum/Spectrum-planning/Current-APs-info-and-resources/spectrum-embargoes-spectrum-planning-acma). [↑](#footnote-ref-4)
5. Ofcom, [Consultation on the future use of the 700 MHz band—Cost-benefit analysis of changing its use to mobile services](http://stakeholders.ofcom.org.uk/binaries/consultations/700MHz/summary/main.pdf), 28 May 2014. [↑](#footnote-ref-5)
6. LSA and ASA are concepts that allow spectrum that has been licensed to another user to be used by more than one entity in areas or at times when it is not being used by the incumbent or primary user. [↑](#footnote-ref-6)
7. LTE-U refers to the use of LTE technology in unlicensed (or class licensed in Australia) spectrum. LAA is a term used by some vendors to describe the same technology. [↑](#footnote-ref-7)