



TELSTRA CORPORATION LIMITED

Planning for wireless broadband use of urban areas in the 3400–3475 MHz band

Options Paper

Public Submission

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01 Introduction

We welcome the opportunity to provide this submission to the ACMA's consultation on **Planning for wireless broadband use of urban areas in the 3400–3475 MHz band** - consultation 31/2021 (the Options Paper).

Spectrum is a scarce and valuable resource so technical arrangements must be optimised to allow the spectrum to achieve its highest value use. In the case of the Urban Excise spectrum, we consider this means allowing for the possibility of macro base-station deployment in the future, to accommodate technology evolution that may introduce better and more sophisticated interference management, potentially overcoming the current limitations in the proposed 'urban excise' areas that make macro base-station deployment very difficult.

Our submission is structured as follows:

- Section 2 explains that our preferred option is Option 4 and why this is the case;
- Section 3 contains our comments on other matters raised in the Options Paper;
- Appendix 1 contains our responses to the seven specific questions in the Options Paper; and
- Appendix 2 contains our views on Interference Management mechanisms canvassed in Table 10 of the Options Paper.

02 Preferred option

This section sets out our position that Option 4 is the best approach to allocating the Urban Excise spectrum. Further, this spectrum should be allocated via a price-based allocation process at the same time as the 3700-3800 MHz band.

2.1. Principles for option selection

A key objective in identifying and selecting an appropriate allocation option is to maximise the potential use and value of this scarce mid-band spectrum as per the ACMA's Desirable Planning Outcome 4. We have identified four principles tailored for this band that we consider are helpful in guiding the selection of the best option.

1. **Maximise the population covered.** It is vital the technical configuration is optimised to enable a solution that is capable of serving the greatest population with the greatest potential benefit, rather than optimised solely to serve bespoke, localised users and deployments. Even if the spectrum is ultimately purchased by operators who deploy one or more bespoke, localised solutions, the technical arrangements should not assume this will be the case, but rather should treat each urban excise geographic region as a whole.
2. **Encourage homogeneity.** Mixing use cases (e.g. fixed wireless, mobiles, localised deployment) within a sub-band leads to greater spectrum denial and under-utilisation because greater interference protection (e.g. guard space, lower power, antenna pointing restrictions, synchronisation) is required between heterogeneous operators. This additional interference



protection inherently reduces spectrum utility and may prevent the spectrum from reaching its highest value use.

3. **Allow flexibility for technology to evolve.** Technologies (mobile, fixed wireless, etc) will continue to evolve to better manage the risk of interference. We also assume that NBN Co's FWA will be upgraded to 5G with Adaptive Antenna Systems (AAS) at some point in the next 5-10 years. While current technology may necessitate restricted cell deployment, it is important that the technical characteristics of this band include scope for technology evolution that can accommodate full macro base station deployment without having to revisit licence conditions, s.145 determinations, RALIs and RAGs.
4. **Promote certainty for investment.** The roll out of fixed or mobile networks involves significant investments and licensees require certainty of licence tenure to support these investments. Spectrum licensing provides greater certainty to investors vis-à-vis AWL licensing because the licence terms are generally longer and the regulator cannot unilaterally amend core licence conditions. For these reasons we consider spectrum licences to be the appropriate mechanism for the urban excise areas.

2.2. Achieving efficient use of spectrum requires consideration of demand and technical optimisation

In the assessment of the four options¹ the ACMA analyses each option against four planning criteria, the fourth of which is “maximise the utility of spectrum in urban excise areas for new wireless broadband services.” We always have, and always will support the goal of maximising the use of spectrum and ensuring that spectrum reaches its highest value use, and we fully support the ACMA analysing the spectrum through this lens. Simply optimising the technical arrangements to enable a plethora of localised WBB deployments does not ensure it will be taken up, risking the prospect that the spectrum will remain fallow or only partially used.

We consider the ACMA's analysis regarding maximising the utility of the spectrum overlooks an analysis of the demand for this spectrum by localised WBB operators. The only reference in the Options Paper to demand (in the sense of demand by different use cases such as wide area mobile versus wide area fixed versus localised private WBB deployments) is in the section titled Case for Action² where the “*continuing demand for spectrum supporting wireless broadband, specifically 5G*” is noted. This section of the Options Paper goes on to explain that an ecosystem for 3GPP devices and NBN Co's decision not to deploy in these areas makes the case to “*investigate ways of making spectrum in urban excise areas available for use by wireless broadband operators other than NBN Co.*” Availability of devices and NBN Co not using the spectrum in the excise areas does not of itself create demand.

While we are not necessarily in a position where we would have visibility of demand from localised private network operators or from challenger WISPs or IoT operators for this spectrum, we observe the TLG for the 3.4 GHz Urban Excise spectrum had no attendees from the WISP or private network community, potentially pointing to low interest in this spectrum from these industry sectors. In short, we consider Option 3, which is optimised to accommodate a large number of localised operators, should not be considered in the absence of demonstrable proof of demand from such potential spectrum users.

¹ Options Paper, section titled Assessment of options, p.22-31.

² Options Paper, p.10, first paragraph in the section titled Case for action.



2.3. Timing for making Urban Excise spectrum available

In the section titled *Assessment of Options under Desirable Planning Outcome 4*, the ACMA makes some estimates as to when spectrum could be made available for each of the four planning options.³ The date range proposed by the ACMA for Options 1, 2 and 4 (i.e. as early as second quarter 2022) is commensurate with the timing for an AWL allocation in the band, which concerns us as it would precede the auction for 3700-3800 MHz scheduled for 2023.

Our strong preference is that Urban Excise spectrum is made available through spectrum licensing, as this will lead to the highest value use of the spectrum. Making the Urban Excise spectrum available as part of a larger auction that incorporates 3700-3800 MHz is the most effective way to ensure there is price and demand discovery for 3400-3800 MHz spectrum, and its value is correctly realised through a price-based allocation. If, at the end of an auction, any Urban Excise spectrum remains unsold, then and only then, should it be made available under an AWL (over-the-counter) licensing construct.

The licence term for the Urban Excise spectrum licences should also be aligned with the licence term adopted for 3700-3800 MHz spectrum licences, to simplify the ongoing management of licences across both bands.

2.4. Option 4 is our preferred option

We agree with the ACMA's preliminary selection that the preferred option is Option 4.

We recommend the arrangement for the restricted cell component of Option 4 (3460-3470 MHz) should align with Option 2, namely that it should be a single operator in a specific frequency range in each Urban Excise geography in accordance with the first of the principles we outlined in section 2.1. In other words, the restricted cell component of Option 4 should not be made available in a format where multiple operators share the same spectrum channel (per geography), as contemplated under the Option 3 variant of a restricted cell model.

Commensurate with the principles we outlined in section 2.1, we also agree with and support the ACMA's assessment against its Desired Planning Outcomes that Option 4:

- Provides the greatest technical flexibility for how operators can use urban excise areas. This includes support for both macro and restricted cell deployments.
- It minimises spectrum incorporated into restricted use bands.
- It is expected to result in greater spectrum utility in the 3460–3475 MHz frequency range.
- In a given area, multiple operators could be supported by licensing them in different (i.e. separate) frequency segments of the 3400–3475 MHz frequency range.

³ Options Paper, pp.28-29.



03 Other matters

This section contains our comments on other matters canvassed in the Options Paper.

3.1. Allocation (purchase) of the Restricted Use band

Each of the four options contain a restricted use band (“RB” as the ACMA refers to it in Figure 3); option 1 has a 15 MHz RB, and the other three options each have a 5 MHz RB. The ACMA has not expressed a view on whether the RB should be made available for allocation on an independent basis, or whether it should be “bundled” with the upper channel allocated below the RB, e.g., if the upper channel was 10 MHz in size, the RB should be bundled with 3450-3460 MHz under Option 1, and 3460-3470 MHz under Options 2, 3 or 4. This potentially has some bearing on the extent of the technical restrictions placed on the RB. For example, if the RB is available to be acquired independently of other spectrum in 3400-3475 MHz, then it is entirely possible it will have two frequency-adjacent neighbours to that spectrum; Optus above 3475 MHz, and one below 3470 MHz (or 3460 MHz in Option 1). In the case of Option 4, this would be further compounded because the owner of the Restricted Cell (RC) 10 MHz would potentially also have two frequency adjacent neighbours; the owner of the RB and the operator immediately below 3460 MHz. We consider this scenario, enabled under Option 4 where the RB is independently available for acquisition, to be undesirable due to the compounding potential interference scenarios it creates.

We strongly recommend the RB is not allocated on independent basis. Rather, we recommend the RB is either not offered for allocation at all (and remains fallow) or else it is “bundled” with the upper channel allocated directly below the RB regardless of the Option that is ultimately selected. In the case of Option 4, this means the RB is bundled with the RC (3460-3470 MHz).

3.2. Secondary fallback synchronisation should not be introduced

Network synchronisation is a useful tool, among a range of tools, to mitigate the effects of interference in TDD-based radio networks. However, it is a highly constraining solution, and can only be used to resolve some types of interference, such as cross-link interference between base stations (within certain timing/distance limitations) and adjacent channel co-site interference scenarios between radio systems that use the same access technology (e.g. 4G IMT). It cannot be used to solve some other scenarios, such as a user terminal located on the geographic boundary between two separately licensed networks and operating on the same frequency, where the pfd from those two networks (both assumed to be complying with the DBCs) would be similar at the boundary. In this example, the level of the wanted and unwanted signals is the same, and the device will not be able to discriminate between the two signals, no matter how well synchronised they are.

Further, we consider changing synchronisation from one pattern to a so-called secondary fallback pattern is unlikely to resolve interference issues caused by temporary tropospheric enhancement (e.g. “ducting”) in a timely manner. A notification requesting the change in synchronisation pattern (essentially, to introduce more time delay between the transmission and reception of TDD packets) would need to be communicated to each affected Urban Excise operator, who would then have to plan and apply the change, including restarting each base station. The “ripple effect” of synchronisation in TDD networks means that the change would have to be applied to base stations across a very wide area, if not the entire geographic area of a licence (e.g. the entire Sydney metropolitan area and beyond). This could



take several days. By the time this is completed the ducting effect is likely to have morphed or dissipated.

Despite these obvious shortcomings, the concept of a secondary fallback synchronisation mechanism has persisted through the TLG, to make it all the way to the Options Paper. We wish to restate our strong objection to the prospect of the introduction of a secondary fallback synchronisation mechanism, and remind the ACMA that changing synchronisation has profound operational consequences for mobile network operators as an outage is required at each affected mobile base station (i.e., taking the base station “off air”) every time a frame structure change is implemented. Further, there is a limited menu of TDD frame structures defined in IMT systems, and even though a number of patterns are defined in 3GPP, not every vendor implements all of these (indeed, to our knowledge, no vendor supports all TDD frame structures defined in 3GPP, they typically only support 3 or 4 different ones). It is also entirely possible that there would be no suitable frame structure that would solve the interference problem (there is a limit to how much delay can be introduced between TDD send and receive frames), and so the ACMA is potentially proposing an unrealistic solution.

3.3. Proposed changes to the 3.4 GHz band section 145 determination

We agree with and support many of the proposed changes to the *Radiocommunications (Unacceptable Levels of Interference – 3.4 GHz Band) Determination 2015*,⁴ including amendments to the Level of Protection (LOP) to introduce AAS, and grandfathering clauses for existing device registrations anywhere in the 3400-3700 MHz band.

However, given this s.145 Instrument covers the entire 3400-3700 MHz for all spectrum licences anywhere on the Australian landmass, we consider there are two errors in the drafting of the s.145 amendment instrument when viewed in this context.

- **The amendment to clause 9(1)(b) removes subsection (4).** The updated version says “*subject to subsections (2) and (3) ...*”, whereas the existing instrument says “*subject to subsections (2), (3) and (4) ...*”. We consider it important that the reference to subsection (4) is retained in clause 9(1)(b). Note, clause 9(4) still refers back to 9(1)(b), “*A level of interference mentioned in paragraph 9(1)(b) is not unacceptable ...*”. As such, the deletion creates a conflict between paragraph 9(1)(b) and paragraph 9(4)(a), in that the former says that if “*any part of the device boundary of the transmitter lies outside of the geographic area of the licence*” the level of interference which the transmitter causes will be unacceptable, but the latter provides an instance where the device boundary lies outside the geographic area of the licence, but the level of interference is “*not unacceptable*”. Without the “*subject to*” cross-reference in paragraph 9(1)(b) as is done in the case of subsections (2) and (3), what remains are two provisions that are fundamentally at odds with one another.
- **The amendment removes clause 9(2) which refers to the Australian Spectrum Map Grid (ASMG).** Clause 9(2)(a) currently defines interference that “*lies outside the boundary of the ASMG*” as not being unacceptable, and the draft amendment instrument removes this altogether, such that there will no longer be a reference to the ASMG in the s.145 determination. We observe the March 2021 amendment⁵ to the 2.3 GHz s.145 determination consciously

⁴ <https://www.legislation.gov.au/Details/F2018C00557>

⁵ <https://www.legislation.gov.au/Details/F2021L00303>



retained clause 9(2) referring to the ASMG, such that it has both a reference to the ASMG (in clause 9(2)) and a reference to the Australian territorial sea baseline (in clause 9(4)). We consider it important that both references (i.e., both the ASMG reference and the Australian territorial sea baseline) are also retained in the 3400-3700 MHz s.145 determination, consistent with the precedent in the 2.3 GHz band, and request the ACMA reinstate the clause referring to the ASMG.

3.4. Proposed change to the receiver spurious emission limits on 3.4 GHz spectrum licences

We agree with and support the ACMA's proposed changes to align receiver spurious emission limits with 3GPP Release 17 of TS 38.104, and acknowledge this will result in updating existing 3.4 GHz spectrum licences.

3.5. Minimum Contiguous Bandwidth

While MCB is not canvassed in the Options Paper (because it is the remit of the next consultation stage), MCB is also determined by the technical arrangements, not just the regulatory arrangements. We consider the MCB should be 10 MHz, as a MCB below 10 MHz risks preventing the band from reaching its highest value use due to increased fragmentation and the possible need for more guard band spectrum.

3.6. Comments on Appendix C: Update to RALI MS-44

We agree with and support the ACMA's proposed changes to RALI MS-44, which updates the frequency bands to Moree, Roma, Uralla ESPZs in eastern Australia to include the frequency ranges 3400-3425 MHz and 3492.5-3542.5 MHz.

3.7. Comments on Appendix D: Assessment of utility of urban excise

We have no comments on the ACMA's Spectrum Planning Report 01/2021, *Assessment on utility of 3.4 GHz Urban Excise Areas*, developed as part of the Urban Excise TLG which ran between November 2020 and July 2021.



Appendix 1: Responses to questions

This appendix contains our responses to the seven questions posed in the TLG consultation paper.

1. Comment is sought on the draft amendments to the s.145(4) Determination contained at Appendix B, found as a separate attachment in the key documents section of this consultation.
 - > Should additional measures be included to grandfather device registrations when minor modifications are made?
 - > If so, what minor modifications should be permitted? For example, changes that results in the same or lower horizontal radiated power for the purposes of device boundary calculations. Alternatively, changes that result in the same or smaller device boundary as originally calculated when registering a device.

Telstra supports the grandfathering of conditions to allow NBN Co to re-register devices currently not registered on the RRL as a result of the restack with Optus. According to the Options Paper, the process of re-registering pre-existing devices (retuned as part of the restack) must be completed by February 2022.

From this time onward, our view is that NBN Co should be required to comply with registration requirements without exception. This would include re-registering devices where even just minor modifications are made, such as antenna upgrades. It is vital for Accredited Persons performing coordination activities that the RRL contain fully up-to-date information about devices in operation, regardless of whether those changes cause little or no change to aspects such as horizontal radiated power. Consistent with our advocacy⁶ on 850/900 MHz technical arrangements, we consider change(s) of a nature that do not fundamentally alter the aggregate emission pattern or extent of the radiation from a site should not reset the 'first in time' date for that site (should a 'first-in-time' assessment ever be a relevant factor in assessing any interference disputes).

We note that the introduction of Clause 11 into the s.145 determination grandfathers the pre-existing s.145 conditions for unacceptable interference, and we support grandfathering of the pre-existing definition of unacceptable interference for pre-existing registrations. What we do not support here is alleviation of the requirement to update the RRL. So for clarity, if a device was registered *before* this amendment to the s.145 determination, and an upgrade to that device is such that it would have satisfactorily passed the pre-existing s.145 determination but fails the revised s.145 determination, that transmitter should nonetheless be deemed acceptable under the s.145 determination because clause 11 grandfathers the s.145 requirements that existed prior to the introduction of clause 11. The RRL must still be updated to reflect any upgrade.

⁶ We have separately touched on the topic of device registration in the RRL and first-in-time status in our submission on the draft instruments for the 850/900 MHz bands, see section 3.4.1 of our submission to IFC 16/2021 available at <https://www.acma.gov.au/consultations/2021-04/draft-instruments-850900-mhz-band-auction-consultation-162021>. We wish to stress that our position in relation to device registration for devices in 3400-3475 MHz, whether inside or outside the Urban Excise geography is fully aligned with our advocacy on the 850/900 MHz bands. In both cases we are saying that the RRL must always be kept up to date (there should be no situations whereby licensees are exempted from keeping the RRL up to date), and, if the change is of a nature that does not fundamentally alter the aggregate emission pattern or extent of the radiation from a site, should not reset the 'first in time' date for that site.



2. Comment is sought on the proposed changes to receiver spurious emission limits on 3.4 GHz spectrum licences.

We agree with and support the ACMA's proposed changes to align receiver spurious emission limits with 3GPP Release 17 of TS 38.104, and acknowledge this will result in updating existing 3.4 GHz spectrum licences.

3. Comment is sought on the draft amendments to RALI MS44 contained in Appendix C, found as a separate attachment in the key documents section of this consultation.

We agree with and support the ACMA's proposed changes to RALI MS-44, which updates the frequency bands to Moree, Roma, Uralla ESPZs in eastern Australia to include the frequency ranges 3400-3425 MHz and 3492.5-3542.5 MHz.

4. Comment is sought on the options developed for use of spectrum in urban excise areas.

We agree with the ACMA's reasoning underpinning the development of the four options, and have no further suggestions for either additional options, or modifications to the options proposed.

5. Views are sought on the possible interference management approaches for both co-channel mechanisms (including ducting) and adjacent channel mechanisms (including adjacent band coexistence) contained at Appendix E.

See Appendix 2 of our submission for an attribute-by-attribute response to the interference mechanisms proposed in Table 10 of Appendix E in the Options Paper.

6. Comment is sought on the desirable planning outcomes for use of spectrum in urban excise areas.

We agree with and support the four planning outcomes identified by the ACMA. We have also identified some planning principles for option selection we consider to be helpful (alongside the planning outcomes), which we describe in section 2.1.

7. Comment is sought on the ACMA's preliminary preferred option. Are other options proposed, and if so, why?

We support the ACMA's preliminary preference for Option 4. Justification for our support is contained in section 02 of our submission.



Appendix 2: Responses to interference mechanisms in Table 10

Table 10 of the Options Paper⁷ contains a list of possible interference mechanisms nominally related to Option 1. The ACMA proposes the same set of interference mitigation mechanisms for Option 4 (preferred option) with one minor exception, which is that a power spectral density (psd) limit of 17 dBm EIRP / MHz is applied.

Item	Interference management criteria	Telstra's position
Unwanted emission limits	Adopt the same unwanted emission limits as defined for existing 3.4 GHz spectrum licences.	Agree
Synchronisation requirement	Option A Apply the same synchronisation requirement as per existing 3.4 GHz spectrum licences AND introduce a secondary fallback sync.	Not supported. Secondary synchronisation cannot work in practice, because sync may not be a solution, and even if it is, the time taken to implement the new sync pattern could exceed the duration of some temporary tropospheric events (e.g. ducting). See section 3.2 for further detail.
	Option B Only apply the same synchronisation requirement as per existing 3.4 GHz spectrum licences; i.e., no secondary fallback sync.	Supported.
Application of the current 3.4 GHz device boundary criteria (DBC)	<ul style="list-style-type: none"> > For devices deployed within urban excise areas in the 3400–3475 MHz band, the current DBC does not apply. > For devices deployed in the 3400–3475 MHz band outside urban excise areas, the current DBC does not apply within urban excise areas. > The current DBC continues to apply as usual for all other cases. 	Agree

⁷ Options Paper, p.39.



Item	Interference management criteria	Telstra's position
Registering new devices inside urban excise areas within the 3400–3475 MHz band	Option A For registered devices, the following measures apply: <ul style="list-style-type: none"> > Ensuring the power flux density (or alternatively, field strength or received power level into a notional receiver) from a proposed BS inside an urban excise area does not exceed -99.9 dBW/m²/MHz for non-AAS and -91.9 dBW/m²/MHz at a height of 5 metres above ground level within the NBN Co service areas for (TBD)⁸ % of locations. This criterion is to be met in NBN Co service areas that are within a 64 km radius of a proposed BS. 	No comment - We note that the ACMA plans to consult further on this matter once the planning option is decided.
	Option B For registered devices, the following measures apply: <ul style="list-style-type: none"> > ensuring a proposed BS inside an urban excise area satisfies a minimum aggregate C/(N+I) of 13 dB into a notional CPE within NBN Co service areas for (TBD)⁸ % of locations. This criterion is to be met in NBN Co service areas that within a 64 km radius of a proposed BS. 	No comment - We note that the ACMA plans to consult further on this matter once the planning option is decided.
Registering new devices outside urban excise areas within the 3400–3475 MHz band	Option A Ensure a pfd within urban excise service areas for (TBD) ⁸ % of locations is met.	No comment – This option applies to NBN Co spectrum outside the Urban Excise.
	Option B Ensure a C/(I+N) within urban excise service areas for (TBD) ⁸ % of locations is met.	No comment – This option applies to NBN Co spectrum outside the Urban Excise.
Unregistered devices inside urban excise areas within the 3400–3475 MHz band	Option A No change to existing requirements. These are: <ul style="list-style-type: none"> > Operation is only authorised within a licensee's spectrum space when 3rd party authorised to do so by that licensee. > Devices exempt from registration operate on a 'no interference and no protection' basis. 	Not supported.
	Option B Fixed UEs in the 3400–3475 MHz band and inside urban excise areas, are deemed not to cause interference to adjacent area licences.	Supported.

⁸ The TLG did not define a percentage of locations to apply this limit.



Item	Interference management criteria	Telstra's position
Unregistered devices outside urban excise areas within the 3400–3475 MHz band	Option A No change to existing requirements. These are: <ul style="list-style-type: none"> > Operation is only authorised within a licensee's spectrum space when third party authorised to do so by that licensee. > Devices exempt from registration operate on a 'no interference and no protection' basis. 	Not supported.
	Option B Existing requirements apply with the exception that: <ul style="list-style-type: none"> > Fixed UEs associated with the provision of the NBN in the 3400–3475 MHz band, are deemed not to cause interference into urban excise areas. 	Supported.
Devices (both registered and unregistered) in the 3475–3700 MHz band	No change to existing requirements.	Agree
Measures to enable NBN Co to deploy new more spectrally efficient technologies in the future (e.g., 5G, AAS)	Option A Put a condition on all urban excise area licences in the 3400–3475 MHz band which states that licensees cannot claim protection from interference caused by base stations associated with the delivery of the NBN.	Not supported. It is not appropriate for any network operator to be able to unilaterally upgrade their technology and claim immunity from causing interference.
	Option B Before urban excise areas are made available, NBN Co would coordinate and register devices at all new planned or likely new base station sites, with an exemption given to NBN for antenna upgrades (to higher gain) or to larger contiguous bandwidths.	Supported.



Item	Interference management criteria	Telstra's position
Managing interference between 4G and 5G systems	Option A No change to existing requirements	Not supported.
	Option B For devices operating in the 3400–3475 MHz band inside urban excise areas, a 15 MHz restricted use band will apply when a 4G optimised frame structure is used. No restricted use band is required if the licensee can adopt the same frame structure as the spectrum licensees directly above 3475 MHz. Alternatively, the restricted use band can be relaxed if there is agreement with frequency adjacent spectrum licensees to do so.	Supported. This option provides better protection for 5G networks operating above 3475 MHz.
PSD limit of 17 dBm EIRP / MHz for devices in the RB	Within the 3460–3470 MHz frequency range, the power spectral density of a transmitter must not exceed a defined power spectral density limit; for example, 17 dBm EIRP per MHz.	Agree. We support a limit of 17 dBm EIRP per MHz for transmitters operating in the Restricted Block (RB) in Urban Excise geographies.