



TELUS COMMUNICATIONS INC.

Comments for

**CONSULTATION on REVISIONS to the 3500 MHz BAND
to ACCOMMODATE FLEXIBLE USE and
PRELIMINARY CONSULTATION on CHANGES to the
3800 MHz BAND**

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Executive Summary

1. TELUS appreciates the opportunity to comment on the *Consultation on Revisions to the 3500 MHz Band to Accommodate Flexible Use and Preliminary Consultation on Changes to the 3800 MHz Band* (the Consultation).
2. TELUS is pleased to see continued industry consultation from Innovation, Science and Economic Development Canada (ISED) on key matters related to spectrum management especially at this critical juncture for launching 5G in Canada.
3. The Internet is the railroad of the 21st century and telecom operators have invested billions of dollars year over year to deliver the speeds, reliability, access and bandwidth needed to unleash the power of high-speed Internet. The outcome has been the betterment of Canadian society through breakthroughs in healthcare, education and the birth of entire new verticals such as the Internet of Things (IoT) and artificial intelligence. Innovations in wireless Internet technology have enabled the evolution from third generation (3G HSPA) to fourth generation (4G LTE) networks, and we are now on the precipice of the fifth generation of network technology known simply as 5G.
4. While 5G is the next step in the evolution of the wireless technology continuum, the realisation of 5G and “gigabit societies” will be transformative for individual Canadians, industries and our economy on an unprecedented scale¹, and will require sound public policy from the Government of Canada. While the true culmination of 5G will be achieved through the utilisation of complementary spectrum bands, the 3500 MHz spectrum band is undoubtedly the most critical spectrum to fulfil the promise of 5G in the initial stages of its deployment. This is due to the unique characteristics of 3500 MHz in that it will

¹ TELUS comments and reply for *Consultation on the Spectrum Outlook 2018 to 2022*, executive summary, February 16, 2018 and March 16, 2018. Links:
[https://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/SLPB-006-17-TELUS-CR.pdf/\\$file/SLPB-006-17-TELUS-CR.pdf](https://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/SLPB-006-17-TELUS-CR.pdf/$file/SLPB-006-17-TELUS-CR.pdf)
[https://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/SLPB-006-17-TELUS-replycomments.PDF/\\$FILE/SLPB-006-17-TELUS-replycomments.PDF](https://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/SLPB-006-17-TELUS-replycomments.PDF/$FILE/SLPB-006-17-TELUS-replycomments.PDF)

simultaneously penetrate inside buildings while enabling the delivery of true 5G speeds far and wide over Canada's vast urban and suburban areas.

5. 5G represents an exponential leap in capabilities over previous generations of mobile networks, and will propel innovation for individual Canadians, industries and our economy. 5G enabled by 3500 MHz spectrum will facilitate world-leading 5G networks that will empower Canadians to leverage the coverage, speed, capacity, reliability and ultra-low latency required for future applications such as artificial intelligence, smart cities, autonomous vehicles, innovative healthcare, emergency services, the IoT and many other complex applications being envisioned and developed by innovators across Canada². Specifically, 5G networks will enable new and innovative technologies like driverless cars that can report accidents in real time or smart cities that share parking information and use cranes controlled by connected automation. As TELUS highlighted in its response to the Spectrum Outlook Consultation, the success of the Government of Canada's Innovation Agenda is directly linked to the success of 5G.

6. In recognition of the potential that 5G holds to transform society in such fundamental ways, around the world, the 3500 MHz spectrum band is being allocated and targeted as the most critical for early 5G deployment. Historically, Canada's wireless networks have been routinely recognised for their speeds and quality³. Through generational investments by TELUS and other mobile operators, 98.5 percent of Canadians have access to 4G technology⁴ and Canada continually leads the G8 in LTE speeds⁵. Despite its success in 4G LTE technology advancement, Canada has been lagging other jurisdictions in releasing 3500 MHz spectrum, and as a result, we risk losing our global competitive advantage. To sustain Canada's current leadership position among these nations and enable innovation to

² *Ibid.*

³ OpenSignal, *The State of LTE, "4G Speed Comparison"*, published February 2018. Link: <https://opensignal.com/reports/2018/02/state-of-lte>

⁴ CRTC, *Communications Monitoring Report 2017*. Link: <https://crtc.gc.ca/eng/publications/reports/PolicyMonitoring/2017/cmr2017.pdf>

⁵ OpenSignal, *The State of LTE, "4G Speed Comparison"*, published February 2018. Link: <https://opensignal.com/reports/2018/02/state-of-lte>

flourish in our country, it is imperative for the Government of Canada to make 3500 MHz spectrum available in an auction as soon as possible and no later than mid-2020.⁶

3500 MHz is the key to launching 5G in Canada

7. TELUS believes that the launch of this consultation is a positive step in the right direction in bringing 5G, and all that it encompasses, to Canadians.
8. TELUS believes that there is a clear path forward that will bring 5G to Canadians as soon as possible, while safeguarding the continuation of existing services for Canadians being served in rural and remote areas. This can be achieved through distinguishing between 3500 MHz spectrum that is currently in active use serving Canadians and 3500 MHz spectrum in large population centres that currently is not meaningfully serving Canadians.
9. The best path forward for Canadians is to return all 3500 MHz spectrum in large population centres, while moving forward with ISED's proposed Option 1 scenario elsewhere. TELUS proposes this path as Option 3 in response to Question 6. Option 3 yields the benefit of best delivering the promise of 5G to Canadians by enabling a full 200 MHz of spectrum for auction in large population centres while guaranteeing continuity of service for all Canadians being served by 3500 MHz spectrum today. Under the Department's proposed transition plan based on the "where and as necessary" principle, wireless ISPs (WISPs) serving Canadians anywhere in Canada would continue operating under a status quo with the same bandwidth and frequency assignments they have always used until at least 2023. Moreover, if they are ever displaced, this path would still preserve sufficient spectrum to allow them to continue providing services to their customers uninterrupted.
10. It is important to underscore that 5G is a green-field reality and will be transformational; 5G cannot be viewed or regulated like previous wireless technologies. This is especially important for ISED to consider when developing the framework for the 3500 MHz Phase 1 auction. This auction will include fixed licensees retaining spectrum (reducing the available spectrum supply for the mobile industry) and mobile operators will retain converted licences. For these reasons, a set-aside would be inappropriate and would not serve

⁶ TELUS comments for the Outlook Consultation, executive summary.

Canadians; set-asides would not allow Canada to remain globally competitive. It is important that everyone starts from the same place and under the same rules.

11. Building on the concept of best serving Canadians, it is important to highlight that the Canadian wireless marketplace has benefited from fierce competition, which has resulted in world class networks offering choice of service for every possible demand and need. To learn from, and further this track record, the Canadian Government must create a policy framework that allows all Canadians, regardless of region or provider, to have access to 5G technologies at the same time, rather than a framework that picks one carrier or region over another. TELUS is pleased to see a continued commitment to sustaining this competition as outlined in Paragraphs 56 and 57 of the Consultation which clearly state that providing any incumbent the opportunity to launch 5G ahead of another company would create “a significant competitive advantage” for a band incumbent over a band entrant.
12. Given how important the 3500 MHz spectrum band is to 5G and the demand for large swaths of 5G spectrum, TELUS supports ISED’s proposal to also consider optimising the use of 3400-3450 MHz and 3650-4200 MHz spectrum to support 5G. This additional spectrum will further position Canada for success by facilitating competition in 5G with 400+ MHz of contiguous spectrum in Phase 2 (and presumably further Phase 3 expansion). The expedited release of additional 5G spectrum will help secure Canada’s wireless leadership position.
13. Finally, as outlined above, 5G will revolutionise Canadian society as we know it, and ensuring that Canadians are positioned for success as we move into the next technological era, the top priority of the government must be creating the opportunity for Canadians to flourish. Canada is a world leader in 4G LTE technologies⁷ and we have the tools and industry commitment to lead the world in 5G as well. Steps outlined in both the Consultation and in this response document present part of the larger roadmap to growing Canada’s competitive edge and creating better outcomes for Canadians from coast to coast to coast.

⁷ OpenSignal, *The State of Mobile Networks: Canada*, published February 2018. Link: <https://opensignal.com/reports/2018/02/canada/state-of-the-mobile-network>

14. The detail behind TELUS' recommendations and TELUS' comments in response to various questions raised by the Department follow in the main body of this document.

TELUS' Comments on Specific Questions Posed by ISED

Overview

Q1: Ecosystem for 3500 MHz and 3800 MHz Bands

Q1 — ISED is seeking comments on its assessment of the timelines identified for the development of an equipment ecosystem for 5G technologies in the 3500 MHz and 3800 MHz bands, and whether the timelines will be the same in both bands.

15. In both its initial response⁸ and reply comments⁹ to the *Consultation on the Spectrum Outlook 2018 to 2022* (the Outlook Consultation¹⁰) filed earlier this year, TELUS indicated its views on the relative timelines for the development of equipment ecosystems for 5G technology in the 3300-4200 MHz frequency range.
16. TELUS agrees with the Department's comments on international developments in the "3500 MHz band" (defined by the Department in the Consultation as 3400-3650 MHz, and referred to by TELUS as Phase 1) and the "3800 MHz band" (i.e., 3650-4200 MHz, and referred to by TELUS as Phase 2) in Paragraphs 16-22 of the Consultation. TELUS further agrees with the Department's comments on the timing of available 5G equipment ecosystems in Paragraphs 23-25 and expects that equipment supporting 3GPP bands (n77 and n78) will be available to support initial 5G deployments in 2019. This initially available equipment is expected to include base station radios, mobile chipsets, and early-release user equipment (e.g., mobile hotspots, CPEs, and a limited number of smartphones), with flagship smartphones supporting 5G becoming broadly available in 2020.
17. While TELUS foresees equipment in both Bands n77 and n78 to be available as early as 2019, several indications point towards the first deployments in the 3500 MHz band as being focused on the Band n78 ecosystem. One reason to anticipate earlier availability of equipment in Band n78 is that infrastructure vendors will leverage their past several years of 4G development efforts for base station radios in LTE TDD bands 42 (3400-3600 MHz)

⁸ TELUS comments for the Outlook Consultation.

⁹ TELUS reply comments for the Outlook Consultation.

¹⁰ *Consultation on the Spectrum Outlook 2018 to 2022*, SLPB-006-17, October 2017.

<http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf11333.html>

and 43 (3600-3800 MHz), providing a readily available and optimised baseline design to support their 5G radio development efforts. Going from LTE Band 42/43 to 5G-NR Band n78 (3300-3800 MHz) will be far easier than covering the wider 5G band n77 (3300-4200 MHz). While it will technically be possible for radios to cover the entirety of Band n77, the current state of development for power amplifiers is less optimised, given the more complicated design required to accommodate the (relatively) wide bandwidth of 900 MHz.¹¹

18. In light of these technical challenges, along with the fact that much of the 3500 MHz spectrum that has been earmarked in release plans (or already released) across a number of global jurisdictions falls within the 3400-3800 MHz frequency range¹², TELUS expects that in the early years of 5G, a stronger ecosystem will develop around Band n78, and Band n77 will take slightly longer to mature.
19. The release of spectrum in the 3500 MHz band ahead of the 3800 MHz band has also been noted by industry leaders and technical bodies. Qualcomm, in its response to the Swedish regulator (PTE)¹³ concludes that “3400-3800 MHz will be the primary band in the spectrum between 1 GHz and 6 GHz for the introduction of 5G in Europe before 2020.” Additionally, the GTI (Global TD-LTE Initiative) Group has recently published a white paper on sub-6GHz spectrum where they state that “all leading chipset suppliers will release commercial 5G NR products supporting Band n78 in 2018 as per 3GPP R15 compliance. Definitely, 3300~3800 MHz will be the key band for launching 5G NR services in 2019/2020.”¹⁴

¹¹ *GTI 5G Device RF Component Research Report*, published February 2018. Link: <http://gtigroup.org/Resources/rep/2018-02-22/11877.html>

¹² The Department notes in the Consultation that “Portions of the band ranging from 3400 to 3800 MHz are either available or being made available for commercial mobile or flexible use in several countries, including the United States, the United Kingdom, Ireland, Japan, China, Singapore and Australia.” The consultation also notes that Germany and France have also both made commitments to release spectrum supporting the harmonised CEPT decision which mandates that the frequency range from 3400-3800 MHz is prime spectrum for introduction of 5G services, and that South Korea has also completed its auction of the 3500 MHz band in June 2018.

¹³ Qualcomm, *Preliminary study of future assignment of frequencies for 5G deployment*, published March 2018. Link: <https://www.pts.se/globalassets/startpage/dokument/icke-legala-dokument/remisser/2018/radio/remissvar-5g-forstudie/qualcomm.pdf>

¹⁴ *GTI Sub-6GHz Spectrum and Refarming White Paper*, published February 2018. Link: <http://www.gtigroup.org/Resources/rep/2018-02-23/11899.html>

20. In TELUS' view, the Department's prioritisation of the 3500 MHz band is aligned with this expectation, as is the treatment of the remaining 3800 MHz band in a subsequent spectrum release phase.
21. TELUS notes that the Department does not propose a schedule for the release of 3500 MHz and 3800 MHz spectrum in this consultation, but does indicate in the *Spectrum Outlook 2018 to 2022* (the Outlook Decision) that it considers the 3500 MHz band as Priority 1 and the 3800 MHz band as Priority 2. Further, the Department states that it is "anticipating 3500 MHz spectrum will be released for flexible use in late 2020." While TELUS is encouraged by the release of this Consultation and its implications for the release of 3500 MHz spectrum, TELUS continues to encourage the Department to continue to press for accelerated timelines for a 3500 MHz auction.
22. TELUS recognises that its call for the release of 3500 MHz spectrum by mid-2019 (as proposed in its response to the Outlook Consultation) may no longer be feasible. TELUS acknowledges the complexities involved in the consultation process and the steps that must be completed before 3500 MHz spectrum can be auctioned. However, TELUS also notes that given the Department's proposals for the transition of incumbent fixed service operations, there will be additional delays between the end date of a 3500 MHz auction and the introduction of 5G services to Canadian customers. If the Department wants to enable Canada to maintain a leadership position in the quality and capability of its wireless networks, releasing spectrum in 'late 2020' will not suffice.
23. This opinion is not TELUS' alone; respondents to the Outlook Consultation demonstrate the overwhelming pressure from both Canadian industry and global technology leaders to make 3500 MHz spectrum available to support 5G as soon as possible. TELUS recognises the challenge of completing this transition consultation as well as a follow-up consultation on a technical, licensing and policy framework before initiating a competitive process for the release of 3500 MHz spectrum. Recognising the timing of previous processes, TELUS suggests that this technical, licensing and policy framework decision must be issued no later than mid-2019 to support the auction of 3500 MHz spectrum in early 2020. Expediting the consultation and spectrum release process for the 3500 MHz band is a crucial action needed

to maintain Canada's global leadership in the quality and capability of its wireless networks. Only with such an accelerated pace of regulation will Canadian operators be able to launch 5G service for Canadian customers in the same timeframe as the rest of the world.

24. Even though global regulatory trends and technological developments suggest the relatively earlier development of a 3500 MHz ecosystem, it is crucial to keep in mind that the 3500 MHz and 3800 MHz bands will combine into a global ecosystem moving towards a single band (n77). While Band n77 equipment may mature later than a Band n78 ecosystem, the Department should begin planning for this foreseeable outcome today. In the remainder of its response to this consultation, TELUS proposes steps that can be taken to enable a multi-phased release of spectrum in the 3300-4200 MHz frequency range. In TELUS' view, the Department's ultimate goal should be maximising the amount of contiguous spectrum available to support competition in the provision of 5G service for all Canadians in all regions of Canada, and creating policies to ensure the contiguity of each licensee's assets across the band. Rather than dealing with spectrum in the 3300-4200 MHz frequency range on a piecemeal basis, TELUS recommends actions which minimise the fragmentation of the band through its multi-phased expansion, mitigating the introduction of potential challenges to radio implementation, and facilitating the efficient use of spectrum in the band.

The 3500 MHz Band

Q2/Q3: Further Changes to the Allocations in the 3500 MHz Band and Flexible Use in the 3500 MHz Band

Q2 — ISED is seeking comments on the proposals for:

- adding a primary mobile allocation to the 3450-3475 MHz band
- removing the radiolocation allocation in the 3450-3500 MHz band
- making the corresponding changes to the Canadian Table of Frequency Allocations

Q3 — ISED is seeking comments on the proposal to allow flexible use in the 3450–3475 MHz band.

25. TELUS fully supports each of these proposals addressing the extension of the planned flexible use framework in the 3500 MHz band. The proposed changes are a positive step toward enabling future flexible use licensees to deploy the 3500 MHz band for 5G mobile service. Adding 25 MHz to the band increases the available bandwidth for flexible use in the 3500 MHz band by almost 15%. TELUS strongly supports these steps, as the assignment of large contiguous blocks is a critical requirement in promoting 5G competition across all Canadian markets.
26. Removing the underutilised¹⁵ radiolocation allocation in 3450-3500 MHz and expanding the new primary mobile allocation in the 3500 MHz band by 25 MHz to include 3450-3475 MHz to create a contiguous 200 MHz Phase 1 5G flexible use band will serve Canada well in its development as a digital society. TELUS notes that the governmental agencies that are authorised to use 3450-3475 MHz for radiolocation have confirmed that they will not be negatively impacted by the proposed changes¹⁶.
27. TELUS views these two changes (accompanied by the corresponding modifications to the Canadian Table of Frequency Allocations) as both necessary and appropriate in order to make the extended 3500 MHz band suitable for flexible use licensing for 5G. Giving

¹⁵ Consultation, Paragraph 26.

¹⁶ Consultation, Paragraph 32.

priority to flexible use services in 3450-3475 MHz as the Department has already done in 3475-3650 MHz provides the necessary bandwidth to support healthy 5G competition.

Q4: Coexistence of Radiolocation and Other Services in the 3400–3450 MHz Band

Q4 — ISED is seeking comments regarding interest in sharing spectrum between radiolocation and other services in the 3400–3450 MHz band, and options for doing so.

28. As indicated in TELUS’ comments in response to the Outlook Consultation, the mmWave Consultation¹⁷, its recent addendum¹⁸, and in response to Questions 14-18 of this consultation, TELUS is generally supportive of defining frameworks that enable the sharing of spectrum between new 5G (flexible use) applications and other existing services where exclusive allocations are challenging. In many such cases, sharing is being considered in terms of geographic separation, whereby geographic restrictions and separation criteria can be established to segment the geographic use of multiple services (e.g., sharing between FSS and flexible use in the 3700-4200 MHz and mmWave bands).
29. It is difficult to offer detailed assessments of the feasibility of the geographic separation of new flexible use services with the existing radiolocation allocation in the 3400-3450 MHz band, primarily because information capturing the extent of current use of the band is unavailable to the public. TELUS presumes that the lack of public information available on this subject is due to the band’s reserved status for Government of Canada operations - exclusively used by the military and managed by the Department of National Defence. It is equally difficult to discern the extent of use in the 3400-3450 MHz range by the US, where the FCC’s Table of Frequency Allocations¹⁹ indicates restricted use of the Federal radiolocation service by military services in the 3300-3500 MHz band.

¹⁷ *Consultation on Releasing Millimetre Wave Spectrum to Support 5G*, Canada Gazette SLPB-001-17, June 2017. Link: <https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf11298.html>

¹⁸ *Addendum to the Consultation on Releasing Millimetre Wave Spectrum to Support 5G*, Canada Gazette SLPB-005-18, June 2018. Link: <https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf11399.html>

¹⁹ *FCC Online Table of Frequency Allocations*, June 2018. Link: <https://transition.fcc.gov/oet/spectrum/table/fcctable.pdf>

30. In the Consultation, the Department states that “the 3400-3475 MHz portion of the band is reserved for aeronautical and maritime radars, but currently has limited use.”²⁰ The Department further indicates that that a flexible use system might encounter “intermittent interference”²¹ from radiolocation systems on LTE or 5G systems.
31. TELUS further notes that the Canadian Table of Frequency Allocations (CTFA) includes a reference to Footnote 5.433 from the ITU Radio Regulations, which issues guidance on the discontinuation of use of radiolocation in the 3500 MHz band (emphasis added):

*In Regions 2 and 3, in the band 3 400-3 600 MHz the radiolocation service is allocated on a primary basis. However, all administrations operating radiolocation systems in this band **are urged to cease operations by 1985**. Thereafter, administrations shall take all practicable steps to protect the fixed-satellite service and coordination requirements shall not be imposed on the fixed-satellite service.*

32. In light of this international guidance from the ITU, and combined with the importance of the 3500 MHz band as the critical enabling band for innovation in 5G communications networks, TELUS suggests that the Department consider discontinuing its use of the 3400-3450 MHz band for the long-term operation of Canadian radiolocation systems. Rather than looking first to sharing the 3400-3450 MHz portion of the band, TELUS encourages the Department to consider extending the changes proposed under Questions 2 and 3 of this Consultation to include the 3400-3450 MHz frequency range. Given the importance of maximising the amount of spectrum available for 5G competition, TELUS suggests that if the radiolocation service in the band indeed has “limited use”, the Department should consider this spectrum as part of its repurposing of the wider 3500 MHz band.
33. However, if the Department is committed to a near-term objective of protecting existing radiolocation services²², TELUS offers several suggestions which would support further efforts to explore spectrum sharing between radiolocation and other services in the 3400-3450 MHz band. TELUS requests that the Department publish (to the maximum extent permitted and with the removal of security-critical information) information regarding the

²⁰ Consultation, Paragraph 26.

²¹ Consultation, Paragraphs 39, 74, 75.

²² Consultation, Paragraph 39.

current and planned use of radiolocation systems in the 3400-3450 MHz band. Providing information such as average system parameters, approximate geographic locations, and typical times / durations of use would enable the Department to engage with Canadian industry to develop feasibility studies and engage in fruitful discussions regarding the possibilities of inter-service sharing in the band.

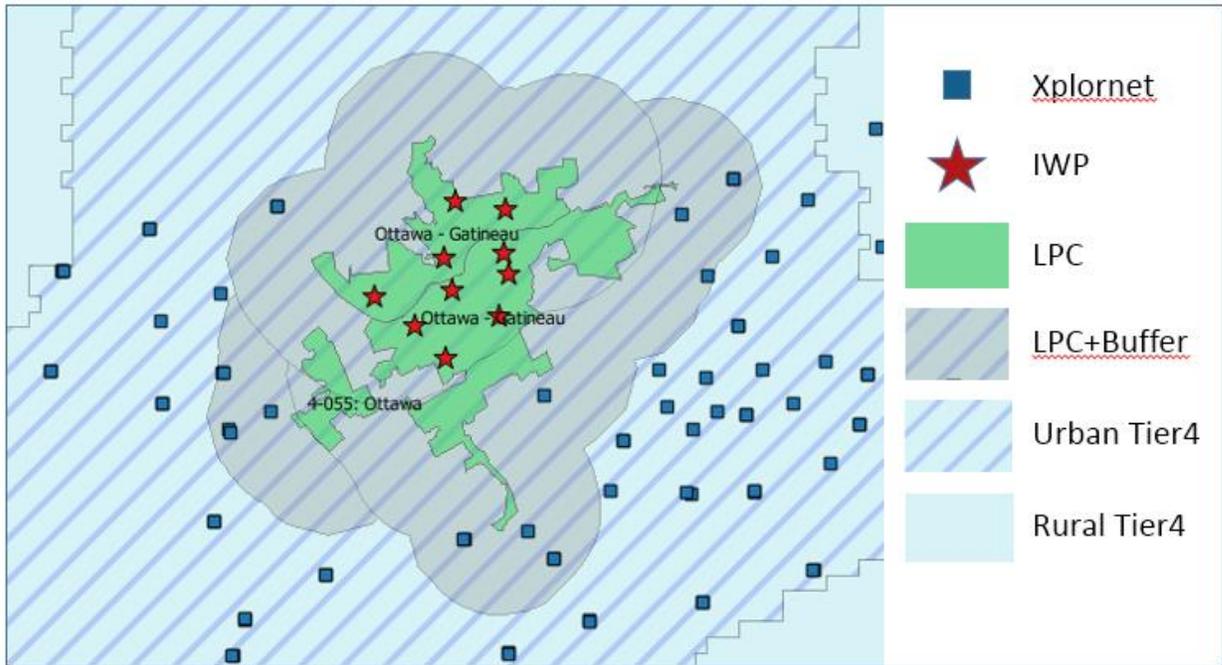
Q5/Q6: Provisions to allow Existing Licensees to Continue Services in the 3500 MHz Band

Q5 — ISED is seeking comments on the expected impacts of the following options with regards to the continuation of existing services, competition in the Canadian marketplace and availability of new 5G services for Canadians.

Continuation of Existing Services

34. About 20% of the spectrum in the 3500 MHz band (as measured in MHz-pops) is licensed by Wireless ISPs (WISPs) to deliver FWA service (i.e., wireless high speed Internet service), typically serving fringe suburban, rural and remote Canadians who generally do not have access to DSL, cable and fibre-based high speed Internet service offerings. It is worth noting that one quarter of this 20% of the band held by WISPs (or 5% of the band) remains fallow in urban areas. Despite the importance of supporting the continuation of existing services for Canadians in underserved markets, the thrust of this consultation is about ensuring that Canada's digital agenda keeps up with the rest of the world by enabling 5G mobile service in Canada as soon as possible. See Figure 1.

Figure 1: Illustration of IWP and Xplornet site locations in Ottawa Tier 4-055



35. Service continuity for WISPs is supported in the first part by recognising, as the Department has, that given the nature of the WISP operating territories, there will be no conflict with initial mobile 5G deployments. Retuning within the band and migrating to higher efficiency technology based on a conversion to a smaller flexible use assignment is on an “only as and when required” basis for WISPs. 96% of the WISP towers nationally fall outside of the proposed 6 month protection zones. Other than Xplornet²³, there are only 4 WISPs (with one tower each) that fall within the 6 month protection zones and may need to transition by 2021. Otherwise, WISPs have no fear of displacement before the 2022-23 timeframe at the very earliest based on the framework proposed by the Department. In practice, WISPs will likely have much longer before they need to retune within the band and migrate to higher efficiency technology with a smaller flexible use spectrum assignment. FWA service

²³ Xplornet has 75 towers out of an estimated 1798 WISP towers which fall within the proposed 6-month protection zones – most of which reside at the periphery of the urban core (within the 10 km buffer).

expansion is supported through spectrum purchases in rural Tier 4 licence areas in Phase 1 and subsequent auctions.

36. Fractional as opposed to full conversion to flexible use of fixed only FWA spectrum licences for actively operating WISPs is justified based on the windfall accruing to these licensees in the conversion of fixed spectrum to 5G mobile spectrum. Continuity of service can be maintained with a partial licence by exploiting the efficiency gains²⁴ available via 5G NR technology (for both fixed and mobile service) and need only be deployed post 2022-23 upon notice of future displacement. This is explicitly recognised by the Department in Paragraph 47 when it states, “The minimum amount that a current licensee could be issued in the relevant licence area would be 20 MHz. ISED considers this to be sufficient for small service providers in rural areas to maintain service offerings, recognizing that changes to the networks may be required including equipment upgrades.” TELUS concurs. The ITU-R defines minimum requirements for IMT-2020 radio interfaces²⁵, specifying average spectral efficiencies ranging from 3.3 bps/Hz for rural environments to 7.8 bps/Hz for dense urban environments. As a result, any downlink allocation above 75% will achieve the CRTC’s newly established target of 50 Mbps²⁶ over a minimum 20 MHz channel.
37. The other almost 80% of the spectrum in the band is held by the Inukshuk Wireless Partnership (IWP) and this includes 90% of the spectrum in the top 30 large population centres. While IWP has deployed towers in each of the 158 service areas it has licences for, to date, there is little to no evidence²⁷ of IWP actively marketing its FWA services in major urban centres. In TELUS’ view, this is unsurprising, as FWA is ill-suited to compete in markets where multiple high-capacity wireline broadband service offerings (i.e., DSL, cable

²⁴ Some WISP licensees of paired FWA spectrum have been utilising only one half of the pair in TDD mode anyway.

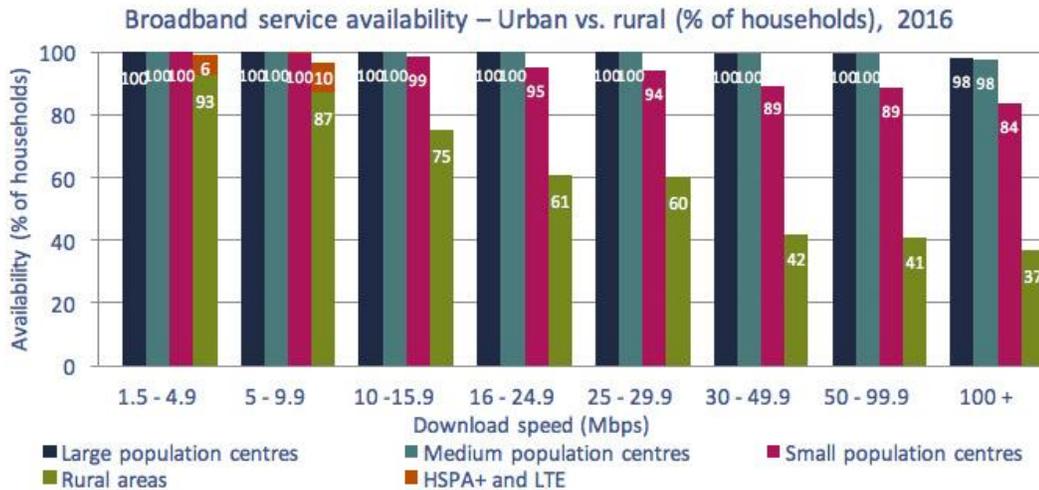
²⁵ Report ITU-R M.2410-0, *Minimum requirements related to technical performance for IMT-2020 radio interface(s)*, Table 2, published November 2017. Link: <https://www.itu.int/pub/R-REP-M.2410-2017>

²⁶ CRTC, *Closing the Broadband Gap*, Published June 2017. <https://crtc.gc.ca/eng/internet/internet.htm>

²⁷ Mirko Bibic, chief legal and regulatory officer at BCE, said the government’s proposals claw back more than in “past precedents” with other spectrum bands, adding they “risk significantly slowing down broadband deployment to communities that need it most.” **BCE recently started using the spectrum to offer fixed wireless home internet in two small Ontario towns** and says it will expand the service to more than 30 communities in Ontario and Quebec by the end of the year. The Globe and Mail, *Federal spectrum auction pits rural internet customers against 5G technology development*, published July 8, 2018. Link: <https://www.theglobeandmail.com/business/article-planned-federal-auction-of-cellular-airwaves-pits-rural-internet/>

and fibre) are available. TELUS notes that this lack of demand is corroborated by the CRTC’s most recent Communications Monitoring Report in its section on broadband service availability²⁸, illustrated in Figure 2 below:

Figure 2 : Broadband service availability (CRTC Communications Monitoring Report 2017)



38. The CRTC’s report demonstrates that since at least 2016, 100% of households in large population centres have been able to obtain broadband connectivity in excess of 50 Mbps. As such, there is no rationale in large population centres for any FWA conversion in order to support the continuation of existing services. Both Options 1 and 2 are unnecessary in large population centres from a service continuity perspective while impairing competition and the availability of new 5G services in areas that cannot be ignored – 23 of Canada’s 30 large population centres.
39. As such, in TELUS’ view, (a) both Options 1 and 2 are unnecessary in large population centres where no spectrum conversion is required because there is little to no service to continue and (b) both Options 1 and 2 adequately provide for the continuation of existing services for operating WISPs outside of large population centres. However, Option 2 causes

²⁸ CRTC, *Communications Monitoring Report 2017*, Figure 5.3.17. Link: <https://crtc.gc.ca/eng/publications/reports/PolicyMonitoring/2017/cmr2017.pdf>

serious problems for the availability of new 5G services for Canadians as described in the following section.

Competition in Canada / Availability of New 5G Services in Canada

40. This consultation is being driven by the global momentum behind the 3500 MHz band as the key global launch band for 5G. As TELUS has detailed in its submissions to the Outlook Consultation, “The potential of the 3500 MHz band is unlocked by its potential to create large contiguous channel bandwidths of 50-100 MHz and beyond, enabling new enhanced mobile broadband capabilities in its deployment for 5G.” TELUS maintains that the ideal case for 5G deployment in Phase 1 of 3500 MHz spectrum release requires at least a 50 MHz channel per mobile operator.
41. With Option 1, 50 MHz per mobile operator is only available in 8 markets covering 50% of the population. At best, 40 MHz per mobile operator (the lowest bandwidth capability supported by 3GPP for Bands n77/n78 that exceeds LTE standards) can be met in most of Canada (95% by population, with some notable exceptions like Kelowna). This is far from ideal for the most critical early 5G band and is why TELUS offers a third alternative in response to Question 6 of this consultation.
42. With Option 2, 50 MHz per mobile operator is only available in the same 8 markets as Option 1. However, in areas covering almost 16 million Canadians (or 45% of the population) including top markets like Ottawa, Edmonton, Winnipeg, Guelph/Kitchener and London, even 40 MHz per mobile operator cannot be achieved. In fact, under Option 2, 40 MHz per mobile operator is not available in 19 of the top 30 markets in Canada. This would have profound deleterious effects on the state of 5G mobile service availability and competition in Canada if the Department decided to implement Option 2. TELUS is strongly opposed to Option 2 for these important reasons.
43. TELUS further details the problems with Options 1 and 2 in its response to Question 6 where TELUS compares Options 1 and 2 to the TELUS recommended alternative.

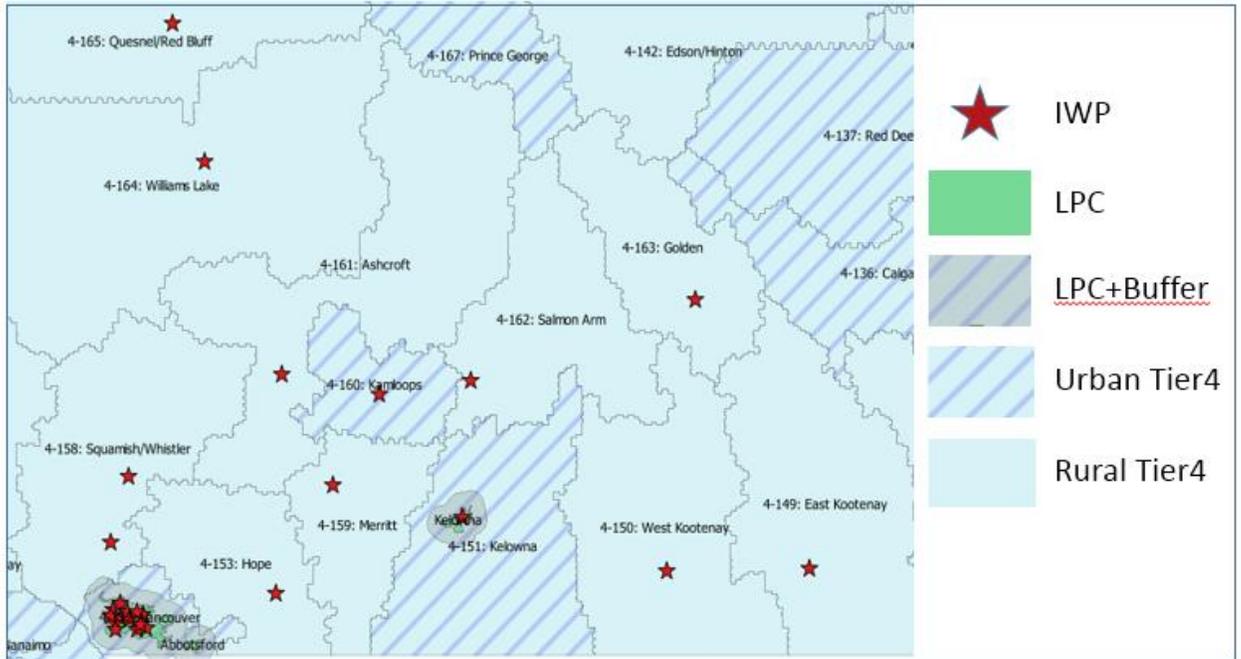
Q6 — ISED is seeking comments on alternative options for licensees to return spectrum to the Department to make available for a future licensing process. Respondents are asked to provide a rationale for any alternative proposals, including how they would meet ISED's policy objectives as stated in section 3.

44. TELUS appreciates the opportunity to provide its recommendation on the best approach to take in returning 3500 MHz band spectrum to complete the fundamental reallocation of the band to mobile service following on from TELUS' previous submissions in response to the Department's two consultations in the band between 2012 and 2014 as well as the recent Outlook Consultation.
45. In October 2012, the Department released a *Consultation on Renewal Process for 2300 MHz and 3500 MHz Licences* (DGSO-006-12)²⁹ noting that after 8 years 75%³⁰ of licences lay fallow. Incumbents were seeking a third extension of their deployment requirements. The Inukshuk Wireless Partnership stated "A decision on these matters should be issued by no later than March 2013. Otherwise, licensees will have to deploy simply in order to satisfy the current deployment requirement." Chatham Internet, an FWA auction winner and operator and also a subordinate licensee to and from IWP (acquired by Xplornet in 2015), noted, "In our tiers we were the only service provider to deploy in the first 9.5 years of the licence. Inukshuk deployed a single base station in each of the tiers. This was required in order to meet the condition of 'use it or lose it'. They only did this at the last minute and only to minimally meet the condition of the licence." See Figure 3.

²⁹ *Consultation on Renewal Process for 2300 MHz and 3500 MHz Licences*, Canada Gazette DGSO-006-12, October 2012. Link: <https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf10470.html>
Consultation on Policy Changes:

³⁰ Consultation, Paragraph 18.

Figure 3: Illustration of IWP sites locations in British Columbia



46. In November 2013 the Department released *Decisions Concerning the Renewal of 2300 MHz and 3500 MHz Licences* (DGSO-004-13) ruling that there would be no renewals³¹ upon an upcoming fundamental reallocation to mobile service and in the meantime there would be one year fixed service renewals for licensees operating fixed networks meeting their deployment requirements. In other words, based on the guidelines in the Spectrum Policy Framework for Canada³² and the Framework for Spectrum Auctions³³ in Canada, an

³¹ *Decisions Concerning the Renewal of 2300 MHz and 3500 MHz Licences*, Canada Gazette DGSO-004-13, November 2013, Para 35: “As noted in the consultation, licensees in the 3500 MHz band are hereby given advance notification that changes to the existing allocation and band plan may be considered in the next two to three years. As well, licensees are hereby given notice that, in the event of a fundamental reallocation, Industry Canada would require that spectrum be returned (i.e. not renewed).” Link: <https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf10705.html>

³² Spectrum Policy Framework for Canada, June 2007, Enabling Guidelines, Guideline h, sub-bullet 7 “Spectrum policy and management should **support the efficient functioning of markets by:** (bullet 6) **reallocating spectrum where appropriate**, while taking into account the impact on existing services.”

³³ Framework for Spectrum Auctions in Canada, March, 2011, Issue 3, Section 3.5, Licence Term: “licences will have a high expectation of renewal, unless a breach of licence condition has occurred, **a fundamental reallocation of spectrum to a new service is required** or an overriding policy need arises.”

FWA incumbent licensee's expectation of renewal (beyond annual renewals throughout a short phase out period) would be eliminated by a fundamental reallocation of the 3500 MHz band spectrum to a new service (which was confirmed in the December 2014 decision described below).

47. Building on this decision, in August 2014, the Department released the *Consultation on Policy Changes in the 3500 MHz Band (3475-3650 MHz) and a New Licensing Process in Rural Areas* (DGSO-003-14)³⁴ proposing a geographically differentiated policy for fundamentally reallocating the 3500 MHz band whereby it would (i) claw back for auction 3500 MHz spectrum in 61 urban classified Tier 4 service areas (covering 85% of the population of Canada) and (ii) in the remaining 111 predominantly rural and remote Tier 4 service areas, leave the spectrum as fixed only spectrum and as licensed.
48. Despite the merits of the proposals, which TELUS supported in principle at the time, the proposals met with stiff opposition from WISPs and their supporters because they would have resulted in the discontinuation of portions of some FWA networks operating in the rural areas and suburban fringes of a number of Tier 4 service areas classified as urban. (Essentially, the dividing line between FWA services and mid band mobile services is at the rural/suburban fringes and not at the Tier 4 service areas' boundary lines, which by design have been placed in areas of local lowest density to minimise coordination requirements). Thus, in December 2014, the Department released DGSO-007-14 ruling that there would not be a geographically differentiated policy, and that they would go back to the drawing board and devise a flexible use policy in which they would resolve to provide for continuity of fixed service as well as for band entry for mobile operations³⁵.
49. TELUS supports a uniform flexible use regime across the band and across all regions of Canada. Flexible use licensing avoids rigid boundaries between fixed and mobile services. Such flexibility is an important feature of long-term spectrum policy for the 3500 MHz

³⁴ *Consultation on Policy Changes in the 3500 MHz Band (3475-3650 MHz) and a New Licensing Process in Rural Areas*, Canada Gazette DGSO-003-14, August 2014. Link: <https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf10841.html>

³⁵ *Decisions Regarding Policy Changes in the 3500 MHz Band (3475–3650 MHz) and a New Licensing Process*, Canada Gazette DGSO-007-14, December 2014. Link: <https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf10914.html>

band, given that the economics which determine the service boundaries between mobile and fixed access are always changing. By supporting flexibility in licensing, the Department will better facilitate innovative and dynamic market-driven developments amongst competitors. As such, leaving the 3500 MHz band licences in 111 “rural” Tier 4 markets as fixed-service only would have been short-sighted.

50. In this consultation, the Department is proposing a more sophisticated take on a geographically differentiated policy by defining transition protection timelines that are, in general, inversely correlated to population density. In so doing, the Department has combined Statistics Canada’s definition of a large population centre³⁶ with the concept of a 10 km buffer to define what TELUS would describe as new boundaries for “5G initial deployment zones”.
51. With the Department’s proposed transition framework in mind, TELUS recommends Option 3 for the return of spectrum as follows: For each licence area, existing licensees would be issued flexible use licences for one third of their current spectrum holdings rounded to the nearest 10 MHz, with a minimum of 20 MHz, except in a subdivision of 24 of the Tier 4 licences (containing the 30 largest population centres and the 10 km buffer zone around them) where licensees would be required to return all 3500 MHz spectrum.
52. TELUS’ Option 3 essentially follows the Department’s proposed Option 1 while recalling all spectrum within the 5G initial deployment zones. Implementing this option would provide for the continuity of service of all active FWA operators and provide 200 MHz for 5G mobile service in all of Canada’s top markets, thereby ensuring robust competition and new 5G service availability in this first phase release of 3500 MHz flexible use spectrum.
53. As described above in Paragraphs 34, 37 and 38, there is essentially no demand for FWA service provision in the 5G initial deployment zones. As such, there is no need for a conversion for the sake of service continuity – especially when such a conversion will result in diminished competition for 5G mobile service provision in at least 19 of the top 30 new

³⁶ Statistics Canada, *Population and Dwelling Count Highlight Tables, 2016 Census*. Link: <http://www12.statcan.gc.ca/census-recensement/2016/dp-pd/hlt-fst/pd-pl/Table.cfm?Lang=Eng&T=801&S=47&O=A>

5G initial deployment zones (or much worse with Option 2). TELUS' recommendation (Option 3) solves these problems in the top 30 markets.

54. Option 3 respects the objections from WISPs to the Department's proposals of 2014 when the WISPs highlighted their deployments in the rural and suburban parts of urban classified service areas.
55. TELUS estimates that 322M MHz-pops or approximately 25% of all WISP 3500 MHz band spectrum licensed falls within the 30 large population centres where FWA does not compete. Even partial retention of this spectrum would create an "undersupply" of 5G spectrum in Canada's top 30 large population centres that would serve no purpose for FWA providers, while compromising Canada's 5G future. TELUS' Option 3 affects only 4 WISP licensees with impacts ranging from 16-28% (impacting the amount of retained spectrum but not FWA service provision) compared to the Department's Option 1, and results in an incremental clawback of 137 million MHz-pops limited to the 5G initial deployment zones. TELUS' Option 3 still provides WISPs with almost 400 million MHz-pops of highly valuable 5G spectrum.
56. In response to Question 5 above, TELUS describes how the ideal scenario for the Phase 1 release of 3500 MHz spectrum is to ensure 50 MHz per mobile operator. TELUS further illustrates that neither of the Department's proposed options is able to deliver this outcome in a majority of the large population centres – even Option 1 does not enable 4x50 MHz in 19 of the top 30 large population centres.
57. TELUS further notes that its Option 3 proposal could be used to address mobile industry concerns regarding the time still required to get to issuance of flexible use licences. Option 3 could be used to accelerate the launch of 3500 MHz 5G networks by eliminating the 6 month transition protection component for 5G initial deployment zones appearing in the Department's proposed transition policy. With a known 100% clawback in the 5G initial deployment zones, the Department could dictate that all FWA licensees have turned down any operations in the 5G initial deployment zones by the start (or end) of the auction. TELUS highlights that this straightforward policy would yield the benefit of accelerated

timelines with little to no impact to Canadians' choice of broadband connectivity in large population centres.

58. TELUS' proposed Option 3 delivers the outcome that the Department was trying to create with its 2014 geographically differentiated policy proposal. Phase 1, in conjunction with the proposed transition policy, allows FWA providers to continue their provision of service in their existing footprints and frequency assignments likely until a Phase 2 auction. At the same time, all mobile service providers have the opportunity to acquire enough spectrum to deliver true 5G speeds in the 5G initial deployment zones. A Phase 2 expansion of the band should in TELUS' view follow quickly and achieve 400+ MHz for the mobile industry. WISPs are able to expand capacity in both the Phase 1 and 2 auctions.
59. TELUS' Option 3 heavily impacts the Inukshuk Wireless Partnership, but in this regard it must be said that IWP bought this spectrum for almost nothing³⁷ for a different purpose (FWA) with little to no evidence of market activity in large population centres (as has been detailed above). TELUS' Option 3 still provides IWP with a windfall of more than 450 million MHz-pops of 5G TDD spectrum. It is worth noting that IWP received a mobile windfall³⁸ in the 2500 MHz band of over 3 billion MHz-pops including being grandfathered above the spectrum aggregation limit with TDD spectrum which is well suited for 5G deployment. TELUS' Option 3 results in the more efficient allocation of 5G spectrum and increased general revenue from the auction as opposed to the continued subsidisation of the country's two largest telecom and media conglomerates.
60. TELUS notes that its Option 3 would have a minimal impact on auction complexity because the number of products required for a 3500 MHz auction would simply be expanded by no more than 24 additional products for an auction that already has 172 service areas. TELUS has mapped the 30 5G initial deployment zones and found that the 4 large urban population centres (LPCs) in Toronto (when the 10 km buffer zones are accounted for) create one

³⁷ In the primary 3500 MHz Fixed Wireless Access spectrum auction in February 2004, bidders acquired, largely uncontested, 3.6 billion MHz-pops of FWA spectrum for \$10.7M or \$0.003 per MHz-pop (less than a third of a cent per MHz-pop).

³⁸ Despite a 40 MHz BRS aggregation limit, Bell and Rogers were grandfathered over the cap at 65 MHz of BRS during conversion in all of Canada's top markets. Bell and Rogers each received a mobile conversion windfall of average of 49 MHz of BRS spectrum nationally.

contiguous LPC conglomerate region. The same applies to the 2 LPCs in Vancouver, the 2 LPCs in Ottawa and the 2 LPCs in Guelph/Kitchener. Thus 10 of the top 30 LPCs boil down to 4 “Multi-LPCs” and ISED would need 24 new auction products as subdivisions of the 24 affected Tier 4 service areas.

61. The single policy objective in the Spectrum Policy Framework for Canada is to maximise the economic and social benefits that Canadians derive from the use of the radio frequency spectrum resource. TELUS’ Option 3 satisfies that objective better than either Option 1 or 2.
62. The Enabling Guidelines in the Spectrum Policy Framework for Canada state that spectrum management practices should be responsive to changing technology and market place demands; that spectrum policy and management should support the efficient functioning of markets by making spectrum available for use in a timely fashion and reallocating spectrum where appropriate, while taking into account the impact on existing services. TELUS’ Option 3 provides for the efficient functioning of Canada’s top 30 markets at 5G launch and neither Option 1 nor 2 does so.
63. Furthermore, this proposal directly aligns with and supports the Government of Canada’s Innovation Agenda, in that it best positions Canadians to be competitive on the global stage through maximizing the benefits of the early adoption of cutting edge technologies. Specifically, 5G will enable key applications within the Innovation Agenda like artificial intelligence and smart energy development which will further position Canada as a global innovation hub, create jobs, and lay the groundwork for the next wave of emerging technologies. TELUS’ proposed Option 3 will best position Canada to exceed our innovation ambitions, both in terms of accelerating the launch of 5G and maximising competition.
64. Table 1 below shows the quantity of 3500 MHz band spectrum (measured in millions of MHz-pops) retained through licence conversion as proposed in TELUS’ proposed alternative Option 3 compared to the Department’s Options 1. The “Option 1 - Option 3” column illustrates the clawback (incremental to Option 1) of essentially fallow spectrum within the 5G initial deployment zones, as proposed in TELUS’ Option 3. TELUS notes

that the impact of TELUS' Option 3 is limited to mobile carriers and 4 WISPs and only affects a single tower for 3 of the 4 WISPs.

Table 1: Spectrum Quantity in MHz-pops (000's) for TELUS' Option 3 in comparison to ISED's Option 1

	Pre-auction	Option 1	TELUS Option 3	Option 1 - Option 3	% of Option 1
Inukshuk WP	4,601,714	1,569,079	453,272	1,115,808	29%
TELUS	66,293	26,517	4,896	21,621	18%
Xplornet	1,120,760	453,810	325,979	127,831	72%
ABC	36,944	15,307	11,973	3,334	78%
BaseTech	1,859	1,487	1,487	-	100%
BroadPoint	6,990	3,609	3,609	-	100%
CCI	4,824	2,305	2,305	-	100%
Comcentric Net	16,071	6,428	6,428	-	100%
Ice Wireless	899	720	720	-	100%
I.D.Logique	1,143	915	915	-	100%
iTeract	42,151	18,369	15,422	2,946	84%
Kativik RG	2,287	915	915	-	100%
Sogetel	16,980	10,567	8,072	2,495	76%
SSI Micro	1,799	720	720	-	100%
TBayTel	10,541	4,216	4,216	-	100%
Tele Amos	627	502	502	-	100%
Vianet	1,005	402	402	-	100%
WireIE	738	590	590	-	100%
Total MHz-pops (K)	5,933,624	2,116,458	842,422	1,274,036	
Conversion %	100%	36%	14%		

Q7/Q8: Changes to the 3500 MHz Band Plan and Interference Mitigation

Q7 — ISED is seeking comments on a revised band plan using unpaired blocks of 10 MHz in the frequency range of 3450–3650 MHz.

65. TELUS supports the band plan as proposed in the Consultation, using unpaired blocks of 10 MHz in the frequency range of 3450-3650 MHz.
66. First and foremost, there is no doubt that the technology used in the band will be TDD to best support the anticipated 5G ecosystem and its beamforming advances. An unpaired band plan is paramount.

67. Secondly as the Department notes, the band plan provides channel spacing sizes supported by both LTE and 5G NR³⁹.
68. Assuming the Department continues its approach of guaranteeing the contiguity of licensees' spectrum, TELUS believes that the use of 10 MHz blocks provides suitable flexibility for prospective licensees to acquire spectrum according to their business cases (which may vary on a regional basis), thereby leading to an efficient allocation of spectrum in the 3500 MHz band.

Q8— ISED is seeking comments on whether any additional measures should be taken to limit potential interference issues with the proposed TDD band plan.

69. TELUS does not support the introduction of any additional regulatory measures to limit potential interference issues with the proposed TDD band plan at this time.
70. While TELUS acknowledges that TDD coexistence between licensees using adjacent frequencies can be challenging, TELUS also notes that the challenge of managing the coexistence of adjacent TDD licensees is a challenge being considered globally.⁴⁰
71. As noted in the Consultation, TDD coexistence can be managed in different ways. Interference can be mitigated through time-domain synchronisation (i.e., agreeing on a common uplink/downlink ratio and using GPS or other timing mechanisms to align the start time of base stations and user equipment transmissions). Interference can be mitigated by creating sufficient separation between licensees such that the rolloff in adjacent channel emissions will be sufficient to isolate one operator's uplink from their frequency-adjacent neighbour's downlink. Interference can be mitigated through the imposition of stricter emissions masks for unsynchronised systems.

³⁹ LTE supports 5/10/15/20 MHz channel bandwidths; NR in Band n77/n78 supports 10/15/20/40/50/60/80/100 MHz channel bandwidths.

⁴⁰ Draft ECC Report 281, *Analysis of the suitability of the regulatory technical conditions for 5G MFCN operation in the 3400-3800 MHz band*. Link: https://www.cept.org/files/9522/Draft%20ECC%20Report%20281%20PF_1.docx

72. In general, TELUS is opposed to introducing any regulatory measures to address technical challenges which could otherwise be solved through mutual coordination. Regulatory intervention should only be required where irresolvable conflicts arise.
73. If the Department was considering the introduction of regulatory measures to mitigate the risk of interference between frequency-adjacent TDD licensees, TELUS suggests that the only appropriate mechanism to consider at this point in time would be whether or not to implement guard bands within the 3500 MHz band. The question of introducing rules relating to synchronisation or power emissions limits would appear to be better suited for a technical framework consultation (which TELUS presumes will accompany or follow shortly after the issuance of a decision on this transition consultation).
74. TELUS does not believe that imposing guard bands would be appropriate for the 3500 MHz band. The mandatory application of guard bands in this crucial band for the launch of 5G service in Canada would represent an inefficient use of the precious spectrum resource. As TELUS details in its analysis of clawback options in response to Questions 5 and 6 above, creating sufficient 5G mobile competition under the options proposed by the Department would be challenging in many key markets. Adding guard bands to force the separation of adjacent channel licensees would be wasteful of spectrum and limit the potential service offering that each operator could provide to its customers. Conversely, frequency-adjacent licensees have a natural incentive to cooperate and synchronise, thereby maximising the use of their spectrum and their competitive service offerings. Furthermore, if (for whatever reason) operators find themselves unable to mutually solve the challenges of synchronisation, they could always elect to make use of guard bands within their own allocations without forcing that inefficiency on all licensees in the band.
75. Finally, while TELUS has addressed potential issues involving the coordination and coexistence of frequency adjacent TDD licensees in this question, the issue of coordination and coexistence of geographically adjacent TDD licensees must also be considered. TELUS addresses some of the considerations for the impact of geographic adjacency with regards to the transition process in its response to Questions 11 and 12 below, and expects that a more comprehensive treatment of defining technical rules for coordination and coexistence

with geographically adjacent (co-channel) licensees will be addressed within the upcoming technical, policy and licensing framework consultation.

Q9: Timing for the Introduction of Mobile Services in the 3500 MHz Band

Q9— ISED is seeking comments on the proposal to align the timing of the issuance of flexible use licences to incumbents with the issuance of licences to those who acquire 3500 MHz flexible use licences in a future licensing process.

76. TELUS considers it critical from an industry competition standpoint to align the timing of the issuance of flexible use licences to incumbents with the issuance of licences to those who acquire 3500 MHz flexible use in a future licensing process as proposed by the Department.
77. TELUS notes that incumbent FWA licensees are authorised to deploy the latest technologies to deliver fixed services over their current licences at any time (e.g., they are authorised to deploy 5G based fixed-broadband Internet access solutions as soon as equipment is available under the terms of their current licences).
78. The Department has completed the CTFA work to fundamentally reallocate the band 3475-3650 MHz to allocate the mobile service and make it co-primary with the fixed service, and now proposes to do the same for 3450-3475 MHz.
79. The final decision on the conversion of FWA licences will result in a plan to issue flexible use (i.e., mobile) licences to incumbent FWA licensees who apply⁴¹ to transition. Any such conversions would be a mobile spectrum windfall. The advantage of a mobile windfall should not be compounded with a head start advantage. As the Department notes in Paragraph 56 of the consultation, “If ISED were to issue flexible use licences to incumbents in advance of a future licensing process, incumbents would have a significant competitive advantage as they would have the opportunity to deploy mobile services sooner than their future competitors in the 3500 MHz band.” TELUS agrees with the Department that in order

⁴¹ Consultation, Paragraph 44.

to support sustained competition, the issuance of all flexible use licences, to both incumbents and new licensees of the 3500 MHz band, must take place simultaneously at the end of the 3500 MHz band auction.

Q10: Future Licensing Process in the 3500 MHz Band

Q10— ISED is seeking preliminary comments on the importance of price discovery in a licensing process for flexible use licences in the 3500 MHz band.

80. TELUS believes that price discovery in a licensing process for flexible use licences in the 3500 MHz band is of paramount importance.
81. TELUS agrees with the Department’s statement in Paragraph 59 of the Consultation that “demand is expected to exceed supply” and supports the use of an auction for 3500 MHz spectrum, which the Department states as a likely mechanism for the licensing process.
82. The Department has typically only used sealed bid auctions (i.e., no price discovery) in minor auctions where there is limited interest in or limited ability⁴² to bid on the spectrum such as the recent (2018) residual auction for licences in the 700 MHz, 2500 MHz, 2300 MHz, PCS and 1670-1675 MHz bands, and for the 700 MHz and AWS-3 residual auction in late 2015 as well the air to ground auction in 2009.
83. The Department has only ever excluded price discovery in a major auction once and that was the AWS-3 auction in early 2015.
84. In response to the 2018 residual auction licensing framework consultation, TELUS submitted that “the sealed bid auction format is appropriate and efficient for the auction of residual 700 MHz, PCS-G and I Block spectrum (should it be included) due to the limited forecasted competition for these blocks.”⁴³ TELUS opposed the use of the sealed bid auction format for the 2500 MHz band licences, along with its recommendation to remove

⁴² e.g., Where bidders had no remaining room under in-force aggregation limits.

⁴³ TELUS comments for *Consultation on a Licensing Framework for Residual Spectrum Licences in the 700 MHz, 2500 MHz, 2300 MHz, PCS and 1670-1675 MHz Bands*, August 15, 2017. Link: [https://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/SLPB-003-17_comments_telus.pdf/\\$FILE/SLPB-003-17_comments_telus.pdf](https://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/SLPB-003-17_comments_telus.pdf/$FILE/SLPB-003-17_comments_telus.pdf)

the aggregation limit, on the premise that an open auction of 2500 MHz spectrum would be competitive and require price discovery. Given that the Department did not eliminate the aggregation limit in force, and that there was presumably limited contention for the remaining spectrum being auctioned, TELUS maintains that the sealed-bid format was appropriate for the auction of residual licences.

85. In contrast, TELUS was strongly opposed to the use of a sealed-bid format for the AWS-3 auctions of unrestricted (open) spectrum⁴⁴. In response to the AWS-3 licensing framework consultation, TELUS submitted, “With respect to the auction of unrestricted AWS-3 spectrum, TELUS finds the proposed sealed bid format untenable. A sealed bid auction would be very problematic for national LWSPs. Without the benefit of price discovery, the knock out risk and exposure risk in such a format would be unworkably inefficient with three to four strong players in each market”.⁴⁵ The Department, however, determined that the relative simplicity of AWS-3 licensing (with a single set-aside block and two open blocks licensed in Tier 2 areas) combined with its desire to release the spectrum expeditiously (for the sake of the “operating entrants”) justified the use of a “sealed-bid format [as] the most appropriate auction format” for both open and set-aside spectrum. The Department did not seem to account for the strong demand that would exist for the open spectrum, and in TELUS’ view, as it had forecasted during the consultation process, the sealed bid process for the open AWS-3 spectrum was completely unfit for purpose. The auction of open AWS-3 spectrum should have included price discovery.
86. The 3500 MHz licensing process will be unlike the AWS-3 auction in almost every way. The 3500 MHz auction will presumably span (at least) 172 or more licence areas with a variable amount of spectrum available in each licence area. The 3500 MHz auction will be

⁴⁴ TELUS did accept that a sealed-bid format was reasonable and appropriate for the auction of restricted (set-aside) AWS-3 spectrum, given the Department’s decision to limit bidding on that spectrum to so-called “operating new entrants” (meaning that there was generally only a single bidder per service area; i.e., little to no competition). TELUS acknowledged that a sealed-bid auction would achieve the Department’s objectives of getting the spectrum into the hands of the desired licensees with minimum delay, and with virtually no exposure risk, knockout risk, or price discovery issues.

⁴⁵ TELUS reply comments for *Consultation on the Technical, Policy and Licensing Framework for Advanced Wireless Services in the Bands 1755-1780 MHz and 2155-2180 MHz (AWS-3)*, October 2, 2014. Link: [https://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/SLPB-004-14-TELUS-Comments.PDF/\\$FILE/SLPB-004-14-TELUS-Comments.PDF](https://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/SLPB-004-14-TELUS-Comments.PDF/$FILE/SLPB-004-14-TELUS-Comments.PDF)

the first auction of large contiguous allocations of mid-band 5G TDD spectrum. Price discovery for this process is absolutely critical.

87. TELUS strongly opposes the use of a sealed bid auction format for 3500 MHz spectrum. A sealed bid auction of individual blocks (i.e., without package bidding) would create unmanageable geographic exposure risks for bidders bidding on the 172+ Tier 4 licences. That is, bidders could end up with critical geographic holes in their spectrum coverage, with the potential consequence of diminished competition in the provision of 5G service across some regions of Canada.
88. A sealed bid auction could include package bidding of varying sorts to resolve geographic exposure issues. The type of package bidding (i.e., block combination bidding confined within each service area) that was included in the 2015 AWS-3 auctions would not address geographic exposure risk. So again, bidders could end up with critical geographic holes in their spectrum coverage, potentially leading to one or more national wireless service providers being unable to provide consistent 5G service offerings to consumers across all Canadian markets.
89. TELUS surmises that it would be feasible to support package bidding and multiple bids via one sealed entry (akin to supplementary round bidding in a CCA, whereby bidders submit a set of all-or-nothing, mutually exclusive package bids), but this would leave bidders hoping and praying for an outcome rather than controlling their destiny. There is no guarantee that one bidder's (limited) set of solutions would neatly fit with all others; this would likely yield an inefficient allocation. There could be an abundance of blocks retained by the Department in such an auction. Importantly, this approach assumes that bidders are comfortable developing precise views of the maximum absolute and relative value of hundreds of potential winning packages in the absence of any industry feedback on the demand for the spectrum. Bidders are unable to test the market demand for blocks in any given region while making run time trade-offs required to ensure an efficient spectrum allocation. TELUS would strongly oppose such a short-sighted process, especially merely for the sake of saving some time.

90. With respect to timing, TELUS notes that the mobile industry is unanimously calling for the reallocation and licensing of 3500 MHz band flexible use spectrum as soon as possible. Given that the Department has taken from 2014 to 2018 to reinitiate progress on the 3500 MHz band file, TELUS strongly recommends that the Department take thoughtful but decisive action in sustaining the progress made with the release of this Consultation. TELUS notes that the Department has contracted (as of September 2017)⁴⁶, the services of Power Auctions for the design, implementation, testing and operation of the 3500 MHz spectrum auction. Given the Department's forecast of licensing 3500 MHz flexible use spectrum before the end of 2020, Power Auctions appears to have enough time to customise their platform for a Canadian 3500 MHz auction that includes price discovery. They can presumably ramp up their resourcing as required; indeed, if such a decision were made at this early stage, TELUS is fairly certain that a vendor as capable as Power Auctions could deliver a solution before the end of 2019 to support an accelerated timeline for the 3500 MHz auction.
91. Finally, if the Department, in order to enable the deployment of 5G for the benefit of Canadians in a timely manner, needs to compensate for software development delays associated with providing price discovery in an upcoming 3500 MHz auction, TELUS would reiterate the benefit of its proposed Option 3 for the return of spectrum which could be used to accelerate the schedule by 6 months.

⁴⁶ *Provision of Spectrum Auction Services for the 3500 MHz Auction*, published September 12, 2017. Link: <https://buyandsell.gc.ca/procurement-data/award-notice/PW-17-00769577-001>

Q11/Q12: Transition Plan for Incumbents of the 3500 MHz Band

Q11 — ISED is seeking comments on the proposed protection and notification provisions for incumbent licensees as outlined below.

Protection period:

For Tier 4 service areas that include a population centre of 30,000 people or more:

- a minimum protection period of 6 months for sites within large urban population centres and the 10 km buffer zone surrounding those centres
- a minimum protection period of 2 years for all other sites

For all Tier 4 service areas that include a population centre of less than 30,000 people, a minimum protection period of 3 years

Notification Period:

- a minimum notification period of 6 months in large urban population centres and in the 10 km buffer zone surrounding those centres
- a minimum notification period of 1 year in all other areas

Q12 — ISED is seeking comments on alternative transition plans, or variations to the times proposed. Respondents are asked to provide a rationale for any alternative proposals.

92. TELUS recognises the challenge that the Department faces in creating a transition plan which accomplishes its stated objective of balancing the needs of new flexible use licensees wishing to deploy 5G mobile services with those of existing fixed service broadband providers who wish to continue to offer fixed services to their customers.
93. TELUS agrees with the Department’s stated “where and when necessary” displacement principle, and agrees that many of the current fixed-only licensees could potentially continue ongoing operation of their systems beyond the proposed minimum notification and displacement timelines.
94. TELUS generally concurs with the Department’s proposed timelines for protection and notification but offers some suggestions for clarifications of the transition policy in and around large urban population centres in order to address some potential negative consequences of the proposed framework.

Urban areas (i.e., Tier 4 service areas containing a population centre of 30,000 or more people)

95. TELUS recommends that licensees be able to deploy 5G services on any flexible use licences that they might acquire within the 30 large urban population centres (containing a population of 100,000 people or more) immediately following the issuance of auctioned and converted licences. TELUS notes with its proposed Option 3 spectrum return plan, the 6 month joint protection/notification period for large urban population centres and the surrounding 10 km buffer could be eliminated. If the Department chooses to implement Option 1 instead, TELUS would accept the proposed 6 month joint protection/notification period for large urban population centres and the surrounding 10 km buffer, recognising that this would only involve at most 79 WISP towers.
96. TELUS would ideally begin to bring 5G service to the periphery of large population centres and to the centre of “medium sized” population centres (i.e., containing more than 30,000 but less than 100,000 people and where there is likely little or no FWA deployment) before the 2-year mark. However, TELUS accepts the Department’s proposed 2-year protection requirement (with 1-year minimum notification period for displacement) but would strongly oppose a protection period of longer than 2 years in these markets.

Rural areas (i.e., Tier 4 service areas containing only population centres of less than 30,000 people)

97. Finally, TELUS notes that while 5G deployment in the early years is unlikely to make its way to rural and remote markets, some of the 111 “rural” Tier 4 service areas containing population centres of less than 30,000 people may contain small pockets in which 5G deployment will be practical. TELUS supports the Department’s proposed 3-year minimum protection requirement (with 1-year minimum notification period for displacement) for truly rural markets.

Proposed clarifications of the transition plan

Completion of transition must precede deployment of mobile service

98. TELUS is concerned with one aspect of the proposed transition policy in light of the issue of synchronising timing for the issuance of converted and auctioned flexible use licences as described in Question 9 of the Consultation. TELUS understands that the proposed license

issuance mechanism is intended to address the concern expressed by the Department in Question 9 – that incumbents could hold a significant competitive advantage if they are able to deploy 5G mobile services before new licensees of the 3500 MHz band. However, TELUS sees a potential risk in the proposed transition plan as possibly permitting such an advantage.

99. Paragraph 44 of the Consultation states that “to be licensed for flexible use, incumbent licensees in this band will be required to apply to ISED for a new flexible use spectrum licence. At that time, ISED will issue a new flexible use spectrum licence and will cancel the fixed use spectrum licences.” The converse to this is stated in Paragraph 58: “Where incumbent licensees do not intend to provide mobile services, they could continue to be issued annual fixed use licences until they are required to transition as per the transition plan.”
100. TELUS seeks to confirm its interpretation that the cancellation of fixed use spectrum licences specified in Paragraph 44 of the Consultation would apply to **all** fixed use licences within a given licence region where a licensee has applied for a new flexible use spectrum licence (whether it is obtained through the conversion of its old fixed use licences or through a competitive auction process). TELUS’ concern is that an incumbent licensee may wish to continue operating its legacy fixed service on its existing “protected” frequency assignments (which were assigned under the old band plan and are potentially the frequency assignments of a new flexible use licensee under the new band plan) while beginning the deployment of 5G mobile services in its new flexible use licenses, thereby gaining a competitive advantage by blocking its competitors from deploying 5G mobile (flexible use) services during the transition period while deploying its own 5G mobile (flexible use) services.
101. To ensure there is no ambiguity on this issue, TELUS proposes the following clarifying statements to be included explicitly in the transition plan framework:

***Clarification 1:** The transition plan will only offer protection to fixed service licensees who have not been issued a flexible use spectrum licence within the same licence region. Conversely, all operations under a licensee’s existing fixed use spectrum licence within a*

given area must be terminated and the licences cancelled before any flexible use spectrum licences are issued within the same licence region.

Fixed use spectrum licensees beyond the large urban population centre buffer zone must protect flexible use deployments within

102. TELUS notes that the Department's proposed transition policy defines requirements for the protection from transition for incumbent fixed use spectrum licensees (and associated notification periods for their displacement), but fails to introduce any limitations on their operations to prevent them from constraining the ability for new flexible use spectrum licensees to deploy 5G mobile services.
103. TELUS' specific concern is with regards to the ongoing operation of fixed service licensees whose sites are located adjacent to but outside of the buffer zone for a large urban population centre. When flexible use licensees begin the provision of 5G mobile service within the urban core (i.e., the large population centre and its surrounding 10 km buffer), they will presumably need to ensure the protection of such fixed service operations so that they do not suffer interference during the 2-year protection timeline. Such protection could be addressed through the appropriate selection of site parameters (including location, height, azimuth, elevation angle, and transmitted power levels) or through coordination and synchronisation – the same mechanisms for the mitigation of potential adjacent channel interference that are described by TELUS in response to Question 8 above. However, no such obligation to coordinate or modify sites is proposed by the Department for fixed-service licensees sustaining their operations for some prescribed period or an indefinite period of time as the case may be. TELUS proposes that any fixed service licensee located beyond the 10 km buffer zone of a large urban population centre (i.e., with a 2 year protection window) whose continued operations are found to constrain the ability for a flexible use licensee to deploy service within the 5G initial deployment zones 6 months after the issuance of its licences must be required participate in mutual coordination to ensure the protection of flexible use deployments within the large urban population centre.

Q13: Technical and Cross-Border Considerations for the 3500 MHz Band

Q13 — ISED is seeking comments on whether the fixed and mobile equipment for LTE and 5G technologies will be able to operate with intermittent interference from radars, including cross-border interference, within the 3450–3650 MHz band and in adjacent bands.

104. TELUS generally agrees with the Department’s view that “new flexible use systems will be able to tolerate intermittent interference generated by the emissions of maritime and aeronautical radars.”⁴⁷
105. TELUS has not experienced interference from radar systems in the operation of its own LTE networks but notes several studies⁴⁸⁴⁹ that demonstrate a range of outcomes supporting the coexistence of radar and LTE systems under various simulated and experimental configurations. These studies characterise the impact to the uplink of an LTE system by measuring (or predicting) the throughput degradation which is incurred under interference originating from a pulsed radar system.
106. Given that the results of these studies seem to suggest that occasional interference from a co-channel or adjacent channel radar system operating near a flexible use base station may cause some performance degradation (but not complete loss of the radio link), TELUS suggests that coexistence could be feasible. However, TELUS recommends that the Department continue to implement mechanisms that “minimize mutual interference between radiolocation systems in Canada and the United States”⁵⁰ with flexible use systems (rather than with fixed wireless access systems, as exists today). TELUS further recommends that domestic policy and a cross-border arrangement with the U.S. be established to limit the use of co-channel or adjacent channel radar systems to operate only for occasional use (e.g., in cases of national security, as described⁵¹ in SRSP-303.4).

⁴⁷ Consultation, Paragraph 75.

⁴⁸ M. Gorbanzadeh *et al.*, “Radar interference into LTE base stations in the 3.5 GHz band,” in *Physical Communication*, vol. 20, issue C, pp. 33-47, Sep. 2016.

⁴⁹ J. H. Reed *et al.*, “On the Co-Existence of TD-LTE and Radar Over 3.5 GHz Band: An Experimental Study,” in *IEEE Wireless Communications Letters*, vol. 5, no. 4, pp. 368-371, Aug. 2016.

⁵⁰ Consultation, Paragraph 76.

⁵¹ SRSP-303.4, *Technical Requirements for Fixed Wireless Access Systems Operating in the Band 3475-3650 MHz*, December 2008, Section 2.8.1. Link: <https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf02063.html>

The 3800 MHz Band (3650-4200 MHz)

Q14: Future Changes to the 3650-3700 MHz Band

Q14 — ISED is seeking preliminary comments on how to optimize the use of the 3650–3700 MHz band, including the potential use of a database access model.

107. TELUS, in response to prior consultations⁵², has noted that there are significant challenges associated with creating a uniquely Canadian ecosystem which integrates a database access model into the operation of a radio access network within the 3500 MHz or 3800 MHz band.
108. TELUS has further noted that due to the unique requirements defined by the U.S. market (i.e., the creation of a three-tiered CBRS band), a regional Band 48 ecosystem for LTE equipment is emerging. However, TELUS is not aware of any developments extending this ecosystem to support 5G NR. More importantly, TELUS believes that there is a low likelihood of other global jurisdictions developing database access systems which would integrate with 3GPP Band n77 or n78 radio networks.
109. In response to the Outlook Consultation, TELUS proposes a multi-phased expansion of the 3500 MHz band, with the goal of making available 400+ MHz of contiguous spectrum to provide four operators with 100 MHz of contiguous spectrum each to support 5G competition. The continued operation of WBS systems specifically within the 3650-3700 MHz band would pose a significant challenge to achieving this goal.
110. Therefore, TELUS suggests that the Department consider several alternatives (beyond the use of database access models) to maximise the available spectrum in the 3500 and 3800 MHz bands to support sustainable 5G competition across all Canadian markets:
 - a. Displacement of WBS systems from core urban areas. Just as the transition proposed by the Department for the 3500 MHz band recognises the relative importance of enabling 5G deployment in different regions through its differentiated protection and notification timelines, TELUS suggests that the 3650-3700 MHz band would best serve the interest of urban Canadians if it were not

⁵² E.g., the Outlook Consultation, the mmWave Consultations and its addendum Consultation.

being used to support legacy point-to-multipoint systems that maintain a blocking position for the contiguous expansion of the 3500 MHz band. TELUS proposes that at the very least, WBS spectrum must be repurposed for exclusive flexible use licensing within urban areas, accommodating for a reasonable transition of the systems currently operating within it to another band.

- b. Relocation of WBS systems to another band. TELUS notes that as part of its release of 3575-3700 MHz spectrum⁵³, Australia’s regulator (ACMA) has proposed to relocate point-to-multipoint incumbent systems to the 5.6 GHz band, recently closing its consultation⁵⁴ on a framework to define apparatus-based licensing in the band in coexistence with meteorological (weather) radar systems. TELUS suggests that the Department give consideration to alternate bands into which it can relocate WBS systems, providing continued opportunistic use spectrum as an alternative to competing at auction for exclusively licensed flexible use spectrum.
111. TELUS notes that under either proposal, as with the Department’s proposals for the 3500 MHz band in this Consultation, a longer transition could be supported to sustain WBS operations within truly rural and remote communities which benefit from the provision of wireless broadband Internet access by small WISPs.

Q15: Importance of the 3700-4200 MHz band to Future FSS Operations

Q15 — ISED is seeking comments on the importance of the 3700–4200 MHz band to future FSS operations.

112. Unlike many of its industry peers who will respond to this consultation, TELUS does not own a vertically integrated broadcast media business with legacy FSS operations in the

⁵³ ACMA, *Future use of the 3.6 GHz band—Decisions and preliminary views*, October 2017. Link: https://www.acma.gov.au/theACMA/future-approach-to-the-3_6-ghz-band

⁵⁴ ACMA, *Point-to-multipoint apparatus licensing in the 5.6 GHz band*, May 2018. Link: https://www.acma.gov.au/theACMA/point-to-multipoint-apparatus-licensing-in-the-5_6-ghz-band

3700-4200 MHz band. As such, TELUS is not in a position to offer comments on the importance of the 3700-4200 MHz band to future FSS operations.

Q16: Submission of Technical Parameters by Unlicensed Operators

Q16 — ISED is seeking comments on whether unlicensed operators in the 3700–4200 MHz band should be required to submit their technical parameters to ISED to assist in frequency management.

113. TELUS notes that the FCC⁵⁵ announced a temporary freeze effective on April 18, 2018, on filings of new or modification applications for FSS earth stations and fixed microwave for the purposes of preserving the current landscape of authorised 3700-4200 MHz operations as part of their ongoing inquiry of possibly permitting new flexible use services. The FCC also extended a registration window for unlicensed earth station sites to June 20, 2018 to capture the interested FSS operators and technical parameters for consideration in the *Mid-Band Proceedings*. In a recent FCC announcement, the registration window was further extended to October 17, 2018, accompanied with a registration fee reduction to remove the cost barrier cited by FSS incumbents.
114. For operators interested in continued unlicensed earth stations operations in Canada, TELUS proposes that the Department publish a notice immediately following this Consultation announcing a short limited time registration window for the enumeration of sites for possible future domestic coordination and accounting for the parallel FCC inquiry into operations in the 3700-4200 MHz band. TELUS supports the Department’s proposal for the submission of technical parameters by unlicensed operators (i.e., TVRO stations and cable head ends) in the 3700-4200 MHz band to assist in spectrum management and future policy development of the band.

⁵⁵ FCC DA-18-389, *Temporary Freeze on Applications for New or Modified Fixed Satellite Service Earth Stations and Fixed Microwave Stations in the 3.7-4.2 GHz Band; 90-Day Window to File Applications for Earth Stations Currently Operating in 3.7-4.2 GHz Band*, April 19, 2018. Link: <https://docs.fcc.gov/public/attachments/DA-18-398A1.pdf>

Q17/Q18: Flexible Use in the 3700-4200 MHz Band

Q17 — ISED is seeking comments on which steps Canada should take to optimize the use of the 3700–4200 MHz band in consideration of the current services being provided and the developing technologies that would permit the use of new services in this band (e.g. exclusion zones).

Q18 — ISED is seeking comments on the challenges and considerations related to the coexistence of other services, such as mobile and/or fixed wireless access, in the 3700–4200 MHz band.

115. TELUS agrees with the Department when it foresees an “increase in spectrum usage as a result of the introduction of 5G services, particularly in urban areas.”⁵⁶ Canada must take steps to execute a multi-phased expansion of the 3500 MHz band for flexible use service, with the goal of making available 400+ MHz of contiguous spectrum to provide operators with 100 MHz of contiguous spectrum each to support 5G competition in Phase 2. Achieving this goal (and presumably subsequent Phase 3 expansion) requires the inclusion of spectrum from the 3700-4200 MHz band.
116. In TELUS’ view, it appears that expanding flexible use licensing to the 3700-4200 MHz frequency range is achievable. In the Outlook Consultation, the Department indicates “an expected decline of FSS use in this band.”⁵⁷ The Department expands on this thinking in its Outlook Decision, stating that “for FSS and BSS in the C-band, ISED has observed an overall trend towards moving to higher frequencies to better accommodate data-intensive applications that require larger bandwidths (i.e. higher capacity Internet services and high resolution images and video). As a result, ISED continues to believe that it would be appropriate to further review C-band usage.”⁵⁸
117. As TELUS notes in its response to Question 16, the FCC has imposed a moratorium on all new licence applications in the 3700-4200 MHz band, including FSS earth station and fixed microwave operations. TELUS recommends that the first step for Canada to optimise the use of the 3700-4200 MHz band is to impose a similar moratorium on the issuance of new licences or the modification of existing licences for both fixed microwave and FSS earth

⁵⁶ Consultation, Paragraph 93.

⁵⁷ Outlook Consultation, Paragraph 142.

⁵⁸ Outlook Decision, Paragraph 74.

stations. Freezing the current state of the band is crucial to enable the proper assessment of unlicensed and licensed FSS services, fixed microwave, and the potential for flexible use terrestrial services in the band.

118. TELUS does not have sufficient knowledge of the use of 3700 - 4200 MHz in Canada to recommend concrete next steps beyond the recommendation for an assessment of current use. TELUS can however recommend a few principles (consistent with TELUS' input to the mmWave consultations, the Outlook Consultation and the previous sections of this document) that TELUS believes should be taken into account in planning for the introduction of flexible use into the 3700-4200 MHz band.
119. Exclusion zones (i.e., geographic restrictions) are a second choice: All industries (mobile, fixed, satellite, etc.) prefer exclusive frequency bands if possible but recognise that progressively more intense band sharing among services in the geographic domain is the new reality given the needs of the various services appear to no longer be able to be met by the allocation of exclusive bands.
120. Contiguity for flexible use across 3450-3650 MHz and 3650-4200 MHz is highly desirable and should be maximised wherever possible.
121. In frequencies and geographies where flexible use is to be authorised it should be given priority (because the fundamental mobile business case is based on ubiquitous coverage).
122. Any constraints on flexible use deployment should only come from existing earth station site authorisations.
123. As such, TELUS supports geographic restrictions (exclusion zones) in 3700-4200 MHz but only after repacking FSS upward in order to maximise the opportunity for exclusive allocations and the opportunity for contiguity with the 3500 MHz band.

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