TELUS COMMUNICATIONS INC.

Comments for

CONSULTATION on a NEW SET OF SERVICE AREAS for SPECTRUM LICENSING

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Spectrum Management and Telecommunications

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Executive Summary

1. TELUS appreciates the opportunity to comment on the *Consultation on a New Set of Service Areas for Spectrum Licensing* (the Consultation). 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.

2. TELUS supports ISED's commitment to developing licensing policies that consider ongoing service provision in rural areas ensuring that Canadians in all areas of the country have access to the latest technologies, including 5G.

3. As a national mobile network operator, it is important to TELUS that the opportunity to acquire spectrum is available across Canada to support significant investment in the deployment of network infrastructure. Exclusive licensing remains a critical component to ensure the certainty of investment required for a business case for national service deployment. TELUS recognises that this consultation contemplates the design of smaller licence areas to facilitate rural access; however, the potential introduction of new Tier 5 service areas does not have to be the first recourse for increasing the availability of rural spectrum. Deployment requirements and other regulatory tools can be used to encourage any fallow spectrum getting put to use.

4. TELUS notes that past efforts put forward by ISED to encourage innovation have had a particularly notable influence on how spectrum was made available. ISED has lowered the barriers to access spectrum, for example, by enabling spectrum sharing through licence exemption, or by offering local geographic licences on a first come first served basis. ISED has kept pace with licensing mechanisms that has allowed new players to enter the market, innovative use cases to be explored and has ensured more efficient use of spectrum. Examples include: 15 GHz of spectrum earmarked for licence exempt use, all come all served models (WBS and 5150) and shared access (TV White Space and RRBS) among others.

5. The overarching objective for effective spectrum management should be one of minimal intervention. ISED must promote continued mobile broadband growth, effective competition between the network operators and innovation via early 5G roll out. ISED must ensure that the right spectrum bands are available for national 5G deployments, while balancing the demand from a variety of spectrum users for deployments at the regional and local levels.

6. In these comments, TELUS provides details on the specific proposals by ISED. In general, TELUS recognises that ISED has proposed options for a Tier 5 service area that attempt to remain generally consistent with its set of guiding principles. TELUS supports many of the guiding principles that ISED has proposed as directionally appropriate for the determination of a set of geographically smaller service areas, and offers several modifications that TELUS believes will help address several factors that ISED does not appear to have taken into full consideration. TELUS believes that there are too many material issues with the proposed Options 1 and 2 such as impractically small service areas and inappropriately sited boundaries intersecting densely populated areas. TELUS believes these issues can be best resolved with the use of Statistics Canada's existing census consolidated subdivisions (CCS) as the basis for the design of new Tier 5 service areas. TELUS also recommends the amalgamation of all contiguous CCS areas that comprise large urban markets so as to combine them into undivided Tier 5 service areas. When assessed based on ISED's design principles, TELUS' approach scores well above the proposed Options 1 and 2. The detail behind TELUS' recommendations and TELUS' comments in response to various questions raised by ISED follow in the main body of this document.

TELUS' Comments on Specific Questions Posed by ISED

Q1: Design Principles

Q1A—ISED is seeking comments on the proposed design principles. When providing responses, include supporting arguments for or against the proposed principles.

Q1B—ISED is seeking any suggestions on additional design principles that should be considered.

7. TELUS generally supports the proposed design principles. However, ISED needs to carefully consider the principle regarding fostering demand given its transient nature. There are risks with ISED underestimating the size of the area (either at the time of establishing new Tier 5 boundaries or through the future expansion/contraction of geographic demand) which could result in sub-optimal investment or degraded quality of service due to the fragmentation of networks deployed therein.

8. TELUS notes that licensing of smaller service areas by way of a spectrum auction is not the only means through which the Department may address the challenges some small and regional service providers face in accessing spectrum. The adoption of stringent deployment requirements associated with renewal expectations should be used effectively to encourage a secondary market for rural spectrum. Through its comments on the 600 MHz licensing framework consultation, TELUS proposes the adoption of more aggressive deployment requirements to ensure that deployments by both larger and smaller providers put spectrum to good use while encouraging maximum flexibility in the band.

Q1A - Proposed design principles

Recognize geographic differences

9. Urban and rural areas should not always be subject to the same policies since the competitive landscape differs between urban and rural areas. ISED justifies this design principle as "better address[ing] population distribution characteristics within current Tier 4 areas" and "enabl[ing] different business models and service offerings in different

areas". ISED also notes that different licensing approaches could be applied in different areas and that this would allow for deployment requirements tailored to smaller individual areas.

10. TELUS agrees, viewing the creation of Tier 5 areas as an opportunity to better distinguish between urban and rural markets. Tier 4 service areas that contain both urban and rural areas by design can be segmented into Tier 5 service areas to allow for the differential treatment of dense population centres from sparse rural territory.

Foster demand

11. In principle, Tier 5 service areas should be designed around serving a population base or meeting an economic value of spectrum which varies over time. When establishing future licensing frameworks, ISED must continue to consult on which licence area size (Tier 1, 2, 3, 4 or 5) is the most appropriate for a given band, with due consideration to technical and commercial deployment plans and how they may be impacted by very localised, regional or nationwide spectrum licence areas. The licence area size chosen will have a major impact on the quality of services and the use cases that can be supported. If spectrum licence areas are very small then it may be impossible to support deployments using macrocells (including fixed wireless access) as well as in-band backhaul, which may run counter to this principle of fostering demand by diminishing the economic value of the service area.

12. To foster demand for acquiring spectrum licences, the Tier 5 geographic area should be structured in a manner that will allow licensees to most effectively and efficiently establish their market areas and provide their services. However, a lack of demand for spectrum in any particular rural area should not give rise for concern. When Canada is so finely divided there may be low value areas. But as the Framework for Spectrum Auctions in Canada states, "Where the demand for spectrum is not expected to exceed the supply, Industry Canada generally uses a first-come, first-served licensing process to award spectrum licences." After the competitive licensing process, any unassigned licences

should be made available through a first-come, first-served licensing process[1], as is typical.

Maintain technological and competitive neutrality

13. Spectrum licensing has been based on technical neutrality to allow maximum flexibility of use. By not favouring any particular technology or type of service, licensing policies enable the market maximum flexibility to decide which technologies to adopt and what services to provide. Technical frameworks are typically developed in consultation with industry working groups such as the Radio Advisory Board of Canada (RABC) in the period leading up to a spectrum licence allocation. TELUS urges ISED to continue working with industry through the RABC in defining technical frameworks. The technical framework will be increasingly important to ensure spectrum is used most efficiently should Tier 5 service areas be implemented.

14. TELUS notes that within commercial mobile allocations, spectrum licensing policy has historically tended to be technology neutral and not specific to any particular use-case. TELUS supports the Department's design principle that when creating new service area boundaries, favouring or discriminating against one technology or group of stakeholders over another should not be a factor.

Ensure boundaries are in low population areas

15. Spectrum licensees have the flexibility to implement their systems within their service areas. To minimize potential interference issues and to protect other spectrum users from harmful interference, technical frameworks are established to define boundary conditions which limit field strength at the edge of licensed geographic areas. When the current Tier (1, 2, 3 and 4) areas were developed in the 1990s, the boundaries were designed to pass through less-populated areas in order to mitigate interference and coordination issues between licensees in adjacent tier areas.

[1] First-come, first-served licensing should only be implemented after it has been fully demonstrated that supply exceeds demand in an auction without artificial interventions.

16. TELUS notes that dense network deployment is unlikely to be required in low population areas, resulting in fewer coordination agreements with neighbouring radio systems. TELUS supports implementing the principle to ensure Tier 5 service area boundaries pass through low population areas wherever possible. ISED must seriously consider the cost of increased coordination when defining the size and location of Tier 5 service areas.

Ensure areas nest within the existing Tier 4 service areas

17. ISED developed the existing Tier areas in the 1990s using a building block method where smaller Tier areas may be aggregated (nested) to form the larger Tier areas which make up the entire geography of Canada. In contrast, TEL licence areas were defined in the 1980s as being the geographic area of the wireline carriers which do not nest within Tier service areas. As a result, TELUS has seen complexity working with TEL licence areas mixed together with Tier licence areas in the same band.

18. To maintain continuity with ISED's existing licensing structure, TELUS strongly supports nesting smaller Tier 5 licence areas with the existing Tier 4 service areas to ensure spectrum management operations and calculations are far more straightforward.

Use of ISED's existing grid cells as constituent building blocks

19. In 2015 ISED consulted on changes to Tier service areas based on the Department's new software which uses square grid cells rather than the hexagonal grid cells used in the Department's legacy software. Consequently, the Department decided to use square grid cells as the basis for all spectrum licence service areas, including those licences already issued. TELUS strongly supports the use of these existing grid cells as the basis for defining Tier 5 service area borders. Since ISED and industry both build their systems around common rectangular grid cell definitions, it's crucial to ensure that the use of these systems and processes is not disrupted.

Q1B - Additional design principle - Minimum Geographic Area

20. Spectrum licences authorise the use of frequency blocks within a defined geographic area to permit licensees to establish and modify their radiocommunication networks. Spectrum licensees are responsible for ensuring that their radiocommunication networks are properly planned and coordinated prior to operation. If the service area is too small the benefits of area licensing are lost. TELUS recommends that the concept of service areas only makes sense down to a certain minimum geographic size, after which site based licensing or licensed exempt spectrum is more appropriate.

21. TELUS believes that introducing licence areas which are too small would raise the following concerns:

    a. Auction complexity increases when the number of licences made available is very large (this complexity could be mitigated by offering a mixture of both smaller and larger licence areas in the same auction).

    b. Geographic granularity poses a challenge for licensees attempting to aggregate Tier 5 service areas to cover larger geographic areas. National carriers such as TELUS strive to provide a consistent customer experience within their wireless network coverage areas. As licence areas get smaller, this aggregation risk increases dramatically. On top of the aggregation risk, large providers would also face extensive frequency contiguity risk.

    c. Smaller licence areas will introduce additional complexity to coordination and coexistence with adjacent service providers. More frequent coordination processes would be required given the introduction of multiple new service area boundaries; additionally, more stringent power limitations could reduce licensees' ability to deploy, resulting in inefficient spectrum use directly contrary to the one of ISED's core goals. In contrast, with larger geographic licence areas, it is less likely that there

will be another licensee's cell deployed nearby, providing additional flexibility to site deployments near the border with full power.

Q2: Option 1 - Boundaries based on Statistics Canada 2016 census subdivisions

Q2A—ISED is seeking comments on the suitability of Option 1 in addressing the proposed design principles.

Q2B—ISED is seeking comments on whether adjacent urban CSDs should be combined into a single service area.

Q2C—ISED is seeking comments on whether there should be a minimum or maximum size for the service areas and if very small CSDs should be amalgamated into the larger surrounding or adjacent CSD.

Q2D—ISED is seeking comments to gauge if this option is suitable for northern and rural areas.

22. TELUS suggests that census subdivisions (CSD) are too small to merit defining each CSD as a unique service area and therefore opposes Option 1. The use of CSD boundaries in the design of service areas within rural Tier 4 areas would be acceptable only with the application of minimum size cutoff for the service area. In contrast, applying CSD's within or near medium or large population centres (MPC/LPC) would present significant coordination challenges due to the dense nature of deployments in these areas. As discussed further in response to Question 4, TELUS proposes the use of census consolidated subdivisions which better aligns with the Department's design principles for both rural and urban markets.

Q2A - Suitability of Option 1 in addressing proposed design principles:

23. Recognising geographic differences: Partially fails - the resolution of CSDs is fine grained enough to capture regional nuances down to the micro level, but excessive in that it introduces distinction between urban markets that would not otherwise exist. Many adjacent CSDs may end up having the same economic / use case characteristics and as a result foster demand from the same licensee. This suggests that the division of CSDs is too small and would simply introduce too much administrative burden.

24. Fostering demand: Partially fails - CSD level division is small enough to capture near-term commercial viability but perhaps too fine grained to accommodate potential future expansion and long term investment (particularly in growing urban markets).

25. Maintaining technological and competitive neutrality: Partially fails - CSD level division is too small of an area and potentially introduces exposure risk for business cases requiring larger contiguous areas. Additionally, small CSD level divisions may introduce coexistence challenges for incompatible technologies (which offends the principle of technological neutrality).

26. Interference minimisation: Fails - use of CSDs would place boundaries within densely populated areas. If CSDs are used to define Tier 5 licence areas, spectrum management requirements will render the spectrum nearly unusable in parts of urban areas along the boundaries between different licence holders.

27. Alignment with existing tiers: Succeeds - CSD boundaries appear to closely approximate Tier 4 boundaries at their edges.

28. Areas mapped according to ISED grid cells: Succeeds - 1 min x 1 min resolution should be sufficient to approximate any CSD boundary in most cases.

Q2B - Combining adjacent urban CSDs into a single service area

29. In light of the technical coordination challenges that would ensue with deploying spectrum adjacent urban CSDs, TELUS contends that if CSDs were to be adopted as the basis for the definition of Tier 5 service areas, adjacent urban CSDs should be combined into a single service area.

Q2C - Minimum or maximum size of service areas and amalgamation of very small CSDs into larger surrounding or adjacent CSDs

30. In TELUS' view the minimum size of service area should be one that supports the deployment of a cluster of base sites which is the fundamental purpose of area based

licensing. Where ISED lands on the definition of a Tier 5 licence would dictate whether a band would be suitable for Tier 5 licensing.

31. If CSDs were to be adopted as the basis for the definition of Tier 5 service areas, CSDs which failed to meet this minimum size definition would need to be amalgamated into the larger surrounding or adjacent CSDs. TELUS' alternate proposal using CCS boundaries to define the Tier 5 areas would alleviate the need for amalgamation of CSDs except in urban markets.

32. The maximum size of a service area should be no larger than a current Tier 4 - but if an amalgamation of very small CSDs spans an entire Tier 4 it's OK to have a Tier 5 area equal that of a Tier 4 (similar to how several Tier 3 and Tier 4 are one-for-one matches in certain areas).

Q2D - Suitability for northern and rural areas

33. Assuming ISED maintains a minimum size of service area through the amalgamation of very small CSDs as above, TELUS finds this to be suitable for northern/rural areas. However, TELUS reiterates that the use of CCSs would alleviate the need to amalgamate very small CSDs.

Q3: Option 2 - Boundaries based on population centres

Q3A—ISED is seeking comments on the suitability of Option 2 in addressing the proposed design principles.

Q3B—ISED is seeking comments on the proposed minimum population for small population centre service areas. A rationale should be provided if a different population is proposed.

Q3C—ISED is seeking comments on whether the "other" service areas (remainder areas in each Tier 4) should be licensed differently (e.g. on a shared or first-come, first-served basis).

Q3D—ISED is seeking comments on whether this option is suitable for northern or rural areas.

Q3E—ISED is seeking comments on whether population centres, which have adjacent boundaries, should be amalgamated to form a single service area.

34. TELUS is of the view ISED's proposed Option 2 partially meets some of the proposed design principles. Specifically, TELUS supports the use of population centres as the basis for the definition of "urban" service areas. However, the amalgamation of all remaining geographic area within a Tier 4 beyond population centres into a single "other" service area is not the best allocation of that area. Instead of creating an unwieldy "others area", the remaining area should be used to create sufficient buffer zones adjacent to population centres to minimise coordination challenges at urban boundaries, and the remainder of the "others area" should be divided into appropriately sized rural Tier 5 service areas.

Q3A - Suitability of Option 2 in addressing proposed design principles:

35. Recognising geographic differences: Succeeds - TELUS considers the population centre (PC) level of resolution as appropriate to capture the unique characteristics of "urban" vs "rural".

36. Fostering demand: Partially fails - Statistics Canada's definition of population centres aligns exactly with population base. However, this definition does not capture other areas of economic value (e.g., mines, highway and rail corridors, ports, festivals and special events) which may fall into the "other - remaining area" classification.

37. Maintaining technological and competitive neutrality: Partially succeeds - Defining the Tier 5 area boundaries using PCs allows service providers of all sizes to acquire spectrum in regions supported by their individual business cases. However, the licensing of small population centres (SPCs) without sufficient buffers (see below) may introduce coexistence challenges should incompatible technologies be operating in the surrounding "other" licence area (which offends the principle of technological neutrality).

38. Interference minimization: Partially succeeds - Placing the Tier 5 service area boundaries in low population areas by adding buffers around PCs would be appropriate to minimise risk of interference. The design of such buffers would need to take into account both current population density and potential population growth / urban expansion.

39. Alignment with existing tiers: Partially succeeds - The PC boundaries align fairly well with existing Tier 4 areas. However, TELUS notes a handful of observable cases where PC boundaries span the boundaries of multiple Tier 4 areas (mostly in denser areas, e.g. in Southern and Eastern Ontario and Quebec). In such cases, the PCs would need to be divided into multiple Tier 5 service areas to preserve the nesting property.

40. Areas mapped according to ISED grid cells: Succeeds - 1 min x 1 min resolution offers sufficient approximation of PC boundaries when buffers are added.

Q3B - Minimum population for small population centre service areas

41. As per TELUS' recommendation for the minimum size of service area for CSD-based boundaries, the minimum size of service area should be one that supports the deployment of a cluster of base sites which is the fundamental purpose of area based licensing. After a sufficient buffer is added, it is possible that small population centres with sufficient density (>400 pop/km^2) but between 1000-2000 population would still be suitable for Tier 5 licensing. The minimum population threshold for a small population centre service area should therefore not be defined by the absolute population, but rather by whether or not it can support an area based deployment.

Q3C - Different licensing approaches to "other" service areas

42. ISED asks the question of whether the remainder of service areas (typically large and geographically contiguous areas of low population density) should be licensed differently (e.g., on a shared or FCFS basis). TELUS is of the view that this is a question that should be asked on a band-by-band / per process basis.

43. TELUS is of the view that the amalgamation of all remaining geographic area within a Tier 4 beyond population centres into a single "other" service area is not an appropriate means to define a rural Tier 5 service area. Instead of creating an unwieldy "others area", sufficient buffer zones should first be implemented adjacent to population centres as needed, and the remainder of the "others area" should be divided into truly rural Tier 5 service areas. TELUS' alternate proposal using CCS boundaries to define the Tier 5 areas would achieve an outcome satisfying these two goals (buffer creation and subdivision of the remainder area).

Q3D - Suitability for northern and rural areas

44. TELUS notes that Option 2 seems to be well suited to northern areas; in the Territories, the resulting Tier 5 service areas would constitute the existing Tier 4 boundaries with carve outs for a handful of small population centres (Whitehorse, Yellowknife, Hay River, Iqaluit, Rankin Inlet, Arviat).

45. As noted in response to the previous question, Option 2 is not well suited to rural areas in general. The large amalgamation of the "others area" does not support the licensing of individual rural portions of a Tier 4 service area.

Q3E - Amalgamation of population centres with adjacent boundaries

46. If ISED were to base the definition of Tier 5 area boundaries on population centres, TELUS would recommend the amalgamation of population centres with adjacent boundaries. Moreover, TELUS proposes that when amending population centres with

protective buffers, any two population centres whose buffers intersect should be amalgamated into a single Tier 5 service area.

Q4: Alternative Proposals

Q4—ISED invites interested parties to submit alternative proposals for smaller service areas. All alternative service area proposals must be applicable to all of Canada and promote the federal government's policy objectives.

Submissions should include a rationale for the proposal, an explanation of how it satisfies ISED's policy objectives and how it meets each of the proposed design principles, and any other relevant information. One or more maps should also be included, preferably including one which covers all of Canada. Maps should be in a format that is readily accessible by ISED (e.g. in ArcGIS or MapInfo format, or publically available on the Internet with a link provided). Submissions should adhere to the requirements listed above in order to allow other stakeholders sufficient information to provide informed comments.

TELUS' alternative proposal based on census consolidated subdivisions

47. TELUS as noted above does not support either Option 1 or 2 as the best approach. TELUS proposes an approach which combines elements of ISED's proposed Option 1 and Option 2. TELUS' alternative proposal recommends the use of Statistics Canada census consolidated subdivisions (CCS) instead of census subdivisions (CSD) as the basis for defining Tier 5 service area boundaries. Further, TELUS recommends the amalgamation of all contiguous CCS areas that either partially or completely overlap with medium and large population centres so as to combine them into undivided Tier 5 service areas. Adopting the proposed modifications to the rules will help encourage investment and ensure Canada's continued leadership in the development of next generation networks.

Statistics Canada's definition of census consolidated subdivisions[2]

48. The use of CCS as the basis for defining Tier 5 service area boundaries is supported by Statistics Canada's claim of the CCS as a "relatively stable geographic unit because they have infrequent boundary changes."

49. Statistics Canada defines CCSs according to four criteria:

    a. A census subdivision (CSD) with a land area greater than 25 square kilometres can form a CCS of its own. Census subdivisions having a land area smaller than 25 square kilometres are usually grouped with a larger census subdivision.

    b. A census subdivision with a land area greater than 25 square kilometres and surrounded on more than half its perimeter by another census subdivision is usually included as part of the CCS formed by the surrounding census subdivision.

    c. A census subdivision with a population greater than 100,000 according to the last census usually forms a CCS on its own.

    d. The census consolidated subdivision's name usually coincides with its largest census subdivision component in terms of land area.

50. Since the definition of CCS boundaries is provided by Statistics Canada, the corresponding maps can be downloaded from their website[3].

Suitability of TELUS' alternative proposal in addressing proposed design principles:

51. Recognising geographic differences: Succeeds - TELUS considers the CCS level of resolution as appropriate to capture the unique characteristics of "urban" vs "rural".

[2] Statistics Canada, definition of Census Consolidated Subdivision (CCS). Link: https://www150.statcan.gc.ca/n1/pub/92-195-x/2011001/geo/ccs-sru/ccs-sru-eng.htm
[3] Statistics Canada, 2016 Census - Boundary Files. Link: https://www12.statcan.gc.ca/census-recensement/2011/geo/bound-limit/bound-limit-2016-eng.cfm

52. Fostering demand: Partially Succeeds - When urban areas are kept whole using CCS level divisions they align well with the population base. The consolidated subdivisions are at a suitable resolution to capture sufficient economic value beyond population centres (e.g., mines, highway and rail corridors, ports, festivals and special events).

53. Maintaining technological and competitive neutrality: Succeeds - Defining the Tier 5 area boundaries using CCS that are kept whole in urban areas allows service providers of all sizes to acquire spectrum in regions supported by their individual business cases. The use of CCS to define boundaries for smaller population centres creates a buffer that should help reduce the challenges of coexistence between deployments in adjacent areas (thus supporting the principle of technological neutrality).

54. Interference minimisation: Succeeds - Most of the Tier 5 service area boundaries fall in low population areas when aggregating the CCS areas that make up LPC areas. There is concern in minimizing risk of interference due to urban sprawl.

55. Alignment with existing tiers: Succeeds - The existing Tier service areas were designed using a combination of CSD areas; as such, the CCS areas align well with existing Tier boundaries. Should the case present itself where a CCS-based boundary does not closely align with Tier 4 boundary, the CCS would need to be divided across Tier 4 boundaries to preserve the nesting property.

56. Areas mapped according to ISED grid cells: Succeeds - 1 min x 1 min resolution should be sufficient to approximate any CCS boundary in most cases.

Creating new Tier 5 licence areas based on census consolidated subdivisions will promote investment and innovation

57. Basing new Tier 5 licence areas on census consolidated subdivisions versus the smaller census subdivisions better reflects market needs and market realities. Increasing the baseline for the new licence areas from CSD to CCS will stimulate additional investment, promote innovation, and encourage efficient use of spectrum resources.

58. When assessed based on ISED's design principles, TELUS' approach scores well above the proposed Options 1 and 2.

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