

**Innovation, Science and Economic Development Canada**

**Consultation on a Policy and Licensing Framework for Spectrum in**

**the 3500 MHZ Band**

**Gazette Notice SLBP-002-19**

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## Introductory Comments

1. Our response to this consultation is framed by ISED’s recent report, [\*High Speed Access For All: Canada’s Connectivity Strategy\*](#), in which the Honourable Bernadette Jordan, Minister of Rural Economic Development, states that “access to affordable high-speed Internet and mobile wireless coverage is critical to the continued vibrancy and success of rural Canada” (p. 2).
2. In its framing of pro-competitive measures and eligibility criteria (para. 26), ISED relies on data that does not reflect the true state of broadband service availability or quality in rural and remote areas. Competition data from [\*Price Comparisons of Wireline, Wireless and Internet Services in Canada and with Foreign Jurisdictions – 2018 Edition\*](#) is drawn from six urban centres, including three of Canada’s largest (Toronto, Montreal, and Vancouver), and does not include fixed wireless access (FWA) services. Data from the [\*Communications Monitoring Report\*](#), which will be used to determine eligibility for spectrum bidding, does not break down subscriber rates by facility type. Underlying the use of these data sources is the assumption that mobile wireless services are an equivalent or substitute for fixed broadband services, which is dubious (Noam, 2011). As a result, the proposed pro-competitive measures demand scrutiny.
3. Canada’s NMSPs do not often provide fixed-wireless broadband services in rural or remote markets; this gap is filled by smaller-scale competitors. A better picture of regional competition can be drawn by excluding operators that do not provide fixed-wireless service to rural areas, in which case the competitive landscape shifts significantly. For example, Xplornet is a service provider with a minimal presence at national scale, but is actually a dominant service provider in regions where FWA services are the only cost-effective broadband provisioning option. Overall, the Inukshuk Wireless partnership and Xplornet dominate this space (Joseph, 2017). The 10% subscriber limit proposed by ISED (para. 38) will not foster competition in rural and remote areas since it:
  - Only accounts for subscriber rates at national scope, obviating regional variations in service subscriptions
  - Allows eligibility for larger WISPS who already dominate ownership of licenses in the 3500 MHz spectrum range at the national level

We believe that the eligibility criteria, as currently outlined, inhibits access to spectrum for *true* regional FWA competitors.

4. Overall ISED’s intent to implement pro-competitive measures is welcome, especially in the context of rural and remote broadband service provisioning. The initiative aligns with

the March 2019 [Order in Council to the CRTC](#), which adds consumer interests, affordability, and service innovation as considerations to the effect of policy measures. Spectrum policy management intersects critically with the work of the CRTC, and ISED would benefit from adopting the same considerations—for *all* Canadians—in its choice of policy and auction frameworks.

**Response to Q1C—ISED is seeking comments on its proposal to limit the eligibility criteria to bid on set aside spectrum licences to those registered with the CRTC as facilities-based providers\* that are not National Mobile Service Providers, and that are actively providing commercial telecommunication services to the general public in the relevant Tier 2 service area of interest, effective as of the date of application to participate in the 3500 MHz auction.**

5. ISED’s recommendation (para. 39) that eligibility should be restricted to non-NMSPs who are already actively providing services in Tier 2 is problematic. Many existing 3500 MHz licence holders rely on service-based competition to supply fixed-wireless broadband to rural and remote areas, but do not provide Tier 2-based services.
6. One study suggests that service-based competition is key in areas where broadband deployments are immature (McNally, Rathi, Joseph, Evaniew & Adkisson, 2018). Moreover, the CRTC reports that 70% of subscribers in Canada have access to three facilities or less (CRTC, 2018). Restricting eligibility to non-NMSP competitors who are already actively-supplying services in the relevant Tier 2 area of interest excludes existing regional providers of fixed-wireless services and appears to bias a 5G New Radio (NR) evolution of existing technologies over the ongoing deployment of FWA services in underserved areas.
7. The condition also hinders any new competitor who is not already operating in Tier 2 areas from installing new facilities for either FWA or 5G NR service. This scenario will not likely maximize the possibility of increased competition for broadband services in rural and remote areas.
8. To continue to foster the provision of FWA service in rural areas, the Tier 2 service requirement should be either limited to urban contexts or eliminated.

**Response to Q6—ISED is seeking comments on its proposal to use a clock auction format for the 3500 MHz spectrum auction.**

9. ISED’s ongoing commitment to fair auction design is admirable. Recent analysis of auctions in the 700 MHz, 2500Mhz, and 3500MHz ranges suggests that auction design,

more than any other factor, influences the diversity of spectrum licence ownership (Joseph, 2017). The same analysis, however, also proposes that auction participation decreases as the auction model grows more complex (see Table 1; the authors note that this data is cursory and is only intended to suggest more study is warranted to verify the claim). ISED has preferred the Combinatorial Clock Auction (CCA) format for non-residual auctions since 2014, with residual auctions relying on more expedient, sealed-bid formats.

10. When the CCA framework was developed, concerns were expressed by respondents about the complexity of the system (ISED, 2014, para. 42) and rules that would favour national bidders (Industry Canada, 2014a, para. 40). ISED responded by referring to its regional spectrum aggregation limits and by offering training and mock auctions (ISED, 2014, paras. 46, 50). The concerns expressed by respondents have been borne out: the diversity of participation in CCA-style auctions is low, and their results have favoured national and large regional service providers. This is not a recipe for increased competition.
  
11. The updated clock auction format represents a similar barrier to participation. Though the design of the auction is intended to foster fairness, its very existence creates a barrier to access that disadvantages new entrants and regional competitors. If the clock auction format is to be used for this auction, more proactivity on the part of ISED is required to ensure that equitable access to the auction is maintained. If the benefit of shifting from the previously-used CCA format to the proposed clock auction format is marginal, perhaps the CCA format should be reused instead.
  
12. Put another way: though ISED’s rigorous work on auction fairness is valuable, the impact of the effort has been eclipsed by barriers created by the auction format itself.

Table 1. Auctions, formats, and participant counts. Data source: ISED

Year	Frequency Range	Auction Format	Participants
2004	3500 MHz	SMRA	28
2009	3500 MHz	Sealed-Bid, Second-Price	18
2014	700 MHz	CCA	15
2019	600 MHz	CCA	12
2015	2500 MHz	CCA	11

2008	AWS-1	SMRA	26
2015	AWS-3	Sealed Bid	10

**Response to Q12—ISED is seeking comments on its proposal to issue new flexible use spectrum licences in the 3500 MHz band with a 20-year licence term and the proposed wording of the condition of licence above. Licence terms for all flexible use licences, regardless of when they are converted from fixed to flexible use, will terminate on the same date as licences issued through the auction process.**

13. ISED’s increased reliance on 20-year terms for spectrum licences is vexing in the context of increased rural and remote broadband service provision. Responses to other questions have shown that:

- Auction format and participation has been a significant predictor of licence allocations, and recent auctions have favoured incumbents
- The minimum deployment requirements are easily met in rural and remote areas where population distributions are centered in one or two urban areas

These two conditions alone suggest that 20-year terms are not pro-competitive, and two recent examples demonstrate this result.

14. The initial 3500 MHz licence auction in 2004, which was performed under 10-year terms, has led to significant license mobility: analysis shows that the expiry resulted in more than 360 licenses changing hands between 2004 and 2017 (Joseph, 2017). Industry Canada’s (2014) own decision noted that the “use it or lose it” would result in as many as 100 licences coming available in 2014 (para. 50). More recent auctions, such as the 700 MHz auction in 2014 that awarded almost 93% of licenses to Canada’s Top 5 ISPs, will not see any open opportunity for movement until 2034. Though licenses can be transferred or subdivided, there is no incentive for this to occur. Moreover, since the proposed deployment requirements can be easily-met in rural and remote areas, incumbents are able to “lock in” their spectrum holdings, without penalty, while effectively blocking new entrants or competitors to the market. This model perpetuates the ongoing lack of access to modern high-speed broadband services for rural and remote Canadians. The flexible use of 3500MHz licenses is likely to exacerbate this problem, since the ownership of a license precludes any other entrant from making an alternate use of the same spectrum without the agreement or authorization of the licence holder.

15. As Michael McNally has noted in previous consultation submissions, there is value in ISED addressing this problem by extending the provisions of *RP-019 - Policy for the Provision of Cellular Services by New Parties* so that they apply to FWA services in frequency ranges such as 3500 MHz. Industry Canada made a previous decision to examine expansion of this policy in the new bands as part of the 700MHz policy and technical framework (Industry Canada, 2012), but no evidence exists that this examination occurred. The expansion of policy RP-0019 to additional frequency ranges such as 3500 MHz would provide a mechanism for new entrants to petition for access to spectrum in geographical areas where FWA services are not being provided by existing licence holders.

**Response to Q14—ISED is seeking comments on the proposed deployment condition of licence as stated above as well as on the proposed levels of deployment.**

16. ISED should be applauded for developing progressive deployment requirements that increase over time that will require greater deployment of service (though 20 year deployment targets based on 20 year licence terms remain problematic). Deployment requirements remain one of the most important measures by which to encourage rural and remote uses of wireless services (McNally and Trosow, 2014). While the department should be applauded for developing progressive deployment targets, we encourage ISED to carefully consider a broader range of deployment requirements, including population based service requirements, geographic (hex-cell based) deployment requirements, roadway deployment requirements in addition to population based deployment requirements. Furthermore, with regard to the traditional population based deployment requirements we offer considerable analysis on how these can be strengthened in paragraphs 21 to 39.

17. In order to ensure rural and remote Canadian's benefit most from spectrum, ISED should also consider low level service obligations, in addition to traditional deployment requirements, to incent the delivery of service. To be clear, by service requirements we are suggesting that licence holders not only deploy services, but actually have a minimum threshold of subscribed customers. If ISED is going to provide a 20 year exclusive licence, it should not only oblige providers to deploy the service, but require them to actually serve a small percentage of the population. Service obligations could be low. An obligation of serving 5% of the population after five years, 10% after 10 years and 20% after 20 years (though again, ISED should not use license terms longer than 10 years), would have several benefits. Foremost it would ensure that service is being delivered not just deployed. More importantly the service requirements would create necessary incentives for providers to transfer or forfeit licences in tiers in which they no longer are

able or interested in providing service. Such an approach could energize the secondary licence market and help ensure that spectrum is actively used and not hoarded.

18. In addition to service requirements, ISED should also consider adopting a mix of population based deployment requirements and geographic based deployment requirements based on hex cells, which form the basis of each tier. For example, deployment requirements could include deploying service to a progressively increasing share of the population as well as targets for the number of hex cells that service should be deployed in. Like population targets these could be progressively increasing over time. Furthermore, these geographic deployment requirements could factor in the degree of rurality/urbanness of each tier.
19. In alignment with the CRTC's Basic Service Objective, which underscored the importance of having mobile service on major roadways (CRTC, 2016 , para. 64), deployment requirements should also include progressively increasing roadway deployment requirements. For example, licence holders could be obligated to provide continuous service along the roadway with the most vehicular traffic in a tier in the first five years, and then progressively increasing to ensure the second busiest roadway is fully covered within 10 years and the top five roadways within 20 years (again, we reiterate that 20 year licensing is too long).
20. A careful mix of population based deployment requirements, population based service requirements, geographical based deployment requirements and roadway based deployment requirements will ensure that Canadians in each tier have the most to gain for mobile services.
21. Regardless if ISED wishes to consider new and innovative ways to ensure rural deployment of spectrum, the traditional deployment requirements proposed require careful consideration and strengthening. First, the overall deployment targets remain unambitious. In the shorter term, 19 of the 172 Tier 4 service areas have 5 year deployment requirements of a measly 5% of the population. With regard to 20 year deployment requirements 74 of 172 service areas have deployment requirements below 50% of the population to be served. Only 38 of the service areas have the most ambitious deployment requirements (5 year - 30%; 10 year - 50%; and, 20 year 70%).
22. While the "cover x percentage within y years" approach benefits from regulatory simplicity, it possesses several limitations given the highly varied means through which population is distributed in various tiers. Some tiers may have a single dominant population centre, which simplifies the burden on providers to deploy service, while other service areas have more uneven population distributions.

23. In order to develop more substantive deployment targets a purposive sample of Tier 4 service areas was selected with the aim of examining both the current deployment requirements and the impact of increasing deployment requirements (by simply increasing the 5, 10 and 20 year requirements each by 10%). The service areas were selected to illustrate a range of different geographic areas and population distributions. Selected services areas are:

- 4-003 Gander/Grand Falls/Windsor
- 4-024 Mont Joli
- 4-044 Drummondville
- 4-050 Joliette
- 4-090 Windsor/Leamington
- 4-120 Weyburn
- 4-128 Prince Albert
- 4-141 Edmonton
- 4-146 Fort McMurray
- 4-160 Kamloops
- 4-170 Yukon
- 4-172 Northwest Territories

24. The selection of these service areas reflects a range of population distributions from urban metropolis (Edmonton) to sparsely populated territories (Yukon and Northwest Territories), and reflects a range of regions across Canada from British Columbia's interior (Kamloops) the prairies (Prince Albert and Weyburn), Quebec's Eastern Townships (Drummondville) and the small communities of rural Newfoundland (Gander/Grand/Falls Windsor).

25. For each of the 12 service areas selected two sets of tables are provided. The first, immediately following, provides basic information on the deployment requirements including the Tier's population, and deployment requirements with a calculation of the population that would be required to be served. For example, in 4-003 (Gander/Grand Falls/Windsor) the population is 144,229 and a 5 year deployment requirement of 5% means that 7,211 people would have to be served to meet the deployment requirement. Each table also contains a list of major communities in each service area arranged in descending order by amount of population with the most populous community appearing first. In general Statistics Canada (2019) Population Centre data has been used to provide the population and area information. Population Centre data has been preferred over the broader Census Subdivision unit; however, for some communities Population Centre data is not available, and the Census Subdivision data is provided and indicated by "(CSD)"

following the community name where Census Subdivision data has been used instead. The list of communities in each table has, in general, been taken from the Tier 4 Service Area maps and list of communities (Industry Canada, 2015). However, some limitations remain in relying on the Tier 4 maps and list of communities. In four cases (4-044 Drummondville, 4-128 Prince Albert, 4-170 Yukon, and 4-172 Northwest Territories) a list of communities had to be generated as the Tier 4 maps omitted major communities, and in the case of 4-170 Yukon, the map for some curious reason indicates two abandoned communities while omitting the second most populous town of Dawson. The final right hand column in the lower part of the table indicates the cumulative population in a Tier.

26. The cumulative population in a tier, starting from the most populous community and then aggregating in successively smaller communities, provides a useful starting point for examining how deployment requirements may be met in a service area. While service providers may have a range of factors that influence why and where they deploy service in a tier, a logical “path of least resistance” approach would be to serve the most populous community first, the second most populous community second and so on, until the deployment requirements are met. A similar analysis using the “path of least resistance” for Tier 3 services areas and the AWS-3 auction was presented at the Annual Conference of the Canadian Communication Association in 2015 (Stobbs et al., 2015). The tables include a colour coding to indicate in the cumulative population total how many communities would have to be served to meet the 5 ,10 and 20 year deployment targets.
27. Taking 4-003 (Gander/Grand Falls/Windsor) as an example, Grand Falls is the largest community in the service area with a population of 12,046. Servicing Grand Falls (and only Grand Falls) would meet the 5 year deployment requirement target of 7,211 people. To meet the 10 year target a service provider would have to serve at least one other community with a population of 2,377 (=14,423 (10 year deployment requirement) - 12,046 (population of Grand Falls)). Although several communities in the tier would meet this requirement, given the need to consider a 20 year deployment requirement, the analysis proceeds on serving the next largest community (in this case Gander). Gander and Grand Falls have a cumulative population of 22,266, and thus would meet the 10 year target. Finally, to meet the 20 year target the four largest communities would have to be served (Grand Falls, Gander, Clarenville (CSD) and Channel-Port-Aux Basques). While this approach possesses a degree of reductiveness, this path of least resistance approach provides a reasonable insight into how deployment requirements might be met.
28. The cumulative population column has been colour coded with red, orange and yellow, to indicate where the 5, 10 and 20 year targets respectively would be met. For several

communities there are only orange or yellow highlights suggesting that the 5 and 10 or 5, 10 and 20 year targets could be met by serving a single community. For example for 4-024 (Mont Joli), servicing the entire population of Mont-Joli would meet both the 5 and 10 year requirements, and only Amqui would need to be served to meet the 20 year requirements. In the case of 4-141 (Edmonton) servicing the Population Centre of Edmonton alone would meet the 5, 10 and 20 year targets.

29. Another important feature of the cumulative population column is that it serves to indicate which communities could be unserved within 20 years and the deployment requirements still met. Although service providers may have other incentives for deploying service to smaller communities or exceeding their deployment requirements, this analysis is useful for highlighting how deployment requirements based on simple population targets for tiers may result in a lack of service (even over a 20 year period) to smaller rural, remote and Indigenous communities.

Table 2: Deployment Requirements and 'Path of Least Resistance' for Tier 4-003

Tier 4-003 Gander/Grand Falls/Windsor			
	Deployment Requirements		
Tier Population	5 year	10 year	20 year
144,229	5%	10%	20%
Population to Meet Deployment Requirements	7,211	14,423	28,846
Major Population Centres in Tier (Descending Order by Population)			
Population Centre	Population	Area (km <sup>2</sup> )	Cumulative Population of Largest Population Centres in Tier
Grand Falls	12,046	11.42	12,046
Gander	10,220	12.14	22,266
Clarenceville (CSD)	6,291	140.81	28,557
Channel-Port Aux Basques	3,665	4.89	32,222
Bonavista	3,140	4.2	35,362
Lewisporte	2,174	1.87	37,536
Glovertown (CSD)	2,083	70.33	39,619
Springdale	2,080	3.5	41,699
Harbour Breton (CSD)	1,634	13.74	43,333
Baie Verte (CSD)	1,313	371.09	44,646
Burgeo	1,307	1.98	45,953
St. Lawrence (CSD)	1,192	35.5	47,145

Fulfills only 5 year deployment requirements   
 Fulfills 5 and 10 year deployment requirements   
 Fulfills 5, 10 and 20 year deployment requirements 

**Note:** "CSD" indicates a Census subdivision as Population Centre data not available for this community.

Population Centre (and CSD) information from Census 2016 via Statistics Canada

<https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E&TABID=1>

Table 3: Deployment Requirements and 'Path of Least Resistance' for Tier 4-024

Tier 4-024 Mont Joli			
	Deployment Requirements		
Tier Population	5 year	10 year	20 year
37,788	5%	10%	20%
Population to Meet Deployment Requirements	1,889	3,779	7,558
Major Population Centres in Tier (Descending Order by Population)			
Population Centre	Population	Area (km <sup>2</sup> )	Cumulative Population of Largest Population Centres in Tier
Mont-Joli	5,604	6.36	5,604
Amqui	4,511	5.57	10,115
Causapscal	1,041	1.73	11,156
Val-Brillant (CSD)	927	78.04	12,083
Matapedia (CSD)	645	71.55	12,728
Routhierville (CSD)	18	628.16	12,746

Fulfills only 5 year deployment requirements

Fulfills 5 and 10 year deployment requirements

Fulfills 5, 10 and 20 year deployment requirements



**Note:** "CSD" indicates a Census subdivision as Population Centre data not available for this community.

Population Centre (and CSD) information from Census 2016 via Statistics Canada

<https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E&TABID=1>

Table 4: Deployment Requirements and 'Path of Least Resistance' for Tier 4-044

Tier 4-044 Drummondville			
	Deployment Requirements		
Tier Population	5 year	10 year	20 year
112,390	30%	50%	70%
Population to Meet Deployment Requirements	33,717	56,195	78,673
Major Population Centres in Tier (Descending Order by Population)			
Population Centre	Population	Area (km <sup>2</sup> )	Cumulative Population of Largest Population Centres in Tier
Drummondville	68,601	52.15	68,601
Acton Vale	5,399	4.3	74,000
Saint-Germain-de-Grantham	3,485	2.66	77,485
Wickham (CSD)	2,541	98.79	80,026
Saint-Lucien (CSD)	1,647	111.29	81,673
Saint-Guillaume (CSD)	1,476	87.88	83,149
Saint-Felix-de-Kingsey (CSD)	1,430	126.29	84,579
L'Avenir (CSD)	1,307	97.72	85,886
Saint-Cyrille-de-Wendover	1,216	0.93	87,102
Saint-Eugene (CSD)	1,126	75.85	88,228
Durham-Sud (CSD)	1,043	92.67	89,271
Saint-Bonaventure (CSD)	1,031	78.81	90,302
Lefebvre (CSD)	904	66.19	91,206

- Fulfills only 5 year deployment requirements
- Fulfills 5 and 10 year deployment requirements
- Fulfills 5, 10 and 20 year deployment requirements



**Note:** For Tier 4-044 the list of communities on the tier map were not used.

**Note:** "CSD" indicates a Census subdivision as Population Centre data not available for this community.

Population Centre (and CSD) information from Census 2016 via Statistics Canada

<https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E&TABID=1>

Table 5: Deployment Requirements and 'Path of Least Resistance' for Tier 4-050

Tier 4-050 Joliette			
	Deployment Requirements		
Tier Population	5 year	10 year	20 year
161,106	15%	30%	40%
Population to Meet Deployment Requirements	24,166	48,332	64,442
Major Population Centres in Tier (Descending Order by Population)			
Population Centre	Population	Area (km <sup>2</sup> )	Cumulative Population of Largest Population Centres in Tier
Joliette	45,508	36.99	45,508
Sorel	36,088	28.38	81,596
Saint-Gabriel	2,664	2.81	84,260
Saint-Michel-des-Saints (CSD)	2,359	501.61	86,619

Fulfills only 5 year deployment requirements

Fulfills 5 and 10 year deployment requirements

Fulfills 5, 10 and 20 year deployment requirements



Note: "CSD" indicates a Census subdivision as Population Centre data not available for this community.

Population Centre (and CSD) information from Census 2016 via Statistics Canada

<https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E&TABID=1>

Table 6: Deployment Requirements and 'Path of Least Resistance' for Tier 4-090

Tier 4-090 Windsor/Leamington			
	Deployment Requirements		
Tier Population	5 year	10 year	20 year
401,719	30%	50%	70%
Population to Meet Deployment Requirements	120,516	200,860	281,203
Major Population Centres in Tier (Descending Order by Population)			
Population Centre	Population	Area (km <sup>2</sup> )	Cumulative Population of Largest Population Centres in Tier
Windsor	287,069	176.21	287,069
Leamington	32,991	31.7	320,060

Fulfills only 5 year deployment requirements

Fulfills 5 and 10 year deployment requirements

Fulfills 5, 10 and 20 year deployment requirements



Note: "CSD" indicates a Census subdivision as Population Centre data not available for this community.

Population Centre (and CSD) information from Census 2016 via Statistics Canada

<https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E&TABID=1>

Table 7: Deployment Requirements and 'Path of Least Resistance' for Tier 4-120

Tier 4-120 Weyburn			
	Deployment Requirements		
Tier Population	5 year	10 year	20 year
22,877	20%	35%	50%
Population to Meet Deployment Requirements	4,575	8,007	11,439
Major Population Centres in Tier (Descending Order by Population)			
Population Centre	Population	Area (km <sup>2</sup> )	Cumulative Population of Largest Population Centres in Tier
Weyburn	10,679	8.39	10,679
Milestone (CSD)	699	2.17	11,378
Fillmore (Village) (CSD)	311	1.33	11,689
Cambria No. 6 (CSD) (Outram)	309	814.14	11,998
Bengough No. 40 (CSD) (Harptree)	281	1036.91	12,279
Elmsthorpe No. 100 (Truax)	226	843.12	12,505
Surprise Valley No. 9 (CSD) (Gladmar)	217	813.93	12,722
Happy Valley No. 10 (CSD) (Big Beaver)	139	812.74	12,861

Fulfills only 5 year deployment requirements  
 Fulfills 5 and 10 year deployment requirements  
 Fulfills 5, 10 and 20 year deployment requirements



**Note:** "CSD" indicates a Census subdivision as Population Centre data not available for this community.  
 Population Centre (and CSD) information from Census 2016 via Statistics Canada  
<https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E&TABID=1>

Table 8: Deployment Requirements and 'Path of Least Resistance' for Tier 4-128

Tier 4-128 Prince Albert			
	Deployment Requirements		
Tier Population	5 year	10 year	20 year
130,446	20%	35%	50%
Population to Meet Deployment Requirements	26,089	45,656	65,223
Major Population Centres in Tier (Descending Order by Population)			
Population Centre	Population	Area (km <sup>2</sup> )	Cumulative Population of Largest Population Centres in Tier
Prince Albert	35,102	21.15	35,102
Melfort	5,778	4.31	40,880
Humboldt	4,872	2.73	45,752
Nipawin	3,989	3.04	49,741
Tisdale	3,136	2.8	52,877
Rosthern	1,488	1.7	54,365
Hudson Bay	1,306	1.27	55,671
Waldheim (CSD)	1,213	1.97	56,884
Birch Hills	1,033	2.27	57,917
Carrot River (CSD)	973	1.82	58,890
Wakaw (CSD)	922	3.12	59,812
Hague (CSD)	874	1.17	60,686
Porcupine Plain (CSD)	862	2.27	61,548
Kelvington (CSD)	834	3.99	62,382
Cudworth (CSD)	814	2.21	63,196
St Brieux (CSD)	667	2.55	63,863
Naicam (CSD)	661	1.69	64,524
Kinistino (CSD)	654	1.55	65,178
Aberdeen (CSD)	622	1.95	65,800
Bruno (CSD)	611	0.95	66,411
Duck Lake (CSD)	569	2.73	66,980
Star City (CSD)	387	0.7	67,367
Vonda (CSD)	384	2.86	67,751
Choiceland (CSD)	359	1.12	68,110
Arborfield (CSD)	312	0.88	68,422
Rose Valley (CSD)	282	1.12	68,704

Fulfills only 5 year deployment requirements  
 Fulfills 5 and 10 year deployment requirements  
 Fulfills 5, 10 and 20 year deployment requirements



**Note:** For Tier 4-128 the list of communities on the tier map were not used.

**Note:** "CSD" indicates a Census subdivision as Population Centre data not available for this community.

Population Centre (and CSD) information from Census 2016 via Statistics Canada

<https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E&TABID=1>

Table 9: Deployment Requirements and 'Path of Least Resistance' for Tier 4-141

Tier 4-141 Edmonton			
Tier Population	Deployment Requirements		
	5 year	10 year	20 year
1,325,887	30%	50%	70%
Population to Meet Deployment Requirements	397,766	662,944	928,121
Major Population Centres in Tier (Descending Order by Population)			
Population Centre	Population	Area (km <sup>2</sup> )	Cumulative Population of Largest Population Centres in Tier
Edmonton	1,062,643	572.69	1,062,643
Spruce Grove	36,135	29.09	1,098,778
Leduc	29,556	61.96	1,128,334
Lamont County (CSD) (Hilliard)	3,899	2385.09	1,132,233

Fulfills only 5 year deployment requirements

Fulfills 5 and 10 year deployment requirements

Fulfills 5, 10 and 20 year deployment requirements



**Note:** "CSD" indicates a Census subdivision as Population Centre data not available for this community.

Population Centre (and CSD) information from Census 2016 via Statistics Canada

<https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E&TABID=1>

Table 10: Deployment Requirements and 'Path of Least Resistance' for Tier 4-146

Tier 4-146 Fort McMurray			
Tier Population	Deployment Requirements		
	5 year	10 year	20 year
73,953	30%	50%	70%
Population to Meet Deployment Requirements	22,186	36,977	51,767
Major Population Centres in Tier (Descending Order by Population)			
Population Centre	Population	Area (km <sup>2</sup> )	Cumulative Population of Largest Population Centres in Tier
Fort McMurray	66,573	51.79	66,573
Improvement District No. 24 Wood Buffalo (CSD) (Garden Creek and Hay Camp)	648	33416.3	67,221

Fulfills only 5 year deployment requirements

Fulfills 5 and 10 year deployment requirements

Fulfills 5, 10 and 20 year deployment requirements



**Note:** "CSD" indicates a Census subdivision as Population Centre data not available for this community.

Population Centre (and CSD) information from Census 2016 via Statistics Canada

<https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E&TABID=1>

Table 11: Deployment Requirements and ‘Path of Least Resistance’ for Tier 4-160

Tier 4-160 Kamloops			
	Deployment Requirements		
Tier Population	5 year	10 year	20 year
106,972	15%	30%	40%
Population to Meet Deployment Requirements	16,046	32,092	42,789
Major Population Centres in Tier (Descending Order by Population)			
Population Centre	Population	Area (km <sup>2</sup> )	Cumulative Population of Largest Population Centres in Tier
Kamloops	78,026	56.27	78,026
Thompson-Nicola P (Rivers and Peaks) (CSD) (Vinsulla)	3,672	1549.64	81,698
Thompson-Nicola L (Grasslands) (CSD) (Westwold)	2,995	1917.18	84,693
East Kootenay F (CSD) (Copper Creek)	2,726	6096.38	87,419
Thompson-Nicola J (Copper Desert County) (CSD) (Copper Creek)	1,580	3294.52	88,999

Fulfills only 5 year deployment requirements

Fulfills 5 and 10 year deployment requirements

Fulfills 5, 10 and 20 year deployment requirements



**Note:** "CSD" indicates a Census subdivision as Population Centre data not available for this community.

Population Centre (and CSD) information from Census 2016 via Statistics Canada

<https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E&TABID=1>

Table 12: Deployment Requirements and ‘Path of Least Resistance’ for Tier 4-170

Tier 4-170 Yukon			
	Deployment Requirements		
Tier Population	5 year	10 year	20 year
35,928	25%	40%	60%
Population to Meet Deployment Requirements	8,982	14,371	21,557
Major Population Centres in Tier (Descending Order by Population)			
Population Centre	Population	Area (km <sup>2</sup> )	Cumulative Population of Largest Population Centres in Tier
Whitehorse	21,732	34.95	21,732
Dawson (CSD)	1,375	32.45	23,107
Watson Lake (CSD)	790	6.11	23,897
Haines Junction (CSD)	613	34.49	24,510
Carmacks (CSD)	492	36.95	25,002
Old Crow (CSD)	221	14.17	25,223

Fulfills only 5 year deployment requirements   
 Fulfills 5 and 10 year deployment requirements   
 Fulfills 5, 10 and 20 year deployment requirements 

**Note:** For Tier 4-170 the list of communities on the tier map were not used.

**Note:** "CSD" indicates a Census subdivision as Population Centre data not available for this community.

Population Centre (and CSD) information from Census 2016 via Statistics Canada

<https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E&TABID=1>

Table 13: Deployment Requirements and ‘Path of Least Resistance’ for Tier 4-172

Tier 4-172 Northwest Territories			
	Deployment Requirements		
Tier Population	5 year	10 year	20 year
41,668	20%	35%	50%
Population to Meet Deployment Requirements	8,334	14,584	20,834
Major Population Centres in Tier (Descending Order by Population)			
Population Centre	Population	Area (km <sup>2</sup> )	Cumulative Population of Largest Population Centres in Tier
Yellowknife	18,884	17.88	18,884
Inuvik	3,140	1.62	22,024
Hay River	2,728	3.31	24,752
Fort Smith	2,031	2.01	26,783

Fulfills only 5 year deployment requirements

Fulfills 5 and 10 year deployment requirements

Fulfills 5, 10 and 20 year deployment requirements



**Note:** For Tier 4-172 the list of communities on the tier map were not used.

**Note:** "CSD" indicates a Census subdivision as Population Centre data not available for this community.

Population Centre (and CSD) information from Census 2016 via Statistics Canada

<https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E&TABID=1>

30. Examining the deployment requirements in the selected tiers reveals that for five of the 12 communities in the sample (4-090 Windsor/Leamington; 4-141 Edmonton; 4-146 Fort McMurray; 4-160 Kamloops, and 4-170 Yukon) only a single city would have to be served to meet the 5, 10 and 20 year deployment requirements. Put in other terms, while the Tier 4 service area 4-170 covers all of the Yukon, the deployment requirements, even after 20 years, could be met by simply servicing Whitehorse, and as such other communities, such as Dawson, could be unserved. The number of communities needed to be served via the path of least resistance method for each service area are as follows:

Table 14: Summary of ‘Path of Least Resistance’ Analysis for Selected Tiers

<b>Tier/Service Area</b>	<b>Number of Communities to Serve to Meet the 5 year Deployment Requirement</b>	<b>Number of Communities to Serve to Meet the 10 year Deployment Requirement</b>	<b>Number of Communities to Serve to Meet the 20 year Deployment Requirement</b>
<b>4-003 Gander/Grand Falls/Windsor</b>	1	2	4
<b>4-024 Mont Joli</b>	1	1	2
<b>4-044 Drummondville</b>	1	1	4
<b>4-050 Joliette</b>	1	2	2
<b>4-090 Windsor/Leamington</b>	1	1	1
<b>4-120 Weyburn</b>	1	1	3
<b>4-128 Prince Albert</b>	1	3	19
<b>4-141 Edmonton</b>	1	1	1
<b>4-146 Fort McMurray</b>	1	1	1
<b>4-160 Kamloops</b>	1	1	1
<b>4-170 Yukon</b>	1	1	1
<b>4-172 Northwest Territories</b>	1	1	2

31. As reflected in the above table, in every case the 5 year target can be met by servicing only the largest community in a service area. For all but the 4-128 Prince Albert service area only a handful of communities need be served to meet the 20 year targets. The Prince Albert service area is unique in that the deployment requirements there, specifically the 20 year targets, will require investment and deployment in a substantive number of communities.

32. In order to ensure that smaller communities benefit from deployment requirements, ISED must have more ambitious deployment targets. However, as the following analysis

demonstrates, simply increasing deployment targets by 10% (at the 5, 10 and 20 year marks) provides only a partial solution.

33. The tables that follow examine the impact of a 10% increase to the deployment requirements at each time interval. The same path of least resistance approach has been employed to demonstrate how many communities would need to be served after 5, 10 and 20 years to meet the increased deployment requirements.

Table 15: 'Path of Least Resistance' and Higher Deployment Requirements for Tier 4-003

Tier 4-003 Gander/Grand Falls/Windsor			
Tier Population	Deployment Requirements		
	5 year	10 year	20 year
144,229	15%	20%	30%
Population to Meet Deployment Requirements	21,634	28,846	43,269
Major Population Centres in Tier (Descending Order by Population)			
Population Centre	Population	Area (km <sup>2</sup> )	Cumulative Population of Largest Population Centres in Tier
Grand Falls	12,046	11.42	12,046
Gander	10,220	12.14	22,266
Clarenville (CSD)	6,291	140.81	28,557
Channel-Port Aux Basques	3,665	4.89	32,222
Bonavista	3,140	4.2	35,362
Lewisporte	2,174	1.87	37,536
Glovertown (CSD)	2,083	70.33	39,619
Springdale	2,080	3.5	41,699
Harbour Breton (CSD)	1,634	13.74	43,333
Baie Verte (CSD)	1,313	371.09	44,646
Burgeo	1,307	1.98	45,953
St. Lawrence (CSD)	1,192	35.5	47,145

Fulfills only the revised 5 year deployment requirements (+10%)

Fulfills the revised 5 and 10 year deployment requirements (+10%)

Fulfills the revised 5, 10 and 20 year deployment requirements (+10%)



**Note:** "CSD" indicates a Census subdivision as Population Centre data not available for this community.

Population Centre (and CSD) information from Census 2016 via Statistics Canada

<https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E&TABID=1>

Table 16: 'Path of Least Resistance' and Higher Deployment Requirements for Tier 4-024

Tier 4-024 Mont Joli			
	Deployment Requirements		
Tier Population	5 year	10 year	20 year
37,788	15%	20%	30%
Population to Meet Deployment Requirements	5,668	7,558	11,336
Major Population Centres in Tier (Descending Order by Population)			
Population Centre	Population	Area (km <sup>2</sup> )	Cumulative Population of Largest Population Centres in Tier
Mont-Joli	5,604	6.36	5,604
Amqui	4,511	5.57	10,115
Causapscal	1,041	1.73	11,156
Val-Brillant (CSD)	927	78.04	12,083
Matapedia (CSD)	645	71.55	12,728
Routhierville (CSD)	18	628.16	12,746

Fulfills only the revised 5 year deployment requirements (+10%)

Fulfills the revised 5 and 10 year deployment requirements (+10%)

Fulfills the revised 5, 10 and 20 year deployment requirements (+10%)



**Note:** "CSD" indicates a Census subdivision as Population Centre data not available for this community.

Population Centre (and CSD) information from Census 2016 via Statistics Canada

<https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E&TABID=1>

Table 17: 'Path of Least Resistance' and Higher Deployment Requirements for Tier 4-044

Tier 4-044 Drummondville			
Tier Population	Deployment Requirements		
	5 year	10 year	20 year
112,390	40%	60%	80%
Population to Meet Deployment Requirements	44,956	67,434	89,912
Major Population Centres in Tier (Descending Order by Population)			
Population Centre	Population	Area (km <sup>2</sup> )	Cumulative Population of Largest Population Centres in Tier
Drummondville	68,601	52.15	68,601
Acton Vale	5,399	4.3	74,000
Saint-Germain-de-Grantham	3,485	2.66	77,485
Wickham (CSD)	2,541	98.79	80,026
Saint-Lucien (CSD)	1,647	111.29	81,673
Saint-Guillaume (CSD)	1,476	87.88	83,149
Saint-Felix-de-Kingsey (CSD)	1,430	126.29	84,579
L'Avenir (CSD)	1,307	97.72	85,886
Saint-Cyrille-de-Wendover	1,216	0.93	87,102
Saint-Eugene (CSD)	1,126	75.85	88,228
Durham-Sud (CSD)	1,043	92.67	89,271
Saint-Bonaventure (CSD)	1,031	78.81	90,302
Lefebvre (CSD)	904	66.19	91,206

Fulfills only the revised 5 year deployment requirements (+10%)

Fulfills the revised 5 and 10 year deployment requirements (+10%)

Fulfills the revised 5, 10 and 20 year deployment requirements (+10%)



**Note:** For Tier 4-044 the list of communities on the tier map were not used.

**Note:** "CSD" indicates a Census subdivision as Population Centre data not available for this community.

Population Centre (and CSD) information from Census 2016 via Statistics Canada

<https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E&TABID=1>

Table 18: 'Path of Least Resistance' and Higher Deployment Requirements for Tier 4-050

Tier 4-050 Joliette			
Tier Population	Deployment Requirements		
	5 year	10 year	20 year
161,106	25%	40%	50%
Population to Meet Deployment Requirements	40,277	64,442	80,553
Major Population Centres in Tier (Descending Order by Population)			
Population Centre	Population	Area (km <sup>2</sup> )	Cumulative Population of Largest Population Centres in Tier
Joliette	45,508	36.99	45,508
Sorel	36,088	28.38	81,596
Saint-Gabriel	2,664	2.81	84,260
Saint-Michel-des-Saints (CSD)	2,359	501.61	86,619

Fulfills only the revised 5 year deployment requirements (+10%) 

Fulfills the revised 5 and 10 year deployment requirements (+10%) 

Fulfills the revised 5, 10 and 20 year deployment requirements (+10%) 

**Note:** "CSD" indicates a Census subdivision as Population Centre data not available for this community.

Population Centre (and CSD) information from Census 2016 via Statistics Canada

<https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E&TABID=1>

Table 19: 'Path of Least Resistance' and Higher Deployment Requirements for Tier 4-090

Tier 4-090 Windsor/Leamington			
Tier Population	Deployment Requirements		
	5 year	10 year	20 year
401,719	40%	60%	80%
Population to Meet Deployment Requirements	160,688	241,031	321,375
Major Population Centres in Tier (Descending Order by Population)			
Population Centre	Population	Area (km <sup>2</sup> )	Cumulative Population of Largest Population Centres in Tier
Windsor	287,069	176.21	287,069
Leamington	32,991	31.7	320,060

Fulfills only the revised 5 year deployment requirements (+10%) 

Fulfills the revised 5 and 10 year deployment requirements (+10%)

Fulfills the revised 5, 10 and 20 year deployment requirements (+10%)

**Note:** "CSD" indicates a Census subdivision as Population Centre data not available for this community.

Population Centre (and CSD) information from Census 2016 via Statistics Canada

<https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E&TABID=1>

Table 20: 'Path of Least Resistance' and Higher Deployment Requirements for Tier 4-120

Tier 4-120 Weyburn			
	Deployment Requirements		
Tier Population	5 year	10 year	20 year
22,877	30%	45%	60%
Population to Meet Deployment Requirements	6,863	10,295	13,726
Major Population Centres in Tier (Descending Order by Population)			
Population Centre	Population	Area (km <sup>2</sup> )	Cumulative Population of Largest Population Centres in Tier
Weyburn	10,679	8.39	10,679
Milestone (CSD)	699	2.17	11,378
Fillmore (Village) (CSD)	311	1.33	11,689
Cambria No. 6 (CSD) (Outram)	309	814.14	11,998
Bengough No. 40 (CSD) (Harptree)	281	1036.91	12,279
Elmsthorpe No. 100 (Truax)	226	843.12	12,505
Surprise Valley No. 9 (CSD) (Gladmar)	217	813.93	12,722
Happy Valley No. 10 (CSD) (Big Beaver)	139	812.74	12,861

Fulfills only the revised 5 year deployment requirements (+10%)

Fulfills the revised 5 and 10 year deployment requirements (+10%)

Fulfills the revised 5, 10 and 20 year deployment requirements (+10%)



**Note:** "CSD" indicates a Census subdivision as Population Centre data not available for this community.

Population Centre (and CSD) information from Census 2016 via Statistics Canada

<https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E&TABID=1>

Table 21: 'Path of Least Resistance' and Higher Deployment Requirements for Tier 4-128

Tier 4-128 Prince Albert			
Tier Population	Deployment Requirements		
	5 year	10 year	20 year
130,446	30%	45%	60%
Population to Meet Deployment Requirements	39,134	58,701	78,268
Major Population Centres in Tier (Descending Order by Population)			
Population Centre	Population	Area (km <sup>2</sup> )	Cumulative Population of Largest Population Centres in Tier
Prince Albert	35,102	21.15	35,102
Melfort	5,778	4.31	40,880
Humboldt	4,872	2.73	45,752
Nipawin	3,989	3.04	49,741
Tisdale	3,136	2.8	52,877
Rosthern	1,488	1.7	54,365
Hudson Bay	1,306	1.27	55,671
Waldheim (CSD)	1,213	1.97	56,884
Birch Hills	1,033	2.27	57,917
Carrot River (CSD)	973	1.82	58,890
Wakaw (CSD)	922	3.12	59,812
Hague (CSD)	874	1.17	60,686
Porcupine Plain (CSD)	862	2.27	61,548
Kelvington (CSD)	834	3.99	62,382
Cudworth (CSD)	814	2.21	63,196
St Brieux (CSD)	667	2.55	63,863
Naicam (CSD)	661	1.69	64,524
Kinistino (CSD)	654	1.55	65,178
Aberdeen (CSD)	622	1.95	65,800
Bruno (CSD)	611	0.95	66,411
Duck Lake (CSD)	569	2.73	66,980
Star City (CSD)	387	0.7	67,367
Vonda (CSD)	384	2.86	67,751
Choiceland (CSD)	359	1.12	68,110
Arborfield (CSD)	312	0.88	68,422
Rose Valley (CSD)	282	1.12	68,704

Fulfills only the revised 5 year deployment requirements (+10%)

Fulfills the revised 5 and 10 year deployment requirements (+10%)

Fulfills the revised 5, 10 and 20 year deployment requirements (+10%)



Table 22: 'Path of Least Resistance' and Higher Deployment Requirements for Tier 4-141

Tier 4-141 Edmonton			
	Deployment Requirements		
Tier Population	5 year	10 year	20 year
1,325,887	40%	60%	80%
Population to Meet Deployment Requirements	530,355	795,532	1,060,710
Major Population Centres in Tier (Descending Order by Population)			
Population Centre	Population	Area (km <sup>2</sup> )	Cumulative Population of Largest Population Centres in Tier
Edmonton	1,062,643	572.69	1,062,643
Spruce Grove	36,135	29.09	1,098,778
Leduc	29,556	61.96	1,128,334
Lamont County (CSD) (Hilliard)	3,899	2385.09	1,132,233

Fulfills only the revised 5 year deployment requirements (+10%)

Fulfills the revised 5 and 10 year deployment requirements (+10%)

Fulfills the revised 5, 10 and 20 year deployment requirements (+10%)



**Note:** "CSD" indicates a Census subdivision as Population Centre data not available for this community.

Population Centre (and CSD) information from Census 2016 via Statistics Canada

<https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E&TABID=1>

Table 23: 'Path of Least Resistance' and Higher Deployment Requirements for Tier 4-146

Tier 4-146 Fort McMurray			
	Deployment Requirements		
Tier Population	5 year	10 year	20 year
73,953	40%	60%	80%
Population to Meet Deployment Requirements	29,581	44,372	59,162
Major Population Centres in Tier (Descending Order by Population)			
Population Centre	Population	Area (km <sup>2</sup> )	Cumulative Population of Largest Population Centres in Tier
Fort McMurray	66,573	51.79	66,573
Improvement District No. 24 Wood Buffalo (CSD) (Garden Creek and Hay Camp)	648	33416.3	67,221

Fulfills only the revised 5 year deployment requirements (+10%)

Fulfills the revised 5 and 10 year deployment requirements (+10%)

Fulfills the revised 5, 10 and 20 year deployment requirements (+10%)



**Note:** "CSD" indicates a Census subdivision as Population Centre data not available for this community.

Population Centre (and CSD) information from Census 2016 via Statistics Canada

<https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E&TABID=1>

Table 24: 'Path of Least Resistance' and Higher Deployment Requirements for Tier 4-160

Tier 4-160 Kamloops			
Tier Population	Deployment Requirements		
	5 year	10 year	20 year
106,972	25%	40%	50%
Population to Meet Deployment Requirements	26,743	42,789	53,486

  

Major Population Centres in Tier (Descending Order by Population)			
Population Centre	Population	Area (km <sup>2</sup> )	Cumulative Population of Largest Population Centres in Tier
Kamloops	78,026	56.27	78,026
Thompson-Nicola P (Rivers and Peaks) (CSD) (Vinsulla)	3,672	1549.64	81,698
Thompson-Nicola L (Grasslands) (CSD) (Westwold)	2,995	1917.18	84,693
East Kootenay F (CSD) (Copper Creek)	2,726	6096.38	87,419
Thompson-Nicola J (Copper Desert County) (CSD) (Copper Creek)	1,580	3294.52	88,999

Fulfills only the revised 5 year deployment requirements (+10%)

Fulfills the revised 5 and 10 year deployment requirements (+10%)

Fulfills the revised 5, 10 and 20 year deployment requirements (+10%)



**Note:** "CSD" indicates a Census subdivision as Population Centre data not available for this community. Population Centre (and CSD) information from Census 2016 via Statistics Canada

<https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E&TABID=1>

Table 25: 'Path of Least Resistance' and Higher Deployment Requirements for Tier 4-170

Tier 4-170 Yukon			
Tier Population	Deployment Requirements		
	5 year	10 year	20 year
35,928	35%	50%	70%
Population to Meet Deployment Requirements	12,575	17,964	25,150
Major Population Centres in Tier (Descending Order by Population)			
Population Centre	Population	Area (km <sup>2</sup> )	Cumulative Population of Largest Population Centres in Tier
Whitehorse	21,732	34.95	21,732
Dawson (CSD)	1,375	32.45	23,107
Watson Lake (CSD)	790	6.11	23,897
Haines Junction (CSD)	613	34.49	24,510
Carmacks (CSD)	492	36.95	25,002
Old Crow (CSD)	221	14.17	25,223

Fulfills only the revised 5 year deployment requirements (+10%)

Fulfills the revised 5 and 10 year deployment requirements (+10%)

Fulfills the revised 5, 10 and 20 year deployment requirements (+10%)



**Note:** For Tier 4-170 the list of communities on the tier map were not used.

**Note:** "CSD" indicates a Census subdivision as Population Centre data not available for this community.

Population Centre (and CSD) information from Census 2016 via Statistics Canada

<https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E&TABID=1>

Table 26: 'Path of Least Resistance' and Higher Deployment Requirements for Tier 4-090

Tier 4-172 Northwest Territories			
	Deployment Requirements		
Tier Population	5 year	10 year	20 year
41,668	30%	45%	60%
Population to Meet Deployment Requirements	12,500	18,751	25,001
Major Population Centres in Tier (Descending Order by Population)			
Population Centre	Population	Area (km <sup>2</sup> )	Cumulative Population of Largest Population Centres in Tier
Yellowknife	18,884	17.88	18,884
Inuvik	3,140	1.62	22,024
Hay River	2,728	3.31	24,752
Fort Smith	2,031	2.01	26,783

Fulfills only the revised 5 year deployment requirements (+10%)

Fulfills the revised 5 and 10 year deployment requirements (+10%)

Fulfills the revised 5, 10 and 20 year deployment requirements (+10%)



**Note:** For Tier 4-172 the list of communities on the tier map were not used.

**Note:** "CSD" indicates a Census subdivision as Population Centre data not available for this community.

Population Centre (and CSD) information from Census 2016 via Statistics Canada

<https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E&TABID=1>

34. The above tables indicate that the blunt approach of increasing deployment requirements will have mixed results. It produces little discernible impact in the number of communities to be served in several tiers, particularly those dominated by a single large community (e.g. 4-141 Edmonton or 4-146 Fort McMurray).

35. The table below provides an indication of the number of communities that could be served to meet the 10% higher deployment requirements

Table 27: Comparison of Existing and 10% Higher Deployment Requirements

<b>Tier/Service Area</b>	<b>Number of Communities to Serve to Meet the +10% 5 year Deployment Requirement</b>	<b>Number of Communities to Serve to Meet the +10% 10 year Deployment Requirement</b>	<b>Number of Communities to Serve to Meet the +10% 20 year Deployment Requirement</b>
<b>4-003 Gander/Grand Falls/Windsor</b>	2	4	9
<b>4-024 Mont Joli</b>	2	2	4
<b>4-044 Drummondville</b>	1	1	11
<b>4-050 Joliette</b>	1	2	2
<b>4-090 Windsor/Leamington</b>	1	1	>2
<b>4-120 Weyburn</b>	1	1	>8
<b>4-128 Prince Albert</b>	2	10	>26
<b>4-141 Edmonton</b>	1	1	1
<b>4-146 Fort McMurray</b>	1	1	1
<b>4-160 Kamloops</b>	1	1	1
<b>4-170 Yukon</b>	1	1	5
<b>4-172 Northwest Territories</b>	1	1	4

36. First, it should be noted that for three service areas (4-090 Windsor/Leamington, 4-120 Weyburn, and 4-128 Prince Albert) the 10% higher 20 year targets are not achievable without servicing additional communities beyond those listed.

37. However, as indicated by the following table, increased deployment requirements would result, in general, in more communities needing to be served, particularly at the longer 20 year term.

Table 28: Difference in Number of Communities to be Serviced via ‘Path of Least Resistance’  
Methodology

<b>Tier/Service Area</b>	<b>Difference in the Number of Communities to be Served between the 10% and original 5 year Deployment Requirements</b>	<b>Difference in the Number of Communities to be Served between the 10% and original 10 year Deployment Requirements</b>	<b>Difference in the Number of Communities to be Served between the 10% and original 20 year Deployment Requirements</b>
<b>4-003 Gander/Grand Falls/Windsor</b>	1	2	5
<b>4-024 Mont Joli</b>	1	1	2
<b>4-044 Drummondville</b>	0	0	7
<b>4-050 Joliette</b>	0	0	0
<b>4-090 Windsor/Leamington</b>	0	0	>1
<b>4-120 Weyburn</b>	0	0	>5
<b>4-128 Prince Albert</b>	1	7	>7
<b>4-141 Edmonton</b>	0	0	0
<b>4-146 Fort McMurray</b>	0	0	0
<b>4-160 Kamloops</b>	0	0	0
<b>4-170 Yukon</b>	0	0	4
<b>4-172 Northwest Territories</b>	0	0	2

38. As indicated above, increasing deployment requirements would require no additional communities to be serviced in several tiers (4-050 Joliette, 4-141 Edmonton, 4-146 Fort McMurray, and 4-160 Kamloops). However, in other service areas (notably 4-003 Gander/ Grand Falls/Windsor, 4-024 Mont Joli, 4-044 Drummondville, 4-120 Weyburn, 4-128 Prince Albert and 4-170 Yukon) strengthening deployment requirements appears to have a discernable impact of requiring that more communities be served, particularly at the 20 year point.

39. Given the above analysis, ISEDs deployment requirements should be improved as follows:

For service areas dominated by a single large community, increasing deployment requirements as a share of the population to be served does little to spur investment and deployment outside the dominant population centre. As such, for these communities, deployment requirements should come with both a percentage of the population target, and a number of communities outside the dominant population centre target. For example for 4-141 Edmonton, deployment requirements should include current 5, 10 and 20 year targets, plus a requirement to serve one community outside Edmonton at the 10 year mark, and two communities outside Edmonton by the 20 year mark.

For service areas without a single dominant population centre, ISED should establish a minimum number of communities to be served (in addition to the general population deployment requirements). Like the progressively increasing targets, the number of communities to be serviced should also increase over time.

## References

Canadian Radio-television and Telecommunications Commission (CRTC). “Telecom Regulatory Policy CRTC 2016-496” December 21, 2016. <https://crtc.gc.ca/eng/archive/2016/2016-496.htm>

CRTC. “Communications Monitoring Report 2018,” December 20, 2018. <https://crtc.gc.ca/eng/publications/reports/policymonitoring/2018/cmr3c.htm>.

Industry Canada. “Policy and Technical Framework: Mobile Broadband Services (MBS) – 700 MHz Band,” 2012. [https://www.ic.gc.ca/eic/site/smtgst.nsf/vwapj/700MHz-e.pdf/\\$file/700MHz-e.pdf](https://www.ic.gc.ca/eic/site/smtgst.nsf/vwapj/700MHz-e.pdf/$file/700MHz-e.pdf)

Industry Canada. “Licensing Framework for Broadband Radio Service (BRS) -- 2500 MHz Band,” 2014a. [https://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/2500-decisionBRS-Updated-April-2015.pdf/\\$FILE/2500-decisionBRS-Updated-April-2015.pdf](https://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/2500-decisionBRS-Updated-April-2015.pdf/$FILE/2500-decisionBRS-Updated-April-2015.pdf)

Industry Canada. “Decisions Regarding Policy Changes in the 3500 MHz Band (3475–3650 MHz) and a New Licensing Process, 2014b”. <https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf10914.html>

Industry Canada. “Service Areas for Competitive Licenses” October 29, 2015.

[https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/h\\_sf01627.html](https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/h_sf01627.html)

ISED. “Price Comparisons of Wireline, Wireless and Internet Services in Canada and with Foreign Jurisdictions - 2018 Edition,” 2018.

<https://www.ic.gc.ca/eic/site/693.nsf/eng/00169.html>.

Joseph, Kris. “Analysis of Canadian Wireless Spectrum Auctions: Licence Ownership and Deployment in the 700 MHz, 2500 MHz and 3500 MHz Frequency Ranges,” June 1,

2018. <https://crtc.gc.ca/eng/acrtc/prx/2018joseph.htm>.

McNally, Michael, Dinesh Rathi, Kris Joseph, Jennifer Evaniew, and Amy Adkisson. “Ongoing Policy, Regulatory, and Competitive Challenges Facing Canada’s Small Internet Service Providers.” *Journal of Information Policy* 8 (2018): 167–98.

<https://doi.org/10.5325/jinfopoli.8.2018.0167>.

McNally, Michael B., Samuel E. Trosow. “The New Telecommunications Sector Foreign Investment Rules and Rural Broadband.” *Journal of Rural and Community Development*,

8(2) (2013): 23-43. <http://journals.brandonu.ca/jrcd/article/view/1003>

Noam, Eli. “Let Them Eat Cellphones: Why Mobile Wireless Is No Solution for Broadband.”

*Journal of Information Policy* 1 (2011): 470.

<https://doi.org/10.5325/jinfopoli.1.2011.0470>.

Statistics Canada. “Census Profile, 2016 Census.” June 18, 2019.

<https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E&TABID=1>

Stobbs, Robyn, Jennifer Evaniew, Michael McNally, and Dinesh Rathi. “Strengthening Spectrum License Deployment Requirements: An Analysis of the Path of Least Resistance for the AWS-3 Auction.” Presented at the 35<sup>th</sup> Annual Canadian Communication Association Conference. University of Ottawa, Ottawa, ON.

<https://doi.org/10.7939/R32Z12S4K>