

8 Northeast Alberta Information HUB Ltd. (Alberta HUB)

8.1 Current State

8.1.1 Regional Profile

As shown in Table 23, the Northern Alberta Information HUB Ltd. (Alberta HUB) region is made-up of numerous communities – the City of Cold Lake, 10 towns, 13 villages, 3 summer villages, and 9 counties or municipal districts (MDs), 7 First Nations, and 4 Métis Settlements. A map of the Alberta HUB region is shown in Figure 65. Please visit Alberta HUB’s website for more information <http://www.albertahub.com/>.

Of the communities within Alberta HUB, TELUS has made generational fibre investments in Bonnyville, Cold Lake, St. Paul, and Vegreville. Elk Point has started the engagement process with AxiaConnect for their community’s fibre connectivity.

Table 23 – Alberta HUB Communities

City	Towns	Villages	Summer Villages	Counties/MDs	First Nations	Métis Settlements
Cold Lake	Bonnyville Bruderheim Elk Point Lamont Mundare Smoky Lake St. Paul Two Hills Vegreville Vermilion	Andrew Chipman Dewberry Glendon Innisfree Kitscoty Mannville Marwayne Myrnam Paradise Valley Vilna Waskatenau Willingdon	Bonnyville Beach Horseshoe Bay Pelican Narrows	Bonnyville Lac La Biche Lamont Minburn Smoky Lake St. Paul Thorhild Two Hills Vermilion River	Beaver Lake* Cold Lake Frog Lake* Heart Lake* Kehewin Cree Saddle Lake* Whitefish Lk. (Goodfish)	Buffalo Lake Elizabeth Fishing Lake Kikino

*Community resides within the northern Alberta study area and the NADC region but is not presently a member of a REDA.

The region is home to approximately 135,000 residents (including approximately 20,000 for the Alberta portion of the City of Lloydminster).¹⁰⁶ Table 24 provides a population breakdown by municipality (rural and urban), First Nation, and Métis Settlement as well as five-year population growth trends and CAGRs. The MD of Bonnyville and City of Cold Lake are the most populated municipalities in the Alberta HUB region, with populations of 13,575 and 14,961, respectively. The MD of Bonnyville has grown significantly (approximately 21%) during the five-year period between 2011 and 2016; however, the population of the Town of Bonnyville has declined (although the town’s own earlier census suggests differently). Some communities within Alberta HUB have completed their own population census subsequent to the Federal census. Therefore, the population figures provided in this report are subject to change. Statistics Canada’s 2016 Census of Population data indicate that the Buffalo Lake Métis Settlement has grown significantly over the five-year period.

¹⁰⁶ Calculations based on Statistics Canada’s 2016 Census of Population.

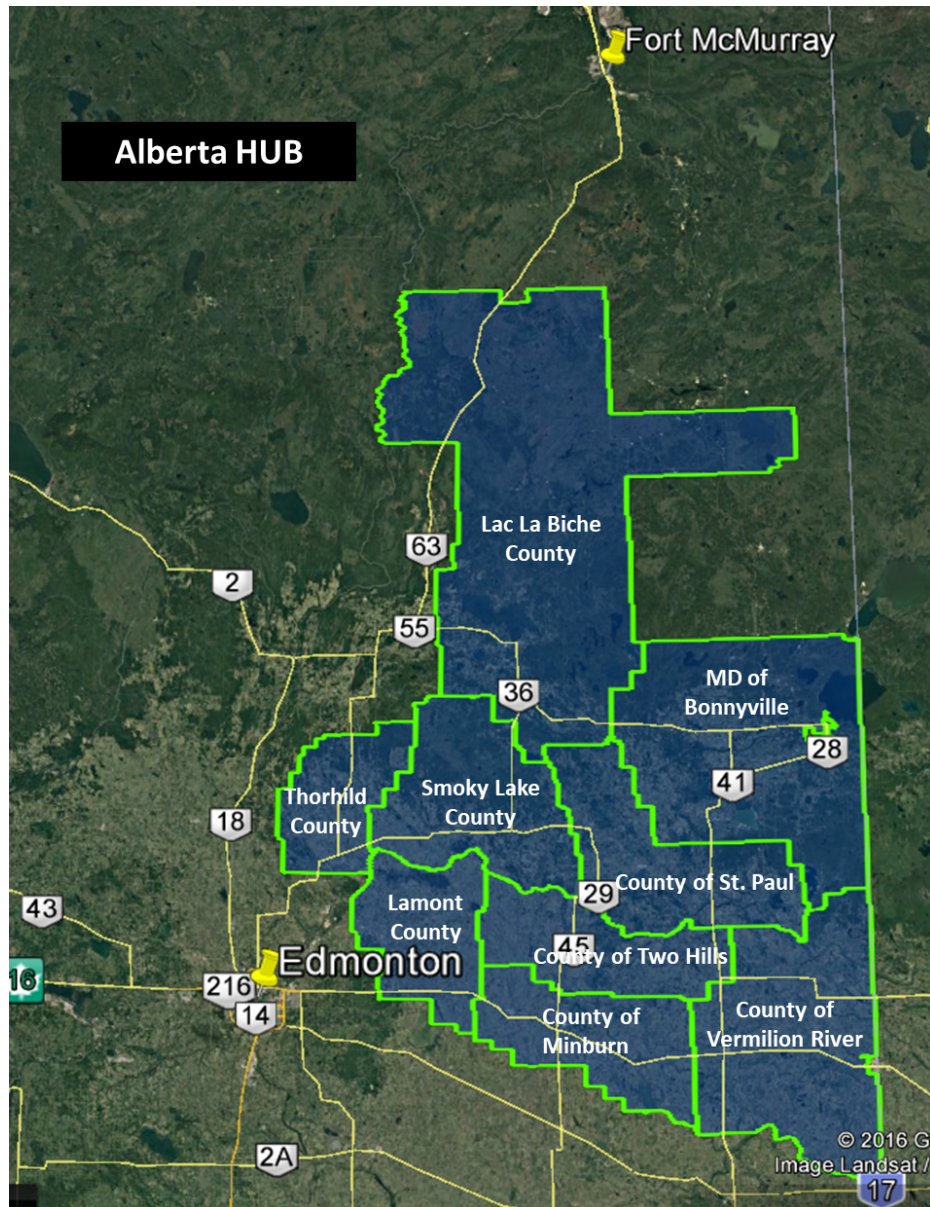


Figure 65 – Alberta HUB region.

It should be noted that the Village of Innisfree is currently undergoing a viability review - data are being collected and a Viability Team is being formed. Effective September 1, 2017, the Village of Willingdon will be dissolved and become a hamlet of the County of Two Hills.¹⁰⁷ Lac La Biche County has applied to Alberta Municipal Affairs to become a specialized municipality. Its largest hamlet, Lac La Biche, has a population of 2,314 and this represents a decline of minus 8.2% between 2011 and 2016.

¹⁰⁷ Order Dissolving the Village of Willingdon; O.C. 240/2017; 12 July 2017.

Table 24 – Alberta HUB Population & Population Growth Trends

Municipality	Rural				Urban				First Nations (FN)/Métis Settlements						
	Population (2016)	CAGR (%) (2011-2016)	5-Year Trend		City/Town/Village	Population (2016)	CAGR (%) (2011-2016)	5-Year Trend		Reserve / Settlement	Population (2016)	CAGR (%) (2011-2016)	5-Year Trend		
			(%) & Direction					(%) & Direction					(%) & Direction		
Bonnyville, MD	13,575	3.9	21.3	▲	Cold Lake	14,961	1.6	8.1	▲	Cold Lake	874	2.1	10.9	▲	
					Bonnyville	5,417	-2.7	-12.9	▼	Kehewin Cree	976	-1.7	-8.4	▼	
					Glendon	493	0.3	1.4	▲	Elizabeth (Métis)	653	0.0	-0.2	▼	
					SV ¹ (2)	235	-1.8	-8.6	▼	Fishing Lk. (Métis)	446	0.5	2.3	▲	
					Sub-total	21,106				Sub Total - FN	1,850				
										Sub Total - Métis	1,099				
Lac La Biche, County	8,330	-0.2	-0.9	▼						Beaver Lake	414	-0.4	-2.1	▼	
										Heart Lake	184	3.0	15.7	▲	
										Sub Total - FN	598				
Lamont, County	3,899	0.1	0.7	▲	Andrew	425	2.3	12.1	▲						
					Bruderheim	1,308	2.5	13.2	▲						
					Chipman	274	-0.7	-3.5	▼						
					Lamont	1,774	0.2	1.2	▲						
					Mundare	852	-0.1	-0.4	▼						
Sub-total	4,633														
Minburn, County	3,188	-1.2	-5.8	▼	Innisfree	193	-2.6	-12.3	▼						
					Mannville	828	0.6	3.1	▲						
					Vegreville	5,708	0.0	-0.2	▼						
					Sub-total	6,729									
Smoky Lake, County	2,459	na	na		Smoky Lake	964	-1.2	-5.7	▼	Saddle Lake	6,500	na	na		
					Vilna	290	3.1	16.5	▲	Whitefish	1,310	2.0	10.3	▲	
					Waskatenau	186	-6.1	-27.1	▼	(Goodfish)					
										Buffalo Lk. (Métis)	712	7.7	44.7	▲	
										Kikino (Métis)	934	-0.5	-2.6	▼	
					Sub-total	1,440				Sub Total - FN	7,810				
					Sub Total - Métis	1,646									
St. Paul, County	6,036	0.7	3.6	▲	Elk Point	1,452	0.6	2.8	▲	Frog Lake	531	1.9	9.7	▲	
					St. Paul	5,827	1.5	7.8	▲						
					SV ² (1)	49	5.8	32.4	▲						
					Sub-total	7,328									
Thorhild, County	3,254	-1.0	-4.8	▼											
Two Hills, County	3,322	1.0	5.1	▲	Myrnam	339	-1.7	-8.4	▼						
					Two Hills	1,352	-0.4	-2.0	▼						
					Willingdon	319	3.0	16.0	▲						
					Sub-total	2,010									
Vermilion River, County	8,267	0.9	4.6	▲	Dewberry	186	-1.5	-7.5	▼						
					Kitscoty	925	1.8	9.3	▲						
					Marwayne	564	-1.6	-7.8	▼						
					Paradise V.	179	0.6	2.9	▲						
					Vermilion	4,084	0.8	3.9	▲						
					Sub-total	5,938									
Total	52,330					49,184				Total - FN	10,789				
										Total - Métis	2,745				

CAGR – Compound Annual Growth Rate

Note 1: SV - Summer Village: Bonnyville Beach and Pelican Narrows

Note 2: SV - Summer Village: Horseshoe Bay

Total Population = 115,048

Source: Statistics Canada Census 2011 and 2016, Saddle Lake First Nations, Smoky Lake County Municipal Census.

There are 4,860 businesses with at least one employee operating in the Alberta HUB region. The top 10 industries in which they operate is shown in Table 25 and Figure 65 (industries were classified according to the NAICS). The data reflects a diverse economy with approximately 17% of businesses with employees engaged in the construction industry. The sector with the second highest participation is the other services

(except public administration).¹⁰⁸ Together the two sectors make up almost 28% of businesses with employees in the region. The 'Other Industries' segment (14.3%) shown in the Figure 66 chart includes industries that individually contribute between 3.5% and 0.3% to the category.¹⁰⁹

Table 25 – Alberta HUB Number of Businesses (with employees) by Industry

Industry	Businesses	Percent (%)
Construction	800	16.5
Other services (except public administration)	538	11.1
Retail trade	491	10.1
Professional, scientific and technical services	488	10.0
Transportation and warehousing	464	9.5
Agriculture, forestry, fishing, and hunting	380	7.8
Mining, quarrying, and oil and gas extraction	322	6.6
Healthcare and social assistance	266	5.5
Accommodation and food services	212	4.4
Administrative and support, waste management and remediation	202	4.2

Source: Calculations based on dataset provided by Alberta Economic Development & Trade, Economic Information & Analytics, Feb. 13, 2017.

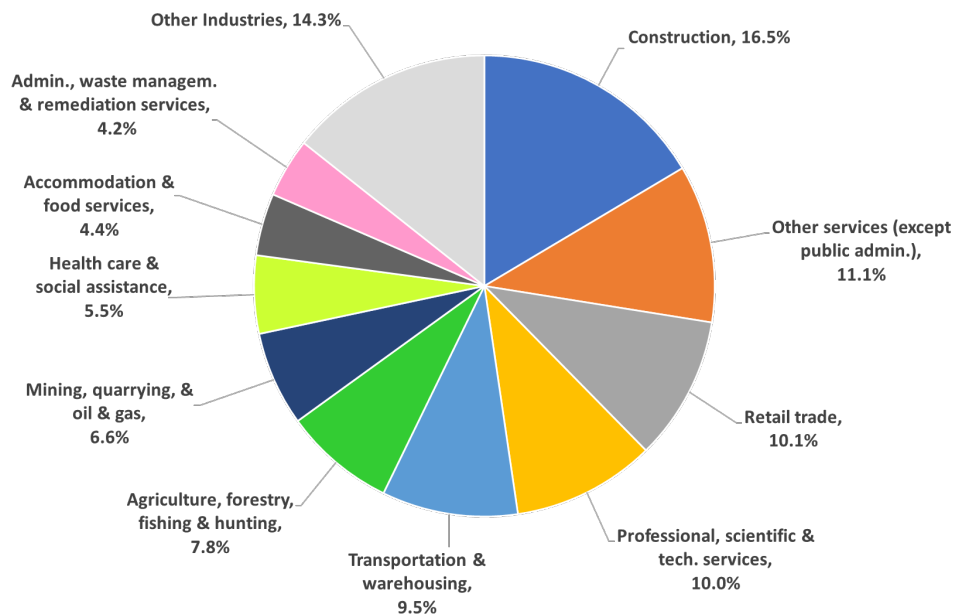


Figure 66 – Alberta HUB mix (based on business counts).

¹⁰⁸ Comprised of businesses primarily engaged in repairing and maintenance on motor vehicles, machinery, and other products; providing personal care, funeral, and laundry services; organizing and promoting religious activities; and supporting causes such as grant making and advocacy.

¹⁰⁹ Real estate and rental and leasing; wholesale trade; manufacturing; finance and insurance; educational services; public administration; information and cultural industries; arts, entertainment and recreation; management of companies and enterprises; and utilities.

During the data collection stage for the Current State, Alberta HUB conducted a broadband survey with businesses in the region. When asked about whether current Internet service levels were preventing their business from expanding, more than 50% of the 54 respondents indicated that service levels were inhibiting their growth and ability to serve their customers as shown in Figure 67.

Q. Are your current service levels preventing you from expansion of your business?

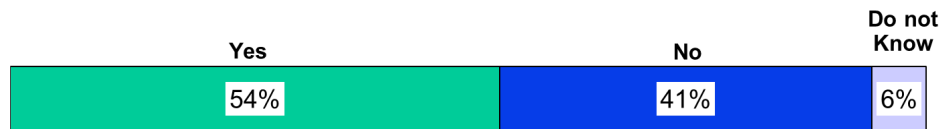


Figure 67 – Current Internet service levels impact.

Cross-tabulation analysis did not generally find a strong correlation between industry sector and affirmative ‘yes’ responses, with the exception of the professional services sector. Firms active in providing accounting, human resources, legal, and web design services predominately felt their current Internet service levels were preventing them from expanding their businesses. Most respondents were small businesses, some working in home offices located in the rural areas of Alberta HUB. Firms involved in banking, financial services, and insurance activities indicated that Internet service levels were not inhibiting their growth. As one might anticipate, businesses currently attaining Internet speeds of more than approximately 20 Mb/s also did not feel their growth was being impacted in a negative way.

Respondents almost unanimously indicated they would need to increase their current levels of Internet service over the next 3, 5, and 10 years, some adding that it would have to be sooner than the timeframes cited. Select explanatory comments included the following (Figure 68):

- Yes, as more educational opportunities are offered online, video and web conferencing technologies (*adult literacy and learning organization*).
- Yes, the availability of the more technological applications is only going to increase (*manufacturing business*).
- Yes, as our business grows, we can see real challenges and potential problems. We would like to increase our use of video conferencing and feel the present system would be taxed (*sand and gravel company currently receiving Internet download speeds of 10 Mb/s*).
- Yes, as we grow our business, Internet service is a necessary component to our success (*retail trade business – automotive, industrial, and agriculture*).

Q. Do you see the need to increase your current level of service over the next 3, 5, 10 years?



Figure 68 – Need to increase current internet service levels.

The Alberta HUB region is strategically located – its transportation corridors connecting Edmonton, the Saskatchewan border area, and the resource rich areas of northeastern Alberta. There are several vital supply chains running through the region, which have created opportunities for trucking, rail

transportation, and warehousing as well as for the use of airport assets in the region.¹¹⁰ “Currently, rubber tire traffic is the dominate means of movement of goods and people in the region.”¹¹¹

Post-secondary educational institutions in the Alberta HUB region include University Blue Quills, Lakeland College, and Portage College. Blue Quills University, near the Town of St. Paul, is a First Nations owned and operated university – owned by seven First Nations.¹¹² Portage College has campuses or learning locations in the communities of Boyle, Cold Lake, Frog Lake, Lac La Biche, Saddle Lake, St. Paul, and Whitefish Lake.

8.1.2 Municipal, First Nations, and Métis Settlements Broadband Interests

Communities within Alberta HUB are at different stages in recognizing the importance of broadband services and connectivity to economic diversification, municipal sustainability, regional competitiveness, public service delivery, and quality of life.¹¹³

The MD of Bonnyville and the Town of Bonnyville are preparing an Inter-Municipal Development Plan for the lands located around the town. Amendments to the MGA include the implementation of mandatory regional planning mechanisms for land-use planning and the requirement for municipalities to work together regarding service delivery and cost sharing.¹¹⁴ Through the *Inter-Municipal Collaborative Development Program (ICMP)*, the MD of Bonnyville provides funding to the Town of Bonnyville, Cold Lake, and the Village of Glendon to compensate them for their infrastructure usage by the MD’s residents.

The City of Cold Lake will be upgrading the city-owned network from leased lines and radio connections to fibre in 2017 to reduce costs, enhance network throughput, and increase reliability.¹¹⁵

Table 26 identifies the awareness and current state of municipal involvement and interest related to broadband and fibre network deployments. Most municipalities in the Alberta HUB region are at a relatively early stage. The County of Vermilion River and its urban centres have formed the Vermilion River Regional Alliance (VRRRA) to evaluate the options to provide capable broadband infrastructure on an open-access utility basis. The Town of Two Hills is possibly interested in working on a regional broadband plan. Lac La Biche County expressed the need for affordable backhaul to Edmonton.

¹¹⁰ Alberta HUB; 15 February 2017.

¹¹¹ *Alberta HUB Transportation Study*, Final Report; Outlook Market Research & Consulting; 31 October 2016. 8.

¹¹² Beaver Lake, Cold Lake, Frog Lake, Heart Lake, Kehewin, Saddle Lake, and Whitefish Lake.

¹¹³ The five elements of broadband’s importance were identified by the Calgary Regional Partnership, Economic Prosperity Steering Committee, *Request for Decision*; 2016-09-08.

¹¹⁴ Alberta Municipal Affairs; *What’s Changing*; 7 February 2017. <http://mgareview.alberta.ca/whats-changing/>.

¹¹⁵ *City of Cold Lake: 2017 Capital Budget*; City of Cold Lake. 5.

Table 26 – Alberta HUB Involvement & Interest in Broadband ¹¹⁶

Community	Enthusiastic	Interested 'Maybe'	Need Help Too Small	Too Expensive	Status Quo	Don't Know ¹¹⁷	No Response ¹¹⁸
City							
Cold Lake (TELUS fibre)			X	X			
Towns							
Bonnyville (TELUS fibre)					X		
Bruderheim			X				
Elk Point	X						
Lamont					X		
Mundare				X			
Smoky Lake	X						
St. Paul (TELUS fibre)					X		
Two Hills		X					
Vegreville (TELUS fibre)					X		
Vermilion	X						
Villages							
Andrew							X
Chipman							X
Dewberry	X						
Glendon		X	X	X	X		
Innisfree							X
Kitscoty	X						
Mannville	X						
Marwayne	X						
Myrnam							X
Paradise Valley	X						
Vilna							X
Waskatenau		X	X				
Willingdon	Effective September 1, 2017 the village will become a hamlet of the County of Two Hills ¹¹⁹						

¹¹⁶ Communities were asked to rate their involvement and interest in broadband. Broadband was defined as follows: In telecommunications, broadband is a wide bandwidth data transmission with an ability to simultaneously transport multiple signals and traffic types - the medium can be twisted-pair copper wiring, optical fibre, coaxial cable, or radio. Broadband service is characterized as offering symmetric bandwidth between 50 Mb/s and 1 gigabit (Gb/s)/1,000 Mb/s and higher (really unlimited bit rates) (symmetric meaning the upload bit rate is as fast as the download bit rate).

¹¹⁷ Don't Know – the respondent was unable to rate their community's interest and involvement in broadband.

¹¹⁸ No Response – the community did not respond to the inquiries regarding their community's interest and involvement in broadband.

¹¹⁹ Order Dissolving the Village of Willingdon.

Community	Enthusiastic	Interested 'Maybe'	Need Help Too Small	Too Expensive	Status Quo	Don't Know	No Response
Counties/MDs							
Bonnyville					X		
Lac La Biche						X, no plan in place	
Lamont		X	X	X	X		
Minburn					X		
Smoky Lake	X	X					
St. Paul		X		X			
Thorhild							X
Two Hills							X
Vermilion River	X						
First Nations							
Beaver							X
Cold Lake							X
Frog Lake							X
Heart Lake							X
Kehewin Cree			X				
Saddle Lake		X					
Whitefish Lake (Goodfish)							X
Métis Settlements							
Buffalo Lake							X
Elizabeth	X						
Fishing Lake							X
Kikino							X

8.1.3 Current Service Providers, Services, and Infrastructure

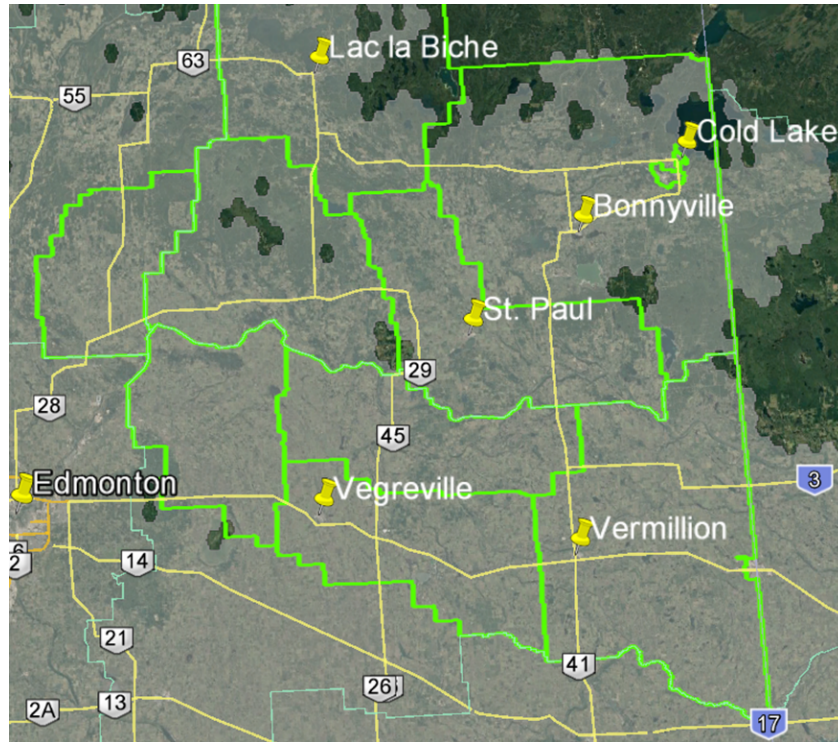
8.1.3.1 Fixed Wireless-based

Current ISPs using fixed wireless technology in the Alberta HUB region include the following. Appendix 16.3 provides the details of their service offerings (Internet only – no bundling unless otherwise stated) and geographic coverage. The coverage maps are those that were available on their websites at the time of the writing of this report.

- Alberta Communication Cable Services,
- Arrow Technology Group,
- Bellevista Broadband,
- CCL Networks,
- Clearwave Broadband Networks (Clearwave),
- Corridor Communications (CCI) (fixed wireless and wired Digital Subscriber Line (DSL)-based),
- DeneTech (Cold Lake First Nations),
- DigitalWeb Internet Services,
- Infinity Internet Solutions,
- MCSNet,
- Wild Rose Internet, and
- XplorNet (fixed wireless and satellite-based).

According to the CRTC website¹²⁰, minimal 5 Mb/s down (toward the end-client) by 1 Mb/s up (from the end-client to the network) service is almost ubiquitously available throughout the Alberta HUB region. A combined view of the fixed wireless coverage is shown in Figure 69 (light gray areas).

Through its DSL partnership with TELUS, CCI offers wired service in the villages of Glendon, Mannville, and Marwayne. Clearwave is planning a province-wide expansion. XplorNet's new satellites will allow them to offer download speeds of 25 Mb/s across their customer base by July 2017.



Source: <http://www.crtc.gc.ca/eng/internet/internetcanada.htm>

Figure 69 – Alberta HUB fixed wireless coverage.

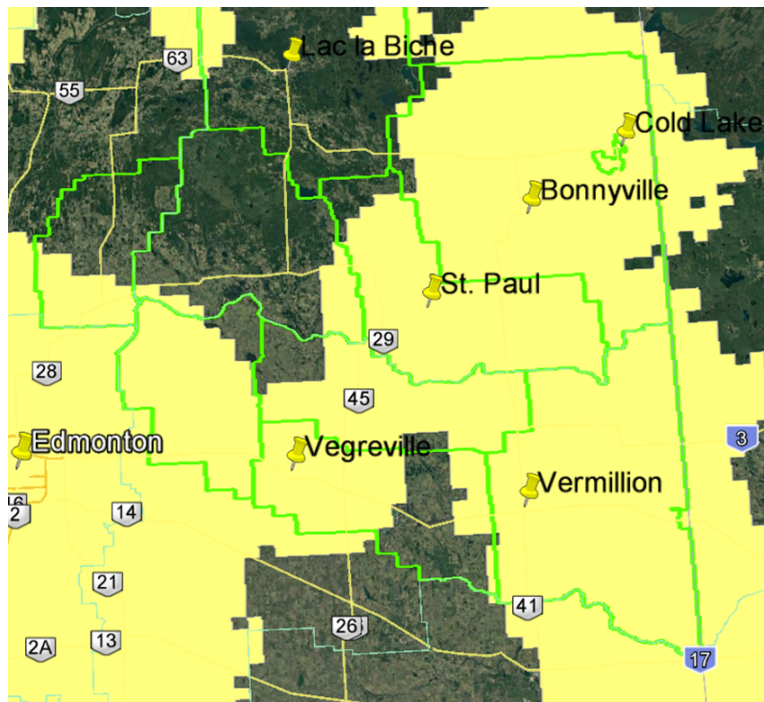
8.1.3.2 Mobility

Shown as yellow areas in Figure 70, mobility data services are widely available from TELUS/Bell and Rogers. Appendix 16.4.2 provides the coverage maps for each of the providers of mobility services. As discussed earlier Bell, TELUS, and Rogers are now using cellular towers and SmartHubs to provide at-home Internet services.

8.1.3.3 Wireline-based – DSL

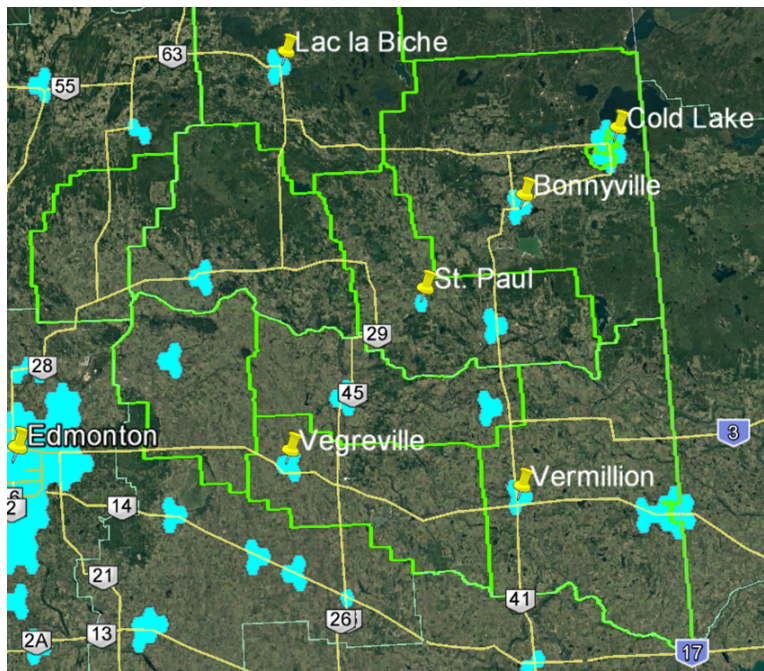
DSL refers to a group of last mile technologies that are used by wireline-based service providers such as TELUS in Alberta to provide broadband services over twisted-pair copper wiring. The local copper wire loop is a remnant from the days when (and how) the telephone company connected residential and business premises to the telephone company's network for the purposes of providing local and long distance telephone services (and dial-up Internet services). Since DSL's performance degrades with distance, the technology is only deployed in urban areas where access distances are less than about two miles. In Figure 71, areas served via DSL technologies are shown in blue.

¹²⁰ <http://crtc.gc.ca/eng/internet/internetcanada.htm>.



Source: <http://www.crtc.gc.ca/eng/internet/internetcanada.htm>

Figure 70 – Alberta HUB mobility data services coverage.



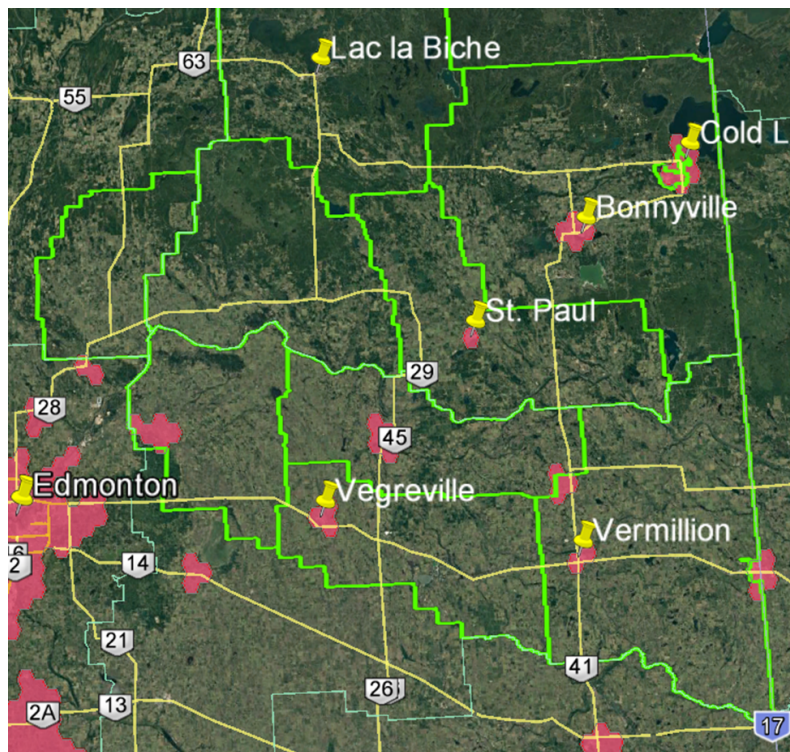
Source: <http://www.crtc.gc.ca/eng/internet/internetcanada.htm>

Figure 71 – Alberta HUB DSL coverage.

8.1.3.4 Wireline-based – Coaxial Cable

Eastlink and Shaw Communications (Shaw), originally television broadcast companies, use coaxial cable and modern cable modem technology to provide broadband services in the Alberta HUB region (red areas in Figure 72). The cable companies currently use the DOCSIS 3.0 standard to achieve broadband speeds

of 100 Mb/s or more over coaxial cable. Shaw expects to complete its DOCSIS 3.1 upgrade by the end of August 2017.¹²¹ According to the Cybera, *State of Alberta Infrastructure Report*, “The next-generation DOCSIS 3.1 standard is expected to revolutionize hybrid fibre-coaxial cable connections by providing up to 10 Gb/s download and 1 Gb/s upload network throughput and significant improvements in latency.”¹²²



Source: <http://www.crtc.gc.ca/eng/internet/internetcanada.htm>

Figure 72 – Alberta HUB coaxial cable coverage.

Maximum advertised wireline offerings are shown in Appendix 16.3. Since these are ‘up to’ bit rates, during high usage periods, actual bit rates will be less – Eastlink and Shaw more so than TELUS due to the way the aggregation is implemented. In both cases, the offerings are highly asymmetric – upload and download bit rates differ significantly.

8.1.3.5 Internet Service Provider Wi-Fi

Bell, Shaw, and TELUS WiFi services are available in the Alberta HUB region. TELUS has multiple sites in Cold Lake and the towns of Bonnyville, St. Paul, and Vegreville as well as single locations in the towns of Elk Point, Lamont, and Smoky Lake (Table 27).

¹²¹ *Shaw Announces Third Quarter and Year-to-Date Results*; Shaw Communications. 8.

¹²² *State of Alberta Digital Infrastructure Report*; Cybera; 13 September 2016. 35.

Table 27 – Alberta HUB Wi-Fi Availability

City/Town	TELUS	Bell
Bonnyville	7	1
Cold Lake	9	4
Elk Point	1	2
Lamont	1	0
Smoky Lake	1	0
St. Paul	11	2
Vegreville	20	1
Vermilion	0	1

Shaw offers multiple Go WiFi locations in urban centres along Highways 15 and 16 as shown in Figure 73.



Figure 73 – Alberta HUB Shaw Go WiFi coverage.

8.1.3.6 Axia Fibre

Axia NetMedia provides retail services to corporate clients and, through AxiaConnect, provides fibre-based retail Internet services in a number of smaller communities. In exchange for access to a community's rights-of-way, Axia will consider investing in fibre-to-the-premise (FTTP) infrastructure in communities that can demonstrate that at least 30% of its residences and businesses are interested in purchasing Internet services from Axia once the 'closed-access' network is built. To date, Axia has not announced any plans for FTTP deployments in any Alberta HUB community.

8.1.4 Backhaul Availability

8.1.4.1 Alberta SuperNet

The extent of the SuperNet within the Alberta HUB region is shown in Figure 74. The green lines represent the Bell-operated BAN portion while the blue lines represent the Axia-operated EAN segments. A more general discussion about the SuperNet is presented in Appendix 16.5.

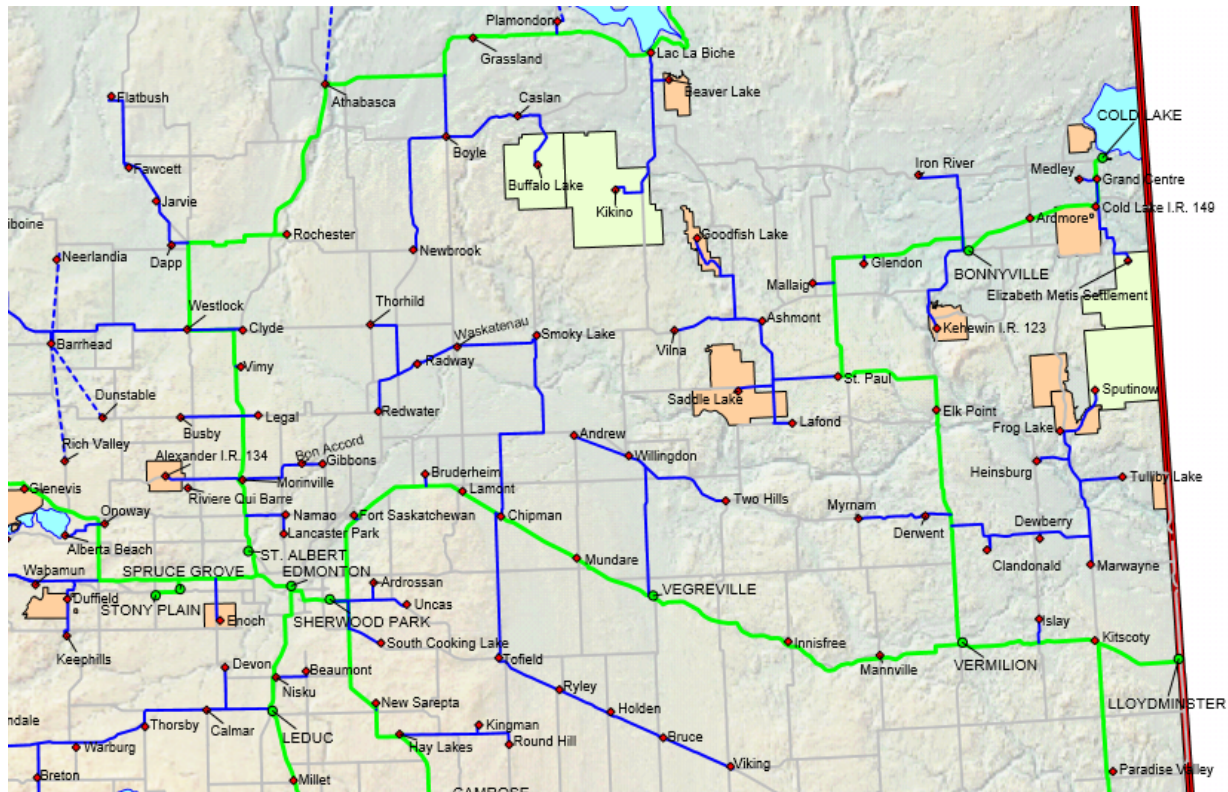


Figure 74 – Alberta HUB SuperNet infrastructure.

8.1.4.2 Shaw Wholesale

Given the uncertainty associated with the next iteration of the SuperNet contract by June 30, 2018, municipalities, First Nations, and Métis Settlements requiring access to fibre transport for backhaul to Edmonton may want to consider Shaw, Bell, or TELUS.

Shaw facilities in Alberta HUB are limited to two runs of fibre:

- The first runs parallel to Highway 63 from Edmonton to Fort McMurray and on to several oilsands camps beyond. Capacity is limited and upgrades to enable DWDM to increase bandwidth would be expensive.
- The second runs parallel to Highway 16 from Edmonton to Lloydminster.

8.1.4.3 TELUS Wholesale

Except under a non-disclosure agreement, TELUS does not provide maps of fibre assets.

8.1.5 Existing Infrastructure

8.1.5.1 Towers and Other Tall Structures

When planning a broadband build-out it is important to build on what is already in place. The key inquiry for the current state analysis is what assets does the community have that can be provided at little or no incremental cost that improve the economics of the broadband deployment and operations? Assets include existing towers, fibre and community networks, which the community might be using for communications or asset management. Existing and possible access to tall structures or buildings are also important to inventory for the potential placement of wireless equipment.

Several municipal districts or counties within Alberta HUB received grant funding to expand high-speed Internet access to unserved areas and address gaps in coverage from Alberta Agriculture and Forestry's *Final Mile Rural Community Program* in the 2012/2013 timeframe. The MDs and counties of Bonnyville, Lac La Biche, Lamont, St. Paul, Thorhild, and Vermilion River each received between approximately \$130,000 and \$400,000.¹²³ Table 28 shows existing MD- and county-owned tower infrastructure.

Table 28 – Alberta HUB Existing MD- and County-owned Towers

	Towers	Details
Bonnyville	9	6, 100' 1, 120' 2, 150' In 2018, the ownership of the above towers will transfer to a local ISP
Lac La Biche	4	1, 200' (fire department VHF repeater (2017)) 1, 95' (needs improvement) 2, less than 100' (at capacity)
Minburn	1	Used for fire/emergency services
St. Paul	9	9, currently used by private company 1 or 2 radio system towers
Thorhild	8	At fire hall sites plus others used by private company
Vermilion River	9	5, 100' 2, 150' 2, 200'

Other tall structures in the Alberta HUB region include the water towers at Kitscoty and Mundare and grain elevators in the villages of Marwayne and Willingdon. Bruderheim has a fire hall. Mannville has a RCMP radio repeater and owns a 50-foot emergency tower while Vermilion has a radio tower.

8.1.5.2 Utility Infrastructure

The existing overhead and underground transmission and distribution lines of electric utility companies (ATCO, Fortis), Rural Electrification Associations (REAs), and natural gas co-operatives (co-ops) present deployment options for community broadband builds - access to and installing fibre cables to travel along utility poles, in ducts and conduit, and along rights-of-way can significantly improve the economics of broadband service expansion projects and network deployments. Inquiries about the availability of

¹²³ Alberta SuperNet Final Mile Rural Task Force: Recommendation Report; 2008-03-14.

communications spaces on utility providers' poles and where multi-party trench agreements exist will be made during the preliminary infrastructure design phase of a broadband network.

8.1.5.3 First Nations Fibre Infrastructure

First Nations Technical Services Advisory Group (TSAG) is a non-profit organization established by the Chiefs of Alberta to provide technical support and training to First Nations in the Treaty 6, 7, and 8 regions. In 2008, TSAG partnered with Health Canada to develop the network components (fibre connections) at First Nations health centres to support First Nations' telemedicine. With Health Canada funding and TSAG project management, community fibre networks connections were made to the Alberta SuperNet points-of-presence on each or close to each First Nations in 2011. Upon completion, each First Nations became the owner of its local fibre network. As shown in Figure 75, First Nations' schools, health centres, band administration offices, and water treatment plants are now connected.

TSAG operates a state-of-the-art Network Operations Centre (NOC). The NOC's real time network monitoring ensures availability, network security/SPAM filtering, telehealth bridge management, and support, and applications (high-speed connectivity and remote water monitoring system for water treatment plants, OneHealth.ca, and FirstNationsTH.ca). Onehealth.ca is a national health portal that provides information and services to health care professionals working in First Nations communities. FirstNationsTH.ca – Telehealth provides education and travel-free patient and health care assessments via video-conferencing.

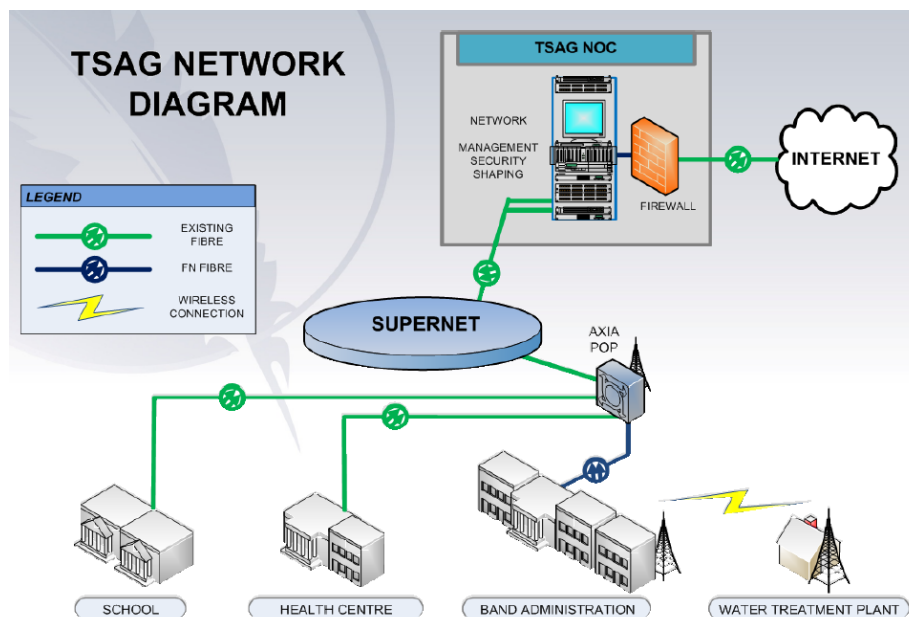


Figure 75 – TSAG network diagram.

8.1.5.4 Rural Electrification Associations (REAs)

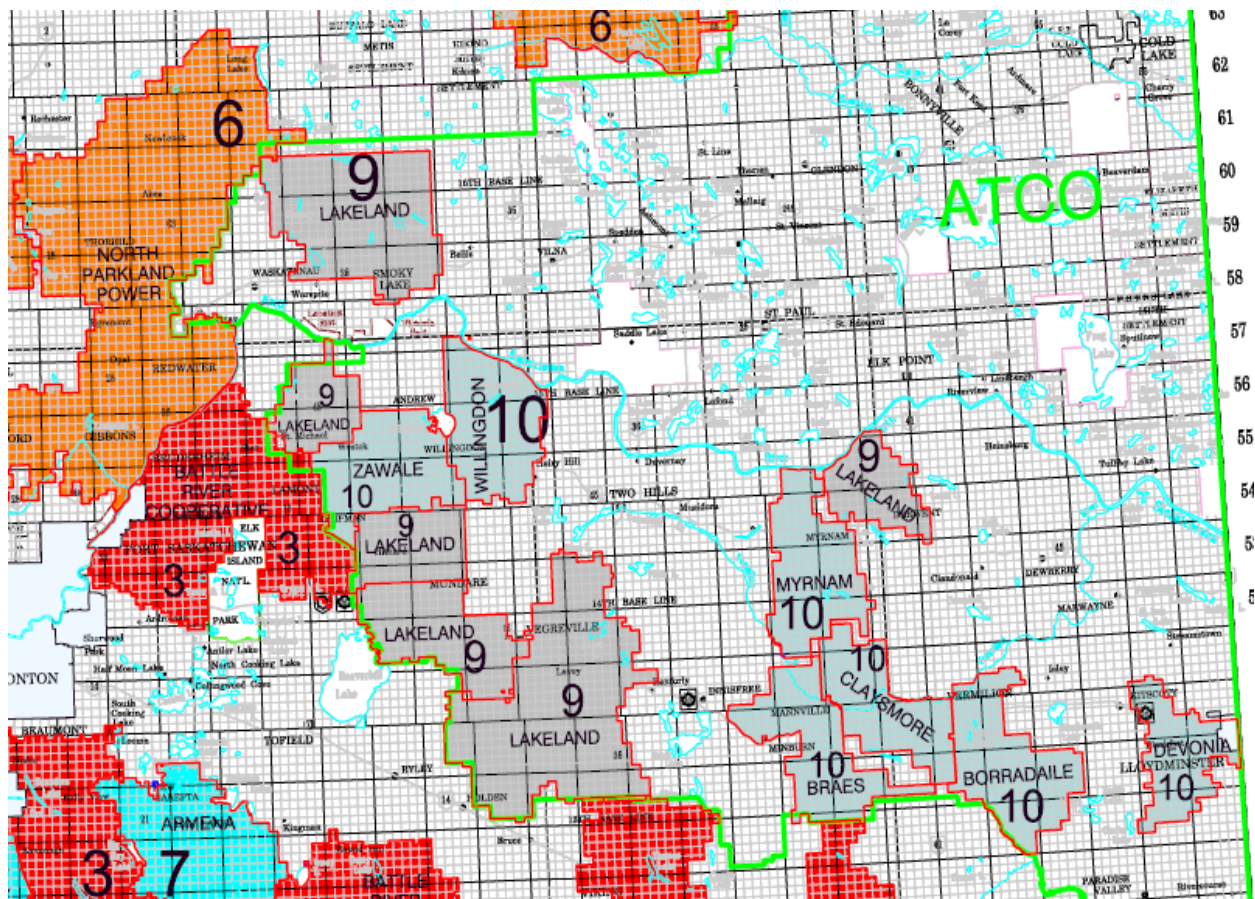
REAs are member-owned electric distribution systems that provide electricity service to farm members within a specific geographic boundary. Each REA has an elected board of directors that is responsible for the business operations of the REA. Construction, operations, and maintenance is done by ATCO Electric (through contracts with the REAs) for following REAs within the Alberta HUB region:

- Borradaile REA Ltd. (Vermilion)
- Braes REA Ltd. (Mannville)
- Claysmore REA Ltd. (Vermilion)
- Devonian REA Ltd.

- Lakeland REA Ltd. (Vegreville)
- Myrnam REA Ltd.
- Northern Parkland Power REA Ltd. (Thorhild)
- Willingdon REA Ltd.
- Zawale REA Ltd. (Wostok)

Appendix 16.6 shows ATCO Electric's and Fortis Alberta's respective service areas in northern Alberta. REA and distribution company systems are intertwined in the REA service area as shown in Figure 76, and they work together to ensure there is reliable service and no duplication of distribution lines and service. In Alberta, most rural areas are radial networks. A radial distribution line may serve both distribution entity and REA customers and different parts of the same line maybe owned by one or the other party.¹²⁴

There are 351 Lakeland REA members (connections) within the County of Minburn. The majority of connections are overhead lines to the landowner's property, at which point it is up to each individual member whether they have an underground or overhead secondary wire to their yard. There are only about 20 underground primary connections out of the total of 351 within the County of Minburn.



Source: Rural Electrification Associations Service Areas, Accessed Nov. 2016.

Figure 76 – Alberta HUB REA & ATCO service areas.

¹²⁴ Alberta Utilities Commission; *Notice of Hearing, Application 21148-A001: Application for an order directing FortisAlberta Inc. to remove certain facilities and effect permanent disconnection Sunset Shores RV Resort Inc. 1.*

8.1.5.5 Gas Co-operatives – Zones 3 and 4

In the 1960s, non-profit gas co-ops were formed to supply natural gas to rural Alberta - franchise areas were designated. The following six Zone 3 gas co-ops currently operate in the Alberta HUB region. Figure 77 provides a map showing the group's geographic coverage.

- County of Two Hills
- County of Vermilion River
- Lac La Biche County
- Smoky Lake County
- Thorhild County
- Town of Smoky Lake



Source: Federation of Alberta Gas Co-ops, <http://www.fedgas.com/Map>. Accessed Feb. 1, 2017

Figure 77 – Alberta HUB Zone 3 gas co-operatives.

Another six gas co-operatives operate in what the Federation of Alberta Gas Co-ops has designated as Zone 4, which is also in the Alberta HUB region. Figure 78 shows the areas they serve. In 2010, the Lac La Biche District Natural Gas Co-op received a grant of \$500,000 from the *Rural Connections: Community Broadband Infrastructure Pilot Program* to assist in the deployment of a wireless broadband network to provide coverage to areas around Plamondon, Lac La Biche, and Hylo.

- Goodfish Lake Gas Utility
- Kehewin Cree Nation
- Lac La Biche District Natural Gas Co-op Ltd (a shareholder of CCI)
- Lamco Gas Co-op Ltd. (Lamont)
- Minco Gas Co-op Ltd. (Innisfree)
- North East Gas Co-op Ltd. (Bonnyville)

There are two rural water co-operatives operating in the Alberta HUB area: Bruderheim Water Co-op Ltd. and Josephburg Water Co-op Ltd. (Lamont).

8.1.6 Planned Infrastructure

8.1.6.1 Major Projects

The Alberta HUB region has several private and public sector capital projects planned. Where possible these projects may be leveraged to reduce the costs associated with the deployment of broadband

infrastructure. Figure 79 shows the capital projects valued at \$5 million or greater in the Bonnyville area.¹²⁵ Besides the projects shown in this figure, other major projects in the Alberta HUB region include a bio-diesel refinery at Bruderheim; a wastewater treatment plant at St. Paul; and various school upgrades and road work – see the Smoky Lake, St. Paul, Vegreville, and Vermilion maps in Appendix 16.7.



Source: Federation of Alberta Gas Co-ops, <http://www.fedgas.com/Map>. Accessed Feb. 1, 2017

Figure 78 – Alberta HUB Zone 4 gas co-operatives.

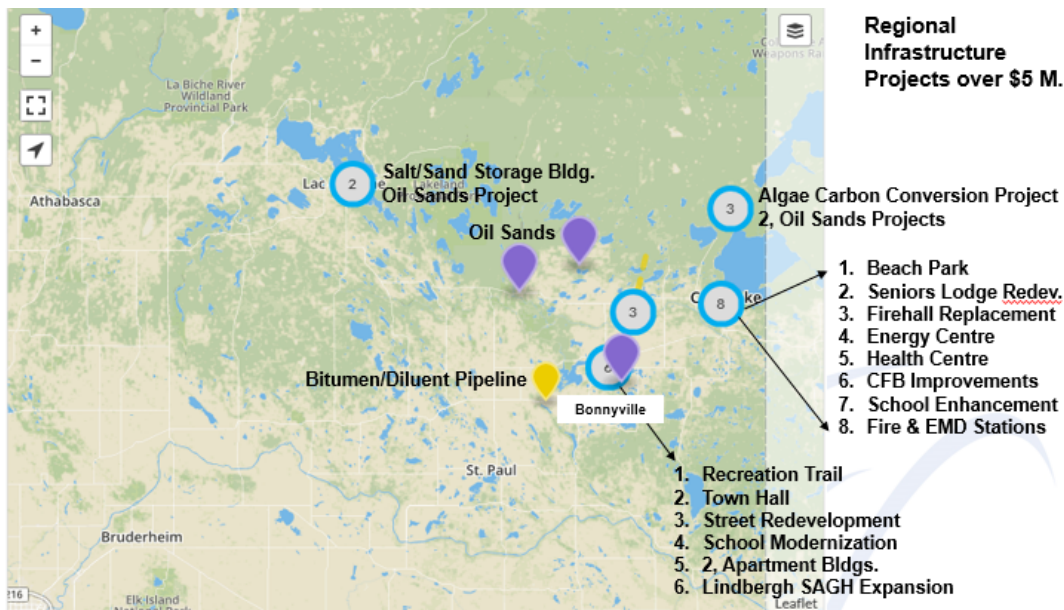


Figure 79 – Major projects – Bonnyville.

The Alberta Central East (ACE) Regional Water System is the corporation comprised of 13 municipalities (shareholders) created to supply potable water through a regional water system. Phases 4 and 5 will be constructed in 2017 and 2018. The Phase 4 water line construction will be 25 kilometres and take place along county road rights-of-way from the City of Lloydminster to the Hamlet of Blackfoot. The line will

¹²⁵ Alberta Major Projects, Economic Development and Trade; December 2016. <http://majorprojects.alberta.ca/>.

then continue west to the Village of Kitscoty. Phase 5 will include 22 kilometres from Kitscoty to Marwayne. Appendix 16.8 provides a map of the route.¹²⁶

Another regional water supply expansion is being undertaken by the Cold Lake Regional Utility Services Commission. Phase 1 will be approximately 46 kilometres and supply water to Bonnyville and the Cold Lake First Nation from Cold Lake's water treatment plant.

Lamont County is installing a water line from Lamont to St. Michael (to be completed in October 2017). The direct drill method is being used, which does not provide an opportunity to lay broadband cable.

8.1.6.2 Electricity Transmission Development Plans

Figure 80 shows the existing electricity transmission system in the Alberta HUB region.¹²⁷ The Cold Lake area is served by 240 kV and local 144 kV transmission lines to support oilsands and industrial development. Major projects approved and/or under construction include 240 kV and 144 kV enhancements in the Cold Lake area.

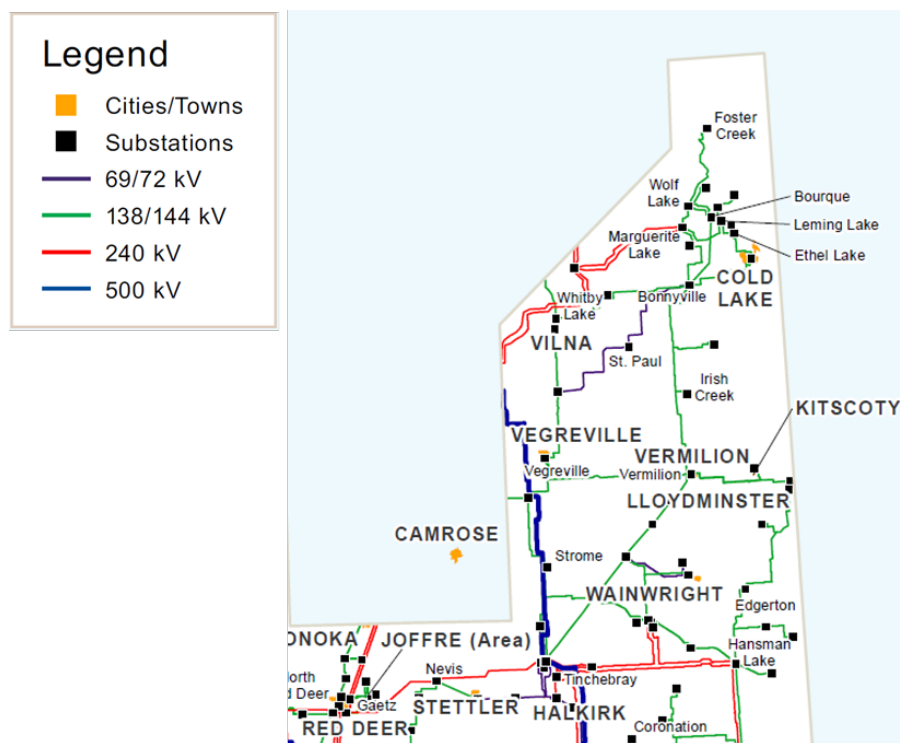


Figure 80 – Alberta HUB – existing electricity transmission system.

Proposed transmission developments relevant to potential fibre deployment include the following new lines (planning horizons are noted as near-term (to 2020); medium term (to 2025); or long-term (to 2035)):

- 240 kV between new substations in Lloydminster and Vermilion (*medium-term*);
- 144 kV between new substations in Vermilion and Vegreville (*medium-term*); and
- 144 kV between Marguerite Lake, Wolf Lake, and Bourque substations east of Cold Lake (*long-term*).

¹²⁶ ACE brochure; November 2016 Update.

¹²⁷ AESO 2015 Long-term Transmission Plan; AESO.

- Projects to rebuild existing lines to higher capacity are proposed for the 144 kV line from Vermilion to Irish Creek (*near-term*) and the 138 kV line between the substations of St. Paul and Bonnyville (*long-term*). The oilsands load is expected to drive 138 kV enhancements.

8.1.6.3 Municipal Capital and Civil Works Projects

Leveraging civil infrastructure projects can reduce broadband deployment costs by 75%. Given civil infrastructure costs typically account for 70% of buried deployment costs, this is significant. Capital projects that involve trenching or erecting towers or poles such as during the development of new subdivisions, road construction, or the construction or rehabilitation of water or sewer lines are typical projects that can improve the economics of community broadband projects.

Lac La Biche County successfully applied for a grant from Alberta Transportation's *AMWWP* for their water treatment plant (\$3,7 million). Thorhild County received a total of \$8.8 million for lagoon repair and expansion from the *AMWWP* and the *W4L Program*. Lamont County also received \$677,700 for the detailed design work for regional water supply from the *W4L Program*.

The Federal *Small Communities Fund* (part of the New Building Canada Fund) for infrastructure projects, now includes a '*Connectivity and Broadband*' category. 2016 approved non-broadband projects within Alberta HUB include (figures shown are the Total Eligible Project Cost - Federal, Provincial, and Municipal):

- Bonnyville – 51 Ave. underground rehabilitation \$11.4 million;
- Marwayne – Underground renewal \$3.1 million;
- Smoky Lake – Cast iron watermain replacement \$556,344;
- MD of Bonnyville – Ardmore underground utilities rehabilitation \$8.7 million;
- County of St. Paul – Counties of St. Paul and Two Hills joint facultative lagoon and transfer station expansion \$5.2 million; and
- Thorhild County – Lagoon repair, capacity upgrade, sanitary forcemain replacement, and lift station upgrade \$6.2 million.

Table 29 shows the capital and civil works projects that either the municipalities self-reported or were identified by another source. TELUS has invested in fibre to the home/premise in the City of Cold Lake and three of the towns (Bonnyville, St. Paul, and Vegreville) within Alberta HUB, subsequently these entities generally did not share information about upcoming civil works that might provide fibre installation opportunities beneficial to the sub-region as a whole. Three villages contributed to the inventory.

8.2 Desired State

As observed in the Current State analysis, the range of interest in broadband varies throughout the Northeast Alberta Information HUB Ltd. (Alberta HUB) region. The majority of communities in Alberta HUB are at a relatively early stage and need guidance on how to proceed, with the exceptions of the towns of Smoky Lake and Vermilion and in general, the Vermilion River region. These communities are ready to move forward with developing their broadband strategies and plans.

Vermilion River Region – To enhance broadband infrastructure in the Town of Vermilion and the villages and hamlets within the County of Vermilion River, these communities have created a partnership, the Vermilion River Regional Alliance (VRRRA). The partnership includes the Alberta portion of the City of Lloydminster, which is not part of the project study area. A detailed evaluation of the broadband strategies and options to enhance and extend broadband offerings throughout the region will commence shortly – beginning with a network infrastructure analysis.

Table 29 – Alberta HUB Municipal Capital & Civil Works Projects

City	
Cold Lake	Water main extension; roadway infrastructure improvements; facilities infrastructure (Energy Centre expansion, artificial turf field, RCMP building expansion) ¹²⁸
Towns	
Bonnyville	Nothing planned ---yet from article: Road paving (Gurneyville Road and 66 th Street)
Bruderheim	Street rebuilding; residential development; possible industry development
Elk Point	Natural gas to new 14 lot residential subdivision (spring 2017)
Lamont	Nothing planned
Mundare	Nothing planned
Smoky Lake	Nothing planned
St. Paul	Road maintenance, paving, and upgrading ¹²⁹
Two Hills	Possible replacement of water and sewer main and distribution lines; installation of storm drainage system
Vegreville	Declined to respond due to TELUS fibre
Vermilion	Residential development (late 2018 – early 2019)
Villages	
Mannville	Nothing planned
Marwayne	Water/sewer renewal (2018)
Willingdon	Nothing planned
Counties/MDs	
Bonnyville	Road construction
Lac La Biche	Nothing planned
Lamont	Road construction; water line
Minburn	Hamlet of Minburn sewer lift station; road construction
Smoky Lake	Water transmission line from Spedden to Ashmont then to Mallaig
St. Paul	Road construction; water transmission line from Ashmont to Mallaig
Thorhild	Lagoon repair and force-main replacement
Two Hills	Did not respond to project inquiries and no information was available on the county's website
Vermilion River	Natural gas distribution (20 km to 50 km annually); water line replacement in Blackfoot (2 blocks); road construction

Other communities and community clusters intent on decisive near-term action include the following:

Town of Smoky Lake and Smoky Lake County – The Town of Smoky Lake is actively looking for and evaluating solutions to improve broadband for their community. Fibre is the preferred option, and discussions with incumbent service providers are occurring. A wireless solution, which the town would deploy itself, is also being considered. The town Council will ultimately decide which option the town will pursue. If the decision is to go with a wireless solution and the town becomes the Internet Service Provider (ISP), the rollout to the community would occur in within three to five years to attain town-wide connectivity. A multi-year project roadmap would define an incremental build-out, likely starting in the commercial areas of downtown.

The County of Smoky Lake helped create and invested in Corridor Communications (CCI) to address the lack of connectivity in their county. Their future broadband vision includes provisioning county/CCI towers with fibre within three years. Within five years they envision the establishment of micro-tower sites to

¹²⁸ *City of Cold Lake: 2017 Capital Budget*; City of Cold Lake.

¹²⁹ Whitfield, Janani; *Town Approves Capital Budget, Projects*. St. Paul Journal; 2017-05-23.

provide service to the remaining two percent of county residents. Ten years will see new technology and gigabit-capability.

County of St. Paul – The County of St. Paul’s ‘desired state’ is high quality, affordable high-speed Internet availability throughout the county. It was one of the counties within Alberta HUB that was successful in receiving grant funding to expand high-speed Internet access to unserved areas and address gaps in coverage from Alberta Agriculture and Forestry’s *Final Mile Rural Community Program* in the 2012/2013 timeframe. Since some coverage gaps still exist in the county, the County plans to address those gaps as well as potentially bring fibre to some of its hamlets. The County recently supported MCSNet’s application to the Federal *Connect to Innovate Program*. If the application is successful, the subsequent deployment of fibre by MCSNet along Highway 28 will serve the hamlets of Ashmont and Mallaig. Also, the County has applied for grant funding to the provincial *Community and Regional Economic Support (CARES) Program*, and if approved, the funds will be used to develop an economic development strategy for the region.

Town of Elk Point – The Town of Elk Point is one of the communities that did not feel it has the funding power to pursue a community-built on their own and is accessing the option of having AxiaConnect build a fibre network and become the ISP for their community.

Town of Bruderheim – Broadband is on the Town of Bruderheim Council’s agenda – Council recently passed a service levy bylaw that includes the provision fibre conduit in new developments and areas where major street repairs are scheduled to take place. Given the town’s small size, a regional initiative is likely to be the most effective and expedient way to attract a single service provider. Within five years their vision is to have 100% of their community supported by fibre-based broadband infrastructure. Ten years would see integration with the surrounding communities, potentially with communities outside of the northern Alberta study area such as Strathcona County.

Elizabeth Métis Settlement – Increased Internet literacy among the community’s people coupled with very poor Internet service levels (unbearably slow and unreliable) provides the catalyst for the community to seek improved broadband solutions.

Saddle Lake First Nation – would like to see broadband widespread in their community of 6,000 to 6,500 people within three years. They are interested in taking an active role in realizing their broadband vision such as an equity partnership or community-owned business.

Figure 81 provides a geographic representation of those communities wanting to move forward while the details of each community’s issues and challenges; whether fibre/broadband is on their Council’s agenda; the factors impacting their community’s capability to pursue a fibre/broadband initiative; and their 3-, 5-, and 10-year broadband visions can be found in the Appendix 16.11.

8.3 Town of Bruderheim– A 600+ Premise Community

8.3.1 Default Scenario

Assume that the Town of Bruderheim deploys an open-access, lit fibre-optic network that will make world-class, fully scalable broadband infrastructure available to every home and business in the town. In the analysis below, the business structure, opto-electronics and backhaul, operations, drop capital, and markets and revenues assumed are those outlined in the default implementation scenario presented in Section 6.5. In this case, the local network entity established to house the local fibre operation will be referred to as B-Net.

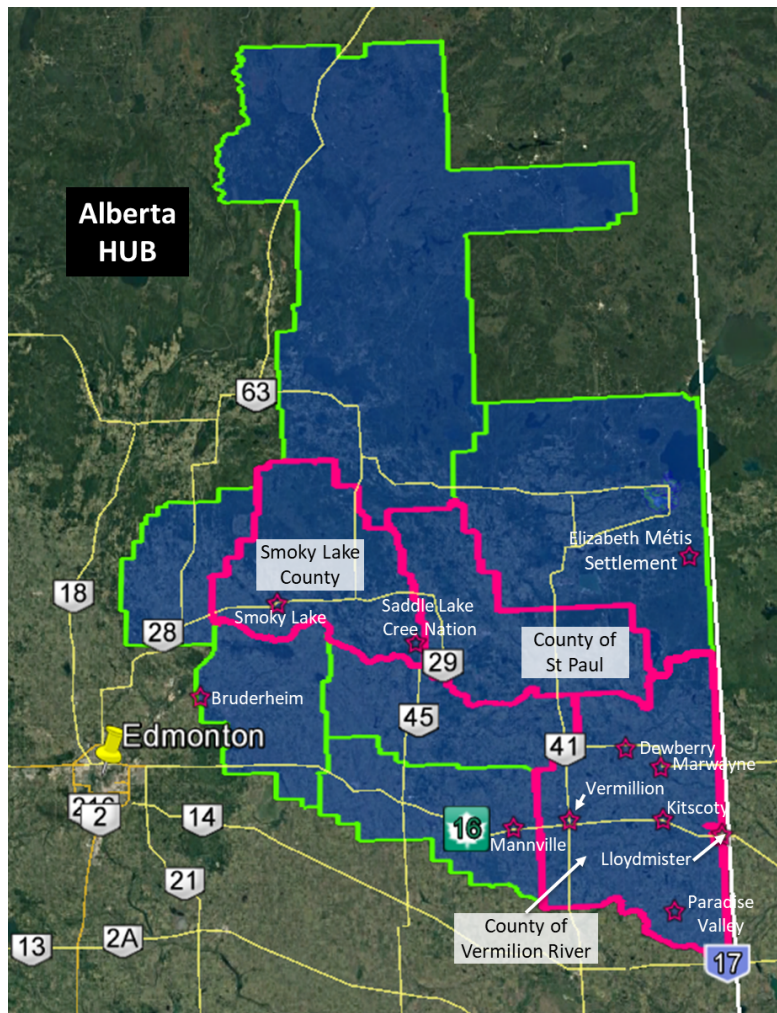


Figure 81 – Alberta HUB – communities with near-term broadband plans.

8.3.2 Deployment Capital

As a pre-conceptual buried fibre design were not completed for the Town of Bruderheim, a high-level estimate of \$2,000/premise to deploy a community fibre network that passes very premise will be assumed. Deployment cost would run about \$1.3M.

Once the feeder and distribution networks are in place throughout the town, additional capital costs will be incurred to deploy conduit and fibre from each premise ordering service to the distribution conduit running past the premise. The wiring within each premise may also have to be upgraded to enable service distribution to the premise computers, phones, and televisions – but that falls to the ISP.

8.3.3 Deployment Schedule

This business case assumes that the network would be deployed throughout Bruderheim over the spring, summer, and fall of 2018.

8.3.4 Opto-electronics and Backhaul

A breakdown of the capital expenditures over the first five years of operation appears in the pie chart in Figure 82. Capital cost estimates over the first five years of operation for the proposed scenario come to \$2.31M. In the chart, the 59% or \$1.36M outside plant (OSP) deployment estimate includes the feeder

and distribution plant required to pass every premise and provide drop connections to those premises that take service.

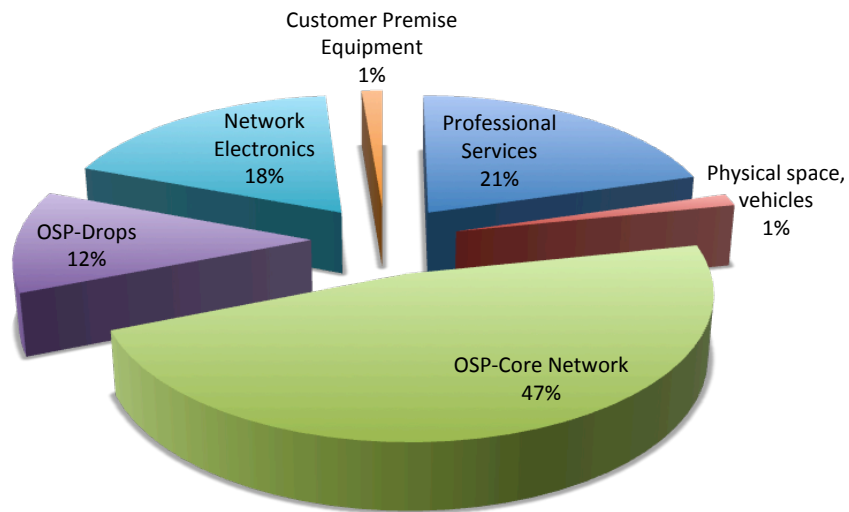


Figure 82 – Cumulative capital expenditures from 2018 to 2022.

8.3.5 Operations

The operational costs for wholesale network operation are straightforward as most are handled via outsourced contracts. Once the network build is completed in 2018 and the target penetration rates are realized, operational costs stabilize and a view of those calculated for 2022 are shown in Figure 83. In the chart, Admin, ops, and o-e refer to administration, operations, and opto-electronics, respectively. The numbers assume that the Town of Bruderheim provides both equipment and storage space at no charge.

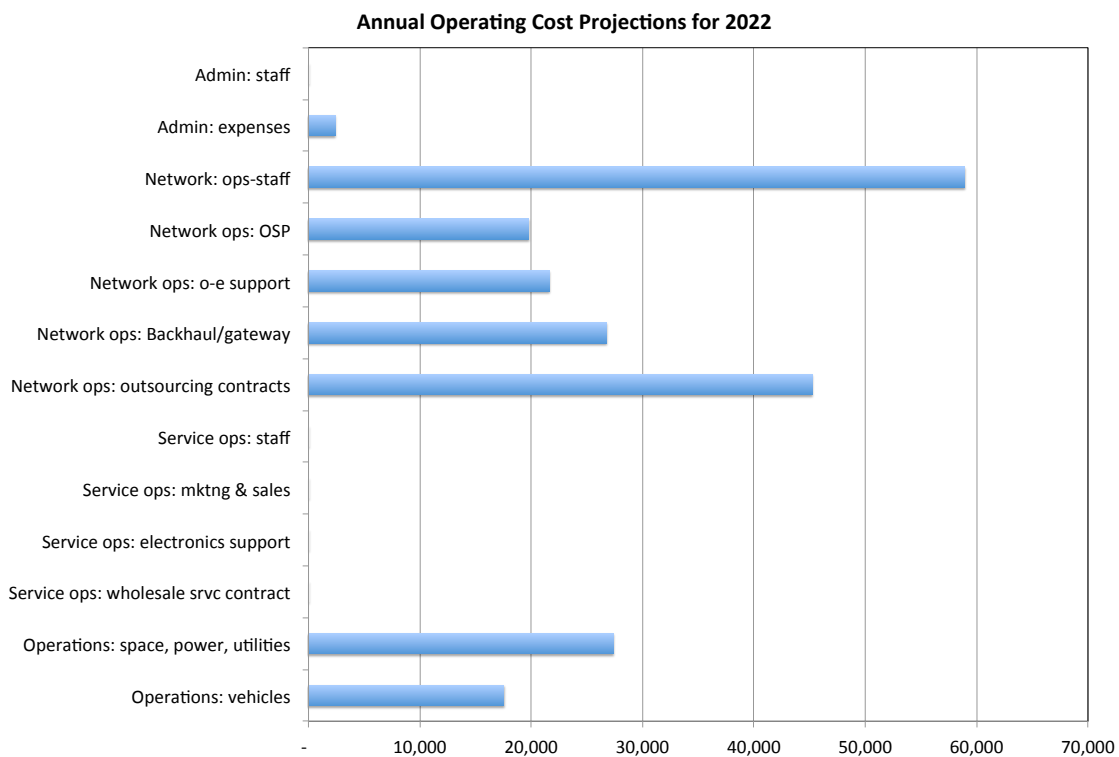


Figure 83 – Projected operational costs in 2022.

8.3.6 Financial Projections

Cashflow results for this scenario for Bruderheim are summarized in Table 30. Though the operation goes cashflow positive in year 5¹³⁰, with debt servicing considered, the overall financials do not go cashflow positive until year 9. As the required capital must therefore be sufficient to cover an 8-year deficit, some \$2.92M in capital will be required to fund the operation. By year 15, approximately \$222,859 is being returned to the Town annually.

Table 30 – Utility Model Results Summary for Bruderheim and Lamont

Bruderheim		Bruderheim & Lamont	
	Results		Results
Years to positive cashflow		Years to positive cashflow	
Operating	4	Operating	4
With debt servicing (p&i)	8	With debt servicing (p&i)	4
Financing		Financing	
Start-up capital required	2,922,361	Start-up capital required	4,799,786
Net Cashflow - before debt servicing		Net Cashflow - before debt servicing	
Profit - annual at 10 yr	193,415	Profit - annual at 10 yr	419,853
Profit - annual at 15 yr	321,991	Profit - annual at 15 yr	590,979
Net Cashflow - after debt servicing		Net Cashflow - after debt servicing	
Profit - annual at 10 yr	98,748	Profit - annual at 10 yr	270,043
Profit - annual at 15 yr	222,859	Profit - annual at 15 yr	433,065

In graphical form, the non-discounted cashflow chart for the proposed utility appears in Figure 84. The capital (red) required to finance the project is shown to pretty much all be required upfront and the financing must be sufficient to maintain a net cashflow of at least zero. Operational sustainability is determined by the gap or difference between the revenue (blue) and operational expenditure (green) lines whereas overall sustainability, which includes principal repayment, is the difference between the revenue (blue) and the operational + principal repayment (dotted blue) lines. The bigger the gap, the better. The net overall cashflow line is the dotted orange line.

While technically these numbers work, operationally, the risk is high due to the small margins and resulting deficits. Given the small client base available in Bruderheim and the importance of scale to operational sustainability, these initial results are typical for communities with small populations. To mitigate the scale issue, Bruderheim might consider partnering with a neighbouring communities. Say, for instance, that the Town of Lamont were to be interested. If Bruderheim and Lamont jointly deployed a utility fibre network and shared operations, the cashflow results would change to those on the left side of Table 30. Being slightly larger than Bruderheim, bringing Lamont on-board more than doubles the projects capital requirements. On the other hand, the increased scale improves margins sufficiently that the project goes cashflow positive in year 5, even with principal repayments considered, and the net profit almost doubles. The cashflow chart for the combined operation appears in Figure 85. As can be seen, the model assumed that the Bruderheim network was deployed in 2018 and Lamont in 2019.

¹³⁰ With 4 years to positive cashflow, the project goes cashflow positive in year 5.

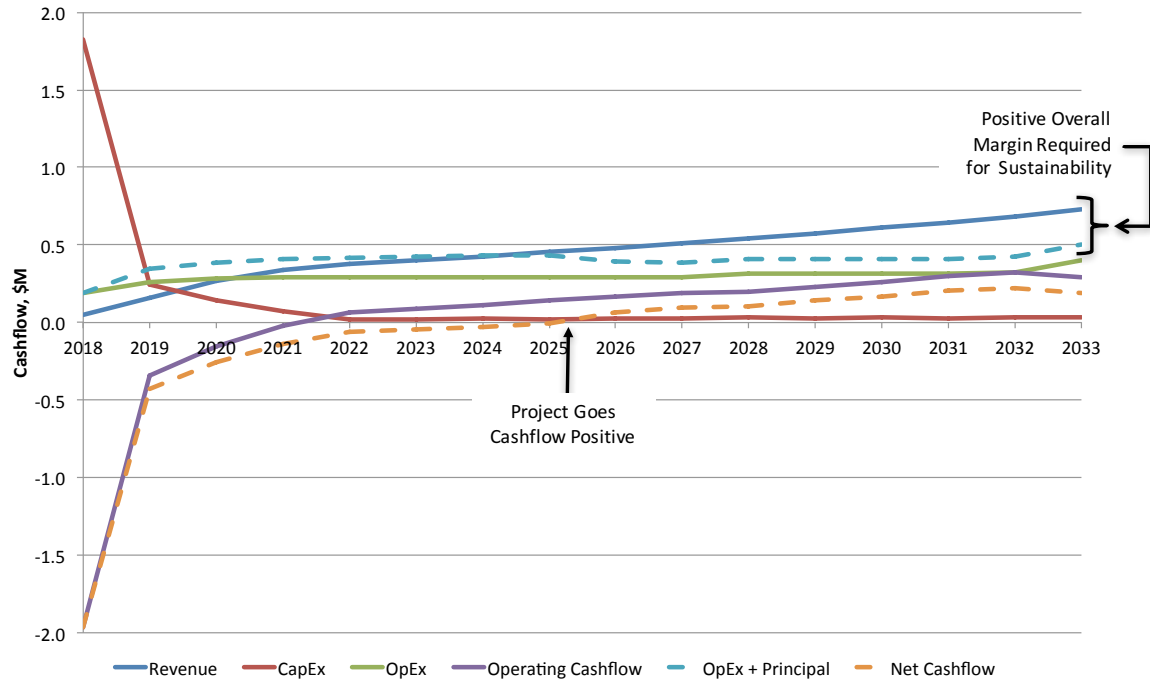


Figure 84 – Non-discounted cashflow projections for Bruderheim.

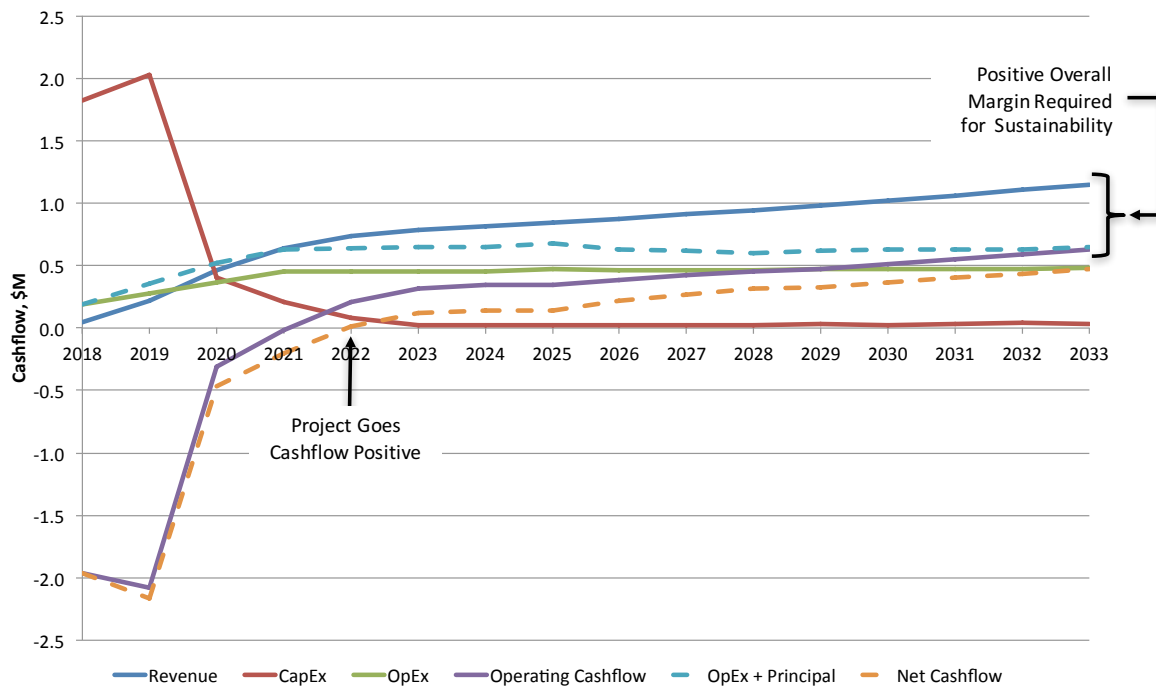


Figure 85 – Non-discounted cashflow projections for Bruderheim and Lamont.

Additional options to be considered to improve margins are outlined in Sub-section 6.5.10.

8.4 Lac La Biche – An Inclusive Regional Network

8.4.1 Context

A map of Lac La Biche County appears in Figure 86. Hamlets are marked by yellow pins. From a fibre perspective, as there are very few premises in Hylö and Venice, they can be well served via wireless and will not be considered further. Rich Lake, though, is home to about 153 premises and will be. SuperNet access sites are shown with yellow text and circles. SuperNet access sites enable connections back to Internet exchanges in Edmonton and Calgary without the need for additional fibre deployment. Each community network must at least indirectly connect back to an Internet Exchange.

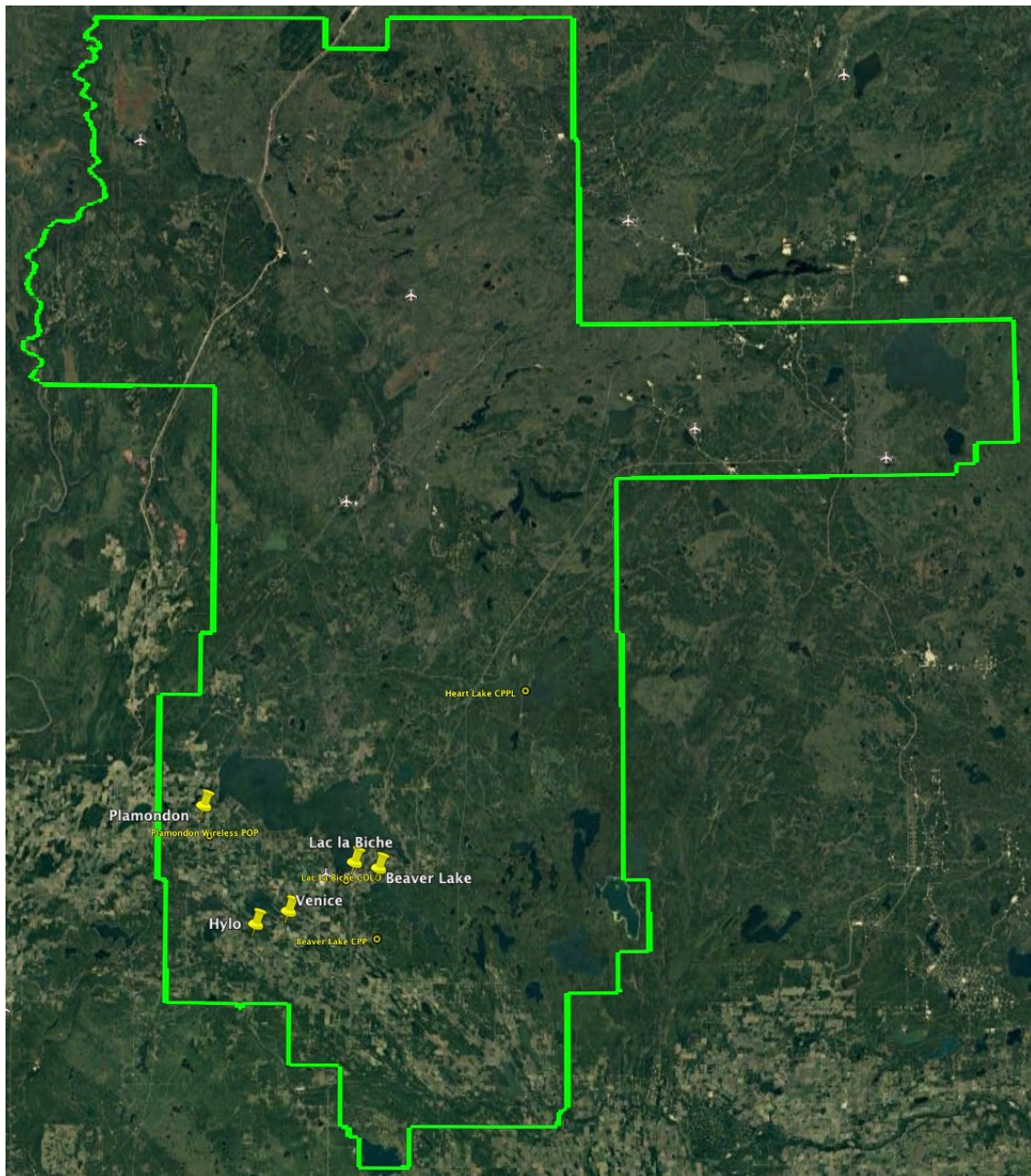


Figure 86 – Lac La Biche County.

8.4.2 Default Scenario

Assume that Lac La Biche County, inclusive of all the municipalities within its boundaries deploys an open-access, lit fibre-optic network that will make world-class, fully scalable broadband infrastructure available to every home and business in the small urban centres of Lac La Biche, Plamondon, Beaver Lake, and Rich Lake. In the analysis below, the business structure, opto-electronics and backhaul, operations, drop capital, and markets and revenues assumed are those outlined in the default implementation scenario presented in Section 6.5. In this case, the local network entity established to house the local fibre operation will be referred to as L-Net.

8.4.3 Deployment Capital

Deploying an inclusive regional network involves both laying fibre to connect all communities and enable connections to key ISP towers (towers that the ISPs would upgrade if a fibre connection became available) as well as deploying access, FTTP networks in the urban centres.

The intercommunity network laid out for Lac La Biche county is shown in yellow in Figure 87. The network provides connections from the hamlet of Lac La Biche to Plamondon, Beaver Lake (and a landfill site east of Beaver Lake), Hylo, and Rich Lake. In the figure, key ISP towers are shown by blue and red triangles. The fibre routes shown in white extend off the intercommunity network and provide connections to these towers. Within the urban centres, the proposed access networks shown have two components – the feeder routes are shown in magenta and the distribution routes in cyan. An enlarged version of the FTTP network for the hamlet of Lac La Biche appears in Figure 88.

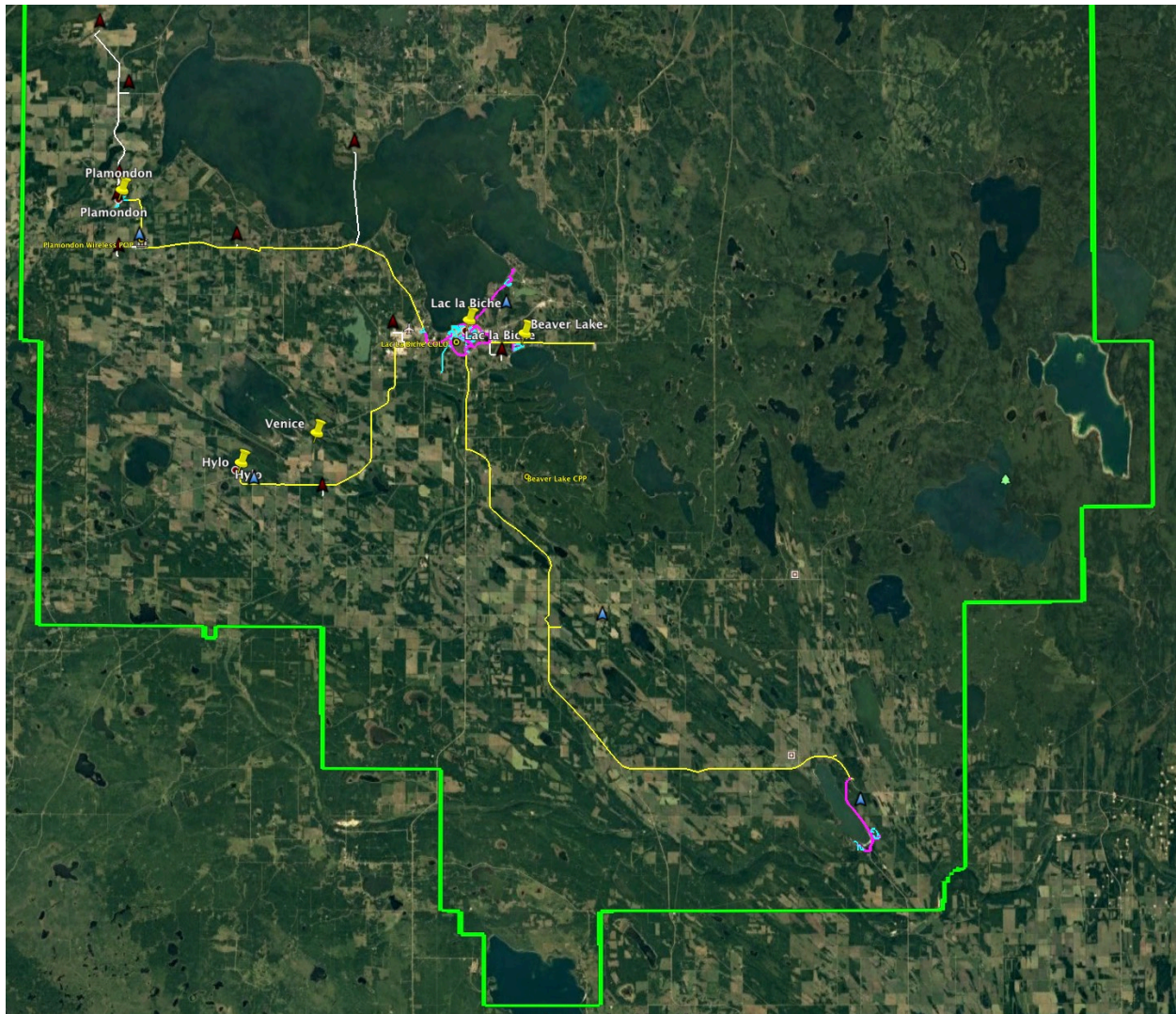


Figure 87 – Utility fibre network for Lac La Biche.

The capital costs to deploy both the inter-community network and access networks in each community are shown in Table 31. In this context, access refers to laying fibre that passes every premise in a community. Overall cost, should the entire network be deployed, comes to about \$9.12M. To become functional, additional capital will then be needed to cover the costs of the drop connections to those premises subscribing to ISP services and the network electronics that will be needed.

Given the low overall population and the miles of fibre that are needed, the county-wide business case, based strictly on potential wholesale revenue is negative – both a capital recovery perspective and operational sustainability. To lower upfront deployment costs and increase cashflow by initially deploying only to population centres and using SuperNet access points in those centres to save on the intercommunity deployment only works for the hamlet of Lac La Biche as SuperNet access points are not available in BeaverLake, Plamondon, or Rich Lake.

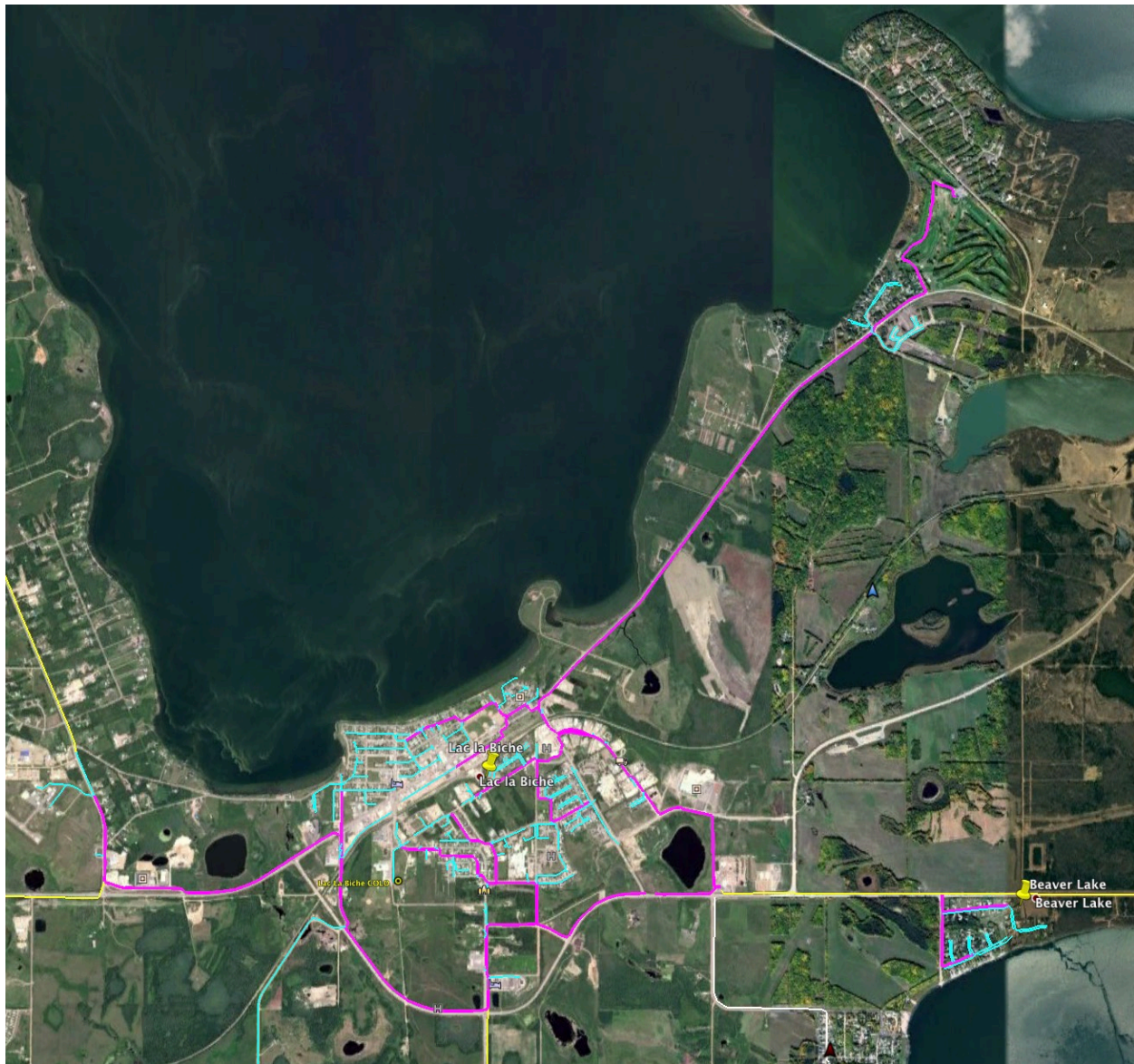


Figure 88 – Utility FTTP network for the Hamlet of Lac La Biche.

Table 31 – Deployment Cost Summary for Lac La Biche

Network Component	County Backbone Routes					Hamlets and Localities				
	LLB Airport to Plamondon	LLB Airport to Hylö	Cnty Office to Beaver Lk Landfill	LLB to Rich Lake Landfill	Spurs to Priority towers	Lac La Biche	Plamondon	Beaver Lake	Rich Lake	
Year of Deployment			2018			2020				
Feeder Distribution	535,745	468,210	131,480	772,890	983,575	1,254,533	29,623	124,004	235,931	
	-	-	-	-	-	1,254,625	222,845	233,200	444,440	
Subtotal - civil construction	535,745	468,210	131,480	772,890	983,575	2,509,158	252,468	357,204	680,371	6,691,101
Mobilization/De-mobilization	10,715	9,364	2,630	15,458	19,672	50,183	5,049	7,144	13,607	133,822
Engineering, Permitting, and Planning	53,575	46,821	13,148	77,289	98,358	270,493	26,728	41,921	79,834	708,165
Activation: Fibre Micro-cabling	188,601	147,896	50,232	359,338	187,530	518,252	6,482	18,046	107,772	1,584,149
Grand-total, deployment	788,635	672,291	197,490	1,224,975	1,289,134	3,348,086	290,727	424,315	881,584	9,117,237

In an effort to get a sustainable business case, assume that a fibre network is just deployed in the hamlet of Lac La Biche and to reduce costs further, the fibre run NE to the golf course is removed. This leaves the network footprint shown in Figure 89. The capital costs for this option is \$3.01M or \$2,355/premise.

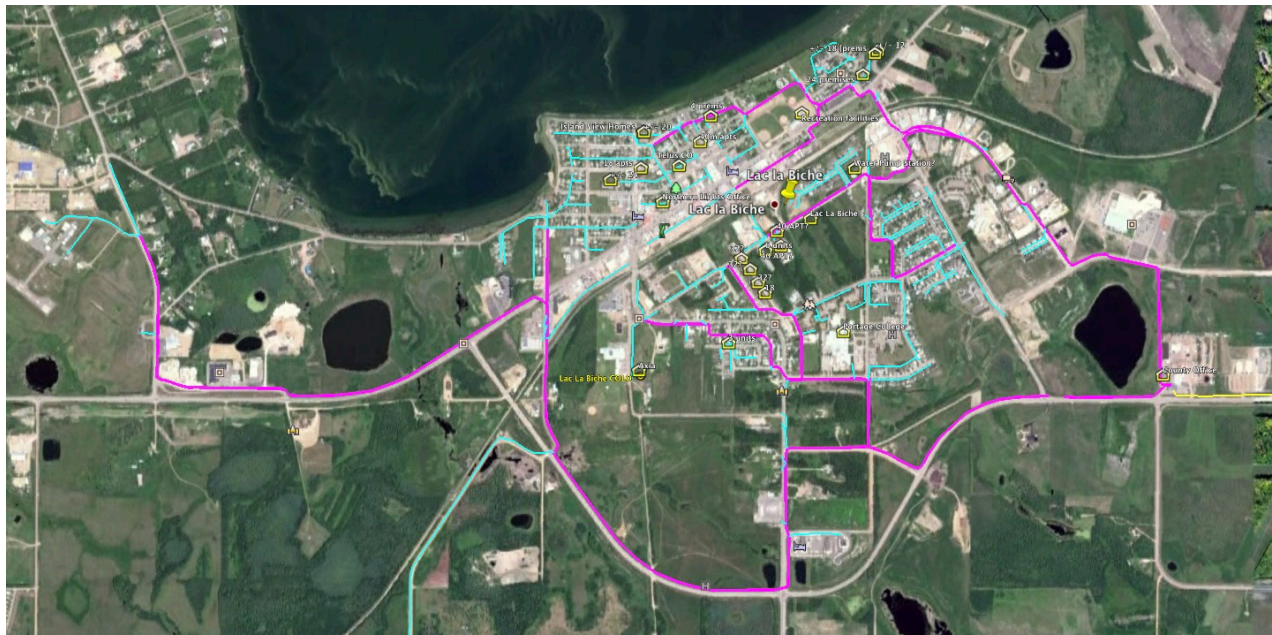


Figure 89 – Scaled down utility FTTP network for the Hamlet of Lac La Biche.

A breakdown of the capital expenditures over the first five years of operation appears in the pie chart in Figure 90. The pie chart represents expenditures of \$5.62M and assumes that the ISPs using the network obtain a collective market penetration of 50% of the residential and 70% of the business communities.

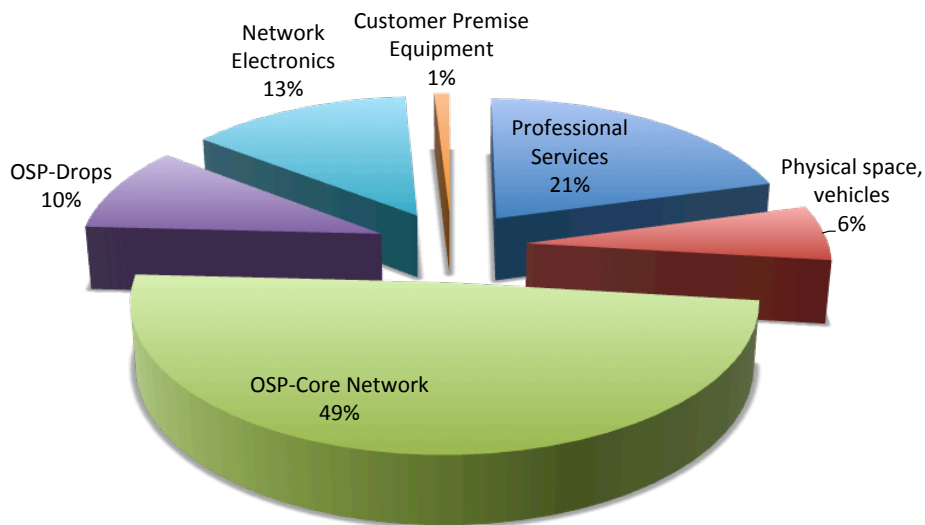


Figure 90 – Cumulative capital expenditures from 2018 to 2022.

8.4.4 Operations

Operational costs include payments to O-Net for network management and monitoring services and for local technical staff required to maintain the network. A breakdown of the expenses, as estimated for the 2022 operating year, appears in Figure 91 for the scenario proposed. In the chart, Admin, ops, o-e, and mktng refer to administration, operations, opto-electronics, and marketing respectively. All service-related costs are zero as responsibility for those remains with the ISPs.

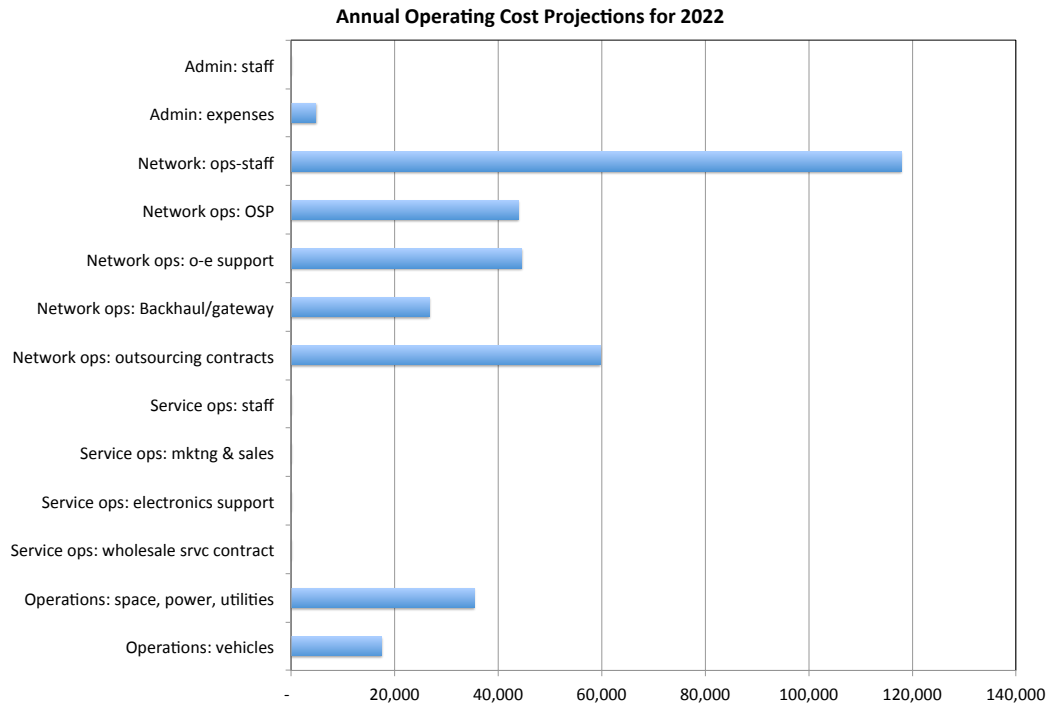


Figure 91 – Annual operational cost projections for the Lac La Biche fibre network in 2022.

8.4.5 Financial Projections

The cashflow results for this scenario are summarized on the left side of Table 32. Though the operation goes cashflow positive in year 5,¹³¹ with debt servicing considered, the overall financials does not go cashflow positive and the operations runs at a deficit. As the required capital must therefore be sufficient to cover a 15-year deficit, some \$7.09M in capital will be required to fund the operation.

Table 32 – Utility Model Results Summary for the hamlet of Lac La Biche

Lac La Biche – Debt Financing Only		Lac La Biche – \$2.5M Grant	
	Results		Results
Years to positive cashflow		Years to positive cashflow	
Operating	4	Operating	3
With debt servicing (p&i)	16	With debt servicing (p&i)	4
Financing		Financing	
Start-up capital required	7,086,399	Start-up capital required	3,127,262
Net Cashflow - before debt servicing		Net Cashflow - before debt servicing	
Profit - annual at 10 yr	110,507	Profit - annual at 10 yr	195,056
Profit - annual at 15 yr	212,857	Profit - annual at 15 yr	286,928
Net Cashflow - after debt servicing		Net Cashflow - after debt servicing	
Profit - annual at 10 yr	0	Profit - annual at 10 yr	106,547
Profit - annual at 15 yr	0	Profit - annual at 15 yr	183,824

On the other hand, if a \$2.5M grant or cash infusion were available, the principle repayments decrease sufficiently that the operation goes cashflow positive overall in year 5 – as shown in the summary results

¹³¹ With four years to positive cashflow, the project goes cashflow positive in year 5.

on the left side of Table 32. Required capital reduces to \$3.13M and by year 10, some \$106,547 is being returned to the hamlet annually.

In graphical form, the non-discounted cashflow chart for the debt-financed deployment appears in Figure 92. As the margin is negative, the operation would require an annual infusion of cash to be sustainable. The cashflow chart for \$2.5M grant funded scenario appears in Figure 93.

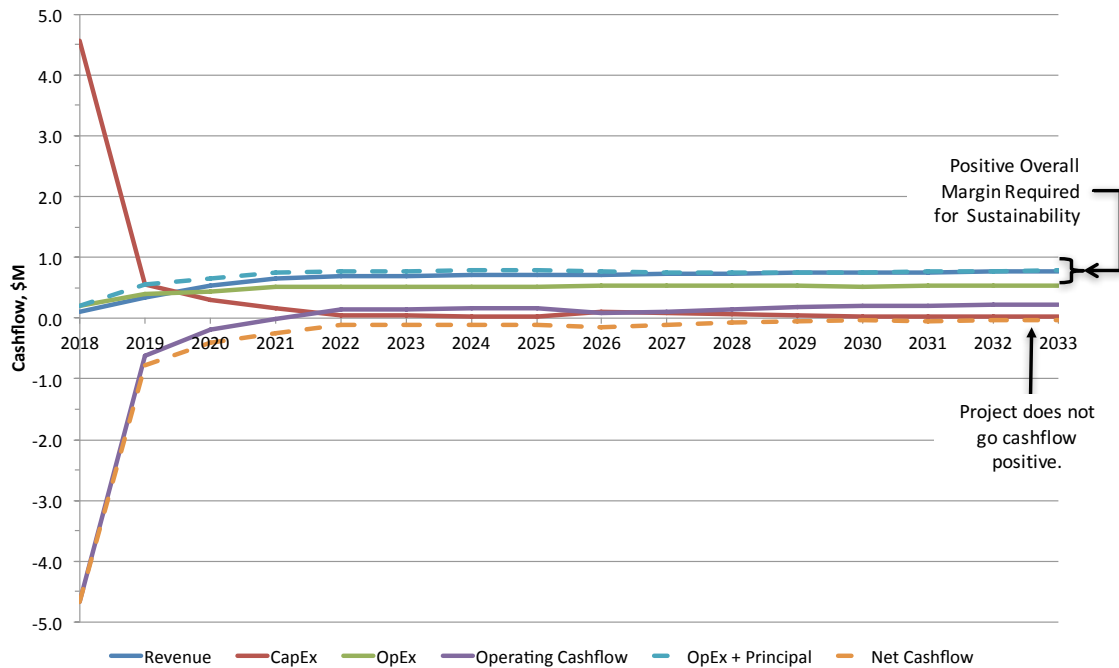


Figure 92 – Non-discounted cashflow projections for the Lac La Biche network.

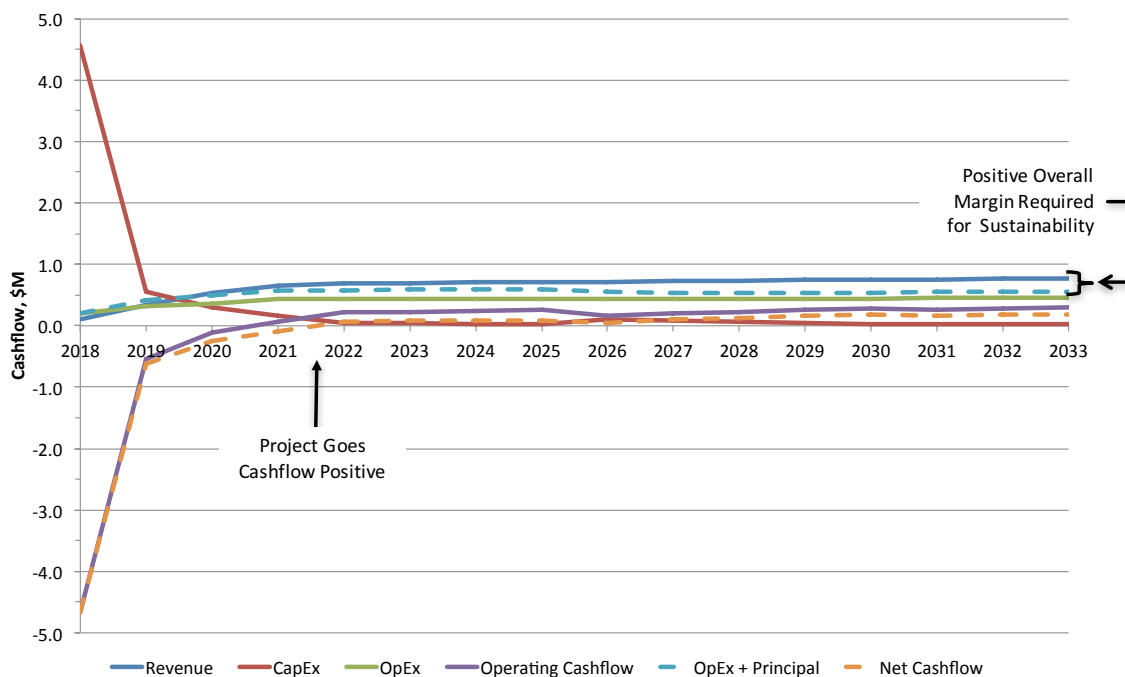


Figure 93 – Non-discounted cashflow projections assuming a \$2.5M grant.

Options to improve margins further and decrease risk were discussed in the Sub-section 6.5.10.

8.5 Vermilion River Regional Alliance – An Inclusive Regional Network

8.5.1 Context

Within the Alberta HUB, the Vermilion River Regional Alliance (VRRRA) and its partner communities are the most advanced in recognizing the importance of broadband and looking for solutions to move forward. A map of the Alliance Region appears in Figure 94. Towns and hamlets are marked with orange and yellow pins. SuperNet access sites are shown with yellow text and circles. SuperNet access sites enable connections back to Internet exchanges in Edmonton and Calgary without the need for additional fibre deployment. Each community network must at least indirectly connect back to an Internet Exchange.



Figure 94 – The Vermilion River Regional Alliance.

The VRRRA took the initiative to apply for CARES funding for a detailed study for the region, inclusive of the municipalities within its boundaries – specifically Town of Vermilion (lead), Dewberry, Kitscoty, Mannville,

Marwayne, and Paradise Valley. The study – *VRRR Broadband Research Project* – will leverage the results of this work and then develop more detailed financials to evaluate the options of most interest to the region. As the more detailed financials have already been developed, they will be used in the analyses presented – thereby increasing both the accuracy and credibility of the financial results presented.

8.5.2 Business Structure

Assume that the VRRR, inclusive of all the municipalities within its boundaries deploys an open-access, lit fibre-optic network that will make world-class, fully scalable broadband infrastructure available to every home and business in the town of Vermilion (lead), the villages of Dewberry, Kitscoty, Mannville, Marwayne, and Paradise Valley, and the hamlets of Blackfoot, Clandonald, Islay, McLaughlin, Rivercourse, Streamstown, and Tulliby Lake. In the analysis below, the business structure, opto-electronics and backhaul, operations, drop capital, and markets and revenues assumed are those outlined in the default implementation scenario presented in Section 6.5. In this case, the local network entity established to house the local fibre operation will be referred to as V-Net.

8.5.3 Deployment Capital

Deploying an inclusive regional network involves both laying fibre to connect all communities and enable connections to key ISP towers (towers that the ISPs would upgrade if a fibre connection became available) as well as deploying access, fibre-to-the-premise networks in all towns, villages, and hamlets.

Normally this would be done over a number of years and staged in a way as to minimize impact on cashflow and capital requirements. For simplicity here, assume that the full intercommunity network and the fibre access network are deployed in 2018 and FTTP networks in the remaining villages are completed in 2019. The intercommunity network is shown in yellow in Figure 95. In the figure, the red balloons represent key ISP towers. An example of the FTTP network, that for the Town of Vermilion, appears in Figure 96. The core feeder ring is in blue, the distribution feeder routes are in magenta and the distribution network is in cyan.

The capital costs to deploy both the connection network and access networks in each community are shown in Table 33. In this context, access refers to laying fibre that passes every premise in a municipality. Later, when a premise orders service, a fibre drop connection from the premise to the fibre running past the premise will be needed. Overall cost, should the entire network be deployed, comes to about \$10.3M. In the financial projections which follow, the year of deployment for each community is shown in the tan coloured row. Overall, the network will be deployed over the two-year period from 2018 to 2019.

Table 33 – Deployment Cost Summary

Network Component	County Backbone Routes					Towns		Villages			
	From Kitscoty SN POP	From Dewberry SN POP	From Marwayne SN POP	From Paradise Valley SN POP	From Town of Vermilion	Vermilion	Dewberry	Kitscoty	Marwayne	Paradise Valley	Mannville (Minburn)
Year of Deployment	2018	2018	2018	2018	2018	2018	2019	2019	2019	2019	2019
Feeder Distribution	629,502	76,640	180,839	247,400	60,135	1,093,164	46,255	140,621	111,988	49,062	152,397
	-	-	-	-	-	2,011,550	166,800	512,430	289,465	157,560	314,090
Subtotal - civil construction	629,502	76,640	180,839	247,400	60,135	3,104,714	213,055	653,051	401,453	206,622	466,487
Mobilization/De-mobilization	12,590	1,533	3,617	4,948	1,203	21,863	4,261	13,061	8,029	4,132	9,330
Engineering, Permitting, and Planning	94,425	11,496	27,126	37,110	9,020	262,513	27,584	116,814	106,120	14,209	14,928
Activation: Fibre Micro-cabling	1,202,100	229,920	500,745	742,200	180,405	262,513	10,125	28,845	28,920	11,130	40,110
Grand-total, deployment	1,938,617	319,589	712,327	1,031,658	250,763	3,651,603	255,025	811,771	544,522	236,094	530,854
					4,252,954						6,029,871

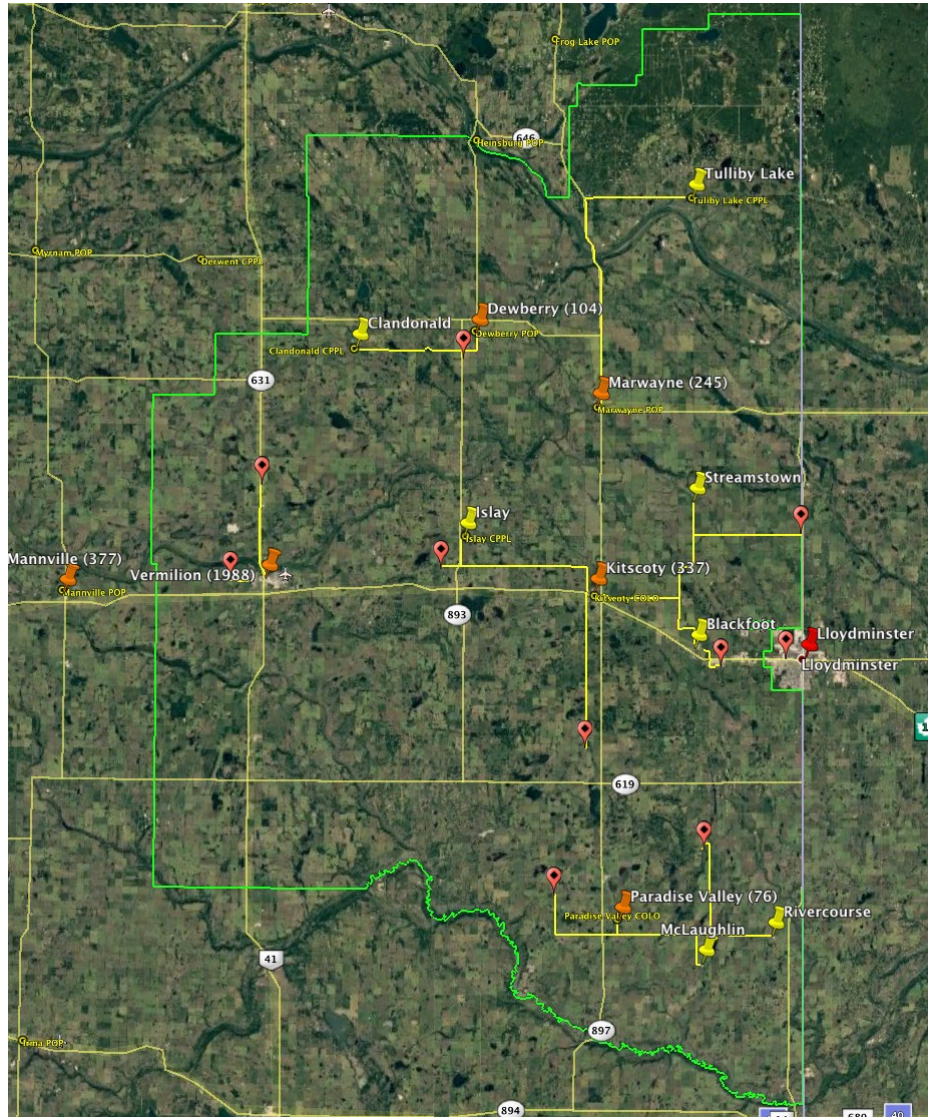


Figure 95 – Utility fibre network for the VRRRA.

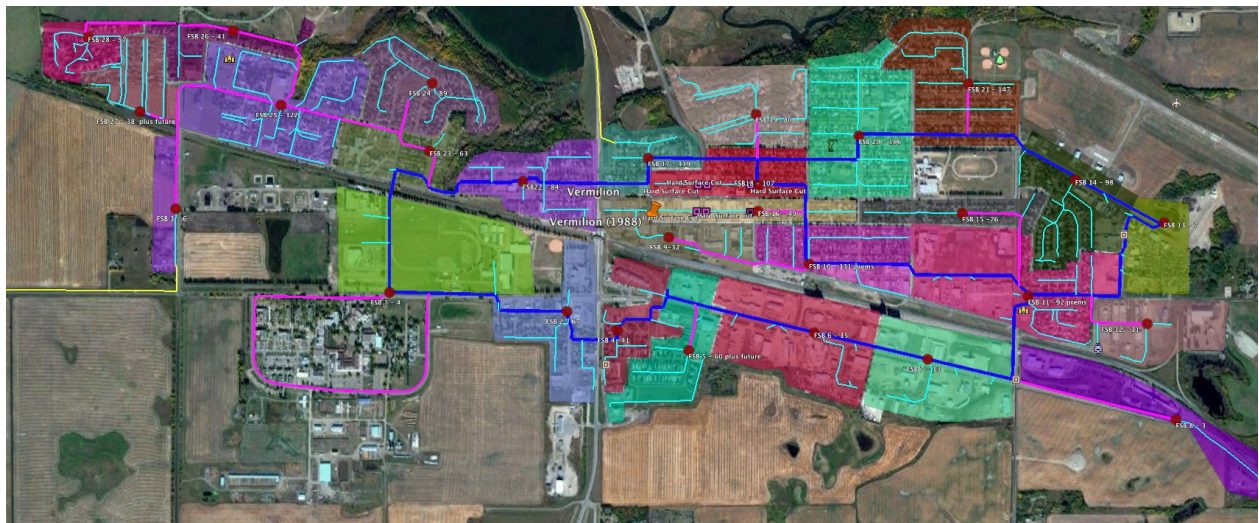


Figure 96 – Utility FTTP network for the Town of Vermilion.

A breakdown of the capital expenditures over the first five years of operation appears in the pie chart in Figure 97. The pie chart represents expenditures of \$14.0M and assumes that the ISPs using the network obtain a collective market penetration of 50% of the residential and 70% of the business communities.

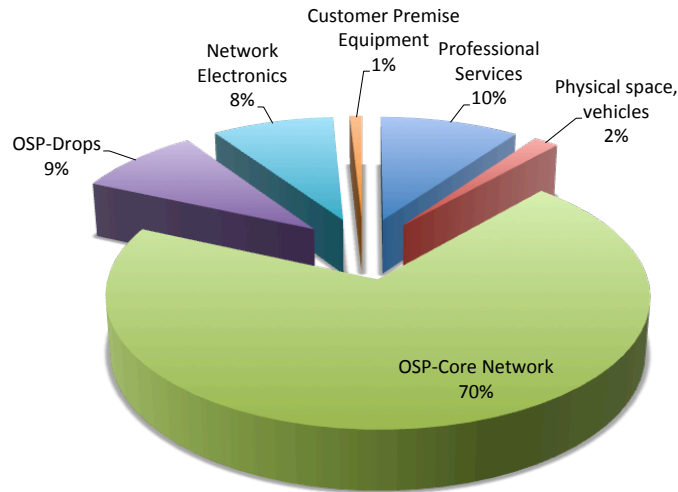


Figure 97 – Cumulative capital expenditures from 2018 to 2022.

8.5.4 Operations

Operational costs include payments to O-Net for network management and monitoring services and for local technical staff required to maintain the network. A breakdown of the expenses, as estimated for the 2022 operating year, appears in Figure 98 for the scenario proposed. In the chart, Admin, ops, o-e, and mktng refer to administration, operations, opto-electronics, and marketing respectively. All service-related costs are zero as responsibility for those remains with the ISPs.

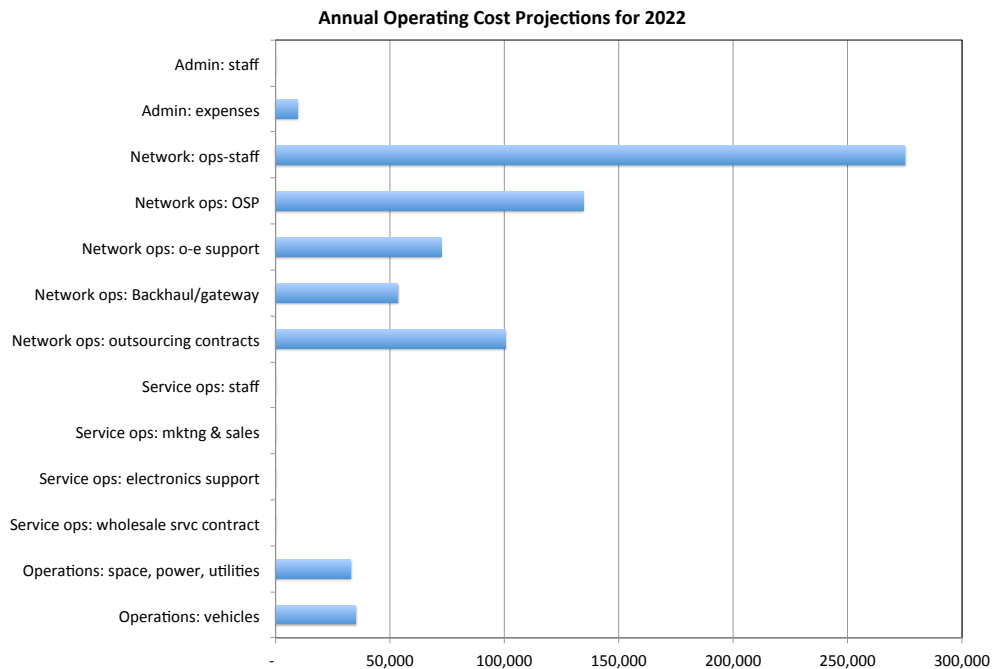


Figure 98 – Annual operational cost projections for the utility fibre network in 2022.

8.5.5 Financial Projections

Cashflow results for this scenario are summarized in Table 34. Though the operation goes cashflow positive in year 5,¹³² with debt servicing considered, the overall financials do not go cashflow positive until year 13. As the required capital must therefore be sufficient to cover a 12-year deficit, some \$15.7M in capital will be required to fund the operation. By year 15, approximately \$63,319 is being returned to the Town annually.

Table 34 – Utility Model Results Summary for the VRRR – all in

	Results
Years to positive cashflow	
Operating	4
With debt servicing (p&i)	12
Financing	
Start-up capital required	15,707,746
Net Cashflow - before debt servicing	
Profit - annual at 10 yr	398,832
Profit - annual at 15 yr	639,363
Net Cashflow - after debt servicing	
Profit - annual at 10 yr	0
Profit - annual at 15 yr	63,319

In graphical form, the non-discounted cashflow chart for the proposed deployment appears in Figure 99. While technically these numbers work, operationally, the risk is too high due to the negligible margins and resulting deficits. Given the small client base available, the assumption to deploy everything upfront – particularly the intercommunity network, and the importance of scale to operational sustainability, these initial results are typical but very encouraging. Basically, with worst-case deployment assumptions, no leverage from other linear infrastructure projects, and an extensive intercommunity network, the business case ‘works’. Wow!

Options to improve margins sufficiently that a community might elect to pursue a deployment are many and varied. To start with, the deployment schedule would be staged – much of the intercommunity network, for instance could be deployed later once the operation was up and running. Let’s say that the intercommunity network is delayed or covered by grant funding. The new summary financials appear in Table 35 and the cashflow chart in Figure 100. With these results, the project is financially sound. The project now goes cashflow positive overall by year 4 and by year 10, some \$257,289/yr is being returned to the Alliance.

¹³² With four years to positive cashflow, the project goes cashflow positive in year 5.

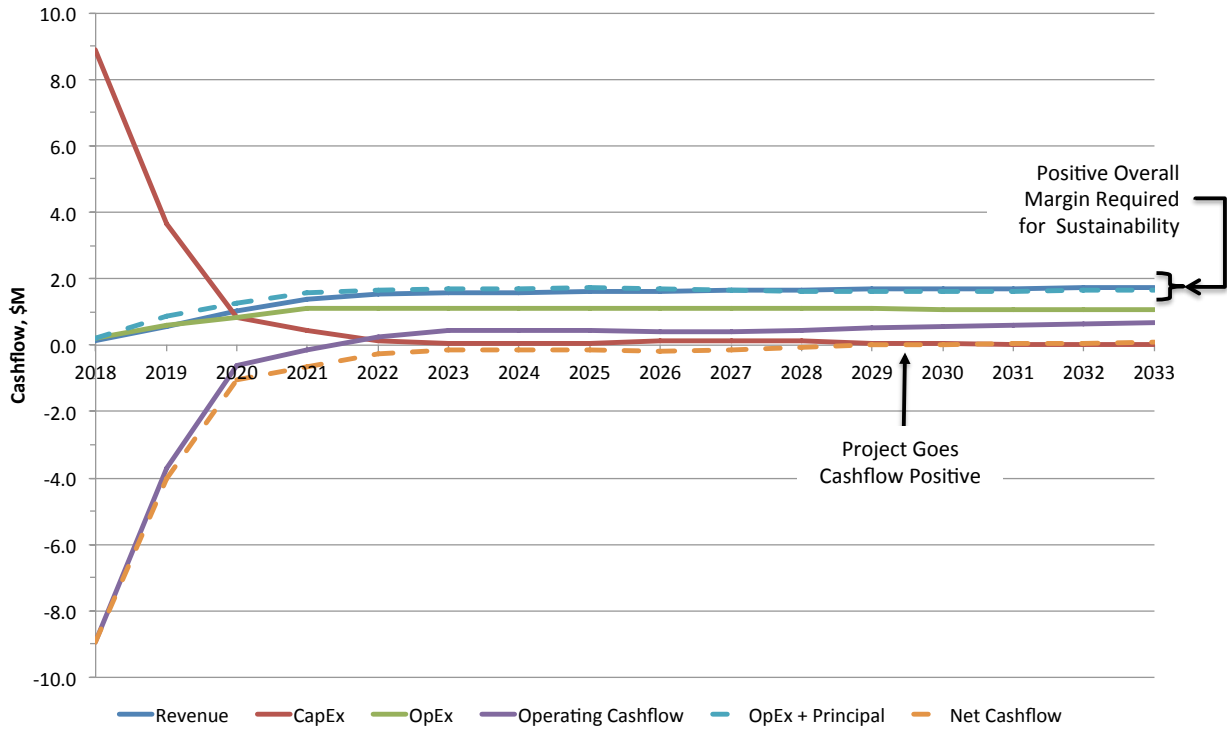


Figure 99 – Non-discounted cashflow projections for the VRR network.

Table 35 – Utility Model Results Summary for the VRR – delayed Intercommunity Build

	Results
Years to positive cashflow	
Operating	3
With debt servicing (p&i)	4
Financing	
Start-up capital required	9,487,035
Net Cashflow - before debt servicing	
Profit - annual at 10 yr	586,853
Profit - annual at 15 yr	799,653
Net Cashflow - after debt servicing	
Profit - annual at 10 yr	257,289
Profit - annual at 15 yr	464,312

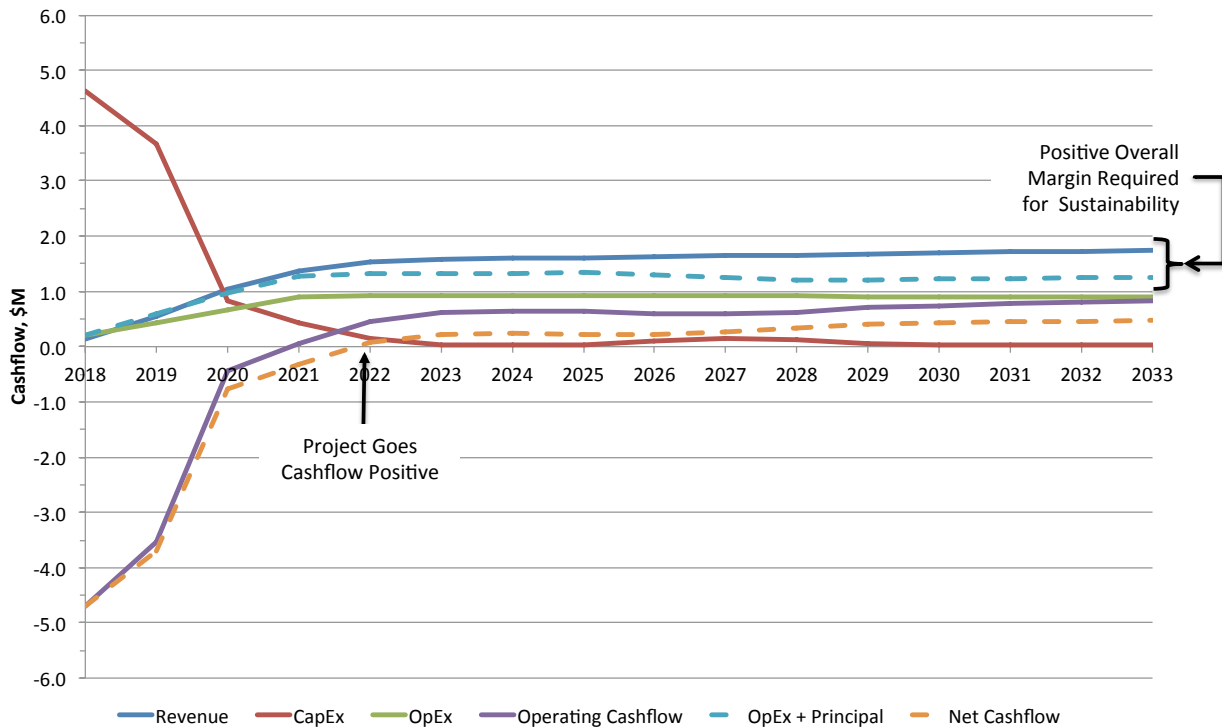


Figure 100 – Non-discounted cashflow projections for the VRRRA network.

Other options to consider to improve margins were discussed in Sub-section 6.5.10.

8.6 Extrapolating the Results

8.6.1 Municipal Networks

Though representative financials were only provided for one urban centre – a town with just over 600 premises – financials for urban centres both larger and smaller are available for consideration in the other reports. As outlined in Table 7, comparative results for communities ranging in size from 4,250 premises down to 725 are available in both the GROWTH Alberta and NADC reports. Whereas financials for centres with in excess of some 2,000 premises are sustainable out of the gate, to reduce risk and improve sustainability, urban centres with less than 2,000 premises will need to collaborate and/or incorporate additional options to make the numbers work.

8.6.2 Regional Networks

As the low densities and small communities found in Lac La Biche County are typical of many in the northern Alberta region, the issues faced by Lac La Biche will be similar to those faced by others. Even though the urban centres are concentrated in the southern half of Lac La Biche and an intercommunity network could be deployed for \$4.17M, the densities are too low to establish a sustainable business case for fibre. Hence, either grant funding, a cash infusion, or a staged rollout over many years will be needed. Other options to improve the financials include cost sharing with local ISPs, leveraging linear infrastructure projects, and/or moving some of the cost to the tax roll, as is done for road and water infrastructure.

Even with worst-case deployment assumptions and no leverage from other linear infrastructure projects, the increased population numbers for the VRRRA area help ensure that the financials for an extensive, inclusive, open-access fibre network in the VRRRA area, 'work'. The result is very encouraging.