12 Regional Economic Development Initiative for Northwest Alberta (REDI)

12.1 Current State

12.1.1 Regional Profile

As shown in Table 65, the current state data collection and analysis focuses on two towns, one county, four First Nations, and Paddle Prairie Métis Settlement within the Regional Economic Development Initiative for Northwest Alberta (REDI) region. A map of the REDI region is shown in Figure 166. Please visit REDI's website for more information http://www.rediregion.ca/.

The region is geographically located in the northwestern corner of Alberta. Its land supports boreal forest while the flat portions are suitable for agriculture in this remote part of Alberta. There are many active grain farmers in the La Crete area. The La Crete area has a unique growing climate, with extended daylight hours during the summer growing season, which result in improved crop yields.

Table 65 – REDI Communities

Towns	Counties	First Nations	Métis Settlement
High Level Rainbow Lake	Mackenzie	Beaver* Dene Tha'* Little Red River* Tallcree*	Paddle Prairie

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

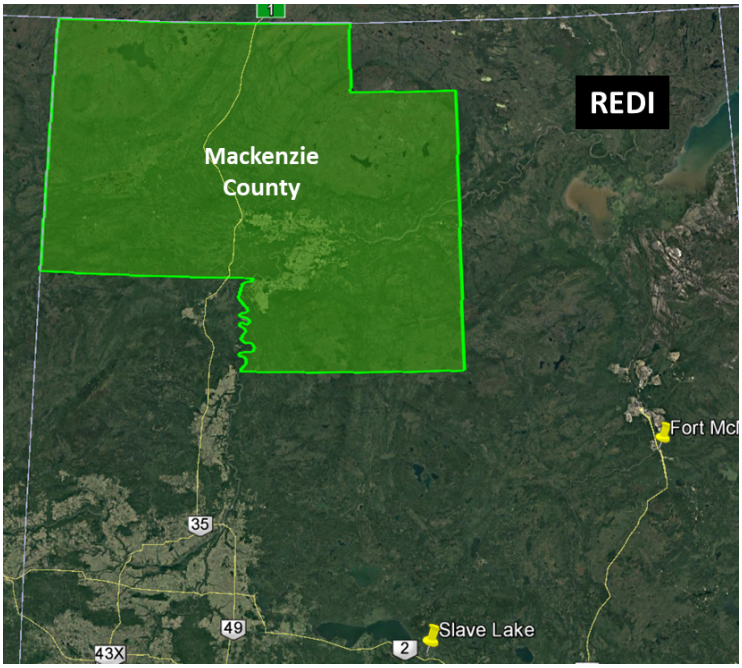


Figure 166 – REDI region.

The region is home to approximately 23,000 residents. Table 66 provides a breakdown by municipality (rural and urban), and First Nation as well as five-year population growth trends and CAGRs. Twenty-eight percent of the region's residents live on First Nations reserves.

Although the 2016 Statistics Canada Census indicates that the population of Mackenzie has increased slightly (2.2%), the County's own 2015 Census shows an increase of 7.5% over the five-year period of 2011 to 2015.[191] The Town of High Level completed its own population census subsequent to the Federal census. Population growth was 2.6% compared to its earlier municipal census in 2015.

The hamlet with the largest population is La Crete (3,376 people) and represents almost 30% of the population within the County. Realizing the rich farmland in the La Crete area, a large number of Mennonites relocated to the area in the early 1930s. They have large families - household size of 10 to 14 are common and population growth has been described as '*intense*'. Youth find employment within the community and, therefore, stay in La Crete. These factors fuel the demand for housing (50 to 80 houses are built annually), and the price of property in the La Crete area.[192]

Most of the First Nations populations have grown between 2011 and 2016, especially the Tallcree First Nation (approximately 30%). The Little Red River Cree First Nation is also growing and has a population comparable to High Level.

Table 66 – REDI Population & Population Growth Trends

Municipality	Rural				Urban					First Nations (FN)				
	Population (2016)	CAGR (%) (2011-2016)	5-Year Trend (%) & Direction		City/Town/ Village	Population (2016)	CAGR (%) (2011-2016)	5-Year Trend (%) & Direction		Reserve / Settlement	Population (2016)	CAGR (%) (2011-2016)	5-Year Trend (%) & Direction	
Mackenzie, County	11,171	0.4	2.2	▲	High Level Rainbow Lk.	3,922 795	na -1.8	na -8.6	▼	Beaver First Dene Tha' Little Red River Tallcree	434 1,900 3,530 484	1.6 na na 4.9	8.2 na na 29.9	▲ ▲
Northern Lights, County										Paddle Prairie (Métis)	544	-0.6	-3.2	▼
Total	11,171					4,717				**Total - FN**	6,348			
										Total - Métis	544			

CAGR – Compound Annual Growth Rate

Total Population = **22,780**

Source: Statistics Canada Census 2011 and 2016, High Level Municipal Census 2017, Little Red River Cree.

There are 826 businesses (with employees) in the REDI region. As shown in Table 67 and Figure 167, almost 50% of the businesses are involved in three industries: (1) construction; (2) agriculture, forestry, fishing, and hunting; and (3) transportation and warehousing. The NAICS was used to classify the industries. *'Other Industries'* segment (14.5%) shown in the Figure 167 chart includes industries that individually contribute between 3.0% and 0.1% to the category.[193] The Tolko Industries Ltd.'s lumber sawmill in the High Level area received a temporary permit from the government to operate its incinerator to burn their accumulating '*hog*' pile. Hog is a co-product of the lumber milling process. It is the bark that is removed

[191] Mackenzie County; *2015 Municipal Census*.

[192] Neufeld, Larry – Manager, La Crete and Area Chamber of Commerce; Telephone conversation; 2017-03-10.

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

from the logs when they first come into the sawmill. The company now has a plan in place.[194] The provincial plan to protect caribou herds in the area will have a socioeconomic impact as 1.8 million hectares is being proposed for conservation and permanent protection by the end of 2017.[195]

Table 67 – REDI Number of Businesses (with employees) by Industry

Industry	Businesses	Percent (%)
Construction	143	17.3
Agriculture, forestry, fishing, and hunting	140	16.9
Transportation and warehousing	112	13.6
Retail trade	90	10.9
Other services (except public administration)	67	8.1
Healthcare and social assistance	34	4.1
Administrative and support, waste management and remediation	34	4.1
Accommodation and food services	31	3.8
Mining, quarrying, and oil and gas extraction	29	3.5
Professional, scientific and technical services	26	3.1

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

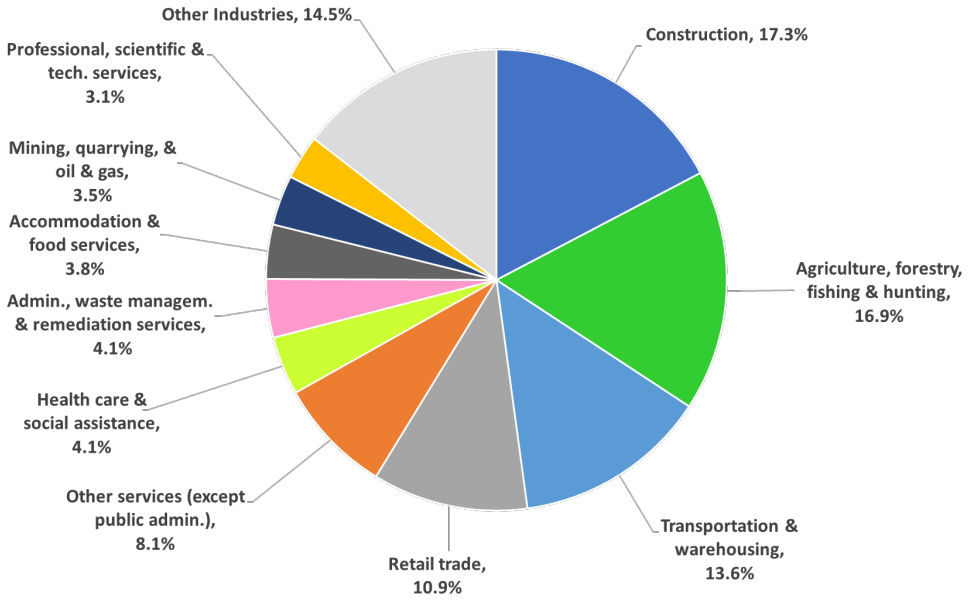


Figure 167 – REDI mix (based on business counts).

Agriculture and Agri-Food Canada has a research facility at Fort Vermilion. The site focuses primarily on the adaptation of technologies for this northern agricultural area. Additionally, the producer-sponsored Mackenzie Applied Research Association (MARA) conducts applied agricultural research and demonstration trials in the REDI region.

[194] Dolling, Joe, Woodlands – Manager, Tolko Industries Ltd. – High Level; 'Telephone conversation'; 2017-05-11.

[195] *High Level Mayor Wants Socioeconomic Impact Assessment of Alberta Caribou Plan;* YL Country; 2016-09-05.

Post-secondary and continuing education in the REDI region are provided by the Northern Alberta Institute of Technology (NAIT), Northern Lakes College, Kayas Cultural College, and Athabasca University. Kayas Cultural College is an adult academic upgrading and training center, operated by the Little Red River Cree Nation.

12.1.2 Municipal, First Nations, and Métis Settlements Broadband Interests

Communities within REDI 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.[196] Table 68 identifies the awareness and current state of municipal involvement and interest in broadband.

Table 68 – REDI Involvement & Interest in Broadband[197]

Community	Enthusiastic	Interested *'Maybe'*	Need Help Too Small	Too Expensive	Status Quo	Don't Know[198]	No Response[199]
Towns							
High Level		X					
Rainbow Lake					X		
Counties/MDs							
Mackenzie	Very interested in improving Internet service delivery within the County. Its strategy is to support the local ISPs						
First Nations							
Beaver							X
Dene Tha'		X					
Little Red River	X						
Tall Cree	X						
Métis Settlement							
Paddle Prairie							X

12.1.3 Current Service Providers, Services, and Infrastructure

12.1.3.1 Fixed Wireless-based

Current Internet service providers using fixed wireless technology in the REDI region include the following. Appendix 16.3 provides the details of their service offerings (Internet only – no bundling unless otherwise

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

[197] 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).

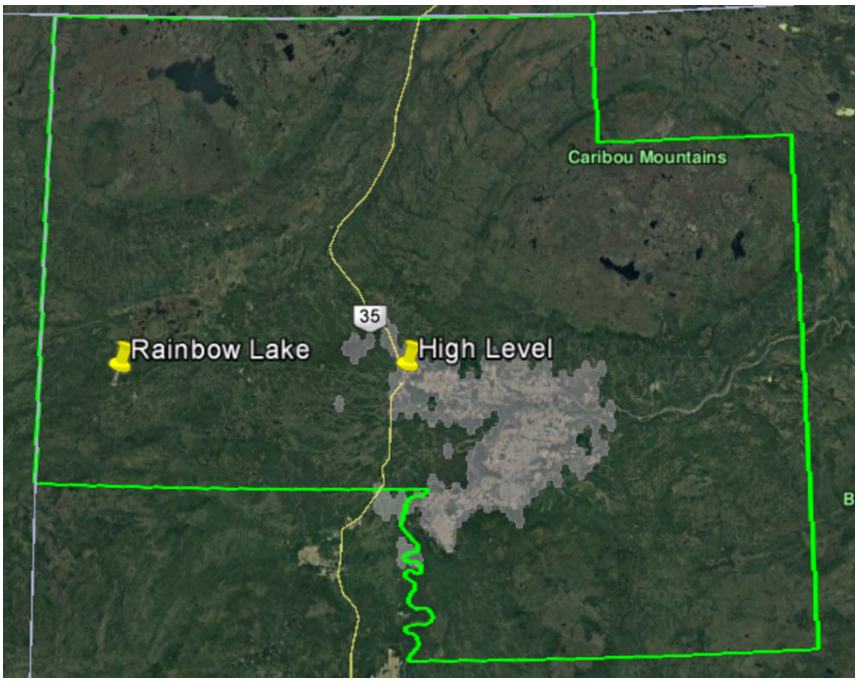
[198] Don't Know – the respondent was unable to rate their community's interest and involvement in broadband.

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

stated) and geographic coverage. The coverage maps of the individual service providers are those that were available on their websites at the time of the writing of this report.

- Arrow Technology Group,
- Corridor Communications (CCI),
- Little Red River First Nations, and
- XplorNet (fixed wireless and satellite-based).

According to the CRTC website[200], minimal 5 Mb/s down (toward the end-client) by 1 Mb/s up (from the end-client to the network) service is only available in the High Level area (i.e., the Town of High Level and to the west and southwest of the town) of the REDI region. A combined view of the fixed wireless coverage is shown in Figure 168 (light gray areas).



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

Figure 168 – REDI fixed wireless coverage.

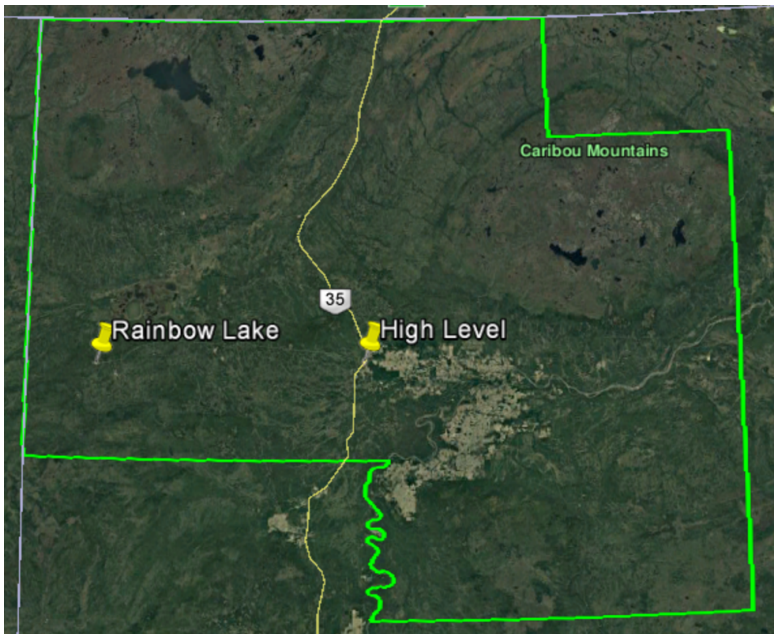
12.1.3.2 Mobility

The lack of yellow areas in Figure 169 indicates that mobility data services are not available; however, the coverage maps in Appendix 16.4.2 suggest there is some coverage.

12.1.3.3 Wireline-based – DSL

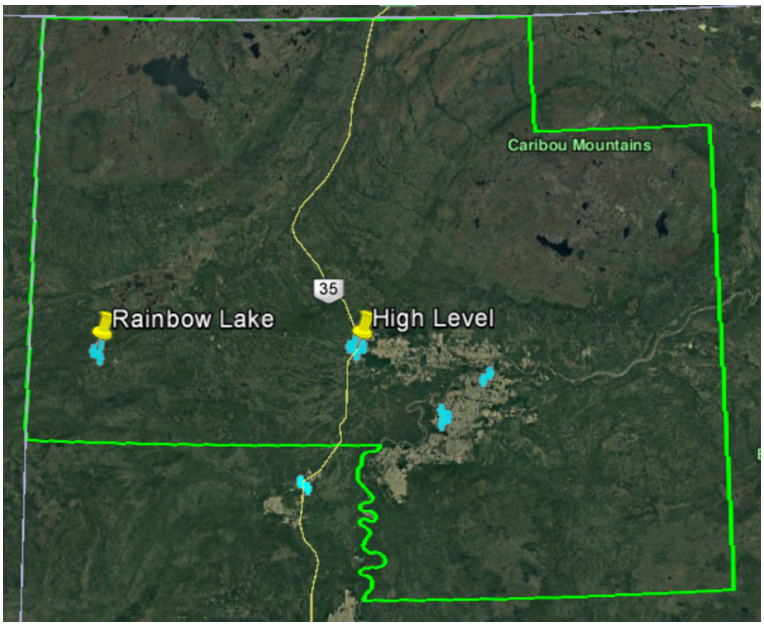
Digital Subscriber Line (DSL) refers to a group of last mile technologies that are used by wireline-based service providers such as TELUS in Alberta to provide broadband services over twisted-pair copper wiring. The local copper wire loop is a remnant from the days when (and how) the telephone company 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 170, areas served via DSL technologies are shown in blue.

[200] http://crtc.gc.ca/eng/internet/internetcanada.htm



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

Figure 169 – REDI mobility data coverage.



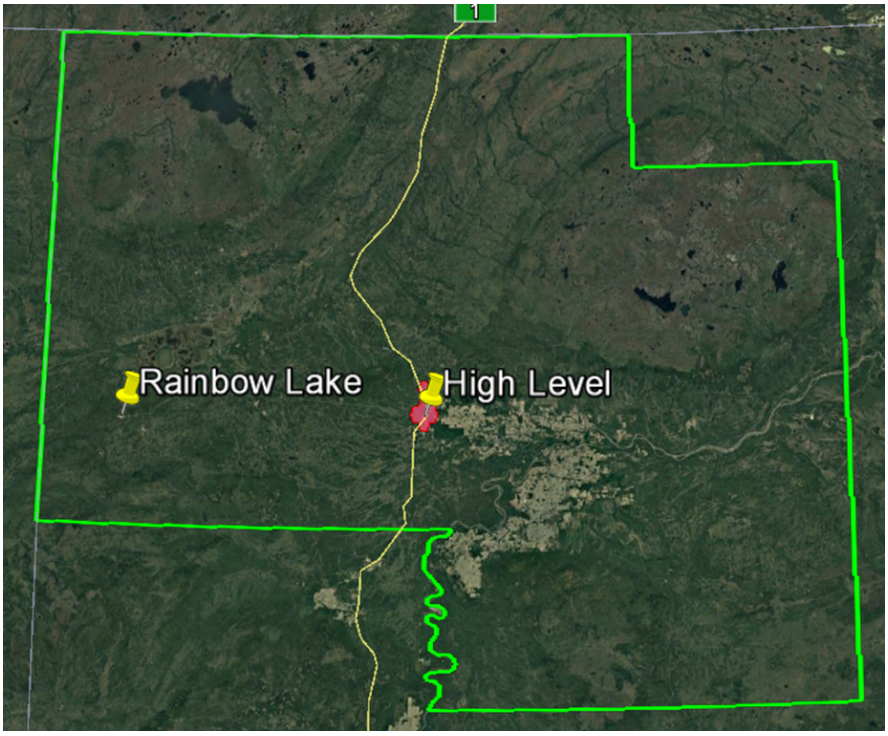
Source: http://www.crtc.gc.ca/eng/internet/internetcanada.htm

Figure 170 – REDI DSL coverage.

12.1.3.4 Wireline-based – Coaxial Cable

NorthwesTel Inc. (NorthwesTel) and the Town of Rainbow Lake, originally television broadcast companies, use coaxial cable and modern cable modem technology to provide broadband services in the REDI region (red areas in Figure 171). The cable companies currently use the DOCSIS 3.0 standard to achieve broadband speeds of 100 Mb/s or more over coaxial cable. 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." [201]



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

Figure 171 – REDI 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. The offerings are highly asymmetric – upload and download bit rates differ significantly.

12.1.3.5 Internet Service Provider Wi-Fi

TELUS offers two WiFi locations in High Level and one location in Fort Vermilion.

12.1.3.6 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. In January, 2017, Axia announced plans to deploy an FTTP network in Fairview. The build is scheduled to complete this fall.

[201] *State of Alberta Digital Infrastructure Report;* Cybera; 2016-09-13.

12.1.4 Backhaul Availability

12.1.4.1 Alberta SuperNet

The extent of the SuperNet within the REDI region is shown in Figure 172. 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.

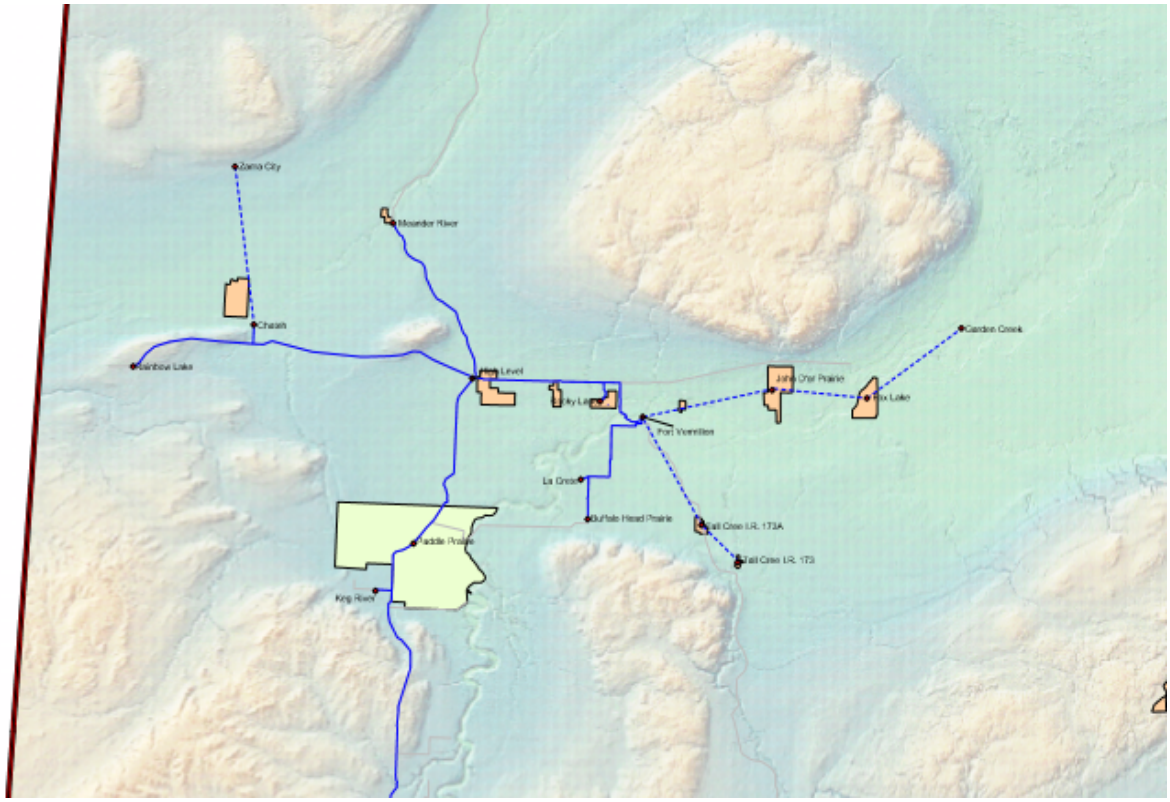


Figure 172 – REDI SuperNet infrastructure.

In 2018, municipalities, First Nations, and Métis Settlements requiring access to fibre transport for backhaul to Edmonton may want to consider Bell or TELUS.

Reliability of the Internet and cellular service are both big concerns for the region. There is only one fibre optic line feeding most of northwest Alberta including the entire County.

NorthwesTel is the only service provider that has their primary infrastructure north of the County and does not rely on backhaul fibre facilities coming from the South. This positions NorthwesTel uniquely as a possible alternative to the current service providers and offers potential redundancy solutions, especially in case of emergencies.[202]

12.1.4.2 TELUS Wholesale

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

[202] Mackenzie County; Mackenzie County, Sustainability Plan 2015 – January 2016, Approved January 12, 2017. 33.

12.1.5 Existing Infrastructure

12.1.5.1 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.

The Dene Tha' and Tallcree First Nations 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. High Level has the following taller buildings which can potentially be used to support broadband hardware: the High Level Arena Complex, the administration building, the swimming pool, and the fire hall.

12.1.5.2 Utility Infrastructure

The existing overhead and underground transmission and distribution lines of electric utility companies (ATCO Electric) 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 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. Appendix 16.6 shows ATCO Electric's and Fortis Alberta's respective service areas in northern Alberta.

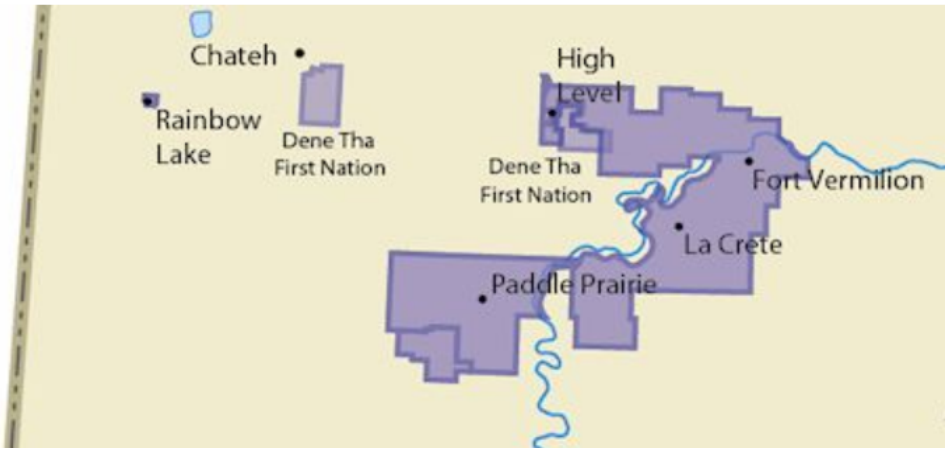
12.1.5.3 Gas Co-operatives

In the 1960s, non-profit gas co-ops were formed to supply natural gas to rural Alberta - franchise areas were designated. Mackenzie County's rural gas co-operative's distribution infrastructure is being used to expand broadband coverage throughout the county and its First Nations communities (Figure 173).

- Dena Tha Natural Gas Utility (Chateh)
- Northern Lights Gas Co-op Ltd. (La Crete)
- Town of Rainbow Lake

12.1.5.4 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 174, First Nations' schools, health centres, band administration offices, and water treatment plants are now connected.



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

Figure 173 – REDI gas co-operatives.

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.

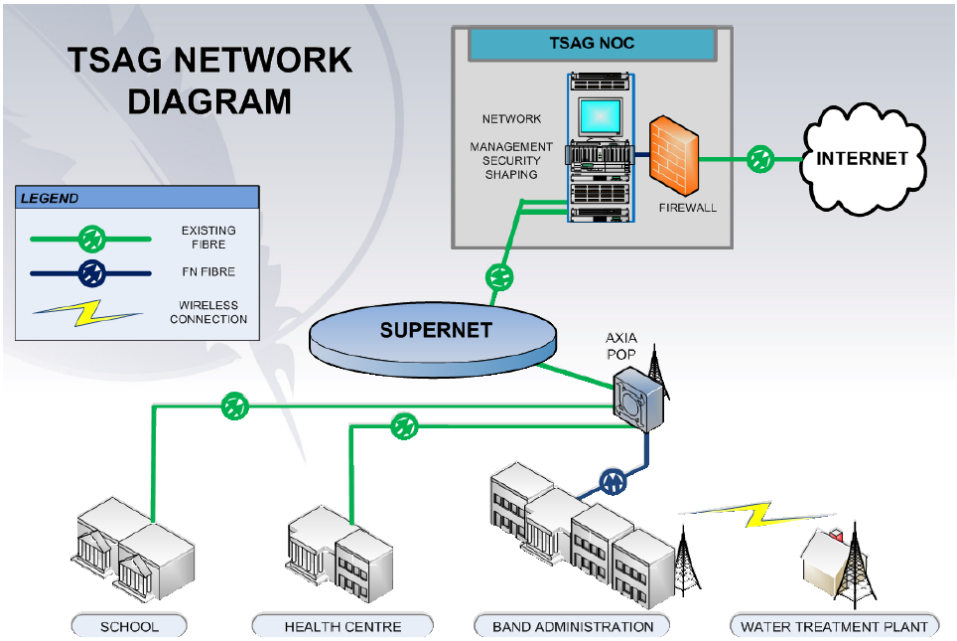


Figure 174 – TSAG network diagram.

12.1.6 Planned Infrastructure

12.1.6.1 Major Projects

Private and public sector capital projects in the REDI region include school modernization and road work. Where possible these projects maybe leveraged to reduce the costs associated with the deployment of broadband infrastructure. Figure 175 shows the capital projects in the within the REDI regions.[203]

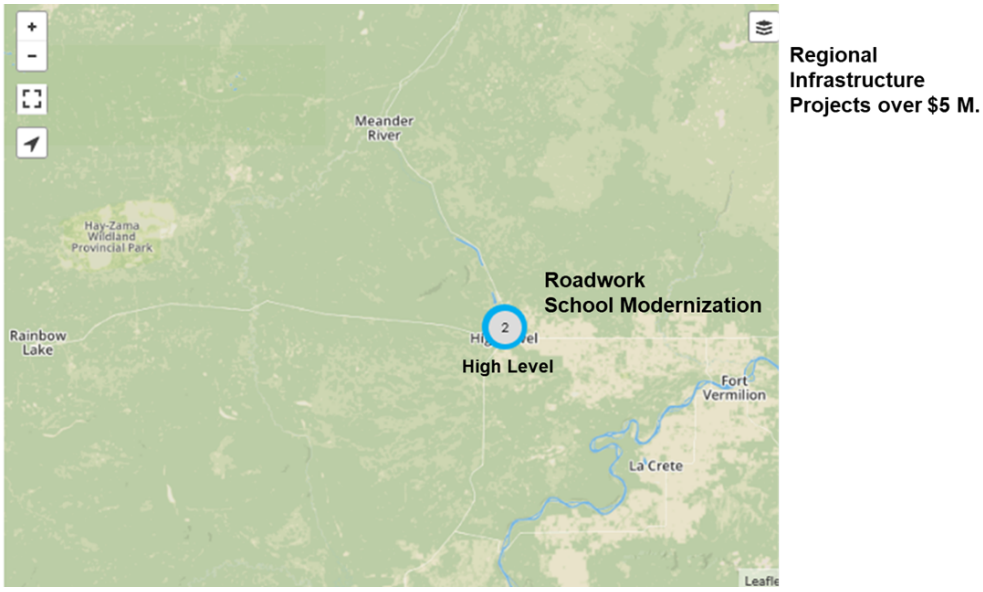


Figure 175 – Major projects.

12.1.6.2 Electricity Transmission Development Plans

As shown in Figure 176, local electricity load is supplied by 138/144 kV transmission lines in the REDI area.[204] In the long-term the rebuild the 144 kV line from Blumenort (near the Hamlet of La Crete) to High Level is proposed.

12.1.6.3 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 of rehabilitation of water or sewer lines are typical projects that can improve the economics, of community broadband projects.

The County of Mackenzie received approximately $1.8 million from the *Alberta Municipal Water/Wastewater Partnership (AMWWP)* for the La Crete sewage lagoon expansion**.**

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 the REDI region include (figures shown are the Total Eligible Project Cost - Federal, Provincial, and Municipal).

- Rainbow Lake – Water distribution system rehabilitation $2.1 million, and

[203] Alberta Major Projects, Economic Development and Trade; December 2016. http://majorprojects.alberta.ca/.

[204] *AESO 2015 Long-term Transmission Plan*; AESO.

- Mackenzie County – Rural potable water infrastructure $5.3 million.

Figure 176 - REDI - existing electricity transmission system.

Table 69 shows the capital and civil works projects that the municipalities self-reported.

Table 69 – REDI Municipal Capital & Civil Works Projects

Towns	
High Level	Road upgrades – on Highways 35 and 58 and on 100 Avenue
Rainbow Lake	Nothing planned
Counties	
Mackenzie	La Crete – commercial subdivision

12.2 Desired State

The range of interest in broadband varies considerably throughout the region, but even the most enthusiastic of the municipalities are still in the early stages of deciding which options to pursue and how. While a formal *'Desired Sta*te' has not yet been agreed to in any of the municipalities, what follows is based on the assumption that, over the next five years, the majority may choose to facilitate the deployment of infrastructure to support a fully scalable broadband network ubiquitously available throughout their municipality and, if possible, the region as a whole. This would typically include a combination of an underlying fibre infrastructure with upgraded wireless services where fibre is not yet practical. Market-wise, the infrastructure would be available on an open-access basis to all service providers interested in serving municipal and regional businesses and residents. Whereas the municipalities do not wish to interfere with private enterprise in the services marketplace, they will entertain options relative to facilitating the underlying lit open-access fibre utility infrastructure.

Within the Regional Economic Development Initiative for Northwest Alberta (REDI) the communities or community clusters shown in Figure 177 have the greatest near-term broadband aspirations (likely a community hybrid fibre/fixed wireless solution). Specifically, they are the Town of High Level and the First Nations' communities of Dene Tha', Beaver First, Little Red River Cree, and Tall Cree.

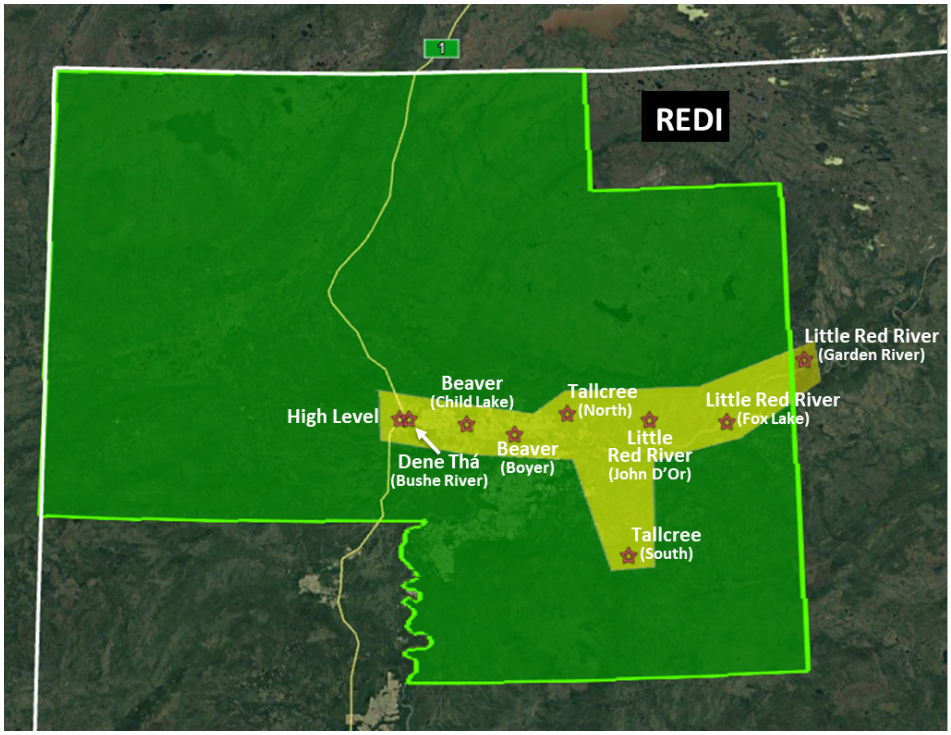


Figure 177 – Communities with near-term broadband plans.

Appendix 16.11 provides 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 the 3-, 5-, and 10-year visions each community has as it relates to broadband.

12.3 A Multi-Community Utility Network

12.3.1 Context

A map of REDI/MacKenzie County is shown in Figure 178. In the map, towns and villages are shown with orange pins and hamlets are shown with yellow. Fixed wireless towers are marked by green triangles. SuperNet fibre routes are shown in black, wireless ones are brown. SuperNet connection points are shown with yellow circles and text.

As can be seen, each of the communities in REDI has access to SuperNet and the existing fibre routes do pass close to a number of fixed wireless towers. Hence, should the communities be interested in establishing an open-access utility network operation to enhance Internet services in the County, they'd be well advised to focus on FTTP solutions in the communities in combination with fibre to the key ISP towers to improve rural coverage.

As of this writing, the plans for SuperNet 2.0 had not been released so it will be assumed that the existing SuperNet connection sites will remain available and that the terms of their use will become more reasonable. With this approach, the more communities, hamlets, First Nations, and Métis Settlements involved, the better. As broadband needs increase and priorities evolve, this initial focus on the communities could move to a greater focus on the more rural areas. The high-level financials developed below indicate that a community focused FTTP play would be financially sustainable, but only if all communities were involved.

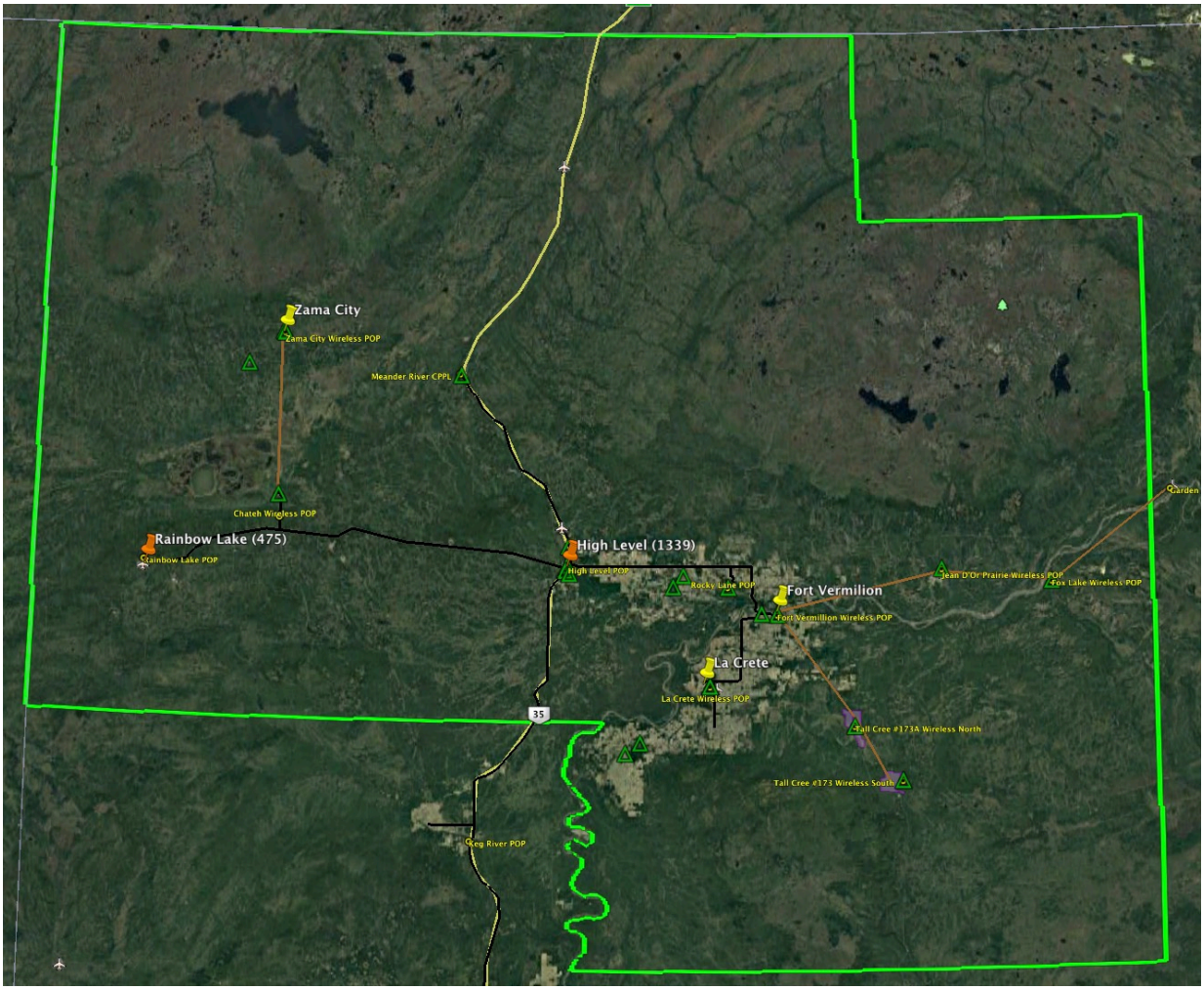


Figure 178 – McKenzie County.

12.3.2 Business Structure

Assume that communities across MacKenzie County jointly deployed an open-access, lit fibre-optic network that will make world-class, fully scalable broadband infrastructure available to all local homes and businesses. 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 Mac-Net.

12.3.3 Deployment Capital

Assuming deployment conditions similar to those experienced in Olds, and a 25% premium due to the remoteness of MacKenzie County, a buried fibre deployment that passes every residence and business in Whitecourt would cost about $7.77M.

12.3.4 Deployment Schedule

The financials below assume that the network would be deployed throughout the communities over the spring, summer, and fall of 2018.

12.3.5 Opto-electronics and Backhaul

Capital cost estimates over the first five years of operation for the proposed scenario come to $11.6M – see Figure 179. In the chart, the $8.1M outside plant (OSP) deployment estimate (core and drops) includes the feeder and distribution plant required to pass every premise and provide drop connections to those premises that take service.

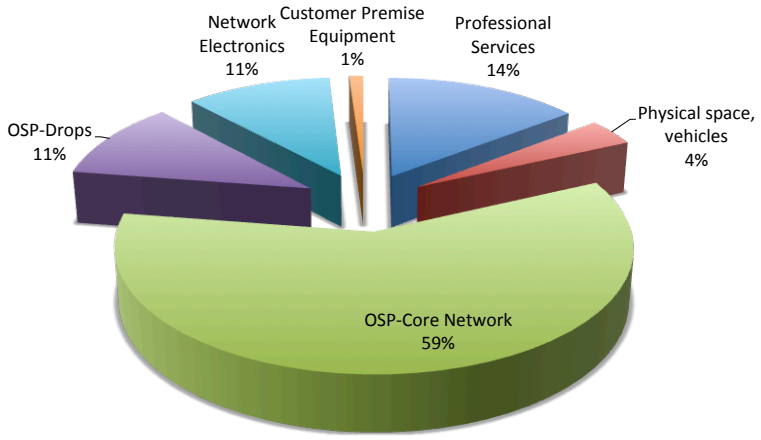


Figure 179– Cumulative capital expenditures from 2018 to 2022.

12.3.6 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 180. In the chart, Admin, ops, o-e, and mktng refer to administration, operations, opto-electronics, and marketing respectively. The numbers assume that the Town provides both equipment and storage space at no charge.

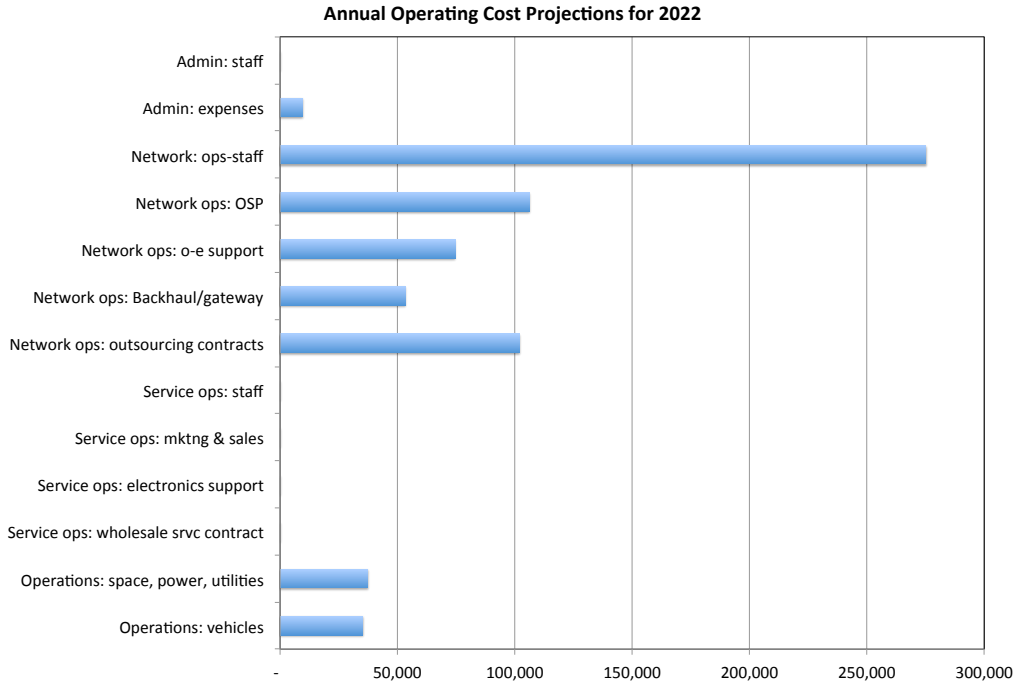


Figure 180 – Projected operational cost projections for the utility fibre network in 2022.

12.3.7 Financial Projections

Cashflow results for this scenario are summarized in Table 70. Though the operation goes cashflow positive two years after the network deployment completes, with debt servicing considered, the overall financials do not go cashflow positive until year 5. As the required capital must therefore be sufficient to cover the capital as well as a 4-year deficit, some $11.8M in capital will be required to fund the operation. By year 15, approximately 333k is being returned to the communities annually.

Table 70 – Utility Model Results Summary for REDI

	Results
Years to positive cashflow	
Operating	3
With debt servicing (p&i)	4
Financing	
Start-up capital required	11,784,506
Net Cashflow - before debt servicing	
Profit - annual at 10 yr	524,905
Profit - annual at 15 yr	763,473
Net Cashflow - after debt servicing	
Profit - annual at 10 yr	138,429
Profit - annual at 15 yr	332,922

In graphical form, the non-discounted cashflow chart for the proposed utility appears in Figure 181. 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.

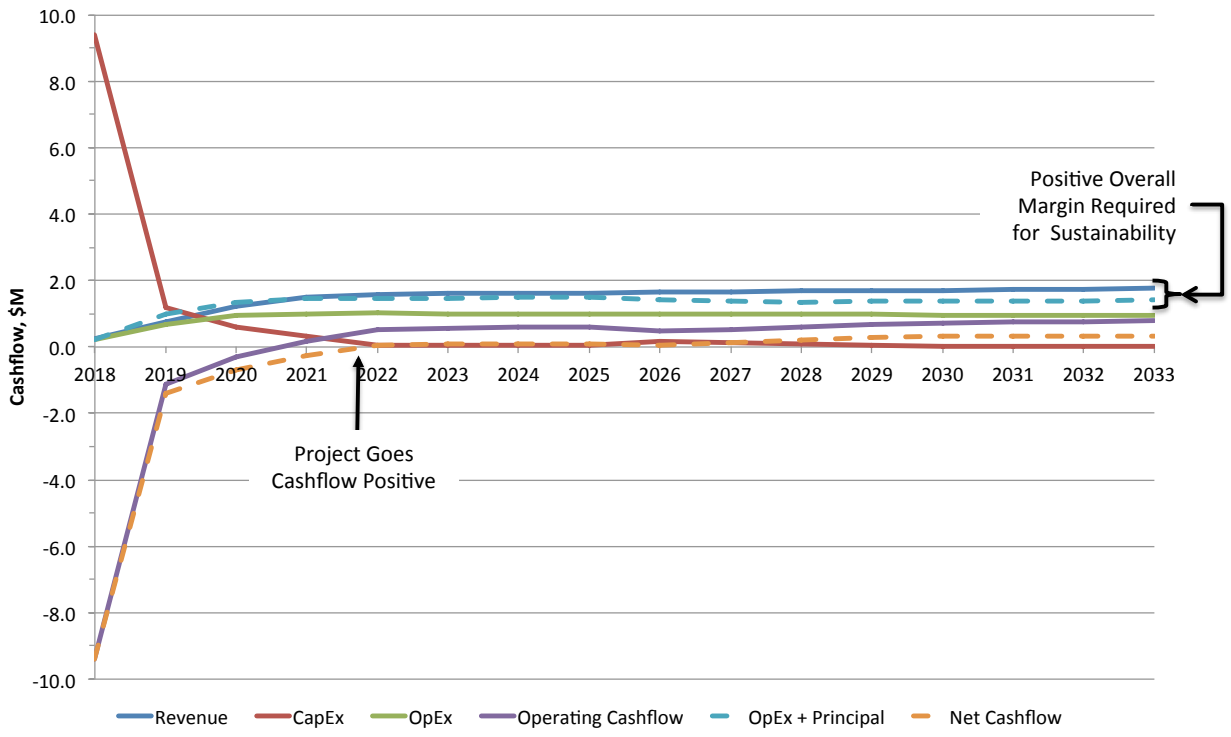


Figure 181 – Non-discounted cashflow projections for High Prairie.

The operating margin is positive in year 4 and, with debt service payments, the operation goes cashflow positive in year 5. While technically these numbers work, operationally, the risk rather high due to the small margins together with the possibility of unexpected issues. Even with all the communities involved, the aggregate client base available in the area is small. As operational efficiency is a scale game, these initial results are typical for communities with populations less than around five thousand people.

Options to improve margins sufficiently that the communities might elect to pursue a deployment are outlined in Sub-section 6.5.10.