



Broadband Master Plan

July 2020

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Executive Summary

In addition to lowering costs and delivering significant improvements in network speeds, additional objectives for the network include positively impacting economic development, livability, public safety, education, healthcare, emergency communications, smart grid, efficient government services, universal access, environmental stewardship and smart city initiatives.

The McCall, Idaho I.T. Department has worked with EntryPoint Networks to develop this Broadband Master Plan to assist with a planning and decision-making process for deploying and operating broadband infrastructure for its municipal fiber deployment within the City of McCall. The information in this report will be used to assist in the planning and implementation of a network that seeks to lower broadband costs and increase network value for residents, commercial entities, and anchor institutions. Additionally, this report is designed to assist City leaders in understanding the operational implications, important risk factors, and a realistic cost framework for developing and operating city owned fiber optic infrastructure.

The Broadband Master Plan is a living document that will evolve as the City completes the backbone and pilot phase of the network and as it progresses from planning to implementation to operational activities.

In addition to lowering costs and delivering significant improvements in network speeds, additional objectives for the network include positively impacting economic development, livability, public safety, education, healthcare, emergency communications, smart grid capabilities, efficient government services, universal access, environmental stewardship and smart city applications.

City leaders will be able to use this document to lay the groundwork to solve near-term and long-term challenges. This report seeks to provide the data needed for City leaders to thoughtfully plan and implement a strategy that will benefit residents, businesses, and anchor institutions for years to come. The key focus of the report is on the following primary activities:

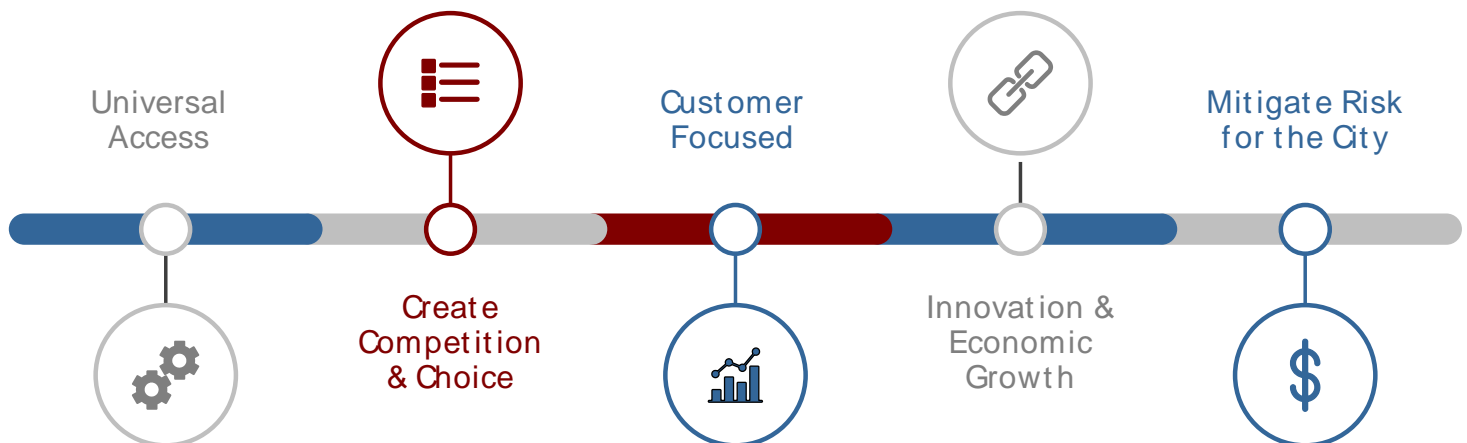
- 1) Network Design & Architecture
- 2) Construction
- 3) Network Operations
- 4) Customer Acquisition
- 5) Risk Management

Strategy

Deploying a large-scale fiber optic network is a significant public works and information technology project.

Key Strategic Ideas guiding this Plan include the following:

1. **Universal Access** – The economy is now an information economy and the importance of digital infrastructure continues to grow in significance. The City of McCall has an interest in ensuring that the City has robust digital infrastructure and adopts policies and projects that make 1 Gig network access available and affordable throughout city limits.
2. **Foster Competition & Choice** – The City seeks to understand initiatives that will increase the number of service providers and types of services that are available to McCall residents.
3. **Focus on Customers** – City leaders seek to understand the needs and interests of network stakeholders and then align policies, initiatives, and projects with those interests.
4. **Foster Innovation & Economic Development** – City leaders are interested in leveraging the network to foster entrepreneurship and business development throughout McCall.
5. **Mitigate Risk for the City, Constituents, and Partners** – City leaders are particularly interested in implementing a business model which mitigates financial and operational risks to the City and its partners while at the same time helping the City achieve its other objectives.



Infrastructure

Comparison of Available Media

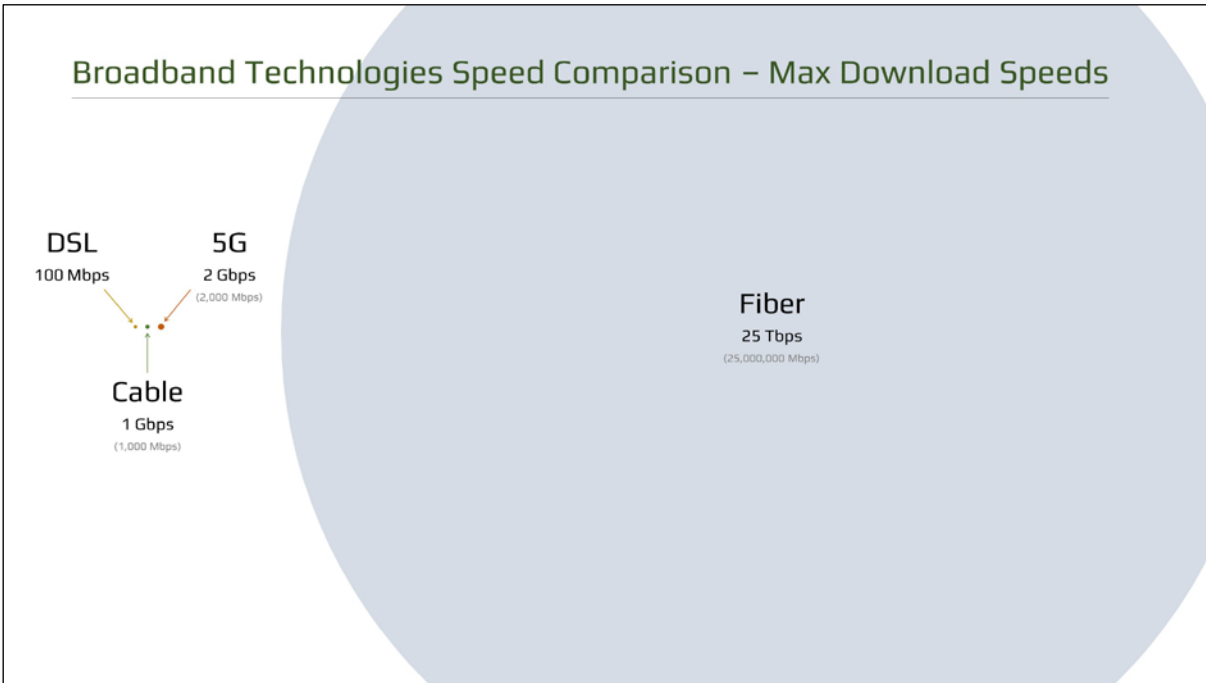
The primary media used for internet access today in the United States includes DSL, Cable, Wireless and Fiber Optic cable.

DSL stands for Digital Subscriber Line and it is one of the technologies used to provide Internet connectivity to homes and businesses. DSL uses existing telephone lines and a transceiver to bring a connection into a home or business and allows the household to use the Internet and make telephone calls at the same time. Frontier / Ziply is the incumbent telephone company in McCall and uses DSL technology. DSL is asymmetrical (the download speed is much faster than the upload speed) and is capable of download speeds up to 100 Mbps. However, most consumers accessing the internet via DSL access speeds between 5 – 25 Mbps.

Coaxial Cable uses copper cable designed with one physical channel that carries the signal surrounded by a layer of insulation and then another physical channel, both running along the same axis – hence the coaxial name. Coaxial cable is primarily used by cable TV companies to connect transmission facilities to customer homes and businesses to deliver cable T.V. and internet access. Charter/Spectrum is the incumbent cable company in the McCall area. Coaxial Cable is asymmetrical and is capable of download speeds up to 940 Mbps.

Fiber Optic Cable sends information down strands of glass known as optical fibers which are about the size of a human hair. These fiber optic strands are capable of transmitting 25 Tbps today and researchers have successfully demonstrated a transmission experiment over 1045 km with a data-rate of 159 Tbps (<https://phys.org/news/2018-04-fiber-transmission.html>). Fiber-optic cables carry information between two places using optical (light-based) technologies which convert electrical information from the computer into a series of light pulses. Fiber Optic Cable is capable of symmetrical speeds up to 25 Tbps.

Because the difference in capacity between fiber optics and alternative media is so significant, fiber optics should be the foundational media for any new broadband infrastructure project when financially feasible.



Wireless Internet access is made possible via radio waves communicated to a person's home computer, laptop, smartphone, or similar mobile device. Wireless Internet can be accessed directly through providers like AT&T Wireless, Verizon Wireless, T-Mobile or by a wireless Internet Service provider (WISP).

5G is the 5th generation of technology used in cellular networks and refers to a standard for speed and connection. Because of the extensive marketing around the emergence of 5G, many people wonder whether 5G will replace fiber optic cables. In fact, 5G depends on fiber optic infrastructure. All wireless technologies work best the faster they get back to fiber optics. The graphic above is not to scale (fiber has much greater capacity than the illustration represents) but this illustrates the magnitude of the difference between the different media types. The emergence of 5G is very early but there is a potential revenue opportunity for 5G carriers to operate on City infrastructure and contribute to the ongoing cost of network operations. Cellular networks can be symmetrical or asymmetrical and are sometimes capable of download speeds up to 2,000 Mbps

Wi-Fi is common in homes and commercial buildings and is a way to deliver a network connection from a network hub over a wired connection to wireless devices via a wireless access point. Most people access the internet over a wireless connection, but it is important to remember that wireless connectivity ultimately depends on a wired connection and wireless access works best the faster it gets back to a wire.

Impact of Bandwidth on Applications

Length & Type of Media	Approx Size	10 Mbps	20 Mbps	100 Mbps	1,000 Mbps
4-Minute Song	4 MB	3 sec	1.5 sec	0.3 sec	0.03 sec
5-Minute Song	30 MB	26 sec	13 sec	2.5 sec	0.2 sec
9-Hour Audio Book	110 MB	1.5 min	46 sec	9.2 sec	0.9 sec
45-Minute TV Show	200 MB	3 min	1.5 min	16 sec	1.7 sec
45-Minute HDTV Show	600 MB	8.5 min	4 min	50 sec	5 sec
2-Hour Movie	1.0-1.5 GB	21.5 min	10.5 min	1.5 min	8 sec
2-Hour HD Movie	3.0-4.5 GB	60 min	32 min	4.5 min	25 sec
Large Archive File	10 GB	Too Long	Slow	Better	80 sec

Upload vs Download Speeds

In addition to the fact that fiber optics offer exponentially greater bandwidth than DSL and cable, fiber optic cable also offers the ability to deliver symmetrical speeds. In an asymmetrical connection, the download speeds are much faster than upload speeds.

Upload speed is the amount of data a person can **send** in one second and download speed is the amount of data a person can **receive** in one second. Upload speeds can be especially important for businesses, including home-based businesses or people who work from home. Applications that depend on good upload speeds include sending large files, cloud applications like Google Docs and Dropbox, VoIP, FaceTime, Skype, hard drive backups and In-house web hosting.

Assessment of Existing Broadband Infrastructure

A 2017 Deloitte Consulting analysis summarizes the current needs and realities for legacy broadband infrastructure in the United States this way:

“The United States requires between \$130 and \$150 billion over the next 5–7 years to adequately support broadband competition, rural coverage and wireless densification.

Despite the demand and potential economic benefits of fiber deployment, the United States lacks the fiber density in access networks to make the bandwidth

Deloitte.

“The United States requires between \$130 and \$150 billion over the next 5–7 years to adequately support broadband competition, rural coverage and

“The primary finding of the Deloitte report is that legacy infrastructure needs to be replaced with Fiber Optic cable in the near-term to meet bandwidth demands.”

advancements necessary to improve the pace of innovation and economic growth.

Some wireline carriers are reluctant or unable to invest in fiber for the consumer segment despite the potential benefits. Expected wireline capital expenditures range between 14–18 percent of revenue. Wireline operating expenditures can be 80 percent of revenue. Fiber deployment in access networks is only justified today if a short payback period can be guaranteed, a new footprint is being built, repairs from rebuilding after a storm or other event justifies replacement, or in subsidized geographies where Universal Service funds can be used. The largest US wireline carriers spend, on average, five to six times more on operating expenses than capital expenditures. Excessive operating expenditures caused, in part, by legacy network technology restrict carriers’ ability to leverage digital technology advancements. Worse, as legacy networks continue to descale, the percentage of fixed costs overwhelms the cost structure leading to even greater margin pressure.”

Citation: <https://www2.deloitte.com/content/dam/Deloitte/us/Documents/technology-media-telecommunications/us-tmt-5GReady-the-need-for-deep-fiber-pov.pdf>

The Deloitte report is not specific to infrastructure in McCall, Idaho, but the conclusions from the Deloitte report are generally applicable. Telco and Cable operators in U.S. cities often have fiber to an aggregation point and then legacy infrastructure from the aggregation point to the premise.

The primary finding of the Deloitte report is that legacy infrastructure needs to be replaced with Fiber Optic cable in the near-term to meet bandwidth demands. There is no indication that incumbents intend to replace legacy infrastructure with Fiber Optic infrastructure in the near term and even if they did, this upgrade would solve the base infrastructure problem but it would not solve for the lack of competition or premium pricing for Gig speeds.

Legacy copper and coaxial infrastructure will need to be replaced with state-of-the-art infrastructure in order to meet the ever-growing demands for greater bandwidth and faster speeds. An important question is whether unique value can be derived by having the City and its residents own and control this infrastructure or whether private companies should continue to own and operate all communications infrastructure.

Ideal infrastructure includes more than just the fiber optic cables running throughout the City. Important infrastructure considerations include the electronics at both ends of the fiber as well as systems that manage and control the network. As the City deploys its infrastructure, the following are important considerations guiding its decision-making framework:

- **Capacity & Speed:** The demand for bandwidth and speed will continue to grow.
- **Emerging Services and Applications:** 5G, connected vehicles, edge computing, and virtual reality are all examples of emerging applications that have infrastructure dependencies. An important consideration is how flexible the business model and technology systems are to enable whatever may come.
- **Local Control:** An advantage of a network that is locally controlled is that the network can be much more responsive to local needs and may enable innovation and adaptation for emerging opportunities.
- **Local Resilience:** Many communities are not locally resilient against attacks on internet infrastructure. It is possible to design networks in a way that provides residents and businesses with a network that is locally resilient if, for some reason, middle mile connections are severed.
- **Privacy & Security:** Subscribers are becoming increasingly sensitive to security, privacy, and confidentiality controls.
- **Risk Analysis:** Consideration of the risks for all potential network stakeholders is an essential part of the planning process.

Market Analysis

In McCall, most residents and businesses subscribe to wireline internet services from the cable operator (Cable One/SparkLight) and telephone incumbent (formerly Frontier, now Ziply). Additionally, residents in McCall have a wireless connectivity option available through Wilderness Wireless.

SparkLight

SparkLight advertises the following residential ISP services in northern Idaho:

Speed (Mbps) [Down / Up]	Introductory Pricing [contract required]	Standard Pricing [not including taxes & fees]	Data Caps
100 / 10	\$39.00	\$55.00	300 GB
200 / 20	---	\$65.00	600 GB
300 / 30	---	\$80.00	900 BG
940 / 50	---	\$125.00	1,200 GB

Shared Network – Speeds are “Up To” not guaranteed.

Speeds are not Symmetrical

Additional Data - \$10.00 per 100 GB used

Availability depends upon location – not available in all areas.



Broadband Master Plan

ZiPLY Fiber

ZiPLY recently bought out the Frontier Communications infrastructure in McCall and advertises the following package in McCall:



Speed (Mbps) [Down / Up]	Introductory Pricing [contract required]	Standard Pricing [not including taxes & fees]
25 / 2	\$41.00	\$59.00

Shared Network – Speeds are “Up To” not guaranteed.

Speeds are not Symmetrical

Soft Data Caps apply to all service plans

Availability depends upon location – not available in all areas.

Wilderness Wireless

Wilderness Wireless offer the following residential services in McCall:



Speed (Mbps) [Down / Up]	Standard Pricing [not including taxes & fees]	Install Fee [not including taxes & fees]
8 / 2	\$59.00	\$129.00
10 / 3	\$69.00	\$129.00
12 / 4	\$79.00	\$129.00

Shared Network – Speeds are “Up To” not guaranteed.

Speeds are not Symmetrical

Soft Data Caps apply to all service plans

Availability depends upon location – not available in all areas.

Marketing & Community Engagement Plan

Introduction

RAPID is the City of McCall's answer to the community's need for better internet connectivity. A faster and more economical method to get quality internet access to a home or business. RAPID is an open access network that will use McCall's existing underground fiber to allow multiple internet providers to offer citizens in McCall city limits residential and commercial high-speed internet through a single web portal.

The RAPID product/service will be made available to the community in stages as infrastructure construction is completed on a year by year basis until the network is available throughout the city. Each phase will require a carefully planned and executed marketing effort to gauge strengths, discover opportunities, maximize the reach, realize potential, and communicate plans to maintain excellent service throughout the life of the utility.

This plan is intended to serve as an initial general outline and guide to McCall City Council, Information Systems staff and those on the planning project team for addressing the important elements of the plan in reference to sales, advertising and marketing. The Outreach plan includes:

- Project market objectives
- Phased Planning
- Brand identity
- Key messages strategies and tactics
- Community Engagement programs
- Roles and responsibilities, reporting and evaluation

This plan is not intended to supersede any existing or future communications plans developed or implemented by Information Systems staff. The plan will be executed in concert with Infosys, the project team, and public relations staff.

Project Market Objectives

The overarching objectives of the RAPID Market plan are as follows:

- Garner recognition, visibility, and community-wide support for the product/service
- Educate the public how the product works and can improve connectivity
- Position RAPID as a critical utility with citizens
- Highlight successful cost savings with successful Local Improvement District (LID) participation.
- Outline features and benefits

- Obtain feedback from test group, stakeholders, and customers

Phased Outreach Objectives

- Phase 1A – Test Area
- Phase 1B – First LID
- Phase 2 – Ongoing Phases Service Plan

Target Audiences

This plan is designed to reach a wide variety of stakeholders. Below are the general target audiences. Specific organizations and individuals are detailed in the appendix to this plan. *(Note: We consider the media to be a vehicle, rather than an audience.)*

- Citizens of McCall/Government and public officials
- Technology industry policymakers, business leaders and regional economic development officials/professionals
- Potential service residential and business customers

Phased Targeting

- Phase 1A (Test Area)
 - Homes within the test area as identified. (See Project Phase Section Below)
- Phase 1B (First LID)
 - Home and businesses within area as identified currently holding adequate underground fiber lines.
- Phase 2
 - All home and businesses within all areas in the City of McCall with appropriate underground infrastructure.

Brand Identity

RAPID requires strong name and logo recognition in the community for developing a brand identity that raises awareness, generates enthusiasm and creates visibility. Specifically, we recommend a logo font and tagline to be utilized on all communication materials relating to the plan, including but not limited to:

- Websites, digital media, and advertisements
- Transportation, vests, hats
- Onsite Work signage
- Contractors serving RAPID
- Correspondence, Press releases and Presentations

- Public notices
- Fliers and door hangers
- Community partner's web posts and newsletters, plans and drafts
- Recommended logo and taglines will be designed to promote continuity of message and establish a unified identity. Through a creative play on words, the proposed tagline theme will position the plan as a forward-thinking initiative with an emphasis on building the future and guiding the Library's vision for tomorrow. The brand identity is used as a unifying theme to foster support and elevate the value and importance of the RAPID product/service
- The current/proposed logo:



- The current/ proposed tagline: Connecting the City of McCall

Key Messages

Effective outreach requires a commitment to communicating an agreed-upon platform of key messages. The following three key messages are intended to serve as a guide for communicating with target audiences about RAPID:

What

RAPID is a faster and cheaper way to get quality internet access to your home or business.

Why

RAPID allows multiple internet providers to offer you high speed internet services to both residential and commercial customers through a single webpage allowing better connectivity at reduced costs.

How

RAPID uses McCall's existing underground fiber network.

Key Messages and Proof Points

The three key messages are repeated below with proof points to support them. This is not intended to be a word-for-word script; persuasive communications require that spokesperson(s) convey the key messages in their own words. To ensure consistency in the messages, we recommend that RAPID spokesperson(s) refer to and utilize the guide prior to communications with elected officials, opinion leaders, media, and other interested stakeholders.

- The City of McCall has identified Internet as an essential service.
- Fiber optic connections are much faster, less expensive to operate and future proof
- We currently have inadequate connectivity limiting capacities in McCall and the region.
- There are three parts to the RAPID fee structure.
 - City Utility Fee- A monthly fee, only charged if you have ongoing internet service and can be canceled any time.
 - Internet Service- A monthly fee, only charged if you have ongoing internet service and can be canceled any time.
 - House Connection- A onetime fee with option to finance over 20 years or if your property is already connected to fiber there is no house connection fee.
- The cost of the RAPID installation can be paid overtime or in one lump sum.
- Subscribers will be able to choose from several Internet Service Providers
- The costs of internet access will depend on the Internet Service Provider the customer selects.
- The costs for everyone will go down as more residents participate because the total cost of the infrastructure will be shared by a bigger percentage of the population.
- RAPID will give its citizens more control over things like online education, remote work, telemedicine, online entertainment options and aid area businesses with future development.
- The installation of fiber to the property will increase the value of a property.

The RAPID project will be maintained by the Information Systems Manager and staff. Updates will be publicized through all media channels, including digital, and a dedicated fiber network website.

Strategies and Tactics

To develop widespread participation and community buy-in for the RAPID project and service, we propose the following overarching communications strategies to occur at three key milestones of the project:

- **Phase 1A – The TEST PHASE**, a residential area is identified. Participants receive service at no cost during the Pilot Phase period as well as delayed or discounted installation fees in return for required opinion and feedback as a part of the process. The feedback is then used to further improve product/service and to educate the community on the unique features of this system.

- **Phase 1B – The FIRST LID PHASE**, a residential area is identified as a first launch area for service.
- **Phase 2 – The RAPID SERVICE/INSTALLATION PHASE** continues across all areas of the system as the infrastructure is built. Construction may move from highest demand areas to lower demand areas. **Strategy:** *Support the RAPID project by generating interest in targeted phase area.*

Specific Tactics May Include the Following –

Evaluation & Education

Document the current state of broadband in McCall and determine the level of interest among residential users and business owners through surveys, neighborhood outreach, and door to door sales activities.

Community Survey

A City specific website (rapidmccall.com) has been deployed and includes a survey for residential and business owners and will be used to determine priorities for consumers and issues that are of interest to potential network customers. Responses will be used to develop an education and promotion program to increase understanding of the value proposition offered by the City.

Publish Educational Information

A website has been created and will be used to outline the core message of broadband as a utility and will educate potential subscribers on the value proposition offered by the City. Customized videos will be used to educate online visitors on the following:

- a. Functionality of the community fiber network
- b. Options for services
- c. Frequently Asked Questions (FAQ's)
- d. Inquiry Form where community members can submit questions to the City

Mapping Community Interest

The website will include an “I am interested” sign-up form with associated heat map where residential and business property owners can register as someone interested in City fiber.

Marketing & Promotion

Press Releases will be used to promote the City fiber program, drive traffic to the fiber website with the goal of educating community members and generate interest and encourage community participation in the survey. The City will also use all available social media platforms (Facebook, Twitter, etc.) to promote the fiber network.

Neighborhood Entrance and Yard Signs

As fiber construction begins in a neighborhood, McCall will post signs at neighborhood entrances announcing the construction to let residents know they can still sign-up to get connected while crews are in the neighborhood.

As homes are connected in the neighborhood, yard signs will be placed in the yards of subscribers, with their permission, indicating that the home is a new customer and will enjoy a fiber broadband connection.

The City will partner with an internet Banner Ad company to deliver targeted Banner Ads to the neighborhoods that are next in line for sign-up and construction.

Open House Events

McCall will hold a series of Open House events where residents and business owners can hear an educational presentation about the fiber project, become educated about the benefits of fiber and automated open access, and get questions answered.

Open Houses will be promoted using the City website, social media platforms, banner ads, flyers, and door hangers.

Open House events are intended to educate residents, promote the network, and identify Fiber Champions in the various neighborhoods (fiber zones). Fiber Champions are individuals that are committed to promoting the network within their neighborhood. Fiber Champions are also incentivized to have their neighborhood prioritized for construction as construction will often move from highest to lowest demand.

Work with Staff to Generate Interest from Local News Outlets

- Organize and hold public meetings to officially launch RAPID.
- Develop a media advisory and press release to publicize the public meetings and public launch of RAPID.
- Pitch media and schedule interviews with Project Leader to discuss RAPID.

Utilize Neighborhood, Community, and Referral Programs to Market RAPID.

- Leverage existing partnerships and foster new relationships to promote and educate the community on RAPID.
- Create programs that reward current users for referrals and new subscribers
- Work with HOA's to develop large scale interest in focused areas.
- Use current utility customer databases to generate interest in RAPID.
- Utilize door hanger construction notifiers (We are working on RAPID next door)
- Reach out to community partners to mention the public meeting through websites and their social media platforms such as blogs, Facebook, and Twitter.
- Prepare short articles on RAPID for inclusion in community partners' newsletters, websites, etc.
- Create and distribute flyers to post on community bulletin boards and hand out at city events.
- Distribute e-blasts to community partners at key milestones in the process.

Influence Public Using Social Media to Promote RAPID and Build Interest.

Create an individual RAPID social media page to pair with the website. Consistent coordinated updates with varying levels of frequency. Create a foundation for social media communications in the future with customers.

- Develop a system and staff for coordinating RAPID content.
- Build the number of Facebook followers using other city social pages.
- Utilize multimedia (videos, etc.) to maximize publicity.
- Distribute press releases, op-eds, and meeting announcements through social media channels.
- Regularly monitor the channel to address comments and questions and ensure all posts are consistent with the overall message of RAPID.

Fiber Champions

Fiber Champions assist sign-up efforts within their designated neighborhood (fiber zone). They organize and lead Cottage Meetings where neighbors come together to discuss the McCall fiber program. McCall leaders and employees provide support to the Fiber Champions in their efforts. Fiber Champions drive conversations and contractual commitments of neighbors via the Door-to-Door Sign-up and Education campaign. Format of meetings will depend on pandemic protocols in place at the time.

Door-to-Door Sign-up Effort

City representatives (could be an independent group representing the RAPID project or city staff or a combination) contact residents and business operators within the planned network footprint to answer questions about the network and ascertain the potential subscribers' intentions regarding their participation in the network. [Yes (Opt-in) or No (Opt-out)].

This direct person-to-person contact gives everyone in the community an opportunity to ask questions, clarify their understanding and express their level of interest in participating. The method of contact will depend on the pandemic protocols in place at the time. To maximize the effectiveness of this process, prior to canvassing a neighborhood, door hangers are distributed to every home and business informing property owners that a representative will be stopping by or contacting them to explain the opportunity, answer questions and get their Opt-in / Opt-out decision.

Roles and Responsibilities

The City of McCall Information Systems Department in conjunction with the Communications Department will control RAPID in all external and internal communications related to development phases.

Evaluation

At multiple times throughout all phases of the project, staff will collect feedback and evaluations regarding the installation services and internet connections. Identification of the most relevant metrics may be developed in advance and may include the following:

- Feedback with the goal to analyze quality in service and installation.
- SWOT with each phase.
- Technical measurements as identified by InfoSys

Broadband Master Plan

Target Media

Below is a list of targeted media, grouped by local outlets and industry/trade publications. We anticipate that most of the interest during the strategic planning process will come from local media, primarily print outlets. The final master plan will present the McCall Public Library with an opportunity to promote its vision regionally and through targeted trade media.

Local Outlets:

- McCall Star-News
- McCall Magazine
- Visit McCall
- Local Blogs & Podcasts
- Radio - KDZY
- Radio - STARR
- KTVB, KBOI, KIVI
- Idaho Business Review
- Idaho Statesman

Goals & Objectives

The objective of the *McCall Community Engagement Plan* is to achieve a minimum of a 60% take-rate for homes and businesses within the City. Additionally, a scale of 1,800 subscribers is an important target for the project to be operationally sustainable over the long run. In the financial section later in the report, the financial models are built to a target of a 60% take-rate. The modeling can easily be adjusted to match actual take-rates.

Business Model – Automated Open Access

Automated Open Access is a model where the network operator places electronics at both ends of the network and subscribers can dynamically select service providers in real-time. Software Defined Networking is used to automate various network management tasks.

In this model, multiple service providers can deliver services simultaneously and independently across a single wire. When a subscriber selects a new service provider, the provisioning is done using automation and therefore happens on-demand. The automated provisioning creates a marketplace for services which includes ISP's and private networks for other services. The ability to switch service providers on demand increases choice and competition. This network

model also includes the ability to provide local network resilience via local communications if connections over the middle mile are down.

Network Design

The Automated Open Access model uses a Switched Ethernet Network architecture rather than a Passive Optical Network (PON) architecture.

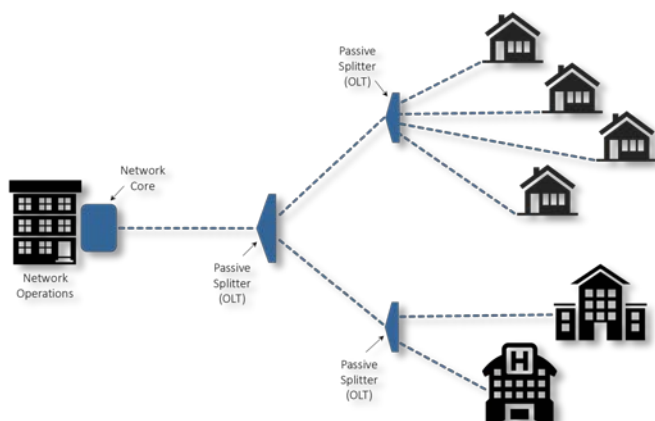
Switched Ethernet Network

The Switched Ethernet architecture provides a dedicated connection for each customer rather than a shared connection and the customer experience is significantly better than in a shared architecture. This is due to the fact that the throughput of switch-based architecture is superior to a bus-based architecture during times of network congestion.

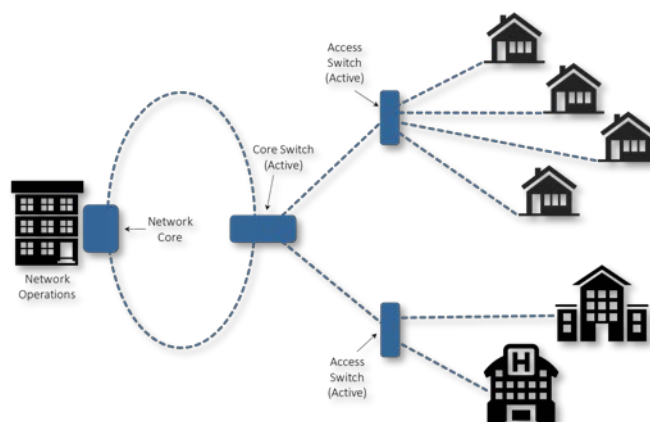
Passive Optical Network (PON)

Passive Optical Networks (PON) and Coaxial (Cable) networks follow a Bus architecture. A Bus architecture is a shared architecture. A splitter is placed in the field and a connection is often shared between 32 or 64 premises. The Bus Architecture leads to more packet collisions on the network which can result in high amounts of packet loss during congestion. Additionally, it is more difficult to isolate and troubleshoot faults in the network with a bus topology.

Passive Optical Network (PON) Design



Switched Ethernet Network Design



Proponents of PON Architecture will argue that PON is less expensive than an ethernet design. That was true historically. The illustration below shows that the variable costs of a switched ethernet deployment is now equal to PON. This change in pricing differences was driven by the fact that all Data Center deployments use Switched Ethernet architectures and the enormous growth of Data Centers over the past 20 years has driven down the cost of Ethernet electronics.

PON - Network Access Equipment

Description	Unit Cost	Qty	Extended Cost
Install Package	\$696.50	1	\$696.50
OLT	\$4,196.50	2	\$8,393.00
10GE SFP+	\$837.90	2	\$1,675.80
2x 1GE BIDI CSFP	\$157.50	24	\$3,780.00
Access Line-up			\$14,545.30
Number of Subscribers Served			96
Average Cost per subscriber			\$151.51

PON - Premise Equipment

Description	Unit Cost	Qty	Extended Cost
Indoor ONT	\$225.15	1	\$225.15
Power supply for 700GE ONT	\$12.00	1	\$12.00
Premise Line-up			\$237.15
Number of Subscribers Served			1
Average Cost per subscriber			\$237.15

Per Premise PON Equipment Costs

Total cost per Subscriber	\$388.66
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Ethernet - Network Access Equipment

Description	Unit Cost	Qty	Extended Cost
Switch	\$1,700.00	2	\$3,400.00
SFP	\$12.00	96	\$1,152.00
Access Line-up			\$4,552.00
Number of Subscribers Served			96
Average Cost per subscriber			\$47.42

Ethernet - Premise Equipment

Description	Unit Cost	Qty	Extended Cost
White Box VBG	\$330.00	1	\$330.00
1000Base 1310nm-Tx/1550nm RX 10km	\$9.00	1	\$9.00
Premise Line-up			\$339.00
Number of Subscribers Served			1
Average Cost per subscriber			\$339.00

Per Premise Ethernet Equipment Costs

Total cost per Subscriber	\$386.42
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Project Partners

Middle Mile

“Middle-mile” is an industry term that describes the network infrastructure that connects local networks to service providers at an Internet Exchange Point. The “last mile” is the local part of a communication network which connects a service provider to a customer. Current Middle Mile options include SparkLight (10 Gig), Syringa Networks (10 Gig) and Ziplly (1 Gig), the company that acquired the Frontier assets.

Approximately 2,500 customers can be served by a 10 Gbps circuit. Peak usage is an important data point for monitoring and is used to inform capacity planning. As the customer base in McCall grows, capacity will need to be adjusted. The cost of the middle mile connection should be allocated on a per subscriber basis

Internet Service Providers (ISP) Partners

An Internet Service Provider gives subscribers access to the internet. Because the City of McCall network will be organized as an Open Access Network, it will have multiple ISP's offering services to subscribers.

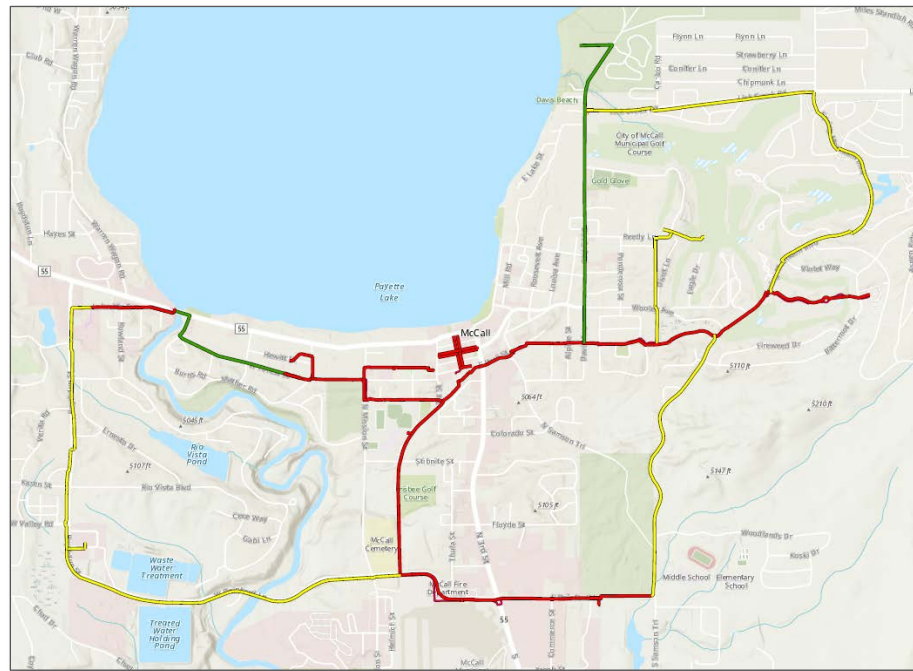
The Internet Service Providers (ISP) listed below have expressed a verbal interest in being service providers to McCall subscribers. The participation of these ISP's will be formalized through an MOU process.

Internet Service Providers –

- Wilderness Wireless – <https://ww2.wildwisp.com/index.html>
- Fybercom – <https://www.fybercom.net/>
- QwikNet – <http://qwk.net/>
- Sumo Fiber – <https://sumofiber.com/>

Cost Analysis & Phasing

Backbone Build-Out | 2019 - 2022



Backbone Phase 1 (2019) - Red (Currently Installed)

Backbone Phase 2 (2020) – Yellow

Contractor: Idaho Site Prep

Spring Mountain Blvd Route

Construction Labor: \$340,435.00

Materials: \$46,000

Distance: 18,000 linear feet

Broadband Master Plan

Deinhard Route (Bid – 2020 Additional Route)

Construction Labor: \$214,063.00

Materials: \$30,000.00

Distance: 11,000 linear feet

Backbone Phase 3 (2021/2022) Green

Projected Construction Labor: \$420,000.00

Materials: \$60,000.00 (est.)

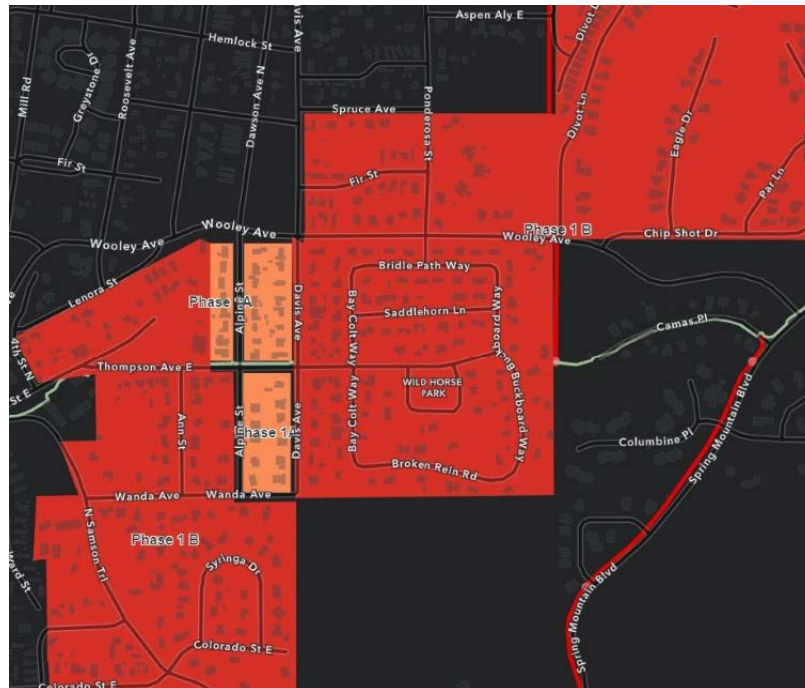
Residential Pilot (2020) – 25 Homes

A residential pilot is planned for 2020 that will include between 20 – 30 homes on Alpine Street and Davis Avenue. The residential pilot will allow the McCall leadership to test financial models and customer acquisition strategies and will also provide a demonstration of the system the city is deploying. This location is proposed as the pilot project area because it consists of primarily full-time residents and local workforce, the Phase 1 fiber backbone already exists in this area, and the density of the lots will keep installation costs lower than neighborhoods with large, dispersed lots.



Local Improvement District #1 (2021) – 300 Homes

Pending a successful residential pilot project in 2020, the Broadband Committee will seek approval for the first Broadband Local Improvement District in 2021 which will include approximately 300 homes.



High Level Network Design

A high-level network design was done for the residential pilot neighborhood to build a cost model for that project. The Biarri Networks Fiber Optic Network Design Tool was used to create the design and calculate materials costs for these designs. The main cost categories for deploying and operating broadband networks are separated to optimize the costs in each of the following categories:

- Infrastructure Capital Costs (Financed over 20-25 years)
- Network Maintenance & Operations
- Services

Infrastructure Capital Costs

The cost modeling that follows assumes the City has established its fiber optic backbone.

Monthly Infrastructure Cost

The first illustration of Infrastructure Capital Costs per premise assumes a 60% take-rate and a project that is 100% underground. The data in the line items in this model come from a combination of the Biarri Network Design tool, actual bids for materials, and network buildout experience.

Broadband Master Plan

Take-rate is a variable that is critical to project success because the operational sustainability of a project depends on crossing a certain take-rate threshold and take-rate has a meaningful impact on the cost per premise.

Monthly Infrastructure Cost Modeled From 25 Premises

The second illustration of Infrastructure Capital Costs per premise assumes a 60% take-rate and a project that is 100% underground. We can adjust these variables on a neighborhood by neighborhood basis as needed.

Costs at 60% Take Rate			
100% Buried			
Description	Common	Drop	Total
Labor - Hours	20.83	5.00	25.83
Labor - Dollars	\$1,250.00	\$300.00	\$1,550.00
Equipment	\$370.72	\$57.25	\$427.97
Materials	\$483.62	\$158.71	\$642.33
Supplies	\$93.27	\$5.63	\$98.90
Restoration	\$48.10	\$1.76	\$49.86
Hut/Cabinet	\$108.07	\$5.90	\$113.97
Feeder Fiber	\$36.02	\$0.99	\$37.01
Engineering	\$31.10	\$1.03	\$38.13
Professional Services	\$148.42	\$15.16	\$163.58
Electronics	\$166.67	\$350.00	\$516.67
Subscriber Acquisition	\$0.00	\$0.00	\$0.00
Total	\$2,741.97	\$896.43	\$3,638.40
Monthly Infrastructure Fee		\$21.19	

Why Take-Rate is Important

The following table illustrates the impact of take-rate on total cost per premise with a rate of 60% as neutral on impact.

Take-Rate	Cost/Sub	Subscribers	Difference	vs. 60% Take-Rate
5.00%	\$33,800.03	202	-	(\$30,161.63)
10.00%	\$17,348.23	403	\$16,451.80	(\$13,709.83)
15.00%	\$11,864.30	605	\$5,483.93	(\$8,225.90)
20.00%	\$9,122.33	807	\$2,741.97	(\$5,483.93)
25.00%	\$7,477.15	1,009	\$1,645.18	(\$3,838.75)
30.00%	\$6,380.36	1,210	\$1,096.79	(\$2,741.97)
35.00%	\$5,596.94	1,412	\$783.42	(\$1,958.55)
40.00%	\$5,009.38	1,614	\$587.56	(\$1,370.98)
45.00%	\$4,552.39	1,815	\$456.99	(\$913.99)
50.00%	\$4,186.79	2,017	\$365.60	(\$548.39)
55.00%	\$3,887.67	2,219	\$299.12	(\$249.27)
60.00%	\$3,638.40	2,420	\$249.27	\$0.00
65.00%	\$3,427.48	2,622	\$210.92	\$210.92
70.00%	\$3,246.69	2,824	\$180.79	\$391.71
75.00%	\$3,090.00	3,026	\$156.68	\$548.39
80.00%	\$2,952.91	3,227	\$137.10	\$685.49
85.00%	\$2,831.94	3,429	\$120.97	\$806.46
90.00%	\$2,724.41	3,631	\$107.53	\$913.99
95.00%	\$2,628.20	3,832	\$96.21	\$1,010.20
100.00%	\$2,541.61	4,034	\$86.59	\$1,096.79

Broadband Master Plan

Full City-Wide Deployment Infrastructure Network Operations

The following Table summarizes the anticipated cost structure for Network Maintenance & Operations. This schedule produces a monthly M&O fee for the Broadband Utility at \$22.66 per month. The City would need to subsidize network operations until enough scale is established to achieve sustainability.

Residential M&O	Subscriber	Monthly	Annual	Percentage
Costs/Accruals/Reserves	\$22.66	\$584,592	\$7,015,103	100.00%
Power	\$1.41	\$36,288	\$435,452	6.21%
Co-Lo Fees	\$0.35	\$9,072	\$108,863	1.55%
Labor	\$8.00	\$206,400	\$2,476,800	35.31%
Office	\$0.58	\$15,016	\$180,187	2.57%
Vehicles	\$0.73	\$18,770	\$225,234	3.21%
Tools	\$0.21	\$5,443	\$65,318	0.93%
Equipment	\$1.18	\$30,344	\$364,128	5.19%
Supplies	\$0.12	\$3,128	\$37,539	0.54%
Dig-line	\$0.19	\$5,005	\$60,062	0.86%
Maintenance	\$1.18	\$30,344	\$364,128	5.19%
Call Center	\$0.36	\$9,385	\$112,617	1.61%
Network Operations Center (Monitoring)	\$0.36	\$9,385	\$112,617	1.61%
Equipment Refresh costs (Reserves)	\$2.00	\$51,600	\$619,200	8.83%
Licenses Fees (SaaS, Etc.)	\$2.00	\$51,600	\$619,200	8.83%
Rentals	\$0.50	\$12,900	\$154,800	2.21%
Business Insurance	\$0.00	\$0.00	\$0.00	0.00%
Bad Debt	\$0.46	\$11,887	\$142,648	2.03%
Equipment Replacement	\$0.02	\$626	\$7,508	0.11%
Taxes and Fees (Property)	\$0.00	\$0	\$0	0.00%
Middle Mile	\$2.00	\$51,600	\$619,200	8.83%
Reserves	\$1.00	\$25,800	\$309,600	4.41%
Total	\$22.66	\$584,592	\$7,015,103	100.00%

Network Management & Operations Cost Structure

The numbers and categories in this model are derived from many years of experience with actual costs for Broadband projects. Labor costs are modeled to reflect Idaho wages.

Staffing Modeling for Internal Network Operations

The following Table models the cost structure for the positions needed for the City of McCall to operate the network with City employees. The model provides sufficient resources for network management and operations. The model does not include resources for construction. The cost structure improves with economies of scale (subscriber growth). The City will need to subsidize this department through the first 6-7 years of operations and that investment will be paid back by operational surpluses as subscribers grow beyond 1,800. The work that will be done by the Network Operations Department includes network



Broadband Master Plan

July 2020

monitoring, network management, outside plant repairs, & new customer installations. Losses in Years 1-6 is being mitigated by leveraging existing City resources.

Position	Fully Compensated Hourly Rate	Fully Compensated Monthly Cost	Fully Compensated Annual Cost
Manager	\$48	\$8,251	\$99,008
Network Admin	\$39	\$6,795	\$81,536
I.T. Technician	\$28	\$4,853	\$58,240
Outside Manager	\$28	\$4,853	\$58,240
Outside Plant Tech	\$22	\$3,883	\$46,592

Subscriptions & Staffing Projections

Subscribers	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
New Subscribers	20	300	300	300	300	300	300	300	300	0
# of Subscriber at year end	20	320	620	920	1,220	1,520	1,820	2,120	2,420	2,420
Labor Allocation	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00	\$8.00
Cash Flow from Labor	\$960	\$16,320	\$45,120	\$73,920	\$102,720	\$131,520	\$160,320	\$189,120	\$217,920	\$232,320

Staffing Projections	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Manager	0	0	0	0	0	0	0	0	0.5	0.5
Network Admin	0	0	0	0.5	1	1	1	1	0.75	1
IT Technician	0	0	0.5	0	0	0.5	0.5	1	1	1
Outside Plant Manager	0	0	0	0	0	0	0	0	0	0
Outside Plant Laborer	0	0.25	0.5	0.5	0.5	0.5	1	1	1	1

Position	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Manager	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$49,504	\$49,504
Network Admin	\$0	\$0	\$0	\$40,768	\$81,536	\$81,536	\$81,536	\$81,536	\$61,152	\$81,536
IT Technician	\$0	\$0	\$29,120	\$0	\$0	\$29,120	\$29,120	\$58,240	\$58,240	\$58,240
Outside Plant Manager	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Outside Plant Laborer	\$0	\$11,648	\$23,296	\$23,296	\$23,296	\$23,296	\$46,592	\$46,592	\$46,592	\$46,592
Total	\$0	\$11,648	\$52,416	\$64,064	\$104,832	\$133,952	\$157,248	\$186,368	\$215,488	\$235,872
Net	\$960	\$4,672	-\$7,296	\$9,856	-\$2,112	-\$2,432	\$3,072	\$2,752	\$2,432	-\$3,552

Project Pro-Forma

Financial Pro-Forma of Full Project Costs – 10 Year Build – Ethernet Architecture

Projected Phase 2	\$630,498.00
Projected Phase 3	\$420,000.00
Projected Cost Per Premise (Common and Drop)*	\$3,638.40
Estimated Subscribers	2,420
Total Cost (Common & Drop) (Includes Professional Services	\$7,537,943.70
	Included
Total Projected Project Costs	\$7,537,943.70

** Assumes 100% underground, 60% take rate & short-term interest rate of 8% and long-term bond rate of 4% for 25 years.*

Projected Subscription Costs

Projected Residential Services Monthly Costs	<u>100% Underground</u>
Infrastructure	\$21.19
Maintenance and Operations	\$22.66
ISP Service (<i>Dedicated 1 GB Symmetrical</i>)	<u>\$9.99</u>
Monthly Total	\$53.84
Projected Business Services Monthly Costs	<u>100% Underground</u>
Infrastructure	\$21.19
Maintenance and Operations	\$39.95
ISP Service (<i>Dedicated 1 GB Symmetrical</i>)	<u>\$49.99</u>
Monthly Total	\$111.13

The Residential \$9.99 monthly ISP fee listed above is based upon current pricing from the list of ISPs interested in providing services in McCall.

The differences between Residential and Business pricing are based on the need for many businesses to have 24x7 customer support.



Broadband Master Plan

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Projected Capital Expenditures & Funding

Timeline	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10+	Total
Capital Costs											
Phase 1	\$630,498	\$0									\$630,498
Phase 2	\$0	\$420,000									\$420,000
Subscriber Drops	\$17,929	\$268,929	\$268,929	\$268,929	\$268,929	\$268,929	\$268,929	\$268,929	\$268,929	\$0	\$2,169,361
Subscriber Common	\$54,839	\$822,590	\$822,590	\$822,590	\$822,590	\$822,590	\$822,590	\$822,590	\$822,590	\$0	\$6,635,559
Interest Reserve (Drops)	\$2,911	\$49,482	\$43,661	\$43,661	\$43,661	\$43,661	\$43,661	\$43,661	\$43,661	\$0	\$358,018
Interest Reserve (Backbone)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total	\$706,177	\$1,561,001	\$1,135,180	\$1,135,180	\$1,135,180	\$1,135,180	\$1,135,180	\$1,135,180	\$1,135,180		\$10,213,436
Short Term Financing											
New Backbone	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Retired											
Total	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
New Build	\$72,768	\$1,091,519	\$1,091,519	\$1,091,519	\$1,091,519	\$1,091,519	\$1,091,519	\$1,091,519	\$1,091,519	\$0	\$8,804,920
Total	\$72,768	\$1,164,287	\$1,091,519	\$1,091,519	\$1,091,519	\$1,091,519	\$1,091,519	\$1,091,519	\$1,091,519	\$0	
Long Term Funding											
New Backbone			\$0	\$0							\$0
New Build			\$1,216,680	\$1,135,180	\$1,135,180	\$1,135,180	\$1,135,180	\$1,135,180	\$1,135,180	\$1,091,519	\$8,804,920
Total Backbone			\$0	\$0	\$0	\$0					
Total Build			\$1,216,680	\$2,351,860	\$3,487,039	\$4,622,219	\$5,757,399	\$6,892,579	\$8,027,758	\$9,119,277	



Broadband Master Plan

July 2020

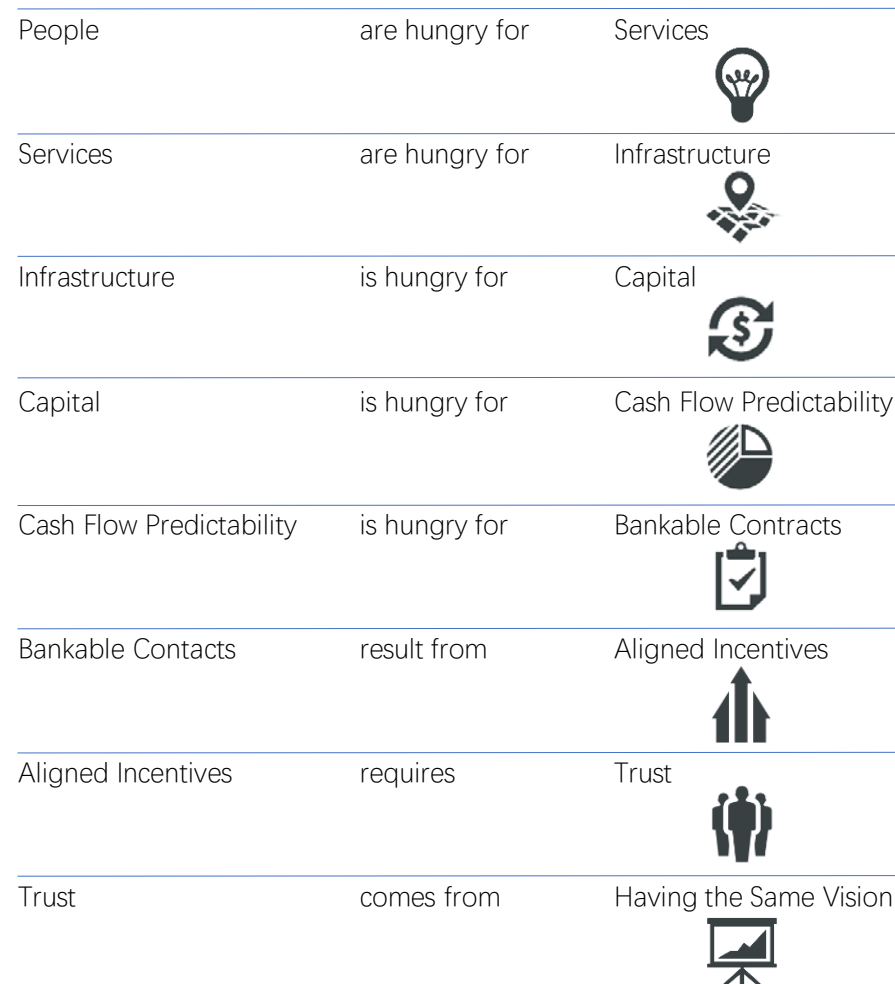
Projected Income & Cash Flow

Timeline	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10 +
Subscribers										
New Subscribers	20	300	300	300	300	300	300	300	300	-
# of Subscriber at year end	20	320	620	920	1,220	1,520	1,820	2,120	2,420	2,420
Income Statement (Revenue)										
Infrastructure Fees	\$2,543.40	\$43,237.75	\$119,539.66	\$195,841.57	\$272,143.48	\$348,445.39	\$424,747.30	\$501,049.21	\$577,351.13	\$615,502.08
Maintenance and Operations	\$2,719.03	\$46,223.54	\$127,794.50	\$209,365.46	\$290,936.42	\$372,507.38	\$454,078.34	\$535,649.30	\$617,220.26	\$658,005.74
Total Revenue	\$5,262.43	\$89,461.29	\$247,334.16	\$405,207.04	\$563,079.91	\$720,952.78	\$878,825.65	\$1,036,698.52	\$1,194,571.39	\$1,273,507.82
Operating Costs (Expenses)										
Maintenance and Operations	-\$2,359.03	-\$40,103.54	-\$110,874.50	-\$181,645.46	-\$252,416.42	-\$323,187.38	-\$393,958.34	-\$464,729.30	-\$535,500.26	-\$570,885.74
M&O Labor Difference	\$960.00	\$4,672.00	-\$7,296.00	\$9,856.00	-\$2,112.00	-\$2,432.00	\$3,072.00	\$2,752.00	\$2,432.00	-\$235,872.00
Middle Mile Difference (assuming \$2,500/mo.)	-\$14,760.00	-\$10,920.00	-\$3,720.00	\$3,480.00	\$10,680.00	\$17,880.00	\$25,080.00	\$32,280.00	\$39,480.00	\$43,080.00
Equipment										
Refresh/Replacement	\$0.00	\$0.00	\$0.00	-\$3,384.00	-\$5,544.00	-\$7,704.00	-\$9,864.00	-\$12,024.00	-\$14,184.00	-\$16,344.00
Interest Reserve	-\$2,910.72	-\$49,482.19	-\$43,660.76	-\$43,660.76	-\$43,660.76	-\$43,660.76	-\$43,660.76	-\$43,660.76	-\$43,660.76	\$0.00
Debt Service Reserve	-\$2,543.40	-\$37,009.97	-\$32,655.86	-\$32,655.86	-\$32,655.86	-\$32,655.86	-\$32,655.86	-\$32,655.86	-\$32,655.86	\$0.00
M&O Reserve	-\$360.00	-\$6,120.00	-\$16,920.00	-\$27,720.00	-\$38,520.00	-\$49,320.00	-\$60,120.00	-\$70,920.00	-\$81,720.00	-\$87,120.00
Total Expenses	-\$21,973.15	-\$138,963.71	-\$215,127.12	-\$275,730.08	-\$364,229.04	-\$441,080.00	-\$512,106.96	-\$588,957.92	-\$665,808.88	-\$867,141.74
Net (Revenue vs Expenses)	-\$16,710.72	-\$49,502.42	\$32,207.04	\$129,476.95	\$198,850.86	\$279,872.77	\$366,718.68	\$447,740.59	\$528,762.51	\$406,366.08
Loan Payment										
Backbone			\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Build Out			\$81,780.00	\$158,081.91	\$234,383.82	\$310,685.73	\$386,987.64	\$463,289.55	\$539,591.46	\$612,958.68
Total Loan Payments			\$81,780.00	\$158,081.91	\$234,383.82	\$310,685.73	\$386,987.64	\$463,289.55	\$539,591.46	\$612,958.68
Net	-\$16,710.72	-\$49,502.42	-\$49,572.96	-\$28,604.96	-\$35,532.96	-\$30,812.96	-\$20,268.96	-\$15,548.96	-\$10,828.96	-\$206,592.60
Cash Flow										
Capital Expenditures	-\$703,265.93	\$1,511,519.00	\$1,091,519.00	\$1,091,519.00	\$1,091,519.00	\$1,091,519.00	\$1,091,519.00	\$1,091,519.00	\$1,091,519.00	\$0.00
Money Borrowed	\$0.00	\$1,164,286.93	\$1,143,911.91	\$1,135,179.76	\$1,135,179.76	\$1,135,179.76	\$1,135,179.76	\$1,135,179.76	\$1,135,179.76	\$0.00
Net	-\$703,265.93	-\$347,232.07	\$52,392.91	\$43,660.76	\$43,660.76	\$43,660.76	\$43,660.76	\$43,660.76	\$43,660.76	\$0.00
Revenue	\$5,262.43	\$89,461.29	\$247,334.16	\$405,207.04	\$563,079.91	\$720,952.78	\$878,825.65	\$1,036,698.52	\$1,194,571.39	\$1,273,507.82
Cash Expenses	-\$1,399.03	-\$35,431.54	-\$118,170.50	-\$171,789.46	-\$254,528.42	-\$325,619.38	-\$390,886.34	-\$461,977.30	-\$533,068.26	-\$806,757.74
Loan Payments			-\$81,780.00	-\$158,081.91	-\$234,383.82	-\$310,685.73	-\$386,987.64	-\$463,289.55	-\$539,591.46	-\$612,958.68
Net Cash	\$3,863.40	\$54,029.75	\$47,383.66	\$75,335.66	\$74,167.66	\$84,647.66	\$100,951.66	\$111,431.66	\$121,911.66	-\$146,208.60
Accrued Interest	-\$2,910.72	-\$49,482.19	-\$43,660.76	-\$43,660.76	-\$43,660.76	-\$43,660.76	-\$43,660.76	-\$43,660.76	-\$43,660.76	\$0.00
Unrestricted Cash	-\$705,216.65	-\$385,814.49	\$6,539.96	\$14,959.80	\$2,991.80	\$2,671.80	\$8,175.80	\$7,855.80	\$7,535.80	-\$233,328.60
Reserve										
Interest Reserve	\$2,910.72	\$49,482.19	\$43,660.76	\$43,660.76	\$43,660.76	\$43,660.76	\$43,660.76	\$43,660.76	\$43,660.76	\$0.00
Debt Service	\$2,543.40	\$37,009.97	\$32,655.86	\$32,655.86	\$32,655.86	\$32,655.86	\$32,655.86	\$32,655.86	\$32,655.86	\$0.00
Maintenance and Operations	\$360.00	\$6,120.00	\$16,920.00	\$27,720.00	\$38,520.00	\$49,320.00	\$60,120.00	\$70,920.00	\$81,720.00	\$87,120.00
Total Reserve	\$5,814.11	\$92,612.17	\$93,236.62	\$104,036.62	\$114,836.62	\$125,636.62	\$136,436.62	\$147,236.62	\$158,036.62	\$87,120.00
Total Cash	-\$699,402.54	-\$293,202.32	\$99,776.58	\$118,996.42	\$117,828.42	\$128,308.42	\$144,612.42	\$155,092.42	\$165,572.42	-\$146,208.60

Financing Considerations

Because project feasibility is ultimately a function of getting people to sign up and remain loyal to the network, there needs to be a value proposition that mobilizes customers to subscribe. For that to happen, subscribers need a compelling solution and the network needs to create cash flow predictability and bankable contracts to attract financing for the project. NetEquity in San Francisco visualizes these dependencies in this way:

NetEquity Stack



*Isfandiyar (Asfi) Shaheen developed the **NetEquity Stack** above. Mr. Shaheen is a Global Broadband Infrastructure Thought Leader based in San Francisco. He is working to provide fiber optic connectivity to unconnected countries around the world.*

Legal Considerations

The McCall City Attorney should prepare a separate analysis describing the City's legal authority to build, own, and operate broadband infrastructure and include legal and risk-related considerations for organizing a broadband utility.

Risk Analysis

9

Risk Factors >
Likelihood
Impact
Mitigation

The following is an analysis of the main risk factors facing the City of McCall as it pursues its fiber-to-the-premise deployment. Nine Risk Factors are analyzed:

1. Subscriber Churn Risk
2. Take-Rate Risk
3. Project Execution Risk
4. Equipment and Technology Risk
5. Community Engagement Risk
6. Cost Modeling Risk
7. Timeline Risk
8. Regulatory Risk
9. Middle Mile Risk

Subscriber Churn

Subscriber Churn is the risk that customers sign up and then do not remain subscribers to the network.

Likelihood: Today customers are primarily driven by cost, speed, and customer service. Churn is possible and is a consequence of the customers pursuing an option to get better value from an alternative solution. The likelihood of churn is high if a new market solution simply replicates the incumbent model. The likelihood of churn goes down under a Business Model where 1) the customer is financially responsible for the drop to their property and 2) where the value proposition is strong enough to make the customer voluntarily committed to the network.

Impact: The impact of churn on the network is potentially catastrophic if it reaches a level where the capital and operational cost of the abandoned infrastructure cannot reasonably be shared by remaining subscribers.

Mitigation: Churn can be mitigated by implementing a business model that makes customers voluntarily committed to the network and by assigning financial responsibility to customers for their lateral connection.

Take-Rate Risk

Take-rate risk is the risk that the City builds out the network and ends up with a take-rate that is lower than expected.

Likelihood: Take-rate risk is possible and is a function of the value proposition of the network and how well that value proposition gets communicated and managed before construction starts. High take-rates lead to lower network costs for subscribers. This creates a virtuous cycle where lower costs lead to higher take rates. The reverse is also true.

Impact: The worst-case scenario is one where lower take rates lead to higher costs and churn which create a death spiral that negatively compounds until the network is not sustainable.

Mitigation: Manage demand aggregation before construction begins and give consumers a value proposition that makes them voluntarily committed to the network infrastructure.

Project Execution

Project Execution includes strategy, planning, project management and fulfillment of the project plan and operational execution.

Likelihood: Project execution failure is possible and is a function of the effectiveness of project planning, management, controls, and execution.

Impact: The severity of impact is in proportion to the effectiveness of project management and execution. A worst-case scenario is one where project execution affects the value proposition, which in turn affects take-rate and churn.

Mitigation: Hire or partner with skilled project managers and key strategic partners. Create alignment among key team members on the project plan and operational plan. Develop project controls that are monitored and reported to senior leadership monthly.

Equipment & Technology Risk

Equipment & Technology Risk includes both software and hardware solutions and is the risk that equipment failure rates are higher than expected, major

software bugs are unresolved, operational reliability is lower than expected, and/or that the technology lifecycle leads to faster obsolescence than is expected. For a network, the size of McCall, an additional risk is scalability risk. Middle Mile risk covered in the Middle Mile pricing section.

Likelihood: Solutions with short deployment histories, unreliable references, unclear quality control and test procedures, weak professional teams, and poorly architected scalability abstractions present increased equipment and technology risk.

Impact: The impact of this risk category is moderate because it is possible to vet both software and hardware systems to assess this risk. The base technology of the network will be fiber optic cable and that has sufficient history to present a minor risk to the project. Remaining risks include electronics and software systems.

Mitigation: Implement thorough due diligence processes with trained professionals to scrutinize references, architecture, software abstractions, quality control systems and the professional histories of vendors being considered.

Community Engagement

Community Engagement is the marketing, education and communication processes and strategies used to inform residents and businesses about the value proposition offered by the network.

Likelihood: Community Engagement risk is possible but nonetheless a risk that can be managed and monitored. Poor planning, management and execution increases the level of risk. Community engagement can be handled by internal City staff, but risk increases if staff member resources are inadequate for a project of this size. There is an abundant supply of marketing professionals available to assist with community engagement processes.

Impact: Community engagement is a key driver of project success due to the relationship between community engagement and take-rate.

Mitigation: Leverage the skills of competent marketing professionals and provide sufficient resources to make it easy for every resident to learn the basic value proposition for the network in comparison to alternatives through a variety of marketing, education and communication strategies.

Cost Modeling Risk

Cost Modeling Risk is the risk that cost modeling significantly underestimates actual design, construction, and/or operational costs.

Likelihood: There is enough industry data to reasonably validate cost estimates.

Impact: Cost overruns can have a moderate to disastrous impact on network sustainability.

Mitigation: Validate financial assumptions against industry assumptions, market conditions, and account for local economic variables.

Timeline Risk

The current plan is to connect 300 homes per year over a 10-year period. This can be a successful strategy. It is a measured approach and is similar to the strategy the Ammon, Idaho has followed for its buildout. Before finalizing this strategy there are several considerations that should be evaluated:

- 1) Each LID phase requires legal, financing and accounting transaction costs. Building the network with fewer LID's will lower the overall transaction costs for the project.
- 2) Maintenance & Operations does not break even until there are roughly 1,800 subscribers. Building at a faster pace will result in an accelerated period to break-even.
- 3) Interest Rates are at an unprecedented low currently and building over a 10- year period may expose later project years to some interest rate risk.

In the approach followed by Ammon, none of the fiber network loans were organized as City debt. The loans were directly between the subscribers via the LID and the lending institution.

Likelihood: Costs are certain to be higher for an extended buildout period. However, there are execution risks for accelerating the buildout and these trade-offs need to be weighed by City leaders.

Impact: Costs will be incrementally higher for an extended build-out schedule and M&O will have a longer ramp to sustainability.

Mitigation: The City can control the buildout schedule following a cost / benefit analysis of the options. An important consideration is alignment with construction partners. If the city is going to outsource construction, it should consult with potential construction partners about the alternative construction

schedules to make sure that the city's strategy is amenable to key construction partners.

Regulatory Risk

Regulatory Risk is the risk that State or Federal regulations become an impediment or barrier to the city successfully building or operating a municipal network. Idaho state law is unclear on whether cities have the right to build and operate a municipal network. Because the law is unclear, cities have pursued Judicial Confirmations to establish the right to build and operate fiber optic infrastructure. Two of the cities that have followed this path are Ammon and Mountain Home.

Likelihood: There is a reasonable amount of risk that an incumbent operator could make a claim to stop McCall from building a competing network.

Impact: If a claim were to be brought against McCall, the likely process is that it would take an extensive amount of time and cost to contest or appeal the claim.

Mitigation: The McCall City Attorney can oversee an effort to follow the same process followed by Ammon and Mountain Home to seek and receive Judicial Confirmation that the City has the authority to build this infrastructure.

Middle Mile Risks

Middle Mile risks include the following:

- 1) Lack of redundant options on divergent paths,
- 2) Pricing risk, and
- 3) The risk of being stranded or isolated without a viable path to an internet exchange point.

Likelihood: The closest internet exchange point is in Boise. McCall does have a divergent middle mile path to Boise via the three Middle Mile options, but bandwidth capacity is a potential issue going forward.

The most likely risk is that incumbent middle mile carriers will not provide competitively priced, high bandwidth middle mile options.

The risk of getting isolated or cut off from internet access is possible but has a low likelihood of occurring.

Impact: Each of the Middle Mile Risks could have a significant impact on network success. The most likely risk is pricing risk followed by insufficient Middle Mile

capacity. The obvious impact of pricing risk is that the per premise cost will increase.

Mitigation: The way the City can mitigate and possibly eliminate Middle Mile Risk is by working with the County to build and operate its own Middle Mile connection back to Boise. This may seem daunting to the City and the County, but it is worth doing a separate analysis and comparison of projected costs to proposals from existing incumbents. A significant benefit of the City & County working together to enable a permanent path to Boise is that the infrastructure could be paid off over 30 years and would provide abundant bandwidth to County residents and businesses.