# Broadband Master Plan

Prepared for the Quincy City Council

December 2020

– Prepared By –

ENTRY POINT NETWORKS

www.entpnt.com

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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 Quincy Broadband Committee (BC) has worked with EntryPoint Networks to develop this Broadband Master Plan to assist with a planning and decision-making process as the Quincy Mayor and City Council determine whether it is feasible to deploy and operate broadband infrastructure for the residents, businesses, and anchor institutions in the City of Quincy. The information in this report will be used to assist in the planning and evaluation of feasibility for implementation of a network that can lower broadband costs and increase network value for all stakeholders in Quincy. 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 first be used to analyze feasibility. If the Mayor and City Council determine that the project has sufficient merit, the planning process will continue toward a formal process for selecting Engineering, Construction, and Network Management Tools. The specific steps to this process are covered at the end of this document in the Next Steps section.

The primary drivers for this analysis include an interest by the Mayor and City Council in lowering costs and improving network speed and reliability. 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.

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

1) Network Design & Architecture
2) Current Market Analysis
3) Business Model and Financing
4) Cost Analysis for Construction
5) Cost Analysis for Network Operations
6) Customer Acquisition
7) 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 were established by the Broadband Committee and include the following:

### Strategic Priorities for a Municipal Fiber Network

1. **Foster Competition & Choice** – The City seeks to promote initiatives that will increase the number of service providers and types of services that are available to Quincy residents.

2. **Improve Affordability** – The City of Quincy seeks to promote policies and initiatives that will reduce the cost of internet access by 20%-25%.

3. **Solve the Digital Divide** – The City of Quincy seeks to promote policies and initiatives that will make internet access universally available and affordable.

4. **Promote Abundant Bandwidth** – City leaders seek solutions that move from the current practice of treating bandwidth as a scarce commodity toward policies and programs which treat bandwidth as an abundant resource.

5. **Improve Network Speed & Reliability** – City leaders seek to promote network attributes that will increase reliability for residents, businesses, and anchor institutions within City limits.

6. **Foster Innovation & Economic Development:** The city seeks to ensure that city residents and businesses have access to infrastructure that will foster innovation, economic development, and growth.

7. **Establish Local Control over Essential Infrastructure** - The economy is now an information economy and the importance of digital infrastructure continues to grow. The City of Quincy has an interest in ensuring that City residents and businesses have robust digital infrastructure and promoting initiatives that will give the City greater influence over this important infrastructure. In building these systems, the city seeks to provide resilience in the event there is a natural disaster or other public safety event.

### Strategy Funding Considerations

The following are the guiding principles for the business model being proposed by the Broadband Committee:

1. Nobody will be forced to participate. Subscription will be on a voluntary, opt-in basis.

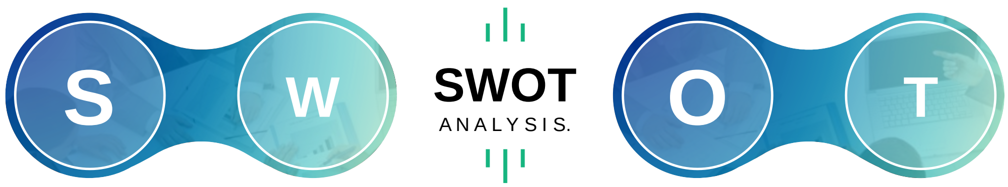
2. Taxes will not be increased to finance the network.

3. The ongoing operation of the network must be self-sustaining and not dependent on any kind of subsidy from the City.

4. The City may contribute to get the network started – but any contributions from municipal finances will be paid back over time.

## SWOT Analysis

The SWOT Analysis included here is not an analysis of current offerings within Quincy. Rather, the analysis considers the Strengths, Weaknesses, Opportunities and Threats related to advancing a municipally sponsored fiber optic network within the City of Quincy.




| | |
|---|---|
| STRENGTHS | » Early indication of support from subscribers (Demand)<br>» Frustration with current options<br>» Awareness of importance of infrastructure (Pandemic)<br>» Existing operational capabilities<br>» Leadership support |
| WEAKNESSES | » Utility pole conditions - aerial<br>» Access to poles - aerial |
| OPPORTUNITIES | » Better service<br>» Faster speeds<br>» Introduce competition<br>» Reduce costs<br>» Economic development<br>» Economic growth<br>» Low interest rate environment<br>» Improved property values |
| THREATS | » Incumbent opposition<br>» Potential for interest rates to rise<br>» Fear of the unknown<br>» Inertia<br>» Unknown Construction problems<br>» Risk Factors (Summarized at end of report) |

## Infrastructure

Comparison of Available Media

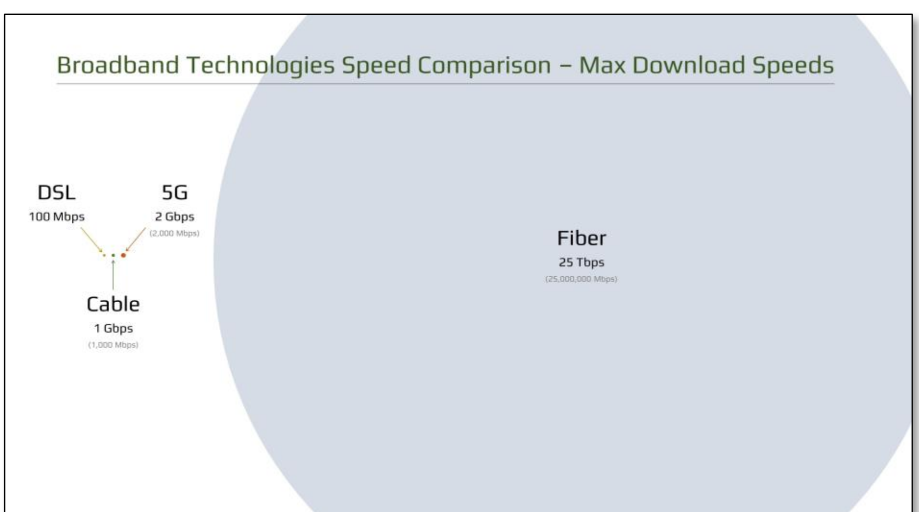
The primary media used for internet access today in the United States includes DSL, Coaxial Cable, Wireless and Fiber Optic cable.

**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. Verizon is the incumbent telephone company in Quincy and uses DSL technology. DSL is asymmetrical (the download speed is much faster than the upload speed), is typically shared between 32 or 64 homes, and is capable of download speeds up to 100 Mbps. However, most consumers accessing the internet via DSL experience 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. Comcast is the incumbent cable company in the Quincy area. Coaxial Cable is asymmetrical, is typically shared between 32 or 64 homes, and is capable of download speeds up to 940 Mbps. A limitation of coaxial cable is that the signal begins to degrade after 360 feet.

**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 can transmit 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 and the signal can travel as far as 60 kilometers without degrading.

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 better 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 coaxial 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.

Transmission Distance

As described above, an additional benefit of fiber optic infrastructure is that a communication signal sent over fiber does not start to degrade for 45 miles while a signal sent over coaxial cable starts to degrade after 340 feet.

## Assessment of Existing Broadband Infrastructure

Deloitte.

*"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."*

*"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."*

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 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 Quincy, Massachusetts, 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 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 that should guide decision making:

- **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 Quincy, most residents and businesses subscribe to wireline internet services from the cable operator (Xfinity Comcast) and telephone incumbent (Verizon).

### Xfinity Comcast

Xfinity advertises the following residential ISP services in Quincy:

| Speed (Mbps) [Down / Up] | Introductory Pricing [contract required] | Standard Pricing [not including taxes & fees] | Data Caps |
|---|---|---|---|
| 25 / 3 | $50.00 | $55.00 | 300 GB |
| 100 / 10 | --- | $78.00 | 500 GB |
| 200 / 10 | $50.00 | $93.00 | 600 GB |
| 600 / 12 | $90.00 | $103.00 | 1,000 GB |
| 940 / 50 | $90.00 | $108.00 | 1,200 GB |
| 2,000 / 50 | $300.00 | $300.00 | 1,200 GB |

**Taxes and Fees often represent an additional (20%-30%) of Standard Pricing**
Shared Network – Speeds are "Up To" and are not guaranteed.
Speeds are not Symmetrical
Additional Data - $10.00 per 100 GB used
xFi Gateway Modem - $14.00 per month
**Availability depends upon location – not available in all areas.**

## Verizon

Verizon advertises the following residential services in Quincy:

| Speed (Mbps) [Down] | Standard Pricing [not including taxes & fees] | Install Fee [not including taxes & fees] |
|---|---|---|
| 1.1 - 3 | $40.00 | Not Disclosed |

**Taxes and Fees often represent an additional (20%-30%) of Standard Pricing**
Shared Network – Speeds are "Up To" and are not guaranteed.
Speeds are not Symmetrical
Soft Data Caps apply to all service plans
**Availability depends upon location – not available in all areas.**

## Comcast Business

Comcast advertises the following business ISP services in Quincy:

| Speed (Mbps) [Down / Up] | Promo Pricing [contract required] | Contract Term | Standard Pricing [not including taxes & fees] | Contract Amount |
|---|---|---|---|---|
| 35 / 5 | $70.00 (24 mo.) | 2 Years | $70.00 | $1,680.00 |
| 100 / 15 | $70.00 (24 mo.) | 3 Years | $100.00 | $2,880.00 |
| 100 / 15 | $80.00 (24 mo.) | 2 Years | $80.00 | $1,920.00 |
| 200 / 20 | $90.00 (24 mo.) | 3 Years | $120.00 | $3,600.00 |
| 200 / 20 | $100.00 (24 mo.) | 2 Years | $100.00 | $2,400.00 |
| 300 / 30 | $140.00 (24 mo.) | 3 Years | $170.00 | $5,400.00 |
| 300 / 30 | $160.00 (24mo.) | 2 Years | $160.00 | $3,840.00 |
| 600 / 35 | $190.00 (24 mo.) | 3 Years | $220.00 | $7,200.00 |

**Taxes and Fees often represent an additional (20%-30%) of Standard Pricing**
Shared Network – Speeds are "Up To" and are not guaranteed.
Speeds are not Symmetrical
xFi Gateway Modem - $14.00 per month
**Availability depends upon location – not available in all areas.**

# Market Analysis Conclusion

Xfinity/Comcast holds the equivalent of an ISP Monopoly in Quincy. Because of this, residents and businesses in Quincy are significantly overpaying for internet connectivity.

Quincy residents and businesses are paying for a luxury automobile but getting a subcompact.

## Community Engagement Plan

*The sample Community Engagement Plan that follows is built on an assumption that Quincy will take the next step toward a City Sponsored project by aggregating demand through a Community Engagement process. It is our recommendation that Quincy consider hiring a professional Marketing / PR firm to help drive the Community Engagement efforts.*

### Goals & Objectives

The objective of a *Quincy Community Engagement Plan* is to achieve a minimum 40% take-rate for homes and businesses within Quincy City limits. Additionally, a scale of 2,500 subscribers is an important target for the project to be operationally sustainable. In the financial section later in this 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.

### Evaluation & Education

Document the current state of broadband and determine the level of interest among residential users and business owners.

#### Community Survey

A survey for residents and business owners is in place to determine the level of interest in a municipal fiber network. Education and promotion programs should be influenced by survey engagement and response.

#### Publish Educational Information

Leverage the website specific to the municipal fiber program to outline the core message of broadband as a utility that will support an environment of choice and subscriber control. Additionally, use customized videos 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 municipality

#### Mapping Community Interest

Distribute an "I am interested" sign-up form with associated heat map where residential and business property owners can register as someone interested in municipal fiber.

Evaluation & Education Budget = $3,000 - $10,000

### Marketing & Promotion

Quincy can issue Press Releases and use inserts in monthly utility bills to promote the municipal fiber program, driving traffic to the fiber website with the goal of educating community members and generating interest and encouraging community participation.

Use all available social media platforms (Facebook, Twitter, etc.) to promote the fiber network.

### Neighborhood Entrance and Yard Signs

As construction (fiber build) begins in a neighborhood, Quincy can post signs at neighborhood entrances announcing the construction and letting 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 are placed in the yards of subscribers indicating that the home now enjoys a fiber broadband connection.
Marketing & Promotion Budget = $10,000 - $15,000

## Grassroots Engagement

### Webinars & Open House Events

Quincy can use Webinars and Open House events to educate residents and business owners can hear an educational presentation about the fiber project, ask questions about the fiber project, become educated about the Quincy fiber plan, business model, etc.

Webinars and Open Houses are promoted using utility bill inserts, press releases, public service announcements, local news reports, city websites, social media platforms, etc.

Webinars and 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 be the first neighborhood to get connected (initial fiber zones are connected in order of take-rates – highest to lowest).

### Fiber Champions

Fiber Champions assist sales efforts within their designated neighborhood (fiber zone). They organize and lead Cottage Meetings where neighbors come together to discuss the Quincy fiber program. Quincy 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 Sales and Education campaign.

Grassroots Engagement Budget = $2,000 - $5,000

## Door-to-Door Campaign

Network sales agents (typically an independent group representing the network) 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.

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 to explain the value proposition, answer questions and the interest of individual property owners.

Door-to-Door Campaigns are very effective in giving people an opportunity to learn and ask questions in a personal interaction. The Covid pandemic impacts the timing of utilizing this tool.

It is important that Quincy support this effort through public notifications, press releases, mass emails, websites, social media sites, mobile applications, and other community outreach venues available to Quincy. This may include outside professional marketing and/or PR firms.

Door-to-Door Sales Effort Budget = $100 per Premise that Subscribes
[Sign-up Fee or Wrapped into the Infrastructure Installation Costs]

Total Quincy Community Engagement Plan Budget = $15,000 to $30,000 + Door to Door Sales Commissions.

Please Note – The work outlined in the various Steps of this Community Engagement Plan, in whole or part, can be managed by internal Quincy personnel or can be outsourced to a professional marketing and promotions organization.

## Quincy Broadband Survey Results

In October 2019, the City deployed a website to begin the process of educating the public regarding its evaluation of the feasibility of a City sponsored fiber optic network. The City distributed an initial survey to Quincy residents assessing current sentiment regarding existing services and the level of interest in a municipal network. The survey was not developed by professional survey administrators. To date key findings from the survey, include the following:

*And the Survey Says…*

| | | | |
|---|---|---|---|
| Total Responses | 1,920 | | |
| Support Network | | | |
| | 38 | No | 2.05% |
| | 310 | Possibly | 16.72% |
| | 1,506 | Yes | 81.23% |
| | 1,816 | Yes/Possibly | 97.95% |
| Internet Speed Importance | | | |
| | 26 | Not Important | 1.40% |
| | 348 | Somewhat Important | 18.79% |
| | 1,478 | Very Important | 79.81% |
| | 1,826 | Important/Very Important | 98.60% |
| Average Connection Speeds | | | |
| | 1,920 | Download | 168 Mbps |
| | 1,920 | Upload | 41 Mbps |
| Choice in ISP & Plans - Importance | | | |
| | 65 | Not Important | 3.52% |
| | 284 | Somewhat Important | 15.36% |
| | 1,500 | Very Important | 81.12% |
| | 1,784 | Important/Very Important | 96.48% |
| Rate Current ISP | | | |
| | 532 | Poor | 27.71% |
| | 733 | Fair | 38.18% |
| | 474 | Good | 24.69% |
| | 146 | Very Good | 7.60% |
| | 35 | Excellent | 1.82% |
| | 1,265 | Poor/Fair | 65.89% |

# Municipal Broadband Models Comparison

The Institute for Local Self Reliance has mapped municipal networks throughout the United States using an interactive map that can be found at the following link:

*https://muninetworks.org/communitymap*

To compare the various models that exist in the United States today, a mix of prominent municipal fiber optic projects were selected to illustrate the types of models that have been deployed. The following comparison summarizes different approaches to funding and operating municipal broadband infrastructure and services followed by a description of the advantages and disadvantages of each:

| Municipality | Population | Model Type | Electric Utility | Take-Rate | Cost of 1 Gig |
|---|---|---|---|---|---|
| Chattanooga, TN | 179,139 | Electrical Utility ISP | Yes | 60% | $68.00 |
| Lafayette, LA | 126,000 | Electrical Utility ISP | Yes | 40% | $99.95 |
| Westminster, MD | 19,000 | City Fiber, Private ISP | No | 20% | $89.99 |
| Huntsville, AL | 194,585 | Dark Fiber Open Access | Yes | Not Published | $70.00 |
| Sandy, OR | 10,000 | Municipal ISP | No | 60% | $59.95 |
| Longmont, CO | 86,000 | Electrical Utility ISP | Yes | 55% | $69.95 |
| Ammon, ID | 17,000 | Automated Open Access | No | 65% | $47.50 |
| Monmouth, OR | 15,083 | Municipal ISP | No | 80% | $129.65 |
| Lexington, KY | 321,959 | Private Partner Owned | No | Not Published | $59.95 |
| Santa Monica, CA | 110,000 | Dark Fiber Business Only | No | N/A | N/A |
| Fort Collins, CO | 165,000 | Electrical Utility ISP | Yes | Early Stage | $59.95 |
| UTOPIA | 150,000+ | Manual Open Access | No | 15% | $70.00 |

## Municipal Broadband Models Defined – Summary | Pros | Cons

### City Owned & Operated, Single ISP

**Summary:** The City owns and operates the network and is also the sole service provider on the network.

**Pros**: This model can be successful when incumbent operators have some combination of the following: monopoly or near monopoly status, high prices, poor infrastructure, slow speeds, a poor reputation, and widespread customer resentment.

**Cons**: A single ISP does not significantly expand choice or competition. There have been very few *City Owned & Operated, Single ISP* deployments that have been successful. The City is essentially replicating the incumbent model and competing against the incumbent head-to-head. This model leaves the City vulnerable to the incumbent dropping their price to influence the municipal take-rate and destabilize the municipal network.

Examples of this model include Sandy, OR and Monmouth, OR.

## Municipal Electrical Utility Owned & Operated, Single ISP

**Summary:** The Municipal Electrical Utility owns and operates the network and is also the sole service provider on the network.

**Pros**: The most common municipal model that has been successful using a Single ISP approach has been the Electrical Utility model. A measure of this success can be attributed to the fact that the Electrical Utility has the advantage of having an established reputation in the community. Also, electrical Utilities often have financial, customer service, and engineering expertise that may be beneficial to the network and the skill set for Outside Plant personnel for a municipal network is similar in kind to the existing range of skills in an Electrical Utility. The likelihood of success increases in instances where the incumbent operator has monopoly or near monopoly status, higher than average prices, poor infrastructure, slow speeds, a poor reputation and/or widespread customer resentment.

**Cons**: A single ISP does not significantly expand choice. Expertise in network operations will need to be enhanced or developed. This model is essentially replicating the incumbent model and involves competing against the incumbent head-to-head. This model leaves the City / Electrical Utility vulnerable to the incumbent dropping their price to impact the take-rate and destabilize the network.

Examples of this model include Chattanooga, TN and Longmont, CO. Fort Collins, CO. is in the early stages of deployment and is replicating this model.

## Dark Fiber, Open Access

**Summary**: Dark Fiber Open Access is a model where the city builds infrastructure to the curb and the subscriber then selects an ISP as its provider and the ISP finishes the connection to the home with its own infrastructure and electronics.

**Pros**: Open Access increases choice for consumers. Operating a dark fiber network is less complicated than operating a lit network. The Dark Fiber model enables Public ownership of infrastructure.

**Cons**: The Dark Fiber model gives up control over last mile infrastructure, i.e., the drop from the curb to the premise. The Dark Fiber model therefore limits the usability of each strand of fiber. With an isolated dark fiber connection, it is impossible to connect to other services that may not be available through the ISP that controls the drop to the customer premise. The Dark Fiber Model may not scale easily due to difficulty in anticipating the required fiber count to meet the demand. This can create significant complications for the network operator.

An example of this model is Huntsville, AL.

## Manual Open Access

**Summary:** Manual Open Access is a model where the network is lit end to end. This means that the network operator places and controls the electronics at both ends of the network. In this model, switching service providers can be requested from a web portal and may appear to be automated but the network provisioning is not automated.

**Pros**: A manual Open Access network increases choice for consumers.

**Cons**: Operating a Manual Open Access network is more complex than operating a Single ISP network because of the requirement for human management of network tasks. Any increase in the number of service providers operating on the network adds to network complexity.

An example of this model is the UTOPIA Network. UTOPIA is the largest manual open access network in the United States with just over 20,000 premises connected. UTOPIA struggled under heavy debt obligations for 15 years but is now operating on a sustainable trajectory. In addition to UTOPIA, there are several Manual Open Access networks throughout Europe.

### Automated Open Access

**Summary:** 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.

**Pros**: 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.

**Cons**: The model was first implemented in late 2016. Ammon, ID is the only city that has a full implementation operating today.

Examples of this model include Ammon, ID and early-stage deployments in McCall, Idaho, Mountain Home, Idaho, and Elkhart County in Indiana.

Disclosure: EntryPoint Networks owns and operates a SaaS model Automated Open Access solution and is the technology solution provider in these networks.

### Private Sector Owner & Operator, Single ISP

**Summary:** A private builder designs, builds and operates a network. The private entity is also the sole ISP on the network – replicating the incumbent model.

**Pros**: A private builder and operator assumes all the risk and does the work of overseeing design, project management, construction, customer acquisition and operations. This model increases the choices available to consumers with minimal obligation or burden for the city.

**Cons**: The new operator is replicating the incumbent model. There is no local control over infrastructure and ISP choices increase by just one new provider. There is no guarantee that the operator will address the digital divide. The network can be sold to another operator.

There are many examples of over-builders but Lexington, Kentucky is a recent example.

### Private Sector Owner & Operator, Open Access

**Summary:** A private builder designs, builds and operates a network. The private entity uses an Open Access model rather than the incumbent model for service delivery.

**Pros**: A private builder and operator assumes all the risk and does the work of overseeing design, project management, construction, customer acquisition and operations. This model provides an increase in the choices available to consumers at almost no cost to the city. Risk exposure to the city is very low. The private builder/operator builds and stabilizes the network and may give the city the option to acquire the network after an agreed upon number of years for a premium price above the actual cost to develop.

**Cons**: There is no local control over infrastructure. There is no guarantee that the operator will address digital divide issues. A private owner will be free to sell the network to a new operator that may or may not be aligned with community objectives for the network.

An example of this model is Fullerton, CA (SiFi).

### Cooperative Owned & Operated, Open Access ISP

**Summary:** A fiber-optic infrastructure cooperative owns and operates the network using an Open Access model.

**Pros**: The subscribers to the network are the owners of the infrastructure. This creates local control over infrastructure. The speed to market can be much faster than municipal ownership because the model is established up front. The model gives subscribers choice and competition among service providers which will likely lead to lower pricing in comparison to incumbent operators. Probability of success increases when incumbent operators have some combination of the following: monopoly or near monopoly status, high prices, poor infrastructure, slow speeds, a poor reputation, and widespread customer resentment.

**Cons**: It is more difficult to obtain financing because the cooperative has no assets at the beginning of the project. If financing can be obtained, the cost of money will be more expensive than a city or town sponsored project.

# Network Design

## Switched Ethernet Network

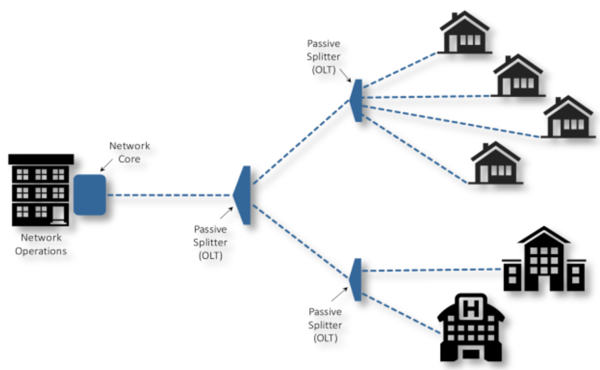
The Switched Ethernet architecture provides a dedicated connection for each customer rather than a shared connection and the customer experience is significantly better than in a shared architecture during periods of network congestion. This is due to the fact that the throughput of switch-based architecture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

## Passive Optical Network (PON)

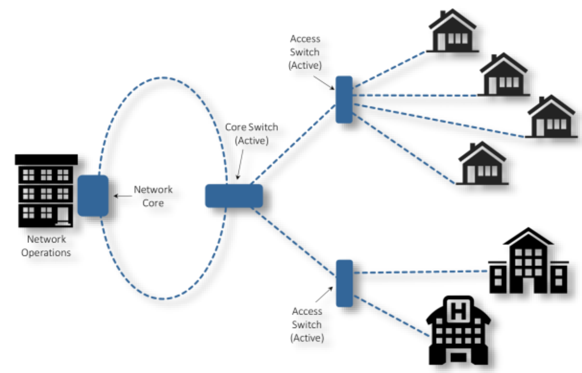
Passive Optical Networks (PON) and Coaxial (Cable) networks follow a Bus architecture.

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 |
| Splitter Shelf | $84.00 | 8 | $672.00 |
| 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 | | | $15,217.30 |
| Number of Subscribers Served | | | 96 |
| Average Cost per subscriber | | | $158.51 |

#### 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 | **$395.66** |

#### Ethernet - Network Access Equipment

| Description | Unit Cost | Qty | Extended Cost |
|---|---|---|---|
| Switch | $1,300.00 | 2 | $2,600.00 |
| SFP | $12.00 | 96 | $1,152.00 |
| Access Line-up | | | $3,752.00 |
| Number of Subscribers Served | | | 96 |
| Average Cost per subscriber | | | $39.08 |

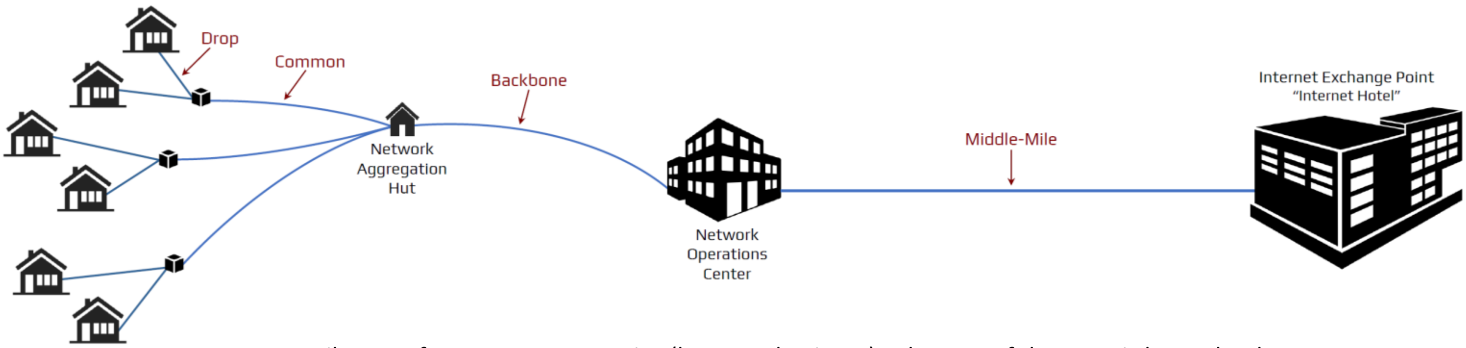
#### Ethernet - Premise Equipment

| 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 | **$378.08** |

## Network Segments – Definitions & Costs Allocations




Drop = Fiber run from street to premise (home or business). The cost of the Drop is borne by the individual subscriber.

Common = Fiber runs from street in front of premise to closest Aggregation Hut. The cost of the Common is borne by all subscribers on the network.

Backbone = Fiber runs from Aggregation Hut back to the Network Operations Center. The cost of the Backbone is borne by all network subscribers, with potential municipal contribution.

Middle-Mile = Third-Party fiber run from the Network Operations Center to the closest Internet Exchange Point. The cost of the Middle-Mile is included in the Monthly M&O Utility Fee and is borne by all network subscribers.

# Project Partners

## Middle Mile

"Middle-mile" is an industry term that describes the network infrastructure that connects local networks to an Internet Exchange Point. The "last mile" is the local part of a communication network which connects a service provider at the Network Operations Center. On behalf of the City of Quincy EntryPoint sought and received a proposal from a Middle Mile carrier from 1120 Hancock St, Quincy, MA to 1 Summer St, Boston. The proposal is competitively priced and is also scalable.

Approximately 2,500 customers can be served by a 10 Gbps circuit. If the City pursues a City owned network, it will need to adjust Middle Mile capacity according to take rate and utilization. Peak usage is an important data point for monitoring and is used to inform capacity planning. 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. The City will need to determine what model it will follow or support before it engages one or more Internet Service providers. If the City selects an Open Access Model, there are several ISP's that have expressed a verbal interest in being service providers to Quincy subscribers. The participation of these ISP's could be formalized through an MOU process.

# Cost Analysis & Phasing

## High Level Network Design

A high-level network design was done for a 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 years)*
- Network Maintenance & Operations
- Services

## Infrastructure Capital Costs

The cost modeling that follows assumes that the infrastructure that was deployed to connect City Assets in 2018 has sufficient fiber count so that it can be leveraged as a Fiber to the Premise backbone.

## Monthly Infrastructure Cost Modeled From 1,691 Premises

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

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.

The second illustration of Infrastructure Capital Costs per premise assumes a 60% take-rate and a project that is 50% aerial and 50% underground. We can adjust these variables on a neighborhood-by-neighborhood basis as needed.

The third illustration of Infrastructure Capital Costs per premise assumes a 60% take-rate and a project that is 100% underground.

| Costs at 60% Take Rate | | | |
|---|---|---|---|
| 100% Aerial | | | |
| **Description** | **Common** | **Drop** | **Total** |
| Labor - Hours | 10.42 | 2.50 | 12.92 |
| Labor - Dollars | 572.92 | 137.50 | $710.42 |
| Equipment | 185.36 | 28.63 | $213.98 |
| Materials | 241.81 | 79.36 | $321.16 |
| 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 | $37.10 | $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** | **$1,637.72** | **$625.95** | **$2,263.67** |
| Backbone Cost per Premise | | | $82.14 |
| **Total w/ Backbone** | | | **$2,345.80** |
| Short Term Interest | | | $90.55 |
| **Total Capitalized** | | | **$2,436.35** |

| Monthly Infrastructure Per Premise Cost | $14.29 |
|---|---|

| Costs at 60% Take Rate | | | |
|---|---|---|---|
| 50% Buried \| 50% Aerial | | | |
| **Description** | **Common** | **Drop** | **Total** |
| Labor - Hours | 15.63 | 3.75 | 19.38 |
| Labor - Dollars | 859.38 | 206.25 | $1,065.63 |
| Equipment | 278.04 | 42.94 | $320.98 |
| Materials | 362.71 | 119.03 | $481.75 |
| 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 | 37.10 | 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** | **$2,137.76** | **$748.69** | **$2,886.45** |
| Backbone Cost per Premise | | | $82.14 |
| **Total w/ Backbone** | | | **$2,968.58** |
| Short Term Interest | | | $118.74 |
| **Total Capitalized** | | | **$3,087.33** |

| Monthly Infrastructure Per Premise Cost | $18.10 |
|---|---|

| Costs at 60% Take Rate | | | |
|---|---|---|---|
| 100% Buried | | | |
| Description | Common | Drop | Total |
| Labor - Hours | $20.83 | $5.00 | $25.83 |
| Labor - Dollars | $1,145.83 | $275.00 | $1,420.83 |
| 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 | $37.10 | $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** | **$2,637.80** | **$871.43** | **$3,509.23** |
| Backbone Cost per Premise | | | $82.14 |
| **Total w/ Backbone** | | | **$3,591.37** |
| Short Term Interest | | | $140.37 |
| **Total Capitalized** | | | **$3,731.74** |

| Monthly Infrastructure Per Premise Cost | $21.88 |
|---|---|

## Why Take-Rate is Important

The following table illustrates the impact of take-rate on total cost per premise under a 100% buried network with a take-rate of 60% as neutral on impact.

| Take-Rate | Cost/Sub | Subscribers | Difference | vs. 60% Take-Rate |
|---|---|---|---|---|
| 5.00% | $35,695.59 | 2,029 | - | ($31,963.85) |
| 10.00% | $18,296.70 | 4,058 | $17,398.89 | ($14,564.96) |
| 15.00% | $12,497.07 | 6,087 | $5,799.63 | ($8,765.33) |
| 20.00% | $9,597.25 | 8,117 | $2,899.82 | ($5,865.52) |
| 25.00% | $7,857.36 | 10,146 | $1,739.89 | ($4,125.63) |
| 30.00% | $6,697.44 | 12,175 | $1,159.93 | ($2,965.70) |
| 35.00% | $5,868.92 | 14,204 | $828.52 | ($2,137.18) |
| 40.00% | $5,247.53 | 16,233 | $621.39 | ($1,515.79) |
| 45.00% | $4,764.23 | 18,262 | $483.30 | ($1,032.49) |
| 50.00% | $4,377.59 | 20,292 | $386.64 | ($645.85) |
| 55.00% | $4,061.24 | 22,321 | $316.34 | ($329.51) |
| 60.00% | $3,731.74 | 24,350 | $329.51 | $0.00 |
| 65.00% | $3,574.56 | 26,379 | $157.18 | $157.18 |
| 70.00% | $3,383.36 | 28,408 | $191.20 | $348.37 |
| 75.00% | $3,217.66 | 30,437 | $165.70 | $514.08 |
| 80.00% | $3,072.67 | 32,466 | $144.99 | $659.07 |
| 85.00% | $2,944.74 | 34,496 | $127.93 | $787.00 |
| 90.00% | $2,831.02 | 36,525 | $113.72 | $900.72 |
| 95.00% | $2,729.27 | 38,554 | $101.75 | $1,002.47 |
| 100.00% | $2,637.70 | 40,583 | $91.57 | $1,094.04 |

## Full City-Wide 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 $21.66 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** | **$21.66** | **$527,383** | **$6,328,591** | **100.00%** |
| Power | $1.41 | $34,248 | $410,976 | 6.49% |
| Co-Lo Fees | $0.35 | $8,562 | $102,744 | 1.62% |
| Labor | $6.00 | $146,099 | $1,753,186 | 27.70% |
| Office | $0.58 | $14,172 | $170,059 | 2.69% |
| Vehicles | $0.73 | $17,714 | $212,574 | 3.36% |
| Tools | $0.21 | $5,137 | $61,646 | 0.97% |
| Equipment | $1.18 | $28,638 | $343,661 | 5.43% |
| Supplies | $0.12 | $2,952 | $35,429 | 0.56% |
| Dig-line | $0.19 | $4,724 | $56,686 | 0.90% |
| Maintenance | $1.18 | $28,638 | $343,661 | 5.43% |
| Call Center | $0.36 | $8,857 | $106,287 | 1.68% |
| Network Operations Monitoring | $0.36 | $8,857 | $106,287 | 1.68% |
| Equipment Refresh (Reserves) | $4.00 | $97,399 | $1,168,790 | 18.47% |
| Licenses Fees (SaaS, Etc.) | $2.00 | $48,700 | $584,395 | 9.23% |
| Rentals | $0.50 | $12,175 | $146,099 | 2.31% |
| Bad Debt | $0.46 | $11,219 | $134,630 | 2.13% |
| Equipment Replacement | $0.02 | $590 | $7,086 | 0.11% |
| Taxes and Fees (Property) | $0.00 | $0 | $0 | 0.00% |
| Middle Mile | $1.00 | $24,350 | $292,198 | 4.62% |
| Reserves | $1.00 | $24,350 | $292,198 | 4.62% |
| **Total** | **$21.66** | **$527,383** | **$6,328,591** | **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 Massachusetts wages.

## Staffing Modeling for Internal Network Operations

The following Table models the cost structure for the positions needed for the City of Quincy to operate the network as a Department within the City structure. The model is conservative in the staffing estimates needed to operate the network in a sustainable manner. The model does not include resources for construction. Assuming the City builds the entire network over a 36-month period, the City will need to subsidize this department for less than 12 months. After that, the investment will be paid back by operational surpluses as subscribers grow beyond the target of 24,350 subscribers. The work that will be done by a Fiber Network Department includes network monitoring, network management, outside plant repairs, & new customer installations.

The City has the option of operating the network with internal staffing resources or an outsource network operations partner. The following staffing model provides anticipated fully burdened salary information, years to profitability, and the revenues and expenses from the operation.

## Staffing Projections

| Position | Fully Compensated Hourly Rate | Fully Compensated Monthly Cost | Fully Compensated Annual Cost |
|---|---|---|---|
| Manager | $87 | $15,080 | $180,960 |
| Network Admin | $44 | $7,627 | $91,520 |
| I.T. Technician | $33 | $5,720 | $68,640 |
| Outside Manager | $38 | $6,587 | $79,040 |
| Outside Plant Tech | $27 | $4,680 | $56,160 |
| | | $39,694 | $476,320 |

## Subscriptions & Staffing Projections

| Subscribers | Year 1 | Year 2 | Year 3 | Year 4 |
|---|---|---|---|---|
| New Subscribers | 4,870 | 9,740 | 9,740 | - |
| # of Subscriber at Year End | 4,870 | 14,610 | 24,350 | 24,350 |
| Labor Allocation | $6.00 | $6.00 | $6.00 | $6.00 |
| Cash Flow from Labor | $175,319 | $701,274 | $1,402,548 | $1,753,186 |

| Staffing Projections | Year 1 | Year 2 | Year 3 | Year 4 |
|---|---|---|---|---|
| Manager | 0.0 | 0.5 | 1.0 | 1.0 |
| Network Admin | 0.5 | 0.5 | 1.0 | 1.0 |
| IT Technician | 0.5 | 2.0 | 5.0 | 6.0 |
| Outside Plant Manager | 0.0 | 1.0 | 1.0 | 2.0 |
| Outside Plant Laborer | 2.0 | 6.0 | 12.0 | 15.0 |

| Position | Year 1 | Year 2 | Year 3 | Year 4 |
|---|---|---|---|---|
| Manager | $0 | $90,480 | $180,960 | $180,960 |
| Network Admin | $45,760 | $45,760 | $91,520 | $91,520 |
| IT Technician | $34,320 | $137,280 | $343,200 | $411,840 |
| Outside Plant Manager | $0 | $79,040 | $79,040 | $158,080 |
| Outside Plant Laborer | $112,320 | $336,960 | $673,920 | $842,400 |
| **Total** | **$192,400** | **$689,520** | **$1,368,640** | **$1,684,800** |
| | | | | |
| **Net** | **-$17,081** | **$11,754** | **$33,908** | **$68,386** |

## Project Pro-Forma

### Financial Pro-Forma of Full Project Costs - 3 Year Build - Ethernet Architecture

| | |
|---|---|
| Projected Backbone | Included |
| Projected Cost Per Premise (Common and Drop) [1] | $3,087.33 |
| Estimated Subscribers | 24,350 |
| Total Cost (Common & Drop) | $75,175,817.21 |
| Professional Services | Included |
| Total Projected Project Costs | $75,175,817.21 |

[1] *Assumes 50% Buried / 50% Arial, 60% take rate & short-term interest rate of 8% and long-term bond rate of 3.5% for 20 years.*

## Projected Monthly Cost to Subscribers

| Projected Residential Services Monthly Costs | 100% Aerial |
|---|---|
| Infrastructure | $14.29 |
| Maintenance and Operations | $21.66 |
| ISP Services (Dedicated 1 GB Symmetrical) | $9.99 |
| Monthly Total | **$45.93** |

| Projected Residential Services Monthly Costs | 50/50 Split |
|---|---|
| Infrastructure | $18.10 |
| Maintenance and Operations | $21.66 |
| ISP Services (Dedicated 1 GB Symmetrical) | $9.99 |
| Monthly Total | **$49.75** |

| Projected Residential Services Monthly Costs | 100% Buried |
|---|---|
| Infrastructure | $21.88 |
| Maintenance and Operations | $21.66 |
| ISP Services (Dedicated 1 GB Symmetrical) | $9.99 |
| Monthly Total | **$53.53** |

*Note: The Residential $9.99 monthly ISP fee listed above is based upon an assumption of an Open Access network with dynamic competition between ISPs.*

## Projected Income & Cash Flow

| Timeline | Year 1 | Year 2 | Year 3 | Year 4 + |
|---|---|---|---|---|
| **Subscribers** | | | | |
| New Subscribers | 4,870 | 9,740 | 9,740 | 0 |
| # of Subscriber at year end | 4,870 | 14,610 | 24,350 | 24,350 |
| **Income Statement (Revenue)** | | | | |
| Infrastructure Fees | $528,945.14 | $2,115,780.58 | $4,231,561.16 | $5,289,451.45 |
| Maintenance and Operations | $662,078.85 | $2,648,315.42 | $5,296,630.83 | $6,620,788.54 |
| Total Revenue | $1,191,024.00 | $4,764,095.99 | $9,528,191.99 | $11,910,239.99 |
| **Operating Costs (Expenses)** | | | | |
| Maintenance and Operations | -$515,980.05 | -$2,063,920.22 | -$4,127,840.43 | -$5,159,800.54 |
| M&O Labor Difference | -$17,081.44 | $11,754.24 | $33,908.48 | $68,385.60 |
| Equipment Refresh/Replacement | $0.00 | -$14,609.88 | -$56,978.53 | -$222,362.37 |
| Interest Reserve | -$602,275.52 | -$1,164,551.03 | -$1,124,551.03 | $0.00 |
| Debt Service Reserve | -$528,945.14 | -$1,057,890.29 | -$1,057,890.29 | $0.00 |
| M&O Reserve | -$146,098.80 | -$569,785.32 | -$1,111,811.87 | -$1,238,625.63 |
| Total Expenses | -$1,810,380.96 | -$4,859,002.50 | -$7,445,163.67 | -$6,552,402.94 |
| Net (Revenue vs Expenses) | -$619,356.96 | -$94,906.50 | $2,083,028.31 | $5,357,837.05 |
| **Loan Payment** | | | | |
| Backbone | $0.00 | $73,175.52 | $73,175.52 | $73,175.52 |
| Build Out | $0.00 | $1,028,620.08 | $3,085,860.24 | $5,143,100.41 |
| Total Loan Payments | $0.00 | $1,101,795.60 | $3,159,035.76 | $5,216,275.93 |
| Net | -$619,356.96 | -$1,196,702.11 | -$1,076,007.45 | $141,561.12 |
| **Cash Flow** | | | | |
| Capital Expenditures | -$15,056,887.93 | -$29,113,775.85 | -$28,113,775.85 | $0.00 |
| Net Money Borrowed | $15,056,887.93 | $28,676,051.37 | $29,238,326.88 | $1,124,551.03 |
| Net | $0.00 | -$437,724.48 | $1,124,551.03 | $1,124,551.03 |
| Revenue | $1,191,024.00 | $4,764,095.99 | $9,528,191.99 | $11,910,239.99 |
| Cash Expenses | -$533,061.49 | -$2,052,165.98 | -$4,093,931.95 | -$5,091,414.94 |
| Loan Payments | $0.00 | -$1,101,795.60 | -$3,159,035.76 | -$5,216,275.93 |
| Net Cash | $657,962.50 | $1,610,134.42 | $2,275,224.27 | $1,602,549.12 |
| Accrued Interest | -$602,275.52 | -$1,164,551.03 | -$1,124,551.03 | $0.00 |
| Unrestricted Cash | -$619,356.96 | -$1,619,816.71 | $105,522.12 | $1,488,474.53 |
| **Reserves** | | | | |
| Interest Reserve | $602,275.52 | $1,164,551.03 | $1,124,551.03 | $0.00 |
| Debt Service | $528,945.14 | $1,057,890.29 | $1,057,890.29 | $0.00 |
| Maintenance and Operations | $146,098.80 | $569,785.32 | $1,111,811.87 | $1,238,625.63 |
| Total Reserve | $1,277,319.46 | $2,792,226.64 | $3,294,253.19 | $1,238,625.63 |
| **Total Cash** | **$657,962.50** | **$1,172,409.93** | **$3,399,775.31** | **$2,727,100.15** |

## Projected Capital Expenditures & Funding

| Timeline | Year 1 | Year 2 | Year 3 | Year 4 + | Total |
|---|---|---|---|---|---|
| **Capital Costs** | | | | | |
| Backbone | $1,000,000.00 | $1,000,000.00 | $0.00 | $0.00 | $2,000,000.00 |
| Subscriber Drops | $3,646,090.35 | $7,292,180.70 | $7,292,180.70 | $0.00 | $18,230,451.76 |
| Subscriber Common | $10,410,797.57 | $20,821,595.15 | $20,821,595.15 | $0.00 | $52,053,987.87 |
| Interest Reserve (Drops) | $562,275.52 | $1,124,551.03 | $1,124,551.03 | $0.00 | $2,811,377.59 |
| Interest Reserve (Backbone) | $40,000.00 | $40,000.00 | $0.00 | $0.00 | $80,000.00 |
| Total | $15,659,163.44 | $30,278,326.88 | $29,238,326.88 | $0.00 | $75,175,817.21 |
| **Short Term Financing (Build Out)** | | | | | |
| New Backbone | $1,000,000.00 | $1,000,000.00 | $0.00 | $0.00 | **$2,000,000.00** |
| Retired | | -$1,000,000.00 | -$1,000,000.00 | $0.00 | **-$2,000,000.00** |
| Total | $1,000,000.00 | $0.00 | $0.00 | $0.00 | **$1,000,000.00** |
| New Build | $14,056,887.93 | $28,113,775.85 | $28,113,775.85 | | **$70,284,439.63** |
| Retired | $0.00 | -$14,056,887.93 | -$28,113,775.85 | -$28,113,775.85 | **-$70,284,439.63** |
| Total | $14,056,887.93 | $14,056,887.93 | $0.00 | -$28,113,775.85 | **$0.00** |
| **Long Term Funding** | | | | | |
| New Backbone | | $1,040,000.00 | $1,040,000.00 | $0.00 | **$2,080,000.00** |
| New Build | | $14,619,163.44 | $29,238,326.88 | $29,238,326.88 | **$73,095,817.21** |

## Financial Modeling Validation

For this report, EntryPoint retained Comm-Tract to review the financial projections provided in this report. Comm-Tract has been providing network infrastructure services to the City of Quincy and is familiar with both existing infrastructure and the City's geography.

Comm-Tract based its analysis on the following demographic information for the City of Quincy:

- 89,059 Residents
- 8th Largest City in the Commonwealth of Massachusetts
- 39,778 Households
- 22,350 Homes (Residential Premises)
- Unknown Number of Businesses
- 5,567 Residents per Sq/Mile
- 16.77 Sq/Mile
- Approximately 281 miles of roads that need to have fiber installed to cover the FTTH footprint

Comm-Tract's financial projections were within 5% of the EntryPoint projections. The two main variables that are not known at this time and can have a material impact on project costs are 1) Take-rate and 2) The Cost of Make-Ready to access the utility poles.

Make-ready work can be completed in stages. The total cost projection by Comm-Tract included $3,000,000 for Make-Ready. Comm-Tract estimates that the construction can be completed in 18 months - assuming work is not slowed by make-ready processes.

The network design process should include an analysis of whether the City's existing fiber network can be leveraged for the Fiber-To-The-Premise backbone.

## Legal Structure & Financing Considerations

The legal structure for financing is organized around the following assumptions:

1. Nobody will be forced to participate as a subscriber to the network. Rather, subscription will be on a voluntary, opt-in basis.
2. Taxes will not be increased to finance the network.
3. The ongoing operation of the network must be self-sustaining and not dependent on any kind of subsidy from the city.
4. The City may contribute to get the network started but will be paid back over time.

Voluntary Participation – The alternative to taxing all residents is to deploy a business model that allocates network costs to voluntary participants. Allowing subscribers to voluntarily opt-in to network participation honors individual preferences for residents and businesses, eliminates Political Risk and can increase public support for the network. Allowing subscribers to voluntarily opt-in or opt-out of network participation is less efficient and more expensive than a model that mandates universal participation. Further, voluntary participation may exacerbate the digital divide.

Ongoing Operations - The City views its roles as enabling the development and implementation of the network and then may choose to operate the network on behalf of Quincy residents. However, the network must become self-sustaining during the first 3-5 years of operations.

# Financing Dependencies

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

## NetEquity Stack

| | | |
|---|---|---|
| People | are hungry for | Services |
| Services | are hungry for | Infrastructure |
| Infrastructure | is hungry for | Capital |
| Capital | is hungry for | Cash Flow Predictability |
| Cash Flow Predictability | is hungry for | Bankable Contracts |
| Bankable Contacts | result from | Aligned Incentives |
| Aligned Incentives | requires | Trust |
| Trust | comes from | Having the Same Vision |

*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 Authority

The Quincy Assistant City Solicitor has prepared a legal summary describing the City's right to build, own, and operate broadband infrastructure under Massachusetts State law. The City's Bond Counsel has also confirmed the findings of the Assistant City Solicitor and has provided a separate legal memo confirming that the City has the authority to own and operate the proposed infrastructure.

[Note: Both the Assistant City Solicitor's legal summary and Bond Council's legal memo are attached at the end of this report.]

# 10

*Risk Factors >*

*Likelihood*

*Impact*

*Mitigation*

## Risk Analysis

The following is an analysis of the main risk factors facing the City of Quincy 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
10. Pole Attachment & Make-Ready 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 (Demand 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 Risk

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 Quincy, an additional risk is scalability risk.

**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 benefits of building the network in an accelerated pace include the following:

1) Each phase requires legal, financing and accounting transaction costs. Building the network with fewer phases will lower the overall transaction costs for the project.
2) 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 an extended period may expose later project years to some interest rate risk.

**Likelihood**: Costs are certain to be higher for an extended buildout period. However, there may be execution risk exposure for accelerating the buildout, depending on the experience and capacity of the construction partner. 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. The Quincy Assistant City Solicitor has prepared a separate analysis describing the City's legal authority to build, own, and operate broadband infrastructure as well as information on the legal structures that are available to cities in the State of Massachusetts to house the operation. The memo also includes some information on legal and risk-related considerations for organizing a broadband utility.

**Likelihood**: Historically, incumbent operators have taken legal action to stop a municipality from building a competing network whenever they have a legal basis for doing so. According to the Assistant City Solicitor, the City does have the authority from the State to own and operate a fiber optic network.

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

**Mitigation**: The Quincy City Solicitor has conducted a thorough review of Massachusetts law related to municipal ownership and control over telecommunications and is confident the City has the authority to proceed. Bond Council confirmed the finding of the Quincy City Solicitor that the City does have the legal 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 Boston. Because of Quincy's proximity to Boston, there are a number of divergent middle mile paths back to the Internet Exchange point.

For this report, we have solicited and received one middle mile proposal and it is competitively priced.

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 but all of them have a low likelihood of occurring because of Quincy's location.

**Mitigation**: The way the City can mitigate and possibly eliminate Middle Mile Risk is by building in redundancy to the network by having multiple backhaul providers along independent paths back to an internet exchange point.

### Pole Attachment & Make Ready Risk

This is the risk that pole owners cause unexpected and significant impact on costs or timeline due to delays in make ready and pole attachment work.

**Likelihood**: Because Quincy does not own the utility poles within city limits, this risk is a potential problem and will have to be actively managed.

**Impact**: Make Ready work for Pole Attachment can have a meaningful impact on costs and on the timeline if the pole owners drag their feet or want the city to replace old poles.

**Mitigation**: The city can mitigate this risk by leveraging its existing fiber network as a backbone, put infrastructure underground where possible, and by assigning a project manager to apply continuous pressure to the pole owners to not unnecessarily delay make ready work.

## Next Steps

1. Finalize recommendations from the Quincy Solicitor's Office and Outside Bond Counsel regarding the proposed legal structure and supporting legal documents for Quincy owned infrastructure.
2. Establish Electric Light Plant Structure.
3. Refine Community Engagement Plan.
4. Explore network financing options.
5. Select outside resources for the Community Engagement Plan (Marketing, Communication, Public Relations, etc.).
6. Implement Community Engagement and demand aggregation process.
7. Conduct RFP to select Design (Engineering) and Build (Construction) partner(s).
8. Conduct RFP to select Network Management / Open Access platform.
9. Create Design/Build Project Plan.
10. Create formal design of the network.
11. Advance initiative to City Council for approval when demand aggregation (Take-Rate) makes the project feasible.
12. Formalize network financing plan.
13. Launch make-ready process for utility pole attachments.
14. Construct network.

# OFFICE OF THE CITY SOLICITOR

**QUINCY CITY HALL**
**1305 Hancock Street**
**Quincy, MA 02169**
**Phone: (617) 376-1516**

**JAMES S. TIMMINS**
**SOLICITOR**

**THOMAS P. KOCH**
**MAYOR**

**JOHN E. BACON**
**ASSISTANT CITY SOLICITOR**


## MEMORANDUM

**Date:** January 15, 2020

**From:** John Bacon, Assistant City Solicitor

**To:** Thomas Koch, Mayor, Christopher Walker, Chief of Staff, and James Timmins, City Solicitor

**Re:** Municipal Broadband Exploratory Project – Legal Considerations

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**GENERAL PROPOSITION:**

Broadband internet service has been deployed in the City of Quincy (the "City") for several years by private sector providers. While Quincy's broadband deployment has been rapid and robust overall, Quincy is exploring the development of a plan that will enable the City to achieve superior levels of speed, performance, and affordability in the future without sole reliance upon by private providers. The Federal Communications Commission (FCC) has defined the minimum speed of broadband at 25 Mbps, leading many communities to consider their future needs and adequacy of current private broadband service and the uncertainty of future commitments to service by private providers. As a solution, some communities have turned to public entities as possible broadband providers. The options under consideration by the City fall under the public broadband umbrella commonly referred to as "Municipal Broadband" or "Community Broadband".

**MUNICIPAL BROADBAND MODELS:**

There are a number of broadband models that have been implemented across the nation. Since each community is different and each faces unique challenges, there is no one size that fits all communities.

(a) Public Ownership: With the public ownership model, the local government is the principal entity building, financing, and operating the broadband network. The network can be run by the local municipal electric utility or it can be run by a city department such as the information technology (IT) department. There are also instances where a publicly owned and built network might be opened to private providers to provide retail internet access or other services to the public.

(b) Public-Private Partnership: With the public-private partnership model, there is many possible forms, from public and private sector entities sharing capital and operations costs, to governments providing access to public rights-of-way or other city infrastructure (e.g., conduits, pole attachments) for privately funded and operated networks, to government-funded projects contracting with private providers to build, operate, and maintain the network. Partners can include private for-profit companies, local non-profits, and even local residents.

(c) Cooperative. With the cooperative model, similar in design to the electric and telephone cooperatives originally created during the 1930s, municipalities have begun to share resources to provide broadband service. These cooperatives may also be in the nature of a public-private partnership, and typically, rely on support from local governments such as the WiredWest project (western Massachusetts) and the OpenCape project (Cape Cod).

Aside from the governance models, the nature of broadband service offered by municipal broadband networks can vary. Municipal networks may provide:

(a) wholesale service ("middle-mile" infrastructure, where retail providers connect into the municipal network), "last mile" retail service directly to customers, or both;
(b) service solely to municipal departments and anchor institutions or also include businesses and residences through planned expansion;
(c) serve solely within municipal boundaries or may be extended to surrounding municipalities and counties (depending on state law geographic and other restrictions);
(d) services that include data or data bundled with video and/or voice (or may include smart grid capacity); and
(e) services other than by deployment and utilization of a fiber infrastructure technology, such as wireless or cable technologies.

**OPPOSITION TO MUNICIPAL BROADBAND:**

Municipal broadband is controversial, because it involves governmental entities entering a commercial telecommunications marketplace that had previously been the exclusive domain of private sector providers. Supporters of municipal broadband argue that in view of substandard, delayed or costly broadband service, communities and local governments should be able to provide this service to meet their citizens' needs and to support the community's economic development. Municipal broadband opponents argue that public entities are not equipped to efficiently develop, operate, and maintain commercial broadband networks, and that municipally owned and supported broadband networks constitute unfair competition to private sector providers, which may ultimately impede private investment in broadband infrastructure.

## NO SPECIFIC FEDERAL RESTRICTIONS:

The FCC, an independent federal agency charged with regulating interstate and international communications, has taken an active role in promoting the deployment of broadband services and broadband infrastructure. The FCC has adopted numerous programs and processes to facilitate access to and the adoption of advanced broadband services, including expressing support for broadband voice services. Former FCC Chairman Wheeler has stated on numerous occasions his support for the development of local government based broadband service options and has expressed his opinion that the FCC has the authority to preempt state laws that ban competition by municipal broadband to private providers. The FCC has generally supported municipal broadband projects and does not presently pose an obstacle to the City's development of a plan for municipal broadband.

Each year, however, Congress considers various options for promoting broadband, seeking to strike a balance between providing government support for broadband in areas where the private sector may not be providing acceptable levels of broadband service, while at the same time minimizing any negative effects that local government intervention in the marketplace may have on competition and private sector investment.

## STATE (MA) AUTHORITY AND RESTRICTIONS:

Massachusetts has not expressly authorized the operation of Municipal Broadband outside the statutory authority granted to municipalities under the Massachusetts Municipal Light Plant Law (the "MLP Law") set forth in M.G.L c. 164 §§ 1, et. seq. M.G.L c. 164, § 35 authorizes the City to create a "Municipal Light Plant" (an "MLP"), M.G.L c. 164, § 47E, passed into law in 2000, authorizes the City MLP (once created) to operate a telecommunication system, providing in pertinent part, that:

> "[a] municipal lighting plant or a cooperative public corporation and any municipal lighting plant member thereof, established pursuant to this chapter or any general or special law may construct, purchase or lease, and maintain such facilities as may be necessary for the distribution or the operation of a telecommunications system for municipal use or for the use of its customers.... Wherever apt, the provisions of this chapter and chapter 44, which apply to the operation and maintenance of a municipal lighting plant, shall apply also to the operation and maintenance of such telecommunications system."

It is clear from M.G.L. c. 164, § 47E that any MLP established under M.G.L. c. 164 may construct, purchase or lease and maintain facilities for a telecommunications system, and "wherever apt," the provisions of Chapter 164 and Chapter 44 that "apply to the operation and maintenance" of MLPs, will "apply also to the operation and maintenance of such telecommunications system.". M.G.L. c. 164, § 47E. Thus, the Legislature appears to have contemplated that an MLP might operate a MLP solely for the purposes of providing a telecommunications system and service, including municipal broadband service. Several towns in Western Massachusetts have built their own telecommunications systems by taking the necessary town meeting votes under. M.G.L. c. 164,

§ 36 to form MLPs. It is pursuant to the provisions of M.G.L. c. 164 then, that such MLPs must operate, regardless of the purpose behind their formation.

The Supreme Judicial Court (the "SJC") has recognized M.G.L. c. 164 as the primary and, in most instances, exclusive statutory authority governing MLP operations. See, Municipal Light Commission of Taunton v. City of Taunton, 323 Mass. 79, 84 (1948); MacRae v. Concord, 296 Mass. 394, 397 (1934). It is well-settled that MLPs are "quasi-commercial" entities created by special act; municipalities themselves have no inherent rights to own and operate a business in the absence of special legislation and the enabling statutes, found at M.G.L. c. 164, §§ 34 et. seq. See, MacRae at 396; Spaulding v. Peabody, 153 Mass. 129, 137 (1891).

M.G.L. c. 164, § 56, provides in pertinent part, that:

> "The mayor of a city, or the selectmen or municipal light board, if any, of a town acquiring a gas or electric plant shall appoint a manager of municipal lighting who shall, under the direction and control of the mayor, selectmen or municipal light board, if any, and subject to this chapter, have full charge of the operation and management of the plant, the manufacture and distribution of gas or electricity, the purchase of supplies, the employment of attorneys and of agents and servants, the method, time, price, quantity and quality of the supply, the collection of bills, and the keeping of accounts."

In direct contrast to M. G.L. c. 164, § 47E, M.G. L. c. 25C, § 6A clearly prohibits the City's regulation of internet and VoIP services, providing in pertinent part, that:

> "(b) Except as set forth in subsections (c) to (f}, inclusive, and notwithstanding any other general or special law to the contrary, no department, agency, commission or political subdivision of the commonwealth, shall enact, adopt or enforce, either directly or indirectly, any law, rule, regulation, ordinance, standard, order or other provision having the force or effect of law that regulates or has the effect of regulating, the entry, rates, terms or conditions of VoIP Service or IP enabled service."

The City Solicitor's Office has contacted government officials in other municipalities (Falmouth and Easthampton) and executive managers in the largest municipal broadband cooperatives (WiredWest and OpenCape), that have had the experience of taking the path to Municipal Broadband via the creation of a Broadband MLP. Their insights have been helpful and will be instructive as the City moves forward. While the City Solicitor's research is not complete on this, it appears the creation of an MLP shall also provide 'access to pole' benefits from utilities at regulated costs for the use of privately owned poles.

**RECOMMENDATIONS & NEXT STEPS:**

As Massachusetts has not expressly authorized the operation of Municipal Broadband outside the statutory authority granted to municipalities under the MLP Law which authorizes the City to create a Broadband MLP and once created to operate a telecommunication system, it is recommended that the City commence the process of forming an MLP after consulting with a local law firm with MLP “telecommunication systems” experience.

END

Locke Lord LLP

**Memorandum**

| | |
|---|---|
| Date: | December 3, 2020 |
| To: | John E. Bacon, Esquire, Assistant City Solicitor, City of Quincy |
| From: | Richard A. Manley, Jr. |
| Subject: | Municipal Broadband Considerations |

You have asked us to address a number of questions we have been discussing regarding the possibility of borrowing money to pay costs of designing, building out and operating a municipal broadband system in the City of Quincy (the "City"). The questions we have been discussing appear below. Our answers appear in italics.

1. Can the City authorize the borrowing of money to design and construct a municipal broadband system?

*Yes, G.L. c. 44, §8(9) provides that a Massachusetts city or town, by a two-thirds vote, can authorize the borrowing of money for the purpose of: " . . . establishing, purchasing, extending, or enlarging a municipally owned gas or electric lighting plant, community antenna television system, or telecommunications system . . . ."*

*In many western Massachusetts communities, debt has been authorized to be pay the local cost (these communities have been receiving significant state assistance to complete these projects) of designing and constructing their own municipal broadband networks. In most of these cases, the individual communities are not intending to operate the networks. Instead, they expect to contract with a third party operator to handle day-to-day operations that would operate their business on the community's broadband infrastructure.*

*The nature of the ultimate operator of the municipal broadband system is of importance because if the system is not expected to be operated by a governmental entity, subject to certain exceptions, the borrowing to pay costs of the system is likely ineligible for federally tax exempt financing. As you know, the interest rates on tax-exempt bonds are typically less than rates on debt that is subject to federal income taxation.*

2. Does the City need to establish a municipal light plant under G.L. c. 164 if it should want to operate a municipal broadband system?

*Yes, the Supreme Judicial Court recognizes G.L. c. 164 as providing the authority for the operation by local governments of municipal light plants, which themselves are authorized to operate municipal broadband systems. To the extent that a community is simply building-out the system, to be operated by others, the establishment of municipal lighting plant is not required in order for a city or town to borrow to pay costs of designing and constructing a municipal broadband system. This model has been utilized in several western Massachusetts communities. However, if the system is to be operated as a municipal activity, the establishment of a municipal light plant under G.L. c. 164 would be necessary.*

3. What is involved in the establishment of a municipal light plant under G.L. c. 164?

*G.L. c. 164, §35 provides that: [a] . . . city shall not acquire such a plant until authorized by a two thirds vote of its city council, . . . passed in each of two consecutive municipal years and thereafter ratified by a majority of the voters at an annual or special city election. If such a vote is not ratified, no similar vote shall be submitted for ratification within one year thereafter.*

*Once it has been established, the Mayor is authorized to appoint a manager of municipal lighting, with full charge of the operations of the municipal lighting plant. A municipal lighting plant can be created solely for the purpose of operating a municipal broadband system, without the need to also establish and operate a municipal electric system.*

4. How would the City provide for the repayment of debt issued to design and construct the municipal broadband network?

*Ideally, revenues derived from customers of the system will be available in annual amounts necessary to operate the system and pay debt service on general obligation bonds of the City issued to pay costs of designing and constructing the system. Of course, this will depend on the pick-up rate (that is, the number of residents opting to sign-up for the system), and the levels at which subscription rates are set. In addition, however, significant expenses (including debt service) will be incurred by the City well before subscription revenue begins to be collected. The City can address these costs with a general fund subsidy (simply making the payments from the general fund until such time as the system is constructed and the subscription revenue beings to flow), borrowing additional funds to capitalize interest on debt issued to design and construct the system, or a combination of the two. Under present law, however, cities and towns are not generally permitted to issue debt to capitalize interest. If this is an option of interest to the City, we can draft special legislation that would permit such a borrowing. If such legislation were to be sought, we would also suggest that the legislation should provide the City with flexibility in the amount of principal that would need to be repaid in each year, to provide further debt service relief until subscription revenue becomes more robust.*

I hope these answers are helpful to you. Please let me know if I can provide you with any further background on this issue.