**PLANNING, LICENSES AND
DEVELOPMENT COMMITTEE
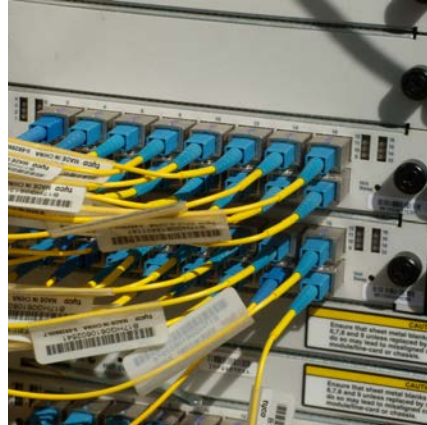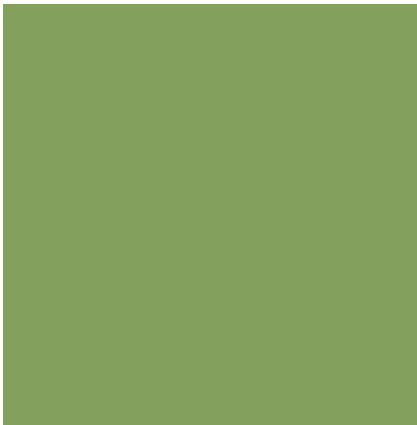AGENDA
Council Chambers A
June 27, 2018
7:00 PM**

David C. Richards
Philip M. Jones
George S. Hansel
Bartlomiej K. Sapeta
Margaret M. Rice

1. Presentation - Broadband Study - WideOpen Networks

2. Peggy Schauffler/Country Life – Use of City Property – Sandwich Board Sign

3. 2018 Pumpkin Festival - Staff Recommended Motion – Public Works Department

MORE TIME ITEMS:

A. Kevin Dremel – Use of City Property – Keene Music Festival

Non Public Session
Adjournment

Broadband Study

Keene, NH

WIDEOPEN NETWORKS

Contents

Broadband For Keene

Broadband has, over the past twenty years, become critical infrastructure for communities. Routine activities of both residents and businesses now often require Internet access. K12 schools continue to expand the use of Internet-enabled learning resources, and children in households with inadequate Internet service are at a severe disadvantage. Work from home and business from home activities are increasing, making business class broadband availability in residential neighborhoods an economic development issue.

Broadband, or perhaps more correctly, the lack of adequate broadband, has become a crisis in America's smaller towns and communities. The larger incumbent providers are making the bulk of their investments in urban and suburban areas of the country, with generally very limited and often reluctant improvements in more rural communities. Rural communities that have developed community-owned networks have service and pricing that is superior to what is available in most urban areas.

The City should focus on providing basic broadband infrastructure, including conduit and fiber) and stay out of the retail Internet business. Much like the way communities manage roads, Keene can provide the digital road system and lease access to that digital road system to private sector service providers.

The FCC has set targets of 10 Meg down/1 Meg up and 25 Meg down/3 Meg up as their definitions of 'broadband," but these are somewhat artificial, and are designed to set a lower limit on what is needed, rather than defining what will be required in the future.

Broadband is not a static number, and the current off the shelf fiber network equipment delivers a full Gigabit of bandwidth affordably.

Despite the enormous pressure from citizens and businesses to "solve the broadband problem," community leaders must recognize that the solution will arrive incrementally over a period of several years, and must manage community expectations.

A broadband survey of residents and businesses was conducted as part of this study, and a very large number of comments were received (see the full business and residential survey data in the appendices). Residents and businesses wrote long and passionate descriptions of their challenges with existing broadband service in Keene.

> *As an IT consultant who works full-time from home, availability and quality of internet service was the number one factor in what location within Keene I chose to purchase my*

property. For example, look only slightly outside Keene to areas such as Westmoreland or Chesterfield and very quickly the choice of internet service drops from cable based, to DSL/ Dial-up or Satellite – all of which are vastly inferior services. There is little to no choice as to what provider to use here in Keene. Anyone who requires a reasonable speed internet service is automatically restricted in their choice to one major provider: Time Warner Cable/ Spectrum. There are no other options, unless being prepared to pay business rates for increased internet service. TwC/Spectrum have a monopoly in this city and I for one would like to see more choice and as a result, competition. Ideally we should be embracing newer technologies such as Fiber based services. If such a thing were technically possible to achieve, I have no doubt it would show Keene as progressive and forward-thinking and have a positive effect on business and commerce in our fine city.

Friends visiting us from other parts of New England, who might otherwise consider moving to Keene or a city like Keene, are shocked to discover that there is no broadband at my house. They'd never consider moving here once they realize how inadequately the City is positioned to be a home to members of the creative and entrepreneurial class who can work from anywhere, and are interested in leaving Boston and the surrounding suburbs, for example, for a smaller New England town with many options for outdoor recreation. The lack of broadband infrastructure in Keene is troubling, and will have a deleterious effect on future economic growth.

We pay high property taxes and have been very frustrated at the lack of access to reliable, consistent, uninterrupted internet services. I recently travelled to Peru and Africa, and discovered our internet access, services and infrastructure are comparable and at times not as state of the art as third-world countries.

We were unaware when we moved to this house 12 years ago that cable was not available. We would NOT have chosen to move here if we had known that… I have many times driven to Panera in the middle of the night to sit in the parking lot and attach and send a file because 6 hours of waiting for it to attach at home didn't work.

I work remotely for a company based in California. Without reliable internet I would have to relocate somewhere else.

The high cost, limited options and poor quality of internet connections for my business and my employees at their homes may eventually force me to move my business out of Keene. We are doubling in size every two years and the current options for office space with adequate internet connection are few and far between in Keene. Combine that with high rents and high property taxes and Keene has a lot going against it for modern companies and growing businesses.

A key question is "***How does Keene benefit from telecom infrastructure investments?***" There are numerous ways that City investments in conduit, handholes, and dark fiber could be beneficial:

- Even modest investments in City-owned infrastructure in key areas targeted for business and community development gives the City and its residents and businesses some

freedom from monopoly providers. Leasing out the infrastructure to competitive providers generally lowers prices for broadband services and improves service quality.

- The leased telecom infrastructure will generate a revenue stream that can be used to finance future expansion of the infrastructure. Some communities like Danville, Virginia and the Eastern Shore of Virginia Broadband Authority are seeing modest contributions from the broadband infrastructure to the local government general fund.

- Fiber installed for City use can improve City services, including traffic light management, increased use of security cameras, support of meter reading, and improved monitoring of City infrastructure (e.g. water pumps, sewer pumping stations, etc.).

- The Internet and telecom infrastructure can provide "green" benefits. Some communities are installing "smart" street lights with sensors that monitor traffic and pedestrian activity to reduce the cost of electricity for street lighting.

- Several studies have projected that widespread use of broadband by citizens and businesses will reduce greenhouse gas emissions; increased use of teleconferencing and online shopping reduces the use of fossil fuels. A University of California-Davis study found that home-based workers reduced their work-related driving by 90%, with corresponding drops in greenhouse gas emissions. The same study found that telehealth services that use online consultations reduced transportations costs and reduced the impact of lost wages due to taking time off from work to drive to a medical clinic.

- Widespread availability of affordable Internet in Keene can facilitate smart buildings, which use ubiquitous Internet access to provide more efficient monitoring and management of energy intensive lighting, heating, cooling, and power systems.

- Fiber can deliver Internet access via controlled access WiFi hotspots for use by City personnel while mobile (e.g. police, public works, etc.).

- Keene could provide some free WiFi Internet access for use in downtown and in City parks. Visitors to Keene could be provided information about the community via a Web page when they first access the free Internet (e.g. local restaurants, City services, local attractions, retail shops and stores). The Keene Chamber of Commerce may be willing to support this venture.

- Several studies have indicated that property values increase when homes and businesses have fiber connectivity.

Broadband Infrastructure as a Utility

Governments build and manage roads, but don't own or manage the businesses that use those roads to deliver goods and services. In this third way, there is true competitive pricing between competing service providers, and little or no government regulation is required.

The tremendous versatility of the Internet and the underlying technology bases now allows services that used to require their own, separate (analog) road system (voice telephony and TV services) to be delivered alongside other services like Internet access on a single, integrated digital road system.

If we managed overnight package delivery the way we manage telecom, UPS and Fedex would only deliver packages to residences and businesses where each delivery firm had built a private road for their exclusive use. We recognize immediately the limitations of such a business model–few of us would have overnight package delivery to our homes because the small number of packages delivered would not justify the expense of building a private paved road.

Before the rise of the automobile, most roads were built largely by the private sector. After cars became important to commerce and economic development, communities began building and maintaining roads because it became an economic development imperative to have a modern transportation system in communities.

Before the rise of the Internet, digital networks were built largely by the private sector. As broadband has become critical to commerce and economic development, communities with digital roads are more competitive globally.

The time has come to recognize that it is inefficient and wasteful to build full duplicated digital road systems, which only raise the cost of telecom services to all public and private users. Networks that share capacity among a wide variety of public and private users have a lower cost of construction and a lower cost of operation—benefiting all users.

A UTILITY COMPARISON		
SHARED ROADS	**SHARED AIRPORTS**	**SHARED TELECOM**
Historically, roads have been built and maintained by the community for the use of all, especially private firms that want to use them to deliver goods and services.	Airports are built and maintained by a community or region as an economic and community development asset. Both public and private users benefit from the shared use of a single, well-designed airport	Duct and fiber may be installed and maintained by the community and/or a neutral owner/operator for the use of all, including private firms that want to use them to deliver goods and services.
Access to the community road system is provided by parking lots and driveways, built by property owners, developers and builders.	Airport assets like departure gates, ticket areas, and runways provide access to the airline services.	In the digital road system, access across private property to the community–wide network in the public right of way is provided by duct and fiber built by property owners and/or developers and builders.
The local government uses roads only to deliver government services. Local government does not offer services like overnight package delivery.	While the local government or a consortium of local governments typically own the airport facility, the local governments do not offer flight services.	Local government uses the digital transport system only to deliver government services. Government does not offer services like Internet access or Voice over IP.
Private sector businesses use roads so that their own cars and trucks can deliver goods and services to customers. Because businesses do not have to build and maintain roads, all businesses benefit directly by being able to reach more customers at less expense.	Private sector airlines are able to offer competitively priced airfares because of the shared cost of the airport terminal facilities. Each airline does not build its own airport (which would sharply increase the cost of airfare).	Private sector businesses use the digital transport system to deliver goods and services to customers. Because businesses do not have to build and maintain a digital road system, all service providers benefit directly by being able to reach more customers at less expense.
There are no road connection fees, and anyone may connect to the road system for free. Governments pay for the cost of maintaining roads largely from those that use the roads . Fees are proportional to use, from taxes on tires and gasoline.	Businesses and citizens do not pay a fee to access the airport facility. The cost of maintaining the airport facility is paid by the airlines, which bundle that cost into the price of airfare. Fees are proportional to actual use by flying customers. Airlines benefit because they do not have to build, own, and operate the airport directly. Those costs are shared across all users.	Any qualified service provider may connect to the digital road system for a nominal fee and begin to offer services, without any significant capital expense. Network capital and operating costs are recovered by charging service providers a small fee that is based on a percentage of their income from services offered over the system.

In the National Broadband Plan, Recommendation 6.8 states, "Congress should consider enacting "dig once" legislation applying to all future federally funded projects along rights-of-way (including sewers, power transmission facilities, rail, pipelines, bridges, tunnels and roads).""

While telecom conduit is less than one dollar per foot and the fiber cable itself is relatively inexpensive at a dollar or two per foot, the cost of placing underground conduit or burying the fiber cable directly represents most of the cost.

> The Federal Highway Administration notes that as much as 90% of [underground] broadband costs are related to construction expense.

A related cost that is not always accounted for when underground fiber is being installed is the damage to roads and right of way. It is, unfortunately, common to have one company install fiber along a thoroughfare only to have a second company come along later and install a second cable. In our work around the country, we have seen three and even four fiber cables installed in right of way. As more cables are placed in right of way, further construction becomes more expensive, and damage to other utilities (e.g. electric service, water, sewer) can occur. Where conduit and fiber have to cross streets using trenching, the road surface is repaired but the integrity of the surface has been broken and ice, snow, and plowing damage is more likely to occur later where trench seams are located. Even when underground boring techniques are used, curbs and sidewalks may experience damage.

Some states and communities have tried to address these problems by encouraging shared trenching and "dig once" policies. Arizona, Utah, and Minnesota have all enacted laws to reduce over-building in right of way and to encourage sharing of trenches and/or conduit. The Arizona Department of Transportation was given statutory authority to manage the installation of broadband infrastructure in public right of way on state highways.

Nearly twenty years ago, the Utah Department of Transportation, anticipating the need for better connectivity to support the 2002 Olympics in Salt Lake City, began requiring extra telecom conduit capacity in road construction.

Minnesota law encourages the installation of conduit and fiber cable in state right of way if other kinds of construction is taking place (e.g. road surface remediation, gas/water/sewer line installation, etc.).

On the municipal level, several communities have been encouraging various forms of "dig once." Loma Linda, California is considered a pioneer in this area, with one of the earliest statutes addressing the problem. In Loma Linda, all new construction must connect to the existing City fiber network. The City has included standards not just for outside plant, but also requires Internet capable structured cabling inside homes and commercial buildings (that is, Ethernet cable installed to industry standards). Developers and building owners must bear the cost of the cabling, but it is a small fraction of the total cost of a new structure.

Brentwood is another California community that started the dig once policy very early (1999). Eighteen years later, 150 miles of conduit passes more than 8,000 homes and nearly all commercial properties. Like Loma Linda, the City requires all new construction include telecommunications conduit using a joint trench.

Sandy, Oregon instituted a dig once policy via a two word change to an existing ordinance (Sec. 17.84.60) by adding "broadband fiber" to the City list of public facilities, which already included water, sewer, street lights, underground power lines, and mailbox units. So a developer building a new subdivision in Sandy has to include all of the usual municipal infrastructure AND conduit/fiber infrastructure to their development projects, and turn over all of those assets to the City when completed.

Mount Vernon, Washington has a similar ordinance that instructs developers to place conduit when building roads for a new residential or commercial project, and/or placing conduit if excavating existing roads (e.g. to extend water or sewer service). Both Mount Vernon and Sandy have a conduit/fiber master plan to guide where developers should be placing broadband infrastructure; this ensures that the new assets get used as part of the broader community network.

Mount Vernon's ordinance is as follows:

12.20.015 Construction standards for the regulation of use of public rights-of-way and public property.

All developments shall be required to construct and install telecommunications conduit on all streets that are affected, disturbed, constructed and/or improved by development unless otherwise approved, pending a review by the city engineer. This conduit shall be for the purpose of installing telecommunications cable, fiber optic wiring or other infrastructure as necessary.

This conduit shall be placed at horizontal and vertical locations as determined by the city engineer. The conduit shall conform to the size, shape and characteristics as determined by the city engineer based on industry standards. Once installed and accepted by the city, the conduit shall become the property of the city of Mount Vernon.

Poulsbo, Washington has a lengthy ordinance on conduit standards. The ordinance (12.02.015 Conduit Standards) lays out both the reason and need for high speed telecommunications and provides a detailed specification for installation/use. The technical specification portion of the ordinance is contained in Appendix C.

RECOMMENDATIONS FOR KEENE

A "dig once" for the City of Keene would not impact the City budget but begin the process of getting City businesses and residents affordable access to "future proof" broadband infrastructure. There are several kinds of opportunities for a "dig once" policy to have an impact in Keene.

1) A requirement that all new residential subdivisions include a complete telecom conduit system that connects all homes to a designated telecom cabinet or "meet me" box/shelter.

2) Any new commercial construction and/or any commercial renovations would include telecom conduit installed to adjacent right of way and terminated in an appropriately sized handhole.

3) The City should add a "fiber overlay" layer to its GIS system. The new layer would indicate core network and distribution network conduit routes so that the City and/or developers would be able to identify where new conduit and handholes should be placed.

4) The City could also consider adding a conduit/handhole allocation to its Capital Improvements Plan (CIP) so that the City Public Works department would have conduit and handholes in inventory for placement when opportunities arise (e.g. intersection improvements, sidewalk improvements, etc.).

Despite the apparent attractiveness of placing telecom conduit in open ditches as other utilities are being installed, there are some limitations. Gas companies usually refuse categorically to allow the colocation of any other kind of infrastructure when gas lines are being installed or replaced. Similarly, electric utilities are also typically resistant, and there are also some practical problems to overcome. Telecom conduit cannot be placed below electric lines because of the shock hazard if repairs are needed, and the electric utility will typically not allow conduit to be placed directly over the electric lines—also because maintenance of the electric lines becomes more difficult.

For water and sewer, the problem is similar. Telecom conduit placed too close to other utility lines complicates repairs for both utilities. If the trench can be widened with a 24" to 36" offset for the telecom conduit, this mitigates the problem, but widening the trench also incurs additional expense.

In some cases, telecom conduit has been installed shortly after the trench has been closed but the right of way is still clear of brush and other obstacles (using a 24" to 36" offset).

Telecom conduit can also be installed prior to sidewalk and street repairs (e.g. pavement grinding and restoration); this lowers the cost of installation and takes advantage of the re-surfacing of the road or the sidewalk replacement. This approach highlights the importance of a fiber overlay plan for the City, so that conduit is placed where desirable routes have already been identified.

OVERVIEW OF THE MEET ME BOX

In Keene, "meet me" boxes could be installed by developers and/or the City. A meet me box is a telecom cabinet with fiber cables installed between the cabinet and nearby homes and/or buildings. Providers only have to reach the meet-me box, lowering their costs. Both wireline and wireless providers can use this infrastructure. This approach can also be used to provide fiber services in business and industrial parks. A small Virginia county installed five miles of

fiber in their business park and was able to attract a Tier One provider to provide service to an existing business (a manufacturing plant that was going to leave if the county did not help them get better Internet service).

The dark fiber approach minimizes operational costs. Service providers would install their own equipment in the cabinet and would pay a small monthly lease fee for the fiber strands they use to connect customers to their services.

OWNERSHIP AND GOVERNANCE

The meet-me boxes and related fiber, conduit, and handholes would be owned by the City.

COST DISCUSSION

For a meet-me box installed in a "main street" area (e.g in an alley behind commercial/retail buildings) with relatively inexpensive and short fiber drop cables into nearby buildings, the lower end of an installation might start at $35,000. For a box installed in a sub-division that requires distribution conduit/fiber and drop cables, the cost per home is related to lot size and could vary between a few hundred dollars and about $1500; this is a modest expense and some studies show it adds $5,000 or more to the sales price of the home, so the developer will recover the additional cost with a higher sales price.

Conduit and Dark Fiber Business Model

If the City of Keene pursues a conduit network, which could also include dark fiber, it would be operated as city-owned project. As a city-owned project, the network is vested in the community and can be operated on behalf of the community and economic development needs of the community.

The network would be operated as a dark (no network electronics) fiber optic and telecom conduit network available to any and all service providers, including incumbent providers who want access to the significant market opportunity represented by the residents and businesses of the City.

The City will have a limited number of essential roles:

▶ *Contract and Staff Management* - The City will hold contracts for outsourced network repairs and maintenance and outsourced construction of conduit extensions. The City will also manage service provider contracts for the fiber and/or conduit leases offered on the network. The limited scope of the network should minimize internal staff requirements. Where it is efficient and effective, the City would seek to use qualified private sector firms to handle the technical operations of the network to minimize the number of staff required to manage the network.

▶ *Financial Management* - The City will provide the financial oversight of the network. Most routine bookkeeping and accounting would not require full time staff and can be handled easily with existing City accounting resources.

▶ *Public Awareness* - The City will need to maintain a modest, ongoing public awareness campaign to ensure that residents and local businesses are aware of the opportunity to obtain higher performance, broadband services from local providers using the City infrastructure. While service providers would be responsible for their own sales, billing and customer management, the City would focus on availability awareness in the community.

▶ *Project Development/Management* - As funding sources are developed for individual network projects, the City will provide financial and project oversight of these projects during the implementation and construction phase.

THE CORE NETWORK

In Keene the network core (or fiber backbone) will be the conduit/fiber network and any future expansion. Service Provider equipment will be located at a provider cabinet. The City will provide and manage a centrally located rack and patch panel for allocating and managing the leased fiber strands.

DISTRIBUTION AND ACCESS NETWORKS

Keene will be investing in passive network elements which will primarily consist of conduit, dark fiber, splice closures, and handholes. Any cabinets and last mile fiber infrastructure would be provided by service providers. Drops constructed from the

provider distribution fiber to the customer premise is considered to be the access portion of the network, and would be connected to the nearest City-owned handhole. The service provider would be responsible for constructing and installing the drop cable.

SERVICE PROVIDER ATTACHMENT

Service Providers will be able to connect to Keene fiber at any handhole or splice closure on the network. Access to splice closures is managed by the City. Any IRU/ lease holder who needs a splice in an existing handhole or splice closure must place an order with the City and will be charged for the actual cost, plus 15%.

SERVICE DELIVERY & PROVISIONING

Service providers will be responsible for configuring and managing their own services over the fiber.

Operating a Conduit/Dark Fiber Network

As providers sign agreements with the City to use fiber strands or conduit, Keene must have resources in place to maintain and repair the dark fiber and conduit if damage occurs (break-fix repair). A plan for the maintenance of the network will need to developed prior to leasing any conduit to providers.

▶ **Outside Plant Maintenance** – Keene would be responsible for maintaining the City-owned conduit and any City-owned dark fiber that may be installed in the conduit. These responsibilities will include utility locates, routine maintenance of conduit/fiber (relatively rare), and emergency break-fix (also rare, but requires immediate response).

▶ **Service Providers** – As the City signs an agreement with one or more service providers they will need time to connect their fiber to the City fiber backbone, install equipment, and configure their network for the new services. If construction is involved this process could take several months.

Once the providers are ready to begin providing retail services, the enterprise becomes operational and a variety of ongoing tasks and activities begin to take place.

▶ **Service Provider Management** – Service providers sell directly to their own customers. Once they have obtained a new customer that is passed by City or provider-owned distribution fiber or conduit, the provider completes the fiber connection (e.g. from the curb to the building) to deliver the service requested by the customer (e.g. Internet, phone, data backup, etc.).

▶ **Network Operations** – Dark fiber and conduit networks require little or no ongoing monitoring or support, but the City will have to have procedures and processes in place to receive notification of damage and to manage the repairs.

▶ **Network Maintenance** – Routine maintenance of a conduit/dark fiber network will be limited, but non-routine/emergency maintenance support must be in place as soon as the network has customers. Fiber is occasionally damaged (e.g. tree limb falling on aerial fiber, backhoe damaging buried fiber), and a qualified firm must be available to back repairs within two to four hours. This service is usually outsourced to a qualified private sector company.

▶ **Business Administration** – The fiber and conduit network will have a relatively small number of customers, which are the connected service providers, local business and
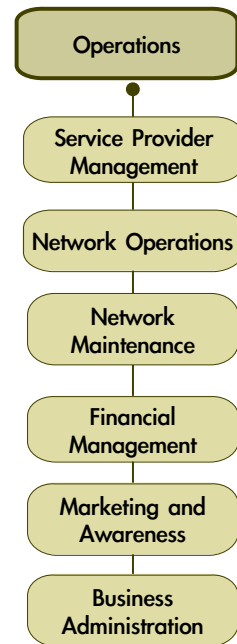
institutional customers that have a need for dark fiber or conduit, and the City itself. Prudent and careful financial management is needed for accounts receivables and accounts payables, along with other normal bookkeeping activities--chart of accounts maintenance, bank deposits, check writing, and other tasks. Existing City financial staff should be able to handle the modest bookkeeping and accounting tasks. The network revenue and direct expenses should be maintained as a separate set of financial records (e.g. an enterprise fund) to provide complete transparency about the financial position of the project.

▶ **Marketing and Awareness** – While service providers will be responsible for their own marketing and sales efforts, an ongoing modest awareness/marketing campaign is required to ensure that businesses and residents are aware of the City effort and its benefits.

EQUIPMENT

The Keene network will include only passive network items, including conduit, dark fiber, cabinets, and patch panels.

PASSIVE EQUIPMENT

Passive equipment is equipment that is not addressable on the network, but still plays an important role.

▶ Fiber patch cables

▶ FTU - A Fiber Termination Unit is the enclosure mounted to a customer premise where fiber is terminated. ("Wall Box"). The City should allow service providers to install their own drops and FTUs.

▶ Closures, Splice Cases, or FOSCs are the enclosures in a handhole that protect the splicing from distribution fiber to drop fiber.

▶ Patch panels (connector types). The City should provision and manage a single patch panel.

▶ Hand holes and vaults - These are part of the dark fiber core network.

▶ Cabinets, Shelters - With the exception of a central "meet-me" cabinet or location, any other cabinets or shelters should be the responsibility of the providers.

▶ Equipment Racks - The City may not wish to offer any rack space for provider equipment. A City patch panel will be used to cross connect leased fibers as needed. All patch cable installs and cross-connects will be performed by City staff or designated contractors.

Network Expansion

If the conduit/fiber network is expanded over time, there will be a period of time when some construction is underway. During a network expansion phase, parts and materials have to be ordered, delivered and stored until put into operation. Shipments have to be reconciled with orders prior to payment. The Keene network will construct new conduit segments through the management of contracts with outside firms and contractors.

Construction and Contractor Management Activities

▶ Build new conduit and install dark fiber as needed.

▶ Inventory and track all significant equipment, parts, and equipment.

▶ Reconcile shipped items with shipping tickets and purchase orders.

▶ Maintain and repair existing fiber facilities as needed.

▶ Ensure all procurement meets local and state procurement rules.

Typical Contract Services

Contract services may be used or required as needed, with some services starting prior to service provider or lessee use of the network. For many work roles and responsibilities, this approach helps manage cash flow and will help match revenue and expenses better.

The City Manager will have primary responsibility for ensuring that appropriate RFPs are developed that adequately describe the work to be performed. Once a firm has been selected for a particular area of responsibility, the City Manager or delegated City staff will have primary oversight of the contractor firm and staff. In some cases the work contracts will require appropriate legal review and that contractors have appropriate insurance, liability and errors and omissions coverage, and bonding where required.

▶ Project management — Expansion of the network may require the use of a firm to manage the construction process (or the City provides this work).

▶ Conduit network design and strategy — The City may make occasional use of a network planning firm to help develop expansion routes, assist with pricing strategy, help with service provider negotiation, and other related tasks.

▶ Conduit network build out — The City, as it expands the network, will typically use a qualified construction firm and/or the Public Works Department for this work.

- Legal services — The City Attorney will assist as needed with lease agreements and IRU contracts.

- Bookkeeping and accounting — City staff will provide the limited amount of financial support needed..

- Marketing services — The City may make occasional use of a local ad agency or marketing firm for assistance with marketing materials (e.g. logo design, Web design, brochure design, etc.).

OTHER CITY MANAGEMENT ROLES

A wide range of high level activities will take place regularly. Some of the items on this list also appear in other sections of this document, but are listed here to provide a high level overview of key business and management related activities.

ACTIVITIES

- Provide continuity of leadership and project management.

- Provide monthly reports to City Council.

- Meet as needed with Council and other interested parties and stakeholders (e.g Chamber of Commerce, Merchants Association, etc.).

- Monitor service provider performance and assist with dispute resolution.

- Manage leases, right of way agreements, and other real estate-related activities.

- Manage contract and work activities of outside plant repair and maintenance contractor.

- Meet with local groups as needed to promote use of the network.

- Represent the project at state level meetings and hearings.

- Meet with visitors and interested parties from other cities and regions.

The City will have the primary responsibility for ensuring that management and administration of the enterprise is handled appropriately.

ASSET MANAGEMENT

A primary role of the project will be to manage assets owned directly by Keene. These assets will include conduit, fiber, cabinets, easements, and right of way. Additionally, these assets have to be managed and tracked during the construction and build out process prior to being put into operation.

The asset management will consist of two primary areas of responsibility:

- Legal contracts, ranging from simple documents of a page or two for property easements, pole attachment rights, or tower access for an antenna to more complex legal documents that might cover twenty or thirty year leases of significant assets. These longer documents will have payment schedules and fee calculations. Legal counsel and review will be required for many if not most of these documents, at least for the first time they are written. Some documents will become "standard" contracts that will likely not require review for each lease unless significant changes are needed.

- Management of hard assets, which will include fiber cable, conduit, and handholes, and other fiber-related materials.

- Procure and manage leases for access to public right of way, private property

- Select, purchase, and track location and value of passive infrastructure, including fiber, duct, cabinets, and other facilities.

City staff and the City attorney will have the responsibility of creating, managing, and tracking leases and other legal documents related to asset management. The network may need additional assistance from qualified legal counsel for occasional review of legal documents. The network will have to maintain a complete inventory of all physical items and real property.

The City will require a network inventory management process, which could be as simple as a set of spreadsheets or modest database, with an accompanying process to ensure that data is entered and updated in a timely manner. For all major pieces of equipment (i.e. purchases of more than $100, typically), data like vendor, model number, serial number, date put in service, and service notes will need to be maintained.

Note that asset management is extremely important, especially fiber strand management. We know of at least one small city that did not maintain adequate strand in-use records and had to install additional fiber cable at significant cost.

LEGAL AND REGULATORY

Investments in community telecom infrastructure require attention to local, state, and Federal regulatory issues. The management of telecom infrastructure is a business enterprise that requires a variety of legal contracts, service agreements, maintenance and work agreements, procurement and performance contracts, and corporate legal documents of various kinds.

- Identification of state and Federal laws that may affect operations.

- Development of service provider master agreements and service agreement addendums.

- Leases for easements and rights of way.

- Review of work contracts for consultants, contractors, and engineering firms.

- Review of maintenance and operations agreements.

The project will require the services of a telecom attorney with some demonstrable experience with community telecom agreements. Many telecom attorneys are not familiar with municipal open access and multi-provider networks, and some time and effort should be made to carefully qualify an attorney or firm prior to hiring them.

OUTSIDE PLANT MAINTENANCE

The conduit (and dark fiber, if included) network will require some limited routine maintenance and some unscheduled maintenance. Routine maintenance could include physical inspection of facilities and equipment, and repairs required by normal wear and tear and weather. Unscheduled maintenance could include repairs due to ice and wind damage, vandalism, or other accidental damage (car/truck accidents, snowplow damage, backhoe and other kinds of damage to underground facilities).

LOCATES

- The budget allocation for locate services will be included in the Keene Network's Operations and Maintenance budget.

- The Network will have a membership in the New Hampshire 811 (Miss Utility) locate service.

- The Network should maintain a list of qualified locate contractors and engage at least one to perform regular locate services for the network. Optionally, City staff can perform locates at significantly less cost with nominal training.

OUTSIDE PLANT MAINTENANCE

- City staff will maintain GIS mapping and documentation of assets for the network.

- If dark fiber has been placed in the conduit network, City staff will track all fiber splices in an appropriate tracking database.

- City staff will manage break/fix services and procedures.

EQUIPMENT INVENTORY

▶ Periodic audits of the network inventory will be especially important during network expansions.

SPARES MANAGEMENT

▶ If required by the OSP maintenance contract, the City of Keene will store spare equipment, and OSP construction materials in a secure location.

▶ Non-tagged network inventory such as connectors, patch cables, clamps, and consumables should be included in the spare inventory.

SERVICE PROVIDER MANAGEMENT

▶ Attraction of service providers will take time and effort during the early formation of the network. During the network build up, there must be a parallel and regular effort to meet with service providers, explain the financial and technical aspects of the opportunity, and work with interested service providers to help them develop business and marketing strategies for their proposed services.

▶ To get a provider commitment to use the network may take several meetings, particularly with incumbents, who often need additional help understanding the business model and how to adjust their own internal business models for the new environment.

▶ Rates for the transport should be reviewed annually and adjusted upward or downward if necessary to ensure both the guaranteed network performance and to meet the network financial goals.

▶ Once providers are on the network, the network operations group will provide routine support for service providers, including the set up, configuration, and testing of new services, troubleshooting problems, and assisting with customer management.

PRICING AND POLICY RECOMMENDATIONS

The City of Keene is providing conduit and dark fiber infrastructure to service providers and dark fiber lessees as a basic infrastructure service. The Keene network is being offered as a dark fiber "transport only" service, and the City does not intend to provide any retail Internet, TV, or voice services. All business and residential services will be provided by private sector service providers.

POLICY RECOMMENDATIONS

▶ Carriers, providers and lessees will have full access to any connected business or institution anywhere on the Keene fiber network.

▶ No single provider may lease (or obtain an IRU) for more than 35% of the dark fiber strands allocated for third party use.

▶ Dark fiber lease prices will be non-discriminatory and available to any public or private entity.

▶ Third party sub-leasing will not be allowed.

▶ Access to splice closures is managed by the City. Any IRU/lease holder who needs a splice in an existing handhole or splice closure must place an order with the City and will be charged for the actual cost, plus 15%.

▶ City patch panel access: The City will provide the patch cables needed for patching fiber strands through the City-owned fiber termination rack. Only City staff will have access to the fiber termination rack.

CONDUIT LEASE PRICE RECOMMENDATION

Empty conduit: $0.50/foot/year

DARK FIBER LEASE PRICE RECOMMENDATION

$75/mile per month per strand, with a minimum of 1 mile per strand. Five year minimum contract and $250 application fee. Splicing will be billed at cost plus 20%.

DARK FIBER IRU PRICE RECOMMENDATION (PERPETUAL)

IRU Lease Lump Sum One-time Fee

$3,550/strand, 6 strand minimum

$2,367/strand, 13 – 24 strands (33% discount)

$1,183/strand, 25+ strands (67% discount)

Annual Maintenance Fee*

$333/strand/year – up to 24 strands

$167/strand/year – 25+ strands (50% discount)

*The annual maintenance fee has been developed based on a cost plus structure. It may be increased or decreased every other year based on changes in actual maintenance costs.

OPERATIONAL EXPENSE ESTIMATE

As a conduit and (optionally) dark fiber network, operational expenses will be few and relatively modest. Not included is the time/salary costs that may be attributed to City staff that contribute to the effort.

We recommend a cash reserve for fiber break-fix of $24,000, which can be accumulated over a two year period.

ANNUAL EXPENSE PROJECTIONS

BUDGET ITEM	DESCRIPTION	SUGGESTED ANNUAL BUDGET AMOUNT
NETWORK OPERATIONS	Network operations expenses are likely to be nominal, and aside from patch cables, there may be little or no other direct costs in this category.	$1,500
ADMINISTRATIVE/ AUDIT COSTS		$2,000
INSURANCE		$1,000
UTILITIES	With no active electronics, electric use will be limited.	$0
LOCATES	If locates are provided by a third party, this will be one of the largest expense items. If provided by City staff, this direct cost can be eliminated.	$1,500
FIBER LEASES	No fiber lease costs are anticipated. As the network expands, there may be some opportunity to do fiber swaps and/or cooperative leases.	$0
POLE USE FEES	No pole attachment fees anticipated. If the network expands, there may some aerial fiber installed for cost or environmental reasons (e.g. stream crossing).	$0
STORAGE	Assumption that the City will provide storage space for spare conduit, fiber, splice closures, handholes.	$0
SITE LEASES	Assumption that no site leases are needed.	$0
BREAK-FIX CONTRACT	It should be possible to negotiate a truck roll/materials cost for emergency break-fix, rather than a monthly retainer. If the former, the City will still need to budget a monthly set-aside to cover fiber damage repairs.	$12,000
TOTAL PROJECTED ANNUAL EXPENSES		$18,000

Tools and Materials

If the City does not already have a splicer and an ODTR (Optical Time Domain Reflectometer), the two tools will minimize the need for outside contractor costs for occasional splicing needs and fiber strand testing. A good splicer costs about $10,000 and an ODTR is about $5,000. They can often be bought as a bundle for around $12,000-$13,000.

Community Fiber Network Cost Studies

NETWORK ARCHITECTURE

In Keene, both fiber and wireless technologies and systems are going to be important to meet the goal of improving access to broadband. The rest of this section provides more detail and some specific build out strategies. There are three major parts of any modern network:

- The **Core Network** provides access to the Internet, a place for service providers (ISPs) to distribute their services locally on the network, and for larger institutional and business customers to meet service providers. Keene already has some fiber infrastructure, originally developed as part of the FastRoads network but now owned by FirstLight, a private sector firm that recently acquired the FastRoads assets and continues to manage the FastRoads network.

- The **Distribution** portion of the network connects the Core Network with collections of users. The Distribution network in Keene will be largely fiber placed underground in streets and roads, but some point to point wireless links can expand access to the edges of the community quickly for modest cost (compared to running fiber).

- The **Access or Last Mile** portion of the network connects individual users and businesses to the network, and like the Distribution network, that connection will be by fiber for most homes and businesses.

The table below summarizes how fiber and wireless can work together in a variety of ways. As noted above, most homes and businesses will receive service via fiber-based Distribution and Access.

Distribution Type	Access Type	Capacity
Wireless	Wireless	Typical customer connection starting at 5 to 10 Megabits, can be higher, with 50 Meg connections common. More dependent on the capacity of the wireless Distribution link.
Wireless	Fiber	Users can have fiber Gigabit connections locally, but total throughput dependent upon the capacity of the wireless link, which can be up to a Gigabit, depending on distance and budget.
Fiber	Fiber	Any amount of bandwidth needed, with standard connection typically a Gigabit (1,000 Megabits).
Fiber	Wireless	Typical customer connection starting at 5 to 10 Megabits, can be higher, with 50 Meg connections common.

The diagram below illustrates the network architecture in Keene. Internet and other services like voice (VoIP) telephone and TV packages can be delivered via a connection to the FirstLight network in Keene.

While the City of Keene can provide the basic infrastructure (e.g. conduit, fiber, circuits), it is recommended that private sector service providers offer all of the services directly to their own customers.

Access - Last Mile

Customer Connections:
Many varieties of indoor and outdoor ONTs are available, and will be tailored to meet the needs of large institutions, or businesses, or residential dwellings.

FTTx - Fiber to the Home and Business

fiber < 10km
1Gbps

Distribution Network

FTTx Distribution Network:
Providers access network customers over distribution fiber owned by the City of Keene. Point to Point wireless will also be a strategy for making important connections and creating redundancy on the network.

Existing City Fiber, and/or new construction are options for distribution fiber.

Two 1.25" conduits will be buried together. One will hold the mainline fiber and the other will provide extra capacity in the future. In some places more conduits may be buried in anticipation of expansion.

Co-location

Co-location and Core Network:
At the Co-location facility or co-lo service providers will install equipment that interface with the network. This allows providers to bring their services from their network to Keene customers.

Network Operations
Core Router
Calix E7-2
Calix E7-2
Calix E7-2
Calix E7-2
Calix E7-2
Patch Panels and Cable Management
Battery Backup Equipment

A small shelter will be installed to serve as a co-location facility in Keene, where providers can install equipment and reach customers.

Service Provider

Service Provider Backhaul Connections

Internet
Provider I
Provider II
Local Government
Telehealth Services
Advanced Services
Data Backup
VoIP Service
Video Surveillance

WIDEOPEN NETWORKS
THE GIGABIT SOLUTION

Drawing: Keene Logical Diagram
Client: City of Keene, NH
Date: 13-MAR-2018
Designer: Matt Bussing
Contact: mbussing@wideopennetworks.us

FIBER COST ESTIMATE

A cost study and estimate was developed using a downtown pilot project and a residential neighborhood pilot project as a potential "phase one" fiber to the home project.

FIBER CONSTRUCTION COST FACTORS
Fiber cost estimates are developed using the the categories below. For each category, the items, labor, and activities associated with that category are calculated, using vendor price quotes, prices for labor and materials from previous construction projects, and other sources of cost information.

BUILDINGS, IMPROVEMENTS, AND PREFABRICATED SHELTERS

This category includes any buildings and shelters constructed as well as improvements to the buildings such as redundant HVAC systems, power improvements, fire suppression systems, security and surveillance systems, etc.

OUTSIDE PLANT CONSTRUCTION MATERIALS

Network construction includes the outside plant materials needed to build the network. Items like conduit, pedestals, cabinets, hand holes, and splice enclosures are all included in network construction.

OUTSIDE PLANT CONSTRUCTION LABOR

Labor is typically included with network construction for the bidding process but is separated here to help identify money that could be saved by leveraging local labor resources. Labor includes the placement of pedestals and hand holes, the underground or aerial placement of conduit, the construction of foundations (pads) for various structures throughout the network, and more. Several material costs such as concrete and gravel are included in labor depending on the type of job to be performed.

NETWORK EQUIPMENT, SOFTWARE, AND RELATED COSTS

Network equipment includes any network electronics that will be used in the network such as routers, switches, and CPE. Network equipment also includes some items that do not use any AC power but fall into a similar category such as patch panels, and patch cables. The equipment cost will vary widely depending on the type of architecture chosen.

ADMINISTRATIVE AND LEGAL

Legal counsel familiar with telecom agreements will be required to review contracts with service providers, contractors, and other participants in the project. In some cases the local government attorney may have some expertise in this area, but the services of a telecom attorney may be required. Legal costs can vary with a particular location and tend to go down over time. The most legal work is needed early in the first construction phase to develop business contracts with service providers, to review construction and vendor contracts, and to broker lease agreements for use of public or private property (where network equipment like cabinets or shelters have to be located).

LEASES, PERMITS, AND RIGHTS OF WAY

Some costs will be incurred based on the permitting requirements of the project. If the City is able to place the colocation facility and any cabinets in public right of way or on City properties at no charge, the cost of leases will be lower. If cabinets or shelters have to be placed on private property, the cost of the land or long term leases will increase. The cost of permits needed for crossing wetlands, streams, other sensitive areas, and DOT permits are also included in this category. Formal leases and negotiated lease payments are more desirable than providing some form of free access to services.

PROJECT MANAGEMENT

Project management for a community network build requires thorough and detailed planning, experience in procuring construction materials for the project, and the ability to oversee and convey project information to contractors through the duration of the project, including construction inspection work (ensuring construction contractors have done their job properly).

NETWORK DESIGN AND ENGINEERING

This work include a full design of the outside plant network, cabinet and shelter specifications, and extensive detail (blueprints) that specifies how all fiber cable, towers, buildings, and network equipment is to be installed. These documents have to be completed prior to bidding out any construction work, and are usually included as part of a construction bid package. The detail includes fiber optic cable route determination and size determination, active and passive network equipment selection and placement planning, splicing layouts and documentation, network configuration planning, and all engineering necessary to complete construction.

NETWORK INTEGRATION AND TESTING

Some configuring and testing will take place after the network is built and before it is ready for use. In a dark network this involves labeling and documenting the routes of individual fiber strands, and testing of any other features of the network such as generators, air conditioners, and locks. In an active network the testing and integration includes integration requirements for a dark fiber network plus the configuring and installation of switches, routers, and other network equipment. Work in this category requires a skilled professional who is familiar with the network architecture and the business model (e.g. open access).

MISCELLANEOUS

This category provides a small budget for miscellaneous expenses that will arise during the course of construction (e.g., bid advertisement costs, inventory tags, etc.).

CONTINGENCIES

The Contingency category is included and calculated as a percentage of the total estimated cost (e.g., 5% of total cost) to provide flexibility in managing the overall budget. Equipment costs can and do change between the time an estimate is made and construction commences. Labor costs can vary depending upon the time of year the work starts, the state of the local economy, and the state of the national economy. Material costs and lead times can vary based on demand on certain industries, energy costs, and location.

KEENE FIBER ROUTES
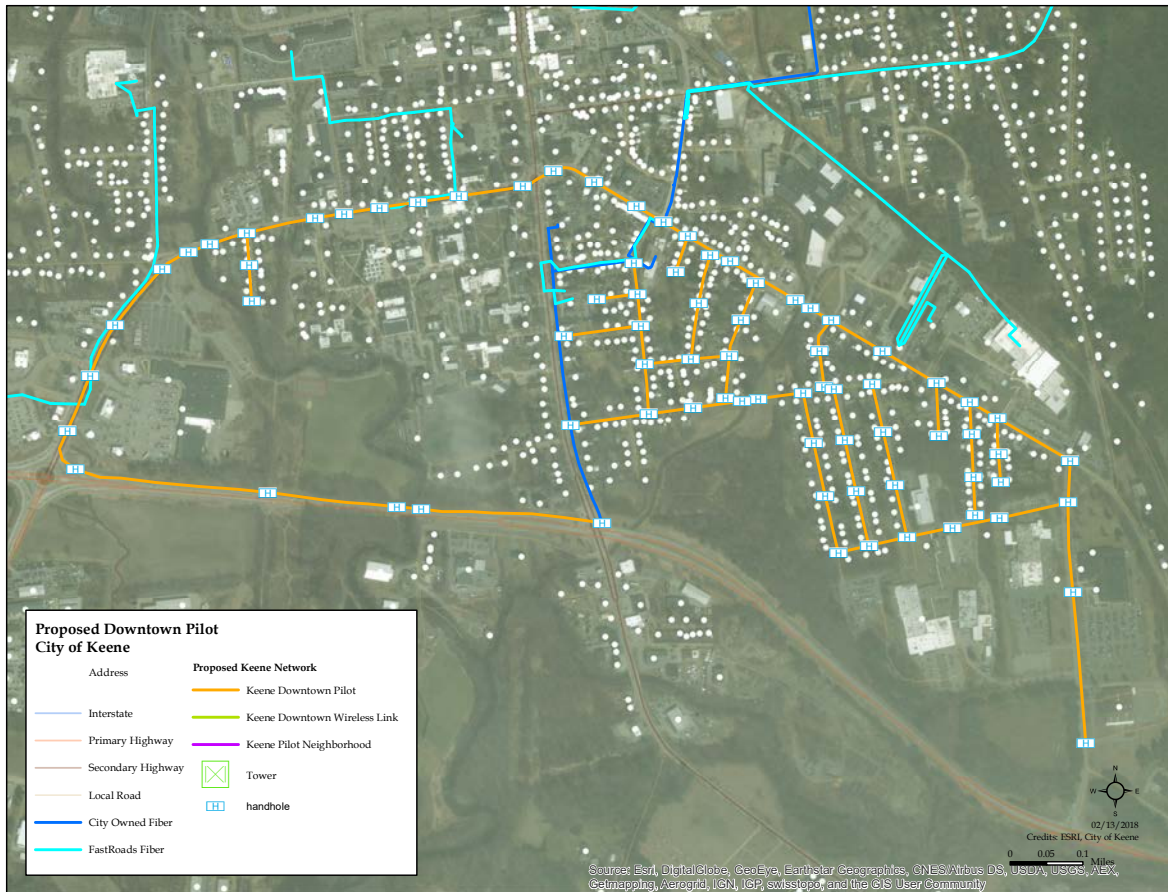
The Keene downtown pilot fiber would be a business and residential network with some opportunities for ring redundancy. The estimate includes a network shelter that would be constructed somewhere on city property. The shelter would serve as a meet-me point for service providers, and would have additional rack space available for future uses. Keene should also investigate the use of other co-location facilities in the city.

The cost tables in this section provide a pre-engineering estimate of the cost of constructing 5.5 miles of underground fiber construction around the pilot area. Handholes would be designed and placed for convenient customer fiber access (shorter fiber drops at less cost). Both business and residential Gigabit fiber connections would be available to any location along the entire route. The standard customer connection for both business and residential customers would be a Gigabit of bandwidth, and both GPON and Active Ethernet services can be offered. Active Ethernet is particularly important so that business class/carrier class services can be offered on the network.

The network can be extended easily to other neighborhoods or developments with additional fiber segments, and any additional equipment required would be placed in the colo facility. The network will support 10Gig, 100Gig, and light path services as requested by larger and enterprise business customers.

Proposed Neighborhood Pilot
City of Keene
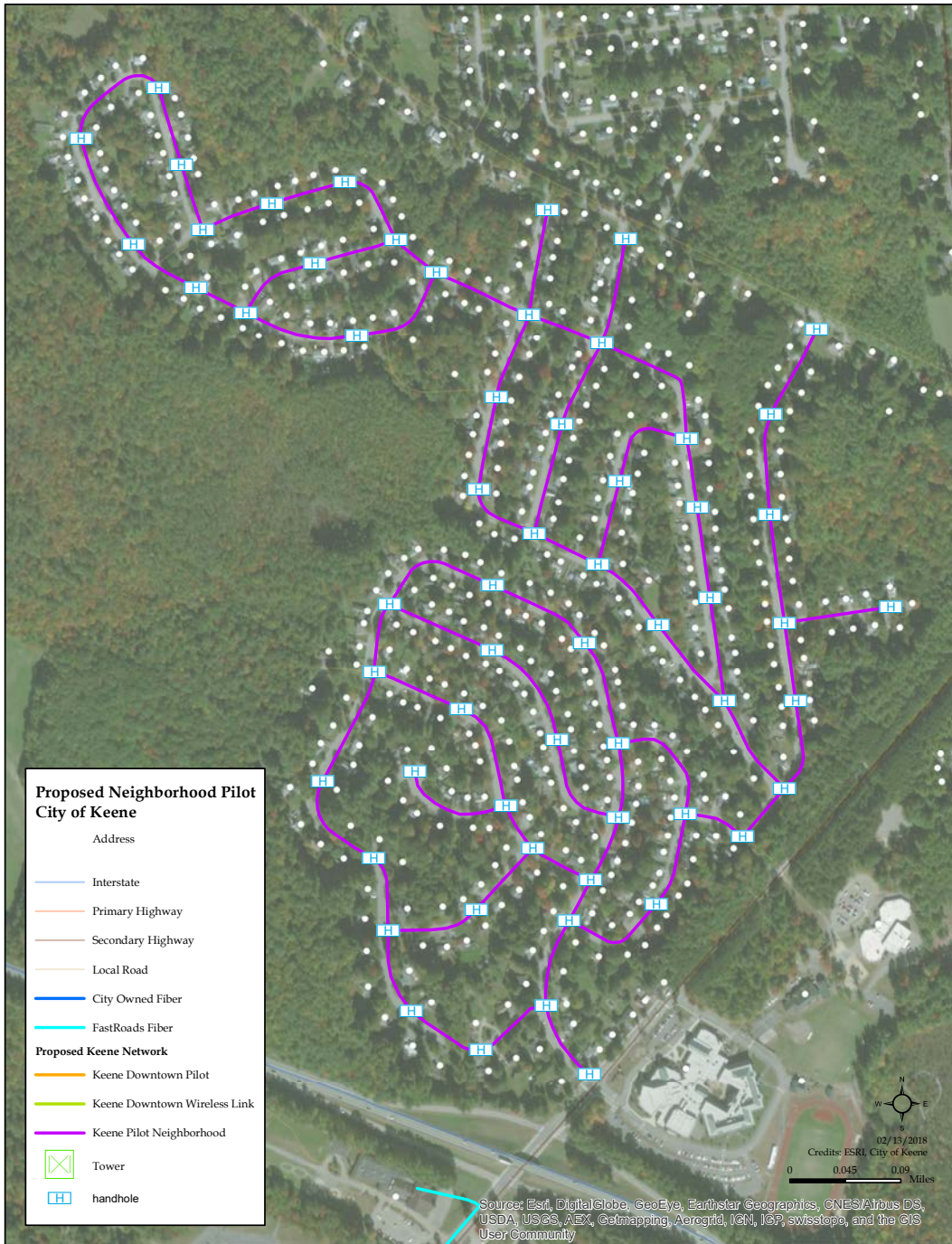
GIGABIT FIBER DOWNTOWN

Proposed fiber in Downtown Keene would be deployed to the premises shown in the map above covering areas adjacent to Marlboro Street, Winchester Street, and areas south.

The map at the beginning of this section shows the area where approximately 5.5 miles of fiber will be installed underground connecting homes and buildings on the network. The estimate of 479 homes passed was developed using address point data and visual inspection. For the mapped network routes, homes on both sides of the road were included as passed.

The Gigabit fiber infrastructure will provide businesses and residents with a state of the art network and a long term asset. The fiber will support telemedicine and telehealth services, distance learning and access to college classes, jobs from home, and businesses from home.

The tables below show key variables used when determining the network costs, and then a cost breakdown of the network overall.

Keene Downtown - Route Overview

0	ITEM/PROJECT	VALUE
1	Miles of Fiber / Conduit Installed	5.5
2	Number of Handholes Installed	95
3	Splice Closures Installed	96
4	Cabinets Installed	1
5	Number of Customers Connected	240
6	Take Rate - Percentage of the Buildings Passed who are connected with a drop and ONT	50%
7	Aerial - Percentage of construction labor expected to be installed on utility poles.	10%
8	Trenching - Percentage of construction installed by trenching (Mini-ex, bucket, hand dig, trencher).	10%
9	Boring - Percentage of construction installed by boring or other HDD methods.	55%
10	Slot Cutting - Construction installed in streets using diamond saws and similar specialty equipment.	15%
11	Rock Saw - Construction method used to install conduit in ROW where rock prevents the use of other methods.	20%
12	Direct Bury - Percentage of construction installed by direct bury methods (plow, vibratory plow,	0%

13	Aerial Info	200 ft average separation between poles. Pole replacements for 5% of poles. Light make-ready for 15% of poles. No heavy make ready expected.
14	FOSCs	Fiber Optic Splice Closures (FOSCs) placed for every 3 buildings passed. (3 drops to a FOSC)
15	Other Notes	Estimated labor rates are based upon common rates seen for recent medium sized rural projects.

Keene Downtown - Cost Summary

0	ITEM/PROJECT	ESTIMATED
1	Keene Downtown - Construction Materials	$106,736.00
2	Keene Downtown - Distribution Labor	$773,782.50
3	Keene Downtown - Structures, Cabinets, and Equipment	$124,495.00
4	Keene Downtown - Drop Construction	$480,600.00
5	Network Construction Subtotal	$1,485,613.50
6	Project Management, Network Engineering, Integration, and Testing	$222,842.03
7	Engineering, Permitting	$30,250.00
8	Misc Fees, Advertising, Technical Services	$2,500.00
9	Bookkeeping and Administration	$750.00
10	Other Costs Subtotal	$256,342.03
11	Project Total	$1,741,955.53
12	Contingency at 10%	$174,195.55
13	Project Total (with contingency)	$1,916,151.08

NEIGHBORHOOD GIGABIT FIBER

Proposed FTTH in residential neighborhoods would be deployed as shown on the previous maps. The neighborhoods selected for the pilot estimate are those across from the Keene Middle School and across 12A from Tanglewood Estates. In Keene, it is expected that construction costs will not vary significantly from place to place within the City. However, in residential-only areas the city is likely to realize a savings in the cost of installing a drop (reflected in the estimate).

Keene Neighborhood - Route Overview

0	ITEM/PROJECT		VALUE
1	Miles of Fiber / Conduit Installed		5.19
2	Number of Handholes Installed		90
3	Splice Closures Installed		93
4	Cabinets Installed		1
5	Number of Customers Connected		232
6	Take Rate - Percentage of the Buildings Passed who are connected with a drop and ONT		50%
7	Aerial - Percentage of construction labor expected to be installed on utility poles.		10%
8	Trenching - Percentage of construction installed by trenching (Mini-ex, bucket, hand dig, trencher).		10%
9	Boring - Percentage of construction installed by boring or other HDD methods.		55%
10	Slot Cutting - Construction installed in streets using diamond saws and similar specialty equipment.		15%
11	Rock Saw - Construction method used to install conduit in ROW where rock prevents the use of other methods.		20%
12	Direct Bury - Percentage of construction installed by direct bury methods (plow, vibratory plow,		0%
13	Aerial Info	200 ft average separation between poles. Pole replacements for 5% of poles. Light make-ready for 15% of poles. No heavy make ready expected.	
14	FOSCs	Fiber Optic Splice Closures (FOSCs) placed for every 3 buildings passed. (3 drops to a FOSC)	
15	Other Notes	Estimated labor rates are based upon common rates seen for recent medium sized rural projects.	

Keene Neighborhood - Cost Summary

0	ITEM/PROJECT	ESTIMATED
1	Keene Neighborhood - Construction Materials	$101,475.84
2	Keene Neighborhood - Distribution Labor	$731,838.60
3	Keene Neighborhood - Structures, Cabinets, and Equipment	$79,229.00
4	Keene Neighborhood - Drop Construction	$325,060.00
5	Network Construction Subtotal	$1,237,603.44
6	Project Management, Network Engineering, Integration, and Testing	$185,640.52
7	Engineering, Permitting	$28,545.00
8	Misc Fees, Advertising, Technical Services	$2,500.00
9	Bookkeeping and Administration	$750.00
10	Other Costs Subtotal	$217,435.52
11	Project Total	$1,455,038.96
12	Contingency at 10%	$145,503.90
13	Project Total (with contingency)	$1,600,542.85

WIRELESS TOWER COST ESTIMATES

During the planning stages in this project the Assisted Living Facility was identified as a project that would benefit from a wireless point to point connection to the network. To reach the assisted living facility a tower, or very tall wooden pole will be required (100' or taller). Since the site is wooded the City should conduct a visual line of sight analysis (balloon test) during the early tower siting efforts. Site acquisition and site preparation costs can affect the overall cost of such a project. Existing Keene properties (e.g. fire/rescue stations, City parks, dump transfer sites, etc.) may be candidates for point to point wireless sites.
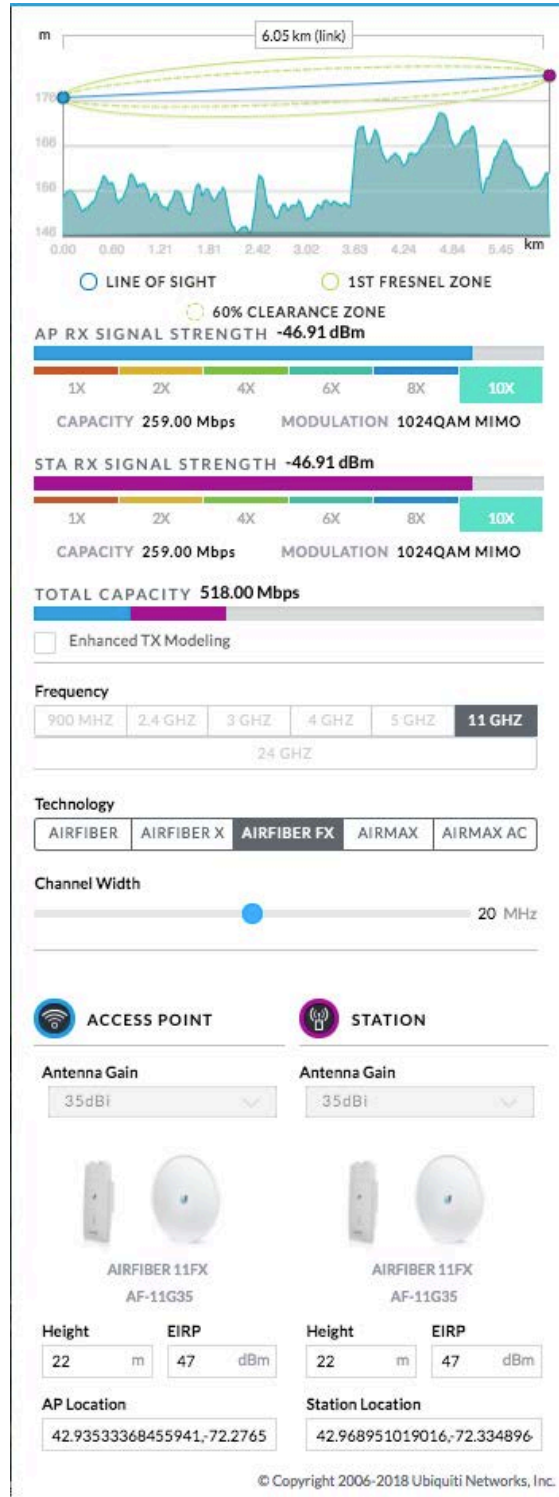
Wireless PtP Location 1 (Google Street–view Imagery)

Wireless PtP Location 1 (Google Street–view Imagery)

Wireless PtP Location 2 (Google Street-view Imagery)

WIRELESS POINT TO POINT LINK - COST ESTIMATES W/ TOWER

To extend a wireless link out to the assisted living development, it is likely that a tower will be required. If there is a elevated location on the property it may be possible to get wireless back to the network with just a large wooden utility pole. On the ground tower siting and visual line of sight testing will be necessary to make this determination. Switching from a tower to a wooden utility pole could reduce the cost by $30,000 or more. The following table goes through the costs of constructing a tower with a licensed point to point link back to the network.

I	ITEM/PROJECT	UNITS	UNIT COST LOW	UNIT COST HIGH	TOTAL (AVG)
2	Labor and Contracting: $5,925.00				
3	120' Lattice Self Supporting Tower Construction Labor & Contracting	1	$50,000.00	$65,000.00	$57,500.00
4	New Power Service / Installation	1	$1,250.00	$3,000.00	$2,125.00
5	Cabinet Installation Labor	1	$600.00	$1,000.00	$800.00
6	Power System Installation Labor	1	$300.00	$500.00	$400.00
7	Generator Installation Labor	1	$1,250.00	$1,700.00	$1,475.00
8	FCC License Coordination	1	$750.00	$1,500.00	$1,125.00
9	Materials: $13,235.00				
10	Small Telecom Cabinet	1	$4,000.00	$6,000.00	$5,000.00
11	Cabinet Foundation and Installation Materials	1	$1,000.00	$1,500.00	$1,250.00
12	10kW Liquid Propane Generator	1	$4,000.00	$6,000.00	$5,000.00
13	Spare Fuses	1	$10.00	$20.00	$15.00
14	Power System Installation Materials	1	$20.00	$40.00	$30.00

15	Samlex 1000W Inverter	1	$350.00	$450.00	$400.00
16	Samlex SEC1230-UL Battery Charger	1	$200.00	$300.00	$250.00
17	100ah 12v Non Spillable Backup Battery	4	$250.00	$350.00	$1,200.00
18	DC Voltage Monitoring Device	1	$40.00	$60.00	$50.00
19	Unmanaged Rack Mount PDU (6O)	1	$35.00	$45.00	$40.00
20	Wireless Equipment: $6,500.00				
21	Tower Site Switch (Cisco/Juniper/Equivalent)	1	$1,700.00	$2,300.00	$2,000.00
22	Point to Point Licensed Wireless (price per link) Carrier Class	1	$3,000.00	$6,000.00	$4,500.00
23	Ubiquiti AirFiber 5GHz un-licensed PtP	0	$900.00	$1,350.00	$0.00
24	Ubiquiti Access Point + 120° Sector	0	$375.00	$500.00	$0.00
25	LTE Broadband Base Station	0	$2,500.00	$3,000.00	$0.00
26	LTE Broadband Antenna(s)	0	$275.00	$350.00	$0.00
27	Total:				$81,160.00
28	Project Management, Network Engineering, Testing				$20,290.00
	Contingency				$8,116.00
	TOTAL:				$109,566.00
31	Notes/Assumptions:				

Financial Analysis

A ten year pro forma was developed to analyze the funding, revenue, and operating expense requirements for a fiber to the home/business project in Keene. Building a city-wide fiber network is not inexpensive, but it can generate revenue that can be used to pay back any loans needed to fund the capital expense, and over time, return some revenue to the City's General Fund.

 It is important to note that the recurring revenue generated is a monthly connection fee used to support the cost of managing and maintaining the physical network. In this model, that fee is $40/month. Fiber customers will choose from one or more service providers for retail services like Internet, voice, video, home security, tele-medicine, and business services.

PRO FORMA OVERVIEW

The pro forma summary includes the following data.

▶ Total Recurring Revenue represents payments for monthly service from fiber subscribers.

▶ Total Non-Recurring Revenue are one time construction payments collected from property owners who elect to be connected to the fiber network.

▶ Cost of Services are the direct expenses related to the operation of the network.

▶ Gross Profit and Gross Margin provide the standard business metrics for an enterprise.

▶ Sales, General, and Administration (SG&A) are the overhead and administrative costs of managing the enterprise.

▶ EBITDA (Earnings Before Interest, Taxes, Depreciation, Amortization) represents the net income before certain other expenses are accrued.

▶ Net Income compares expenses to revenue. Negative values indicate that expenses are higher than revenue.

▶ Cash At Year End is one of the most important values. A network may lose money for several years, but as long as the Year End Cash retains an adequate positive balance, the network can continue to grow and expand.

▶ Equity Provided represents the funds required to build the network. This does not include the Non-Recurring Revenue collected from connection fees.

▶ Total Debt indicates how much money has been borrowed to help build the network.

▶ Accumulated Capex shows the total amount of funds used for capital expenses.

- Book Value represent the value of the infrastructure after depreciation and amortization.

- Residential Fiber Take Rate indicates the percentage of customers who receive service. If 1000 homes are passed with fiber and 500 buy service, the take rate is 50%. It is not recommended to build fiber until a market demand study has been completed that shows that at least 50% of passed properties intend to buy services and pay the one time connection fee. Binding pre-service contracts are recommended. Market demand studies normally have two parts. The first step is a simple online survey that identifies neighborhoods and defined rural areas where at least 60% of residents and businesses indicate they are interested in buying services from an improved network. The second step is to collected binding pre-construction service agreements from those residents and businesses that indicated they are willing to buy service. The cost of the Web survey in the first step is minimal, but some marketing awareness will be required via neighborhood mailing lists, newspaper articles and other community news outlets. Collecting the binding agreements will probably require a combination of volunteer and paid (part time) help.

- Residential Subscribers indicates the projected number of connected fiber customers.

- Business Fiber Take Rate indicates the percentage of business customers who receive service.

- Business Subscribers indicates the projected number of connected business customers.

FIBER NETWORK FINANCIAL ESTIMATE

This pro forma projects the ten year results of a municipal fiber to the home (FTTH) in Keene that would provide service to more than 5,000 homes and businesses (not all homes and businesses are expected to take service in this model—a more conservative approach). In this model, some of the capital funds needed are provided by one time construction fees ($750) paid by property owners to get connected.

The fiber build out is modeled on an estimated four year fiber construction phase, with incremental growth starting in year five. For all ten years, between 400 and six hundred homes per year would be added to the customer base.

Revenue from the fiber connections is adequate to get the network into the black in year two; note that there is projected cash on hand in year one to cover the modest first year loss. By year four, the network could be generating enough revenue to support continuing expansion through year ten without any additional capital funds or loans from the City.

10 Year Financial Overview

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
REVENUE:										
Total Recurring Revenue	$90,471	$394,982	$676,425	$1,033,357	$1,376,746	$1,672,606	$1,999,457	$2,384,332	$2,777,953	$3,232,670
Total Non-Recurring Revenue	$376,513	$399,313	$431,131	$470,469	$287,550	$289,938	$306,106	$320,088	$336,256	$349,319
Other Services	$4,344	$20,088	$34,752	$50,520	$63,552	$73,584	$84,192	$95,328	$106,992	$119,208
TOTAL PROJECTED REVENUE	**$471,328**	**$814,382**	**$1,142,308**	**$1,554,346**	**$1,727,848**	**$2,036,128**	**$2,389,755**	**$2,799,747**	**$3,221,201**	**$3,701,197**
Cost of Services	$243,287	$310,372	$338,804	$371,247	$398,771	$422,185	$446,986	$473,422	$501,634	$531,809
Gross Profit	$228,041	$504,011	$803,504	$1,183,099	$1,329,077	$1,613,942	$1,942,770	$2,326,325	$2,719,568	$3,169,388
Sales, General & Admin Expenses (SG&A)	$378,568	$366,905	$374,421	$385,495	$344,445	$348,929	$355,422	$361,535	$368,113	$374,183
EBITDA	-$150,526	$137,106	$429,083	$797,604	$984,632	$1,265,014	$1,587,348	$1,964,791	$2,351,454	$2,795,205
Net Income	**-$150,526**	**-$44,306**	**$162,337**	**$307,679**	**$413,163**	**$648,819**	**$925,552**	**$1,258,819**	**$1,600,906**	**$2,001,881**
Cumulative Equity Provided	$4,600,000	$7,000,000	$9,000,000	$9,000,000	$9,000,000	$9,000,000	$9,000,000	$9,000,000	$9,000,000	$9,000,000
Total Debt (end of year)	$0	$0	$0	$2,005,000	$1,825,892	$1,634,247	$1,429,187	$1,209,772	$974,998	$723,791
Accumulated CAPEX	$4,517,254	$6,674,005	$8,777,007	$10,873,759	$12,073,880	$13,313,368	$14,576,219	$15,879,119	$17,206,272	$18,571,220
Book Value (net plant)	$4,517,254	$6,492,594	$8,327,312	$10,071,574	$10,833,238	$11,579,520	$12,291,660	$12,985,622	$13,642,810	$14,276,019
Cash-on-hand at year end	**-$15,959**	**$369,014**	**$699,628**	**$1,271,672**	**$740,896**	**$452,376**	**$461,908**	**$808,978**	**$1,520,092**	**$2,640,245**
Residential Fiber Take Rate	60%	63%	65%	68%	70%	73%	75%	78%	80%	83%
Residential Fiber Subscribers	543	1,131	1,765	2,444	2,851	3,281	3,734	4,209	4,707	5,227
Business Fiber Take Rate	35%	40%	45%	55%	60%	62%	65%	67%	70%	71%
Business Fiber Subscribers	12	18	24	39	53	54	57	59	61	62
Total Subscribers	555	1,149	1,789	2,483	2,904	3,335	3,791	4,268	4,768	5,289

It is important to note that City investment in fiber infrastructure will have a conservative life span of forty years or more (e.g. conduit, fiber cable). These types of infrastructure investments create hard assets that have tangible value and can then be leveraged for additional borrowing. The demand for services and the associated fees paid for those services will provide the revenue that will pay back loans over time. There is ample time to recoup not only the initial capital investment, but also to receive regular income from the infrastructure.
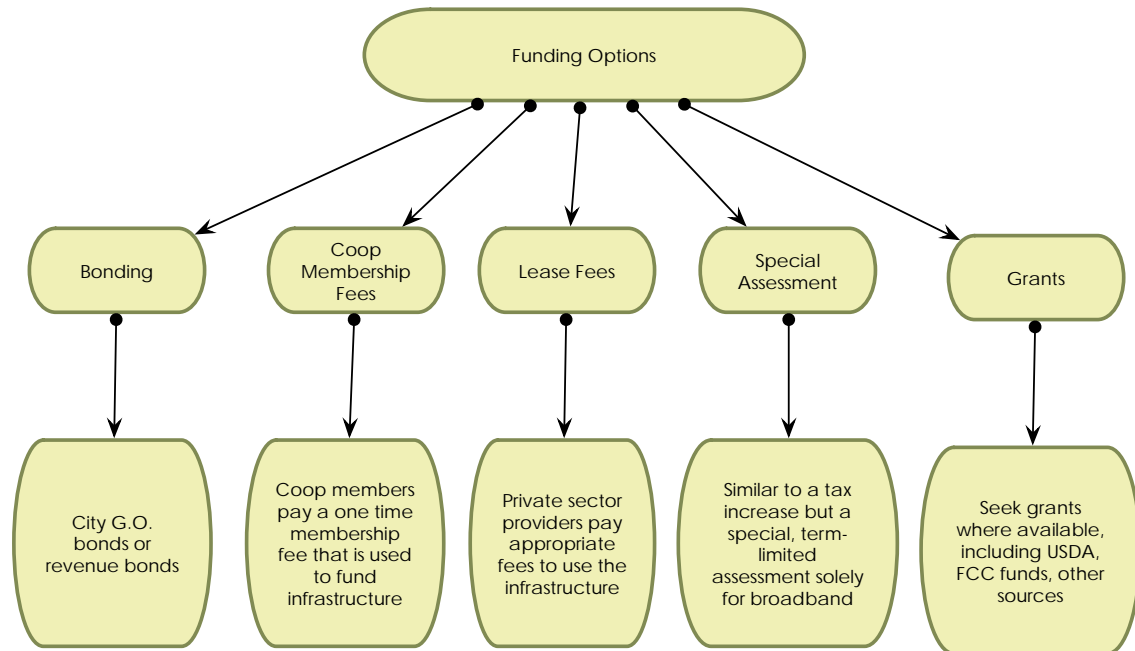
The financing of community-owned telecommunications infrastructure faces several challenges with respect to funding.

- Not all local governments are willing to commit to making loan guarantees from other funding sources like property taxes, because the idea of community-owned telecom infrastructure has a limited track record and therefore a higher perceived risk.

- Similarly, citizens are not always willing to commit to the possibility of higher taxes that may be needed to support a telecom infrastructure initiative, for many of the same reasons that local governments are still reluctant to make such commitments: perceived risk and a lack of history for such projects.

- Finally, banks and investors are also more skeptical of community telecom projects because of the relative newness of the phenomenon. By comparison, there are decades of data on the financial performance of water and sewer systems, so the perceived risk is lower.

Somewhat paradoxically, the cost of such a community digital road system is lower when there is a day one commitment to build to any residence or business that requests service. This

maximizes the potential marketplace of buyers and attracts more sellers to offer services because of the larger potential market. This is so because:

- Service providers are reluctant to make a commitment to offer services on a network without knowing the total size of the market. A larger market, even if it takes several years to develop, is more attractive.

- Funding agencies and investors that may provide loans and grants to a community network project want to know how the funds will be repaid and/or that grants will contribute to a financially sustainable project. Knowing that the size of the customer base is the maximum possible for a service area helps reduce the perceived risk for providing loans and grants.

BONDING

Revenue bonds are repaid based on the expectation of receiving revenue from the network, and do not obligate the local government or taxpayers if financial targets are not met. In that respect, they are different from general obligation bonds. Many kinds of regional projects (water, sewer, solid waste, etc.) are routinely financed with revenue bonds. We believe many community projects will eventually finance a significant portion of the effort with revenue bonds, but at the present time, the limited financing history of most community-owned broadband networks has limited the use of revenue bonds.

Selling revenue bonds for a start up municipal network can be more challenging because there is no financial or management history for the venture. Bond investors typically prefer to see two or three years of revenue and expenses and a track record of management success. It would be advisable for the City to have an early conversation with qualified municipal bond counsel to assess the viability of this approach.

Obtaining funding using revenue bonds requires an excellent municipal credit rating and an investment quality financial plan for the operation and management of the network. Revenue bonds must be used carefully, and a well-designed financial model is required to show investors that sufficient cash flow exists to pay back the loans.

General obligation bonds are routinely used by local governments to finance municipal projects of all kinds. G.O. bonds are guaranteed by the good faith and credit of the local government, and are not tied to revenue generated by the project being funded (i.e. revenue bonds). G.O. bonds obligate the issuing government and the taxpayers directly, and in some cases could lead to increased local taxes to cover the interest and principal payments. Some bond underwriters have indicated a willingness to include telecom funds as part of a larger bond initiative for other kinds of government infrastructure (e.g. adding $1 million in telecom funds to a $10 million bond initiative for other improvements).

In discussions with bond underwriters, it has been suggested that it would be easier to obtain bond funds for telecom if the telecom bonding amount was rolled into a larger water or sewer bond, or some other type of bond request that are more familiar to the bond market.

Coop Membership Fees

If a broadband coop were formed, coop one time membership fees could be used to provide a substantial portion of the needed funds. For fiber improvements, this fee could be set at a level that pays for part or all of the cost of building the fiber to the business or residential premises. It may also be possible to work with local banks to provide a financing option (e.g. the membership fee could be paid monthly over a period of several years to reduce the financial burden on a household or business). In this case, the coop would own and manage the network instead of the City.

Lease Fees

Initiatives like tower access and access to local government-owned conduit and fiber can create long term revenue streams from lease fees paid by service providers using that infrastructure. The City of Danville has recovered their entire initial capital investment from lease fees paid by providers on the nDanville fiber network.

Special Assessment

Communities like Bozeman, Montana and Leverett, Massachusetts have been funding broadband infrastructure improvements with special assessments (in Leverett, $600/year for five years), and in Bozeman, TIF (Tax Increment Funding) is being used in some areas to add telecom conduit, handholes, and dark fiber.

Connection Fees

Tap fees, pass by fees, and connection fees are already commonly used by local governments for utilities like water and sewer. The revenue share model can be strengthened from additional sources of revenue, including one time pass by fees, connection fees and sweat equity contributions.

Pass By Fees – Pass by fees could be assessed once the fiber passes by the property, just as some communities assess a pass by fee when municipal water or sewer is placed in the road or street– and the fee is assessed whether or not the premise is connected, on the basis that the value of the property has been increased when municipal water or sewer service passes by. At least one study has indicated that properties with fiber connections have a higher value by $5,000 to $7,000 than similar properties without fiber access.

One Time Construction Fees – A one time construction fee can be assessed to property owners (e.g. residents and businesses) when the fiber drop from the street to the premise is installed. This is similar to the kinds of connection fees that are typically charged when a property is connected to a municipal water or sewer system. The fee is used to offset the cost of the fiber drop and the Customer Premise Equipment (CPE) needed to provide the operational access to the network. The connection fee can be modest (e.g. $100) or it can be a larger percentage of the actual cost of the connection. Fiber CPE may range from $250 to $350 and a fiber drop may cost from $200 for a premise very close to the distribution fiber passing along

the property to $1,000 or more if the premise is hundreds of feet from the road. One variant would be to charge a minimum connection fee for up to some distance from the road (e.g. $100 for up to 75' and $2 for each additional foot).

There is already some data that indicates that residential property values increase by as much as $5,000 to $7,000 if fiber broadband services are available, so pass by fees can be justified on the basis of increased property values accruing to the property owner. Given the novelty of this approach, pass by fees may need more time to become an accepted finance approach, but tap fees (for installing the fiber cable from the street or pedestal to the side of the home or business) may be easier to use, especially for businesses that may need improved broadband access. Tap fees have the potential of reducing the take rate in the early phases of deployment, but as the value of the network becomes established, it is likely that there will be much less resistance to paying a connection fee.

GRANTS

Grant funding is limited and should be viewed as part of a larger basket of funding. Federal funds from sources like the USDA and the FCC are highly competitive and often come with substantial limitations on who can qualify and how the funds can be used. CDBG funds can support telecom infrastructure construction but must be tied to job creation and/or job retention.

The state of Minnesota has a broadband grants program that is offering significant funding to approved broadband projects. The state legislature has approved $20 million for the Border-to-Border grant program, which can provide up to 50% matching funds for broadband projects, with a maximum grant amount of $5 million. The application period for 2018 is not yet listed on the grant Web site, but if the dates are similar to those in 2017, applications should plan to be submitted by late summer (2018).

NEW MARKETS TAX CREDIT

New markets tax credits are a form of private sector financing supported by tax credits supplied by the Federal government. The New Markets Tax Credit (NMTC) Program permits taxpayers to receive a credit against Federal income taxes for making qualified equity investments in designated Community Development Entities (CDEs). The CDEs apply to the Federal government for an allotment of tax credits, which can then be used by private investors who supply funds for qualifying community projects. Substantially all of the qualified equity investment must in turn be used by the CDE to provide investments in low-income communities.

The credit provided to the investor totals 39 percent of the cost of the investment and is claimed over a seven-year credit allowance period. In each of the first three years, the investor receives a credit equal to five percent of the total amount paid for the stock or capital interest at the time of purchase. For the final four years, the value of the credit is six percent annually. Investors may not redeem their investments in CDEs prior to the conclusion of the seven-year period.

Throughout the life of the NMTC Program, the Fund is authorized to allocate to CDEs the authority to issue to their investors up to the aggregate amount of $19.5 billion in equity as to which NMTCs can be claimed.

These tax credits can be quite useful, and there may be some areas that qualify. However, it can take up to a year or more to apply and then finally receive NMTC-related cash. This can be a useful long term source of funds.

Risk Factors, Legal and Regulatory Issues

MARKET SIZE

Market size is a key consideration for evaluating risk. Market size (called "addressable market," or the number of potential customers) determines the level of interest of service providers, who are the primary customers of an open network. Certain kinds of services are essential to the financial viability of a community network, especially TV and telephone services. While telephone services can be offered affordably in even very small markets, the overhead costs of establishing a local or remote TV head end (equipment that manages and distributes the channels available from a provider) is still relatively expensive compared to providing other services like Internet access. A rule of thumb for evaluating market size is that a minimum of four to five thousand potential residential customers (households) are needed to attract an IP TV provider. Note that fiber is required for adequate TV package offerings.

The City of Keene represents a business opportunity for service providers who can make a business case for providing advanced services beyond Internet access, TV, and telephone: home health care, home security monitoring, computer backups, pay per view/video on demand, and other high margin services are going to become increasingly common. Alternatives to existing cable and satellite TV offerings will not become available until fiber connections are more widely available.

TAKE RATE

Take rate refers to the number of customers that actually subscribe to one or more services. Take rate targets are established in a detailed financial projection, and are adjusted over time as actual take rate data becomes available once the network is in operation. If the take rate is too low, revenues will not meet goals, and lowered revenues may affect the project's ability to pay its bills and maintain and operate the network.

Take rate projections are a significant risk factor in any project of any size, and must be considered carefully. Take rate risk can be managed by only building in areas where businesses have made a threshold commitment to buy a minimum dollar value of services (e.g. 40% of businesses in a defined area must commit in advance before build out would commence).

FUNDING

Excellent leadership and hard-nosed business management of the enterprise are essential to the project's ability to obtain necessary funding. Although the network may be operated as a government effort, it must be managed with the same attention to costs, revenue, and financial administration as any private sector business. The project must be able to develop and maintain "investment quality" financial reports and business models to attract private sector sources of funding like revenue bonds, municipal leases, commercial loans, and business contributions. If investments are restricted to basic infrastructure like tower sites, fiber, towers, and equipment shelters, maintenance costs will be relatively low and it should be possible to

structure attractive tower space lease rates to cover routine maintenance, minimizing financial risk and requiring limited funding.

SERVICE PROVIDERS

While in many respects a community broadband network shares many similarities with other public utilities (e.g. roads, water, sewer) there is one fundamental difference. Other public utilities like water and sewer have a captive audience and the utility is able to operate as a monopoly–meaning the customer base can be taken for granted. Based on our experience with service providers in southwest New Hampshire, we do not anticipate any difficulties obtaining service providers.

A community broadband network is a public/private enterprise, and service providers are the primary customers of the network. Service providers cannot be taken for granted. Instead, a fair fee structure, a high quality network, excellent maintenance and operations processes, and organizational flexibility will be required to recruit and retain service providers.

Projects that are not successful in attracting service providers will fail. Affordable lease rates for tower space and/or fiber connections will attract service providers. Other open access projects(e.g. Danville, VA; New Hampshire FastRoads,; Bozeman Fiber; Utopia/Salt Lake City area) have not had any difficulty getting service providers to use the infrastructure. Indeed, the Utopia project has twenty-three providers on its network.

TECHNOLOGY

A question that often dominates early discussions of community broadband projects is, "Are we picking the right technology and systems?" Everyone has experienced the rapid obsolescence of computers, cellphones, printers and other IT equipment.

There is always some risk associated with making a substantial investment in a network. However the risk can be managed. In a predominantly fiber network, a large portion of the investment will be dedicated to getting fiber in the ground or on poles throughout the community. Properly installed fiber has a minimum 25 to 30 year useful life, and fiber installed by the telephone companies in the seventies is still in use today. Fiber also has a useful property not shared with other public systems like water, roads, and sewers. The capacity of fiber can be increased without replacing the fiber or adding additional fiber. Instead, fiber capacity can be increased indefinitely by replacing the electronics at each end of the fiber. This means that a community investment in fiber creates a stable, long term asset for the community with long lasting value.

The equipment used to light the fiber has a shorter useful life, and is usually depreciated over a period of 7 to 9 years. Some equipment may remain useful longer than that. Wireless equipment must be replaced much more often (typically 2 to 4 years of useful life) because it is typically exposed to much harsher conditions (extreme heat and cold, lightning strikes, ice, snow, rain, wind).

The primary technology risk is selecting a vendor who provides equipment that does not perform as advertised. This risk can be managed by a careful procurement process which would include a careful analysis of network capacity and features, detailed RFPs that specify equipment features and functions explicitly, and a thorough RFP evaluation process.

LEGAL AND REGULATORY ISSUES

Community-owned broadband projects are subject to state and Federal regulations of various kinds, but unless a project is offering retail services (e.g. the local government is selling Internet, TV, and/or voice services directly to residents and businesses), there are limited regulatory issues. The City of Eagan, Minnesota's AccessEagan Gigabit fiber network has been in operation for seven years, and has four private sector service providers offering services. There has never been an incumbent legal challenge because incumbent providers like Comcast and CenturyLink have been invited to use the network (both have repeatedly declined).

The key strategy is for community-owned projects to adopt the wholesale model of leasing passive infrastructure like towers and dark fiber and for active networks (with network electronics) to lease circuits to providers on a wholesale basis rather than selling retail services. The Utopia project, which offers services in fourteen communities in the Salt Lake City area, has been targeted in the past as a "failed" effort but has overcome some early financial challenges and today has 23 private sector providers offering a wide range of price points and service packages—delivering true choice and competition to citizens and businesses. The wholesale model is not subject to many of the FCC (Federal Communications Commission) regulatory requirements.

Getting Started

PLANNING FOR SUCCESS

With more than a dozen years of operation for a variety of community-owned network infrastructure projects around the country, there is very little "experimentation" that is still necessary. With more than three hundred communities making investments in broadband infrastructure, there is now enough information about what works and what does not work to be able to identify best practice across nearly all areas of operations, planning, management, and finance.

It is now relatively easy to identify the obstacles, challenges, and opportunities that the city is likely to face if it moves forward.

FOCUS ON ECONOMIC DEVELOPMENT

Many communities have made investments in broadband and have been disappointed in the results. What we have seen is that without a well-defined set of goals for the effort, community broadband projects have trouble delivering the hoped-for results. The "quick win" for Keene is to maintain an early focus on broadband improvements that will support rural businesses, work from home, and job from home activities. The effort will need early support from the community, and marketing the project becomes critical, with clear explanations of the benefits to businesses and residents(like lower costs, improved service, and business expansion opportunities).

FUND FOR SUCCESS

Successful projects provide enough funding to support eighteen to twenty-four months of operations. There are a variety of fixed costs (staffing, outside plant maintenance, network operations, utility costs, office costs, etc.) that accrue beginning on day one, when revenue is low. While some community projects have been successful getting into the black operationally in year one, it sometimes takes longer.

DEVELOP A DIG-ONCE POLICY

The value of a dig once policy is discussed in an earlier section of this report.

USE GRANTS AS SUPPLEMENTAL FUNDING

Grants can be extremely important in the early stages of an effort to support planning activities and/or to fund a Phase One build out initiative. But grants rarely will allow spending on operational expenses. Grants should be used to supplement other sources of funding and as one time cash injections to support very specific goals. Communities that have relied too heavily on "the next grant" as a key source of expansion or operational funding usually experience severe financial problems.

MANAGE FINANCES

Broadband infrastructure projects require hard-nosed financial oversight. Projects that have developed financial problems have usually over-estimated early revenue, under-estimated

expenses, and/or simply spent too much without aligning expenses with revenue. Any effort in Keene should maintain a tight focus on setting financial targets, managing to meet those targets, and tracking costs and revenue.

Use take rate targets as a key performance measure

The initial business plan should have a minimum three to five year projection of connected premises (i.e. the take rate), including city facilities, large and small businesses, health care facilities, and residential customers (for wireless). Take rates directly affect revenue: if take rate projections are not being met, revenue shortfalls are likely. Take rates (both raw numbers and month to month growth rates) should be analyzed at least quarterly (monthly would be preferable).

Plan for marketing and public awareness efforts

If a citywide broadband initiative moves forward, it will be necessary to have a modest but regular marketing and awareness campaign to ensure that local businesses know that the new dark fiber network is available, that they know what service providers are available on the network, and they know how to order service. While service providers will be responsible for sales (that is, selling their services and signing up their own customers), the network itself will have to market general awareness of the network.

Plan for Expansion

Most community-funded efforts start small. This minimizes financial risk and gives the senior leadership the opportunity to learn on the job. But some projects tend to stall out after the first year or two. The underlying problem is twofold: even small networks have a certain amount of fixed operational costs regardless of size, and the network needs enough revenue to pay those expenses, as well as make principal and interest payments on any loans. The second problem is that network infrastructure is sometimes damaged and needs both emergency and routine maintenance. Lack of funding to keep the network in good condition will degrade service over time. The solution is to have an expansion plan (which could be modest) that contributes to revenue growth over time.

Budget for Customer Connections

If the network is going to achieve financial sustainability, new customers have to be added on a schedule that matches the financial projections. This means the project must have the funds to support adding customer "drops" from the distribution fiber on poles or underground in right of way at the edge of the street or road. This is where careful budgeting and adequate funding is a necessity. The worst possible outcome is to have business and residents requesting a connection to the network but having a lack of the funds to make that "last hundred feet" connection. There are a variety of charge back and fee-based strategies for raising the capital needed to complete drops, and a plan that supports funding of new customer connections is essential.

IMPLEMENTATION PLANNING

For Keene, the development of a successful community-owned wholesale network will require attention in several areas including the technical (network equipment selection), engineering and construction, and business and financial planning. It is important to note that the business and financial planning are critical elements that will in large part determine the long term success of the effort. This section provides an overview of the key task areas and activities.

The illustration below shows the sequence of key phases and activities in the course of a network project. On the pages following this diagram is more detailed information about the individual tasks and activities that will lead to successful completion of a fully operational network, including the business processes required.

Feasibility Study	Decision point: Is this something the community wants to do?	Implementation Planning	Project Implementation	Operations
Needs Assessment and Market Analysis		Business and Financial Planning	Procurement	Service Provider Management
Pre-engineering Cost Estimates		Survey and Route Engineering	Construction Management	Network Operations
Financial & Business Modeling		Engineered Cost Estimates	Network Installation and Testing	Outside Plant Maintenance
Governance Planning		Network Architecture Design	Business Process Development	Financial Management and Funding
Mapping		Equipment and Materials Specifications	Network Operations Design	Marketing and Awareness
Financing Strategies		Service Provider Development	Service Provider Negotiations	Business Administration
Recommendations & Next Steps			Contracts, agreements, and leases	
			Marketing and Awareness Planning	
4-6 Months		6-9 Months	Variable	Ongoing

A successful project requires a plan that ensures the right resources are available at the appropriate times during the various phases of development. Some resources must be identified and procured during the planning phase, some during the implementation and construction phases, and some during the operations phase.
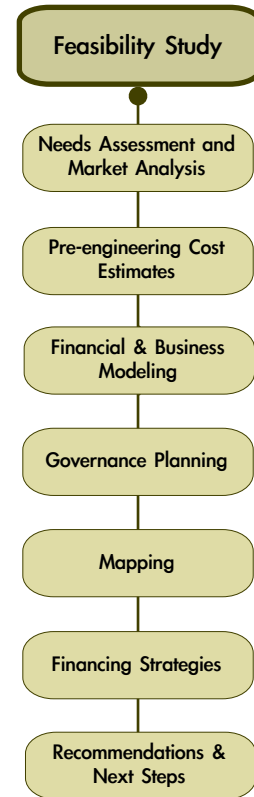
▶ **Financial Planning** – Financial planning includes the development of short term and long term budget estimates and pro-formas. These materials form the basis of developing a funding plan, as well as providing a solid base for ongoing evaluation of the success of the enterprise.

▶ **Business Model** – The business model selected determines the kind and type of revenue that will be generated by the project, and also affects the kind and type of expenses that are incurred. For community-owned infrastructure, there are two basic models. A "retail" network has business and/or residential customers buying services directly from the local government, which creates direct competition with local private sector providers. The alternative is the "wholesale" model, in which the community-owned infrastructure is leased out to private sector providers on a wholesale basis--the local government sells no retail services and does not compete with the private sector.

▶ **Legal Counsel** – Whether the retail or wholesale business model is chosen, there is a short term and long term need for legal counsel familiar with telecom and broadband business agreements and contracts. Well written contracts with service providers protect the network and create a fair and equitable "level playing field" for competitive providers.

▶ **Engineering** – Whether fiber cable is hung on utility poles or placed underground in conduit, prior to construction, the routes must be surveyed and engineered drawings must be developed to meet DOT (Dept. of Transportation) requirements and to provide contractors with the information needed to construct the network to industry and state technical requirements.

▶ **Network Design** – The logical design of the network must be matched to the business model, as the architecture of the network may vary according to a retail or wholesale model. The network design must also meet the requirements of large and small businesses, and for large businesses with extensive broadband and data needs, the network must be capable of meeting both current needs and future growth.

▶ **Equipment** – Once a network design is complete, an evaluation of equipment vendors must take place, ideally via a bidding process to ensure that the selected equipment will meet all of the business and technical requirements of the network, at the best possible price. A Total Cost of Ownership (TCO) evaluation should be completed to ensure that the right initial price is balanced with the longer term costs of extended warranties and technical support. The least expensive purchase price for equipment may be more expensive over time than equipment from a vendor with a higher initial equipment cost but lower support and warranty fees.

▶ **Build Out** – While fiber construction is generally much less expensive than other typical community projects like water and sewer development, care must be taken to select contractors with the appropriate experience installing fiber in both aerial and underground designs. The cost of construction can vary widely, so the development of very specific bid documents that include the right engineering information as well as a carefully structured proposal response on pricing is needed to ensure the community obtains the right contractor at the right price.

PHASE ONE: FEASIBILITY/EARLY PLANNING

This report represents the early phase planning identified in this section. The work includes:

▶ **Needs Assessment and Market Analysis** – An evaluation of current assets and projections of future needs, based on local business and economic conditions.

▶ **Pre-engineering Cost Estimates** – Pre-engineering cost estimates of potential network projects provide a baseline for understanding the costs of getting started, provide necessary inputs to the financial pro forma development, and also inform funding strategies. Cost estimates have been included in earlier sections of this report.

▶ **Financial and Business Modeling** – An understanding of the revenue potential and operational costs is needed to make a decision to move forward.

▶ **Governance Planning** — Before making a commitment to move to implementation planning, it is necessary to have a basic understanding of the key operations and management tasks related to operating the enterprise.

▶ **Mapping** – Mapping of current assets, areas and business locations of needs, economic growth areas, and key customers and stakeholders informs the development of the network architecture and the financial planning.

▶ **Funding Strategies** – Before moving to the next steps, it is vital to understand where the planning, engineering, and initial construction funds will come from. There are many options available.

▶ **Next Steps** – A list of key activities and milestones needed to move the project ahead.

Feasibility Study

Needs Assessment and Market Analysis

Pre-engineering Cost Estimates

Financial & Business Modeling

Governance Planning

Mapping

Financing Strategies

Recommendations & Next Steps

PHASE TWO: IMPLEMENTATION PLANNING

This phase produces the equipment and construction specifications needed to bid out the work of constructing the network. If the city makes the decision to move forward, many of these activities would become part of the "next steps."

Implementation Planning

Business and Financial Planning

Survey and Route Engineering

Engineered Cost Estimates

Network Architecture Design

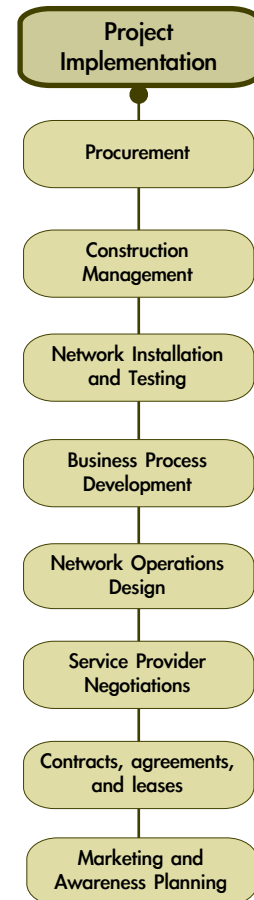**Equipment and Materials Specifications**

Service Provider Development

▶ **Business and Financial Planning** – A more detailed business and financial plan is developed. This includes planning how the business front office and back office will be run.

▶ **Survey and Route Engineering** – An on the ground survey is needed to complete a final route design. This work is performed by an engineering firm that also has the responsibility to produce the engineered design and obtain required permitting. The field survey confirms that the final route can be built to the necessary standards and regulations.

▶ **Engineered Cost Estimates** – If the engineering firm will not perform the build, the full drawing set is attached to the construction bid documents and becomes the basis for the awarded construction contract.

▶ **Network Architecture Design** (Detailed) – Final analysis of vendor equipment is performed and selection is made.

▶ **Equipment and Materials Specifications** – The Engineering firm also completes a detailed list of all equipment required for the construction.

▶ **Service Provider Development** – In an open access network, service providers have to be recruited and formally signed to a contract to become a provider on the network. Providers usually need "coaching" because they are typically unfamiliar with open access networks and need help understanding the unique business opportunities they represent for private sector companies.
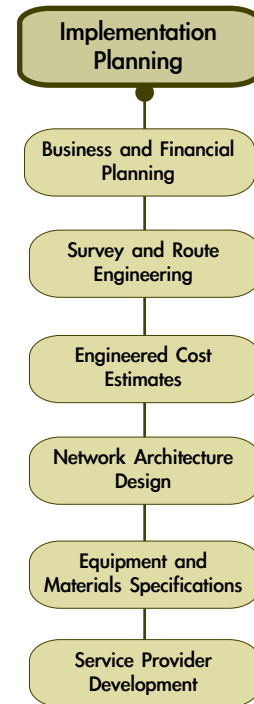
PHASE THREE: PROJECT IMPLEMENTATION

The documents produced in the Implementation Phase are used to bid out the construction work and to procure the network equipment needed to produce an operational network.

▶ **Procurement** – At the beginning of the construction phase the work will be bid out to qualified contractors.

▶ **Construction Management** – The construction work is bid out and an award is made to a qualified contractor with the best price. It is common to negotiate the final cost of this work once a firm has been selected.

▶ **Network Installation** – Network materials are ordered from a vendor that meets the technical specifications. The dark fiber approach does not have any powered equipment other than a generator for the dark fiber cabinet.

▶ **Business Process Development** – During the construction phase, business and operational decisions must be made to produce a set of business processes that will guide the day to day operations of the network.

▶ **Service Provider Negotiations** – Negotiations with qualified service providers continues.

▶ **Contracts, Agreements, and Leases** – The construction phase will generate the need for a variety of legal documents. Some will be related directly to the construction (e.g. an easement agreement to have conduit cross property)

▶ **Marketing and Public Awareness** – As the network is constructed, a modest but ongoing public awareness and publicity effort is required to ensure that business customers, schools, local government agencies and other potential users of the network are aware of the project and the possibility of reducing costs and obtaining more and better services.

Project Implementation

- Procurement
- Construction Management
- Network Installation and Testing
- Business Process Development
- Network Operations Design
- Service Provider Negotiations
- Contracts, agreements, and leases
- Marketing and Awareness Planning

PHASE FOUR: ONGOING OPERATIONS

Once the network is completed, service providers are connected first and then their customers receive connections. At that point, the enterprise becomes operational and a variety of ongoing tasks and activities begin to take place.

▶ **Service Provider Management** – Service providers sell directly to their own customers. Once they have obtained a new customer that is passed by distribution fiber, they contact the network to get either a physical fiber connection completed (e.g. from the curb to the building) and/or a logical connection across the network to deliver the service requested by the customer (e.g. Internet, phone, data backup, etc.).

▶ **Network Operations** – In the dark fiber model recommended for the region, network operations will be very limited and there would be limited day to day management responsibilities. Some monitoring of the dark fiber would be required, but this could be outsourced economically, and the main responsibility would be to coordinate emergency repairs if there is a fiber break of some kind (e.g. errant backhoe, etc.).

▶ **Network Maintenance** – While routine maintenance (e.g. replacement of worn out equipment) may be limited in the first year or two, non-routine/emergency maintenance support must be in place as soon as the network has customers. Fiber is occasionally damaged (e.g. tree limb falling on aerial fiber, backhoe damaging buried fiber), and a qualified firm must be available to back repairs within two to four hours. This service is usually outsourced to a qualified private sector company.

▶ **Business Administration and Financial Oversight** – A dark fiber network only has a small number of customers, which are the connected service providers. Prudent and careful financial management is needed for accounts receivables and accounts payables, along with other normal bookkeeping activities--chart of accounts maintenance, bank deposits, check writing, and other tasks.

▶ **Marketing and Awareness** – While service providers will be responsible for their own marketing and sales efforts, an ongoing modest awareness/marketing campaign is required to ensure that customer take rate targets are met.
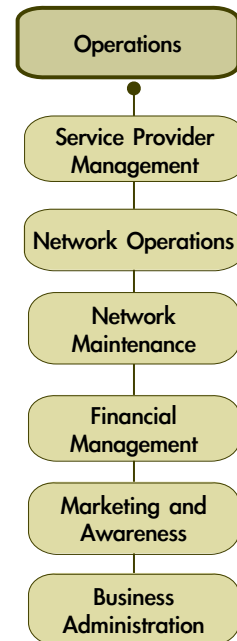
Assessing Demand In the City of Keene

A survey was conducted to determine the market for improved broadband access and affordability. The study was an online and paper survey of residents and businesses in the City of Keene.

The surveying was conducted through an online (Internet) survey and paper survey. Paper surveys were available at the City Clerk's Office to help capture data from residents and businesses who may not have Internet access at home or their place of work.

Paper submissions were returned to the City Clerk's Office. Both the online survey and the paper form were available to any business or resident with no specific target group. The study was done to determine the following:

- Satisfaction with current telephone, Internet/data, and TV service

- Demographic information

- Types of Internet connections

- Current Internet usage and purpose

- Importance of Internet access

- Willingness to pay more for faster, higher quality Internet access

- Cost of services

- Current service providers for telephone, Internet/data and TV service

- Information about residents who work from home

This market research can be very useful in setting priorities for next steps, and can be an important part of state and Federal funding and grant opportunities.

KEY RESULTS OF THE RESIDENTIAL SURVEY

A total of 172 responses were collected. 20 responses were removed from the final analysis because the responses fell outside the city limit or because they were duplicates. Not all responders answered every question. The full data is contained in Appendix A.

Some of the key data points that resulted in the survey include:

- 90% of the respondents desired better Internet/data service.

- 64% of the respondents desired better cellular telephone service.

- 89% of the respondents were not satisfied with all of their services.

- 98% of respondents reported that the Internet is very important to their household.

- 69% of respondents used a cable modem, and 23% of the respondents used a DSL line for Internet access.

- 58% of respondents have the type of Internet they have because there are no other options available.

- 59% of respondents reported they have trouble viewing online videos/lectures/ movies/TV shows.

- 62% of respondents reported they have trouble using the Internet when others are using it.

- 22% of respondents paid $61-$80 per month for their Internet service, and 25% paid $41 to $60 per month.

- 34% reported their Internet speed to be between 10 Mbps and 35 Mbps download. 18% indicated they do not know their Internet speed.

- 35% of the respondents indicated that at least one individual in their household uses / needs the Internet to complete school assignments or job training several times a week.

- 14% of the respondents need nights and weekends access for the company business.

- 16% are self-employed and trying to work from home part time or full time.

- 27% work for another company and are trying to work from home part or full time.

- 43% of respondents are trying to use their home Internet connection for work at least part time work not including weekends or week nights.

CURRENT SATISFACTION OF EXISTING SERVICES

Overall, the respondents felt a need for better cellular telephone service, Internet/data service, and Cable/TV service. 90% of the respondents desired better Internet/data service and 64% of the respondents desired better cellular telephone service. In addition, more than half of the respondents felt the need for better Cable/TV service. 68% of the respondents agreed the price they pay for the service they receive is unreasonable. 89% of the respondents are not satisfied with all of their services. This data indicates that residents generally are in need of better services that can offer reliability, speed, and a better price point.

HOUSEHOLD COMPOSITION

From the sample, 11% of the respondents live in a household of three adults and 67% live in a household with two adults. 29% of respondents have anywhere between one to three K-12 students in their household. 70% have zero k-12 children in their household. 13% have one to two college students in their household. 87% have zero college students in their household. 41% of the respondents live in a household with two Internet users, and 23% of the respondents live in a household with 3 Internet users.

EXISTING INTERNET CONNECTION TYPE, SPEED, AND PRICE

Of the respondents who have an Internet connection, 69% used a cable modem for Internet access and 23% used a DSL line. 1% of the respondents were still on a dial-up connection. 34% reported their Internet speed to be between 25 Mbps and 10 Mbps. 17% of respondents reported their Internet speed to be less than 10 Mbps. In terms of cost, 22% of the respondents paid between $61 to $80 per month for Internet access and 25% paid $41 to $61 per month.

USE OF THE INTERNET

The respondents of the survey used the Internet for a variety of reasons. Some of the main uses of the Internet include checking and sending email, accessing news and current events, social networking, shopping, and banking online. 31% of respondents connected 5-6 devices to their home Internet service, and 24% of respondents connected 7-8 devices to their home Internet service.

An open response question was asked following this question about any other additional uses of the Internet. Respondents use the Internet for business and security purposes as well. 35% of the respondents indicated that at least one individual in their household uses the Internet to complete school assignments or job training at least several times a week.

When asked if the respondents work from home, 14% of the respondents need nights and weekends access for company business. 43% of the respondents work either part time or full time from home remotely as self-employed or for another company.

SATISFACTION WITH SPECIFIC SERVICES

17% are satisfied and 6% are very satisfied with the speed and reliability of their Internet service. 59% of the respondents answered that they have trouble viewing videos, lectures, movies, and/or TV shows, and 62% of the respondents answered that they have trouble using the Internet when others are using it. Lastly, 25% of the respondents were not at all satisfied with their Internet speed and reliability.

CURRENT COSTS AND PROVIDERS

24% of the respondents pay between $100 to $150 for local and long distance telephone, TV, and Internet per month. For an Internet service provider, the majority of residents use Spectrum and 22% of respondents left the question blank. 48% of the residents have only cellphone service as their at home telephone service, and 49% have both cellphone and landline telephone service as their at-home telephone service. As for cable / satellite TV services, 38% of residents use Spectrum and 14% use DireTV. 19% (None) choose not have any cable / satellite TV service. The residents of the City of Keene seem to lack satisfactory options in terms of price and providers.
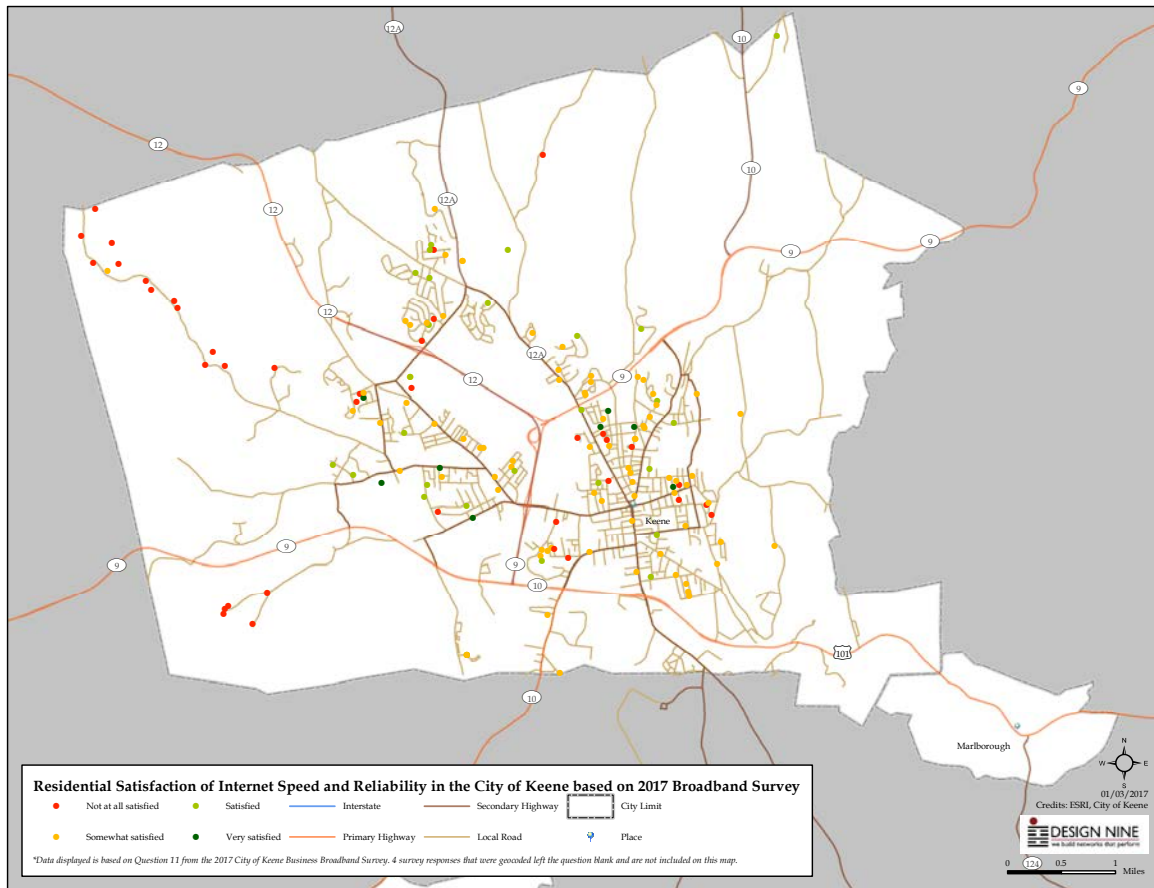
WILLINGNESS TO PAY

When asked if what the respondents would be willing to pay for a faster, higher quality Internet access, 19% said that they would pay between $61 to $80 per month and 32% said they would pay $41 to $60 per month for faster, quality Internet access.

SERVICE DESIRED

Respondents were asked if there were any additional telecommunication needs that were not covered in the survey. A number of the respondents stated that they they would like to see the City of Keene invest in improved broadband options. In addition, almost all respondents desired a reliable Internet connection that is not limited due to geographic location and offered at a fair price.

Below is a map of the residential survey results. 4 survey responses were not geo-code out of the 159 responses that were eligible because only a partial address was provided, no address was provided, or the address could not be located.

Residential Satisfaction of Internet Speed and Reliability in the City of Keene based on 2017 Broadband Survey

● Not at all satisfied	● Satisfied	—— Interstate	—— Secondary Highway	⬜ City Limit
● Somewhat satisfied	● Very satisfied	—— Primary Highway	—— Local Road	⚲ Place

Data displayed is based on Question 11 from the 2017 City of Keene Business Broadband Survey. 4 survey responses that were geocoded left the question blank and are not included on this map.

KEY RESULTS OF THE BUSINESS SURVEY

A total of 34 responses were were collected. 1 response was removed because it fell outside the study area. Not all responders answered every question.   The full data is contained in Appendix B.

Some of the key data points that resulted in the survey include:

- 65% of respondents are not satisfied with all their services.
- 77% of respondents responded that they needed better Internet/data service.
- 97% of respondents stated that the Internet is essential to their business.
- 39% of respondents used a cable modem for Internet access while 19% used a DSL line for Internet access.
- 35% of respondents have the type of Internet they have because there are no other options available.
- 35% of respondents paid between $51 to $100 per month for Internet access. 13% paid between $101 to $150 for Internet.
- 31% of respondents have 10-50 Mbps download speeds and 6% have 1-5 Mbps download speeds.
- Only 6% of respondents answered they were very satisfied with the current speed and reliability of their Internet service. 34% of respondents replied that they were not at all satisfied with the current speed of their Internet service.
- 41% of respondents indicated that the speed they want is not available at their business location.
- 34% of respondents indicated that their Internet service provider has slow or poor technical support.
- 100% of respondents indicated that they found Internet technology to be a very important factor in the success of their company over the next five years.
- 28% of respondents need to work from home occasionally.
- 37% of respondents indicated limited Internet access at employee's residence impacts their business.
- 83% of respondents would not relocate their business due to existing Internet options.

CURRENT SATISFACTION OF EXISTING SERVICES

Overall, respondents felt a need for better telephone service, Internet/data service, and cellular service. 44% of the respondents desired better cellular telephone service, and 77% of the respondents desired better Internet/data service. 31% of the respondents indicated the price they pay for Internet service is unreasonable, and 34% indicated their Internet service provider had slow or poor technical service. 65% of the respondents were not satisfied with all of their services. This data indicates that businesses generally are in need of better services that can offer reliability, speed, and a better price point.

ESTABLISHMENT INFORMATION & EMPLOYEE COMPUTER USAGE

97% of the businesses that responded to the survey indicated that an Internet connection is essential to the business. Of the 34 businesses that responded to the survey, 32 businesses reported they have an average of 38 Internet users per business.

A variety of establishments responded to the survey, which include Professional / Office, Government, Retail / Whole sale, Medical, Non-Profit, Educational, Vocational & Skilled Trades, Restaurant / Food Services, and Other. Retail / Wholesale businesses (34%) were the highest number of responders to the survey. Professional / Office and Other followed by at 25% equally. Other establishments included cyber security, dance and fitness, online retail and training, real estate, and software development.

EXISTING INTERNET CONNECTION TYPE, PRICE, AND SPEED

A cable modem provided Internet access to 39% of the respondent and as DSL line provided Internet access to 19% of respondents. More than half of the respondents paid $51 and up for Internet access each month. The largest proportion of respondents (35%) paid $51 to $100 for Internet access each month. 31% of the respondents had Internet speeds between 10-50 Mbps, while 9% of the respondents had Internet speeds between 5-10 Mbps. 28% did not know the speed of their Internet. In addition, 38% of the respondents were somewhat satisfied with the current speed and reliability of their Internet service, while only 6% were very satisfied with their current Internet speed and reliability.

USE OF THE INTERNET

Respondents were asked how they currently used the Internet to serve their needs at their respective establishments. The most common uses of the Internet were email, online backup, transfer of large files, maintaining a web presence and ordering and managing inventory. 94% of the respondents used the Internet to maintain a Web presence with a blog or other site.

AFFORDABLE PRICE FOR 1 GIGABIT INTERNET SERVICE SPEED

Survey respondents were asked to provide what they thought was a affordable price for 1 Gigabit Internet service speed. This was an opened questions. Respondents indicated that 1 Gigabit Internet service speed is worth as low as $50 per month to as high as $100 per month.

IMPORTANCE OF INTERNET TECHNOLOGY

100% of respondents found Internet technology to be a very important factor in the success of their company in the next five years. Furthermore, 97% of the respondents indicated that the Internet is essential to their business.

EXISTING SERVICE PROVIDERS

Phone: 64% of respondents had both landline and cellphone service. 18% had only landline service and 18% had only cellphone service.

Internet: Spectrum provided Internet access to 36% of the respondents, and FairPoint provided Interest access to 27%. 14% left the question blank. Other providers included Sovernet, Verizon, and True North. None of these providers had more than 10% of the respondents use their Internet services.

Television: Spectrum provided cable / satellite TV service to 18% of the respondents. 18% of the respondents indicated cable / satellite TV service is not available to them (N/A), 18% chose not to have it (None), and 36% left the question blank.
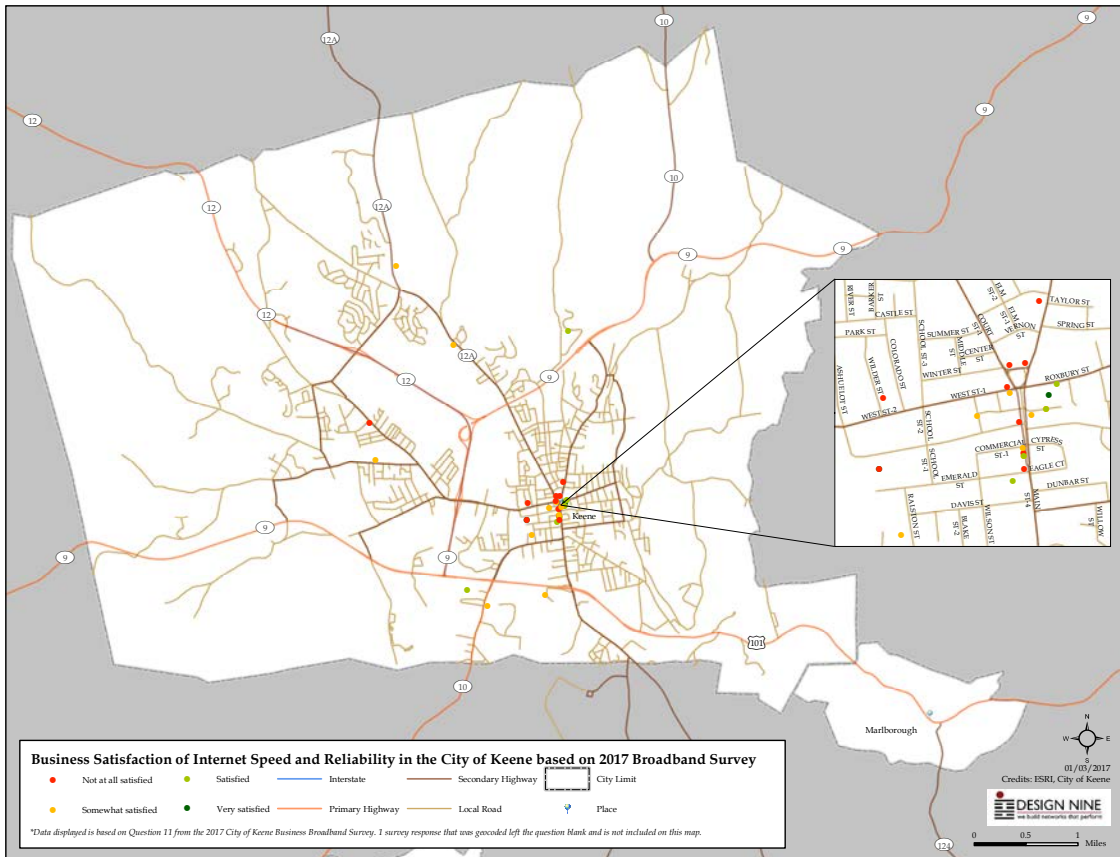
JOB CREATION AND TELEWORK

The survey found that a portion of respondents generally work from home full time or part time. 41% of the respondents use a VPN and 21% work from home on a very consistent basis. 37% of respondents said that an employees's residential Internet service does impact their business, but 83% would not relocate their businesses.

SERVICE DESIRED

Respondents were given the opportunity to provide additional comments not covered in the survey. This was an open ended question. Respondents expressed the need for more reliable Internet and cell service.

Below is a map of the business survey results. 4 survey responses were not geo-coded because the address was a duplicate, only a partial address was provided, or no address was provided.

Business Satisfaction of Internet Speed and Reliability in the City of Keene based on 2017 Broadband Survey

*Data displayed is based on Question 11 from the 2017 City of Keene Business Broadband Survey. 1 survey response that was geocoded left the question blank and is not included on this map.

Appendix A: Residential Survey Results

SUMMARY DATA

1. Select the items you agree with below:

Legend: Yes, No

Statement	Yes	No
I need better landline telephone service.	15%	85%
I need better cellular telephone service.	64%	36%
I need better Internet/data service.	90%	10%
I need better cable/satellite TV service.	56%	44%
I am satisfied with all of my services.	11%	89%
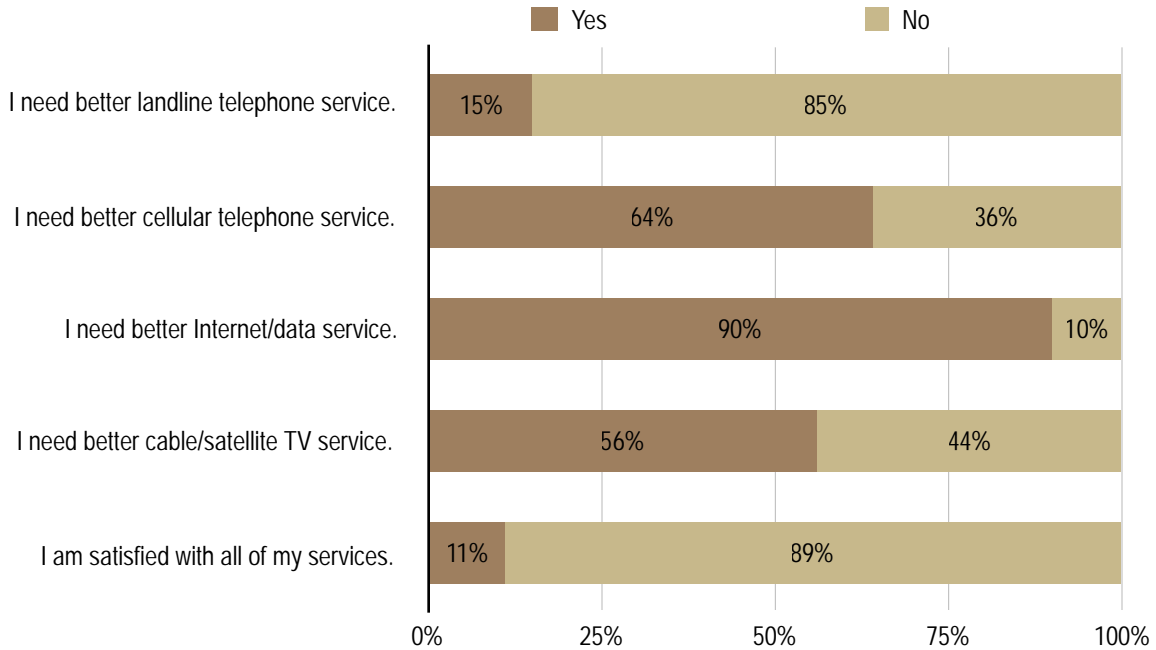
2a. Total number of people in household:

1	2	3	4	5	6	+7
25	105	18	7	1	1	0
16%	67%	11%	4%	1%	1%	0%

2b. Total number of Internet users in household:

1	2	3	4	5	6	+7
22	64	36	18	11	5	0
14%	41%	23%	12%	7%	3%	0%

2c. Total number of k-12 student in household:

0	1	2	3	4	5	6	7+
109	20	17	7	2	0	0	0
70%	13%	11%	5%	1%	0%	0%	0%

2d. Total number of college students in household:

0	1	2	3	4	5	6	+7
130	16	3	0	1	0	0	0
87%	11%	2%	0%	1%	0%	0%	0%

3. How important is Internet access to you or your household?
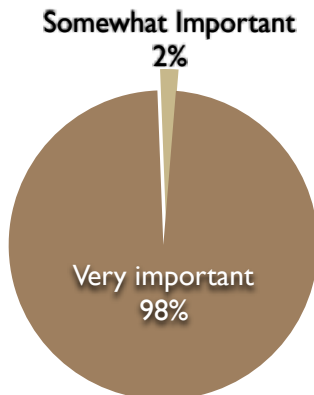
4. For your household, how much do you spend each month for local and long distance telephone , TV, and/or Internet? Do NOT include cell phones.

$50 or less	$50-75	$75-100	$100-150	$150-200	More than $200/ month
8	29	26	38	38	17
5%	19%	17%	24%	24%	11%

5. How much do you pay now for at home Internet access each month? If you select 'No Internet' or 'I only use free hotspots', please skip to question 14.

No Internet	I only use free hotspots	$10 to $20	$21 to $40	$41 to $60	$61 to 80	More than $80/ month	I don't know	My Internet is part of a package
1	0	0	12	40	35	19	2	48
1%	0%	0%	8%	25%	22%	12%	1%	31%

6. What type of Internet do you have at home?

Dial-up	1	1%
Cable modem	106	69%
DSL line	35	23%
Fiber	1	1%
Statelite	1	1%
Cellular wireless	1	1%
T1 line	0	0%
Broadband WISP	1	1%
I don't know	5	3%
Other	2	1%

Other types of Internet

– Also an antenna (cantenna) from Verizon
– Fair point with 3 lines and 2 routers
– Part of Spectrum package.
– We have Fairpoint service and it's lousy despite the fact that we pay more per month , the signal is constantly interrupted. We have several boosters around the house.
– We only use cellular wireless because Spectrum refuses to install cable on our road despite the franchise agreement requiring them to do so.

7. Based on the type of Internet connection you selected above, why do you still have it? (select all that apply)
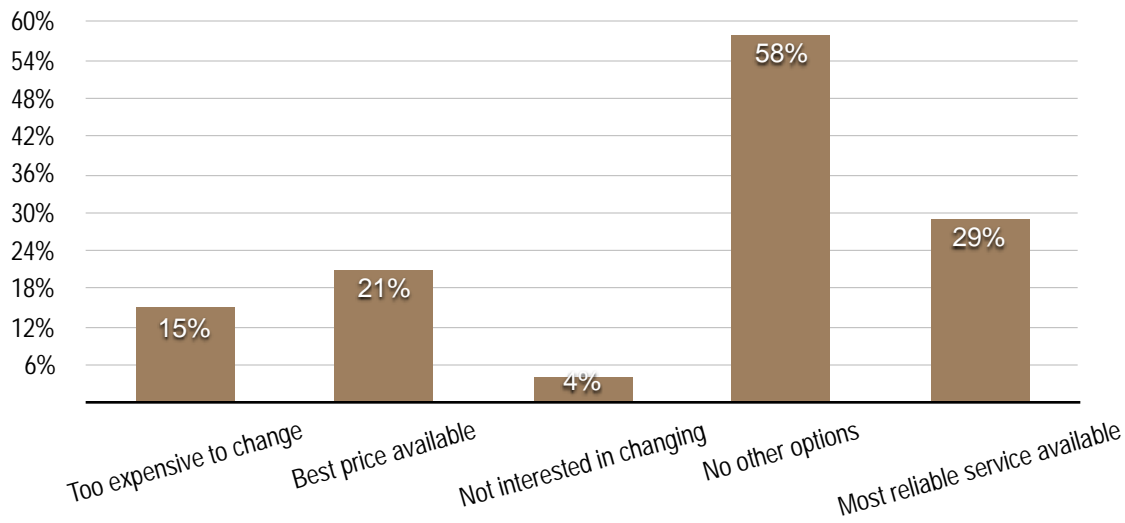
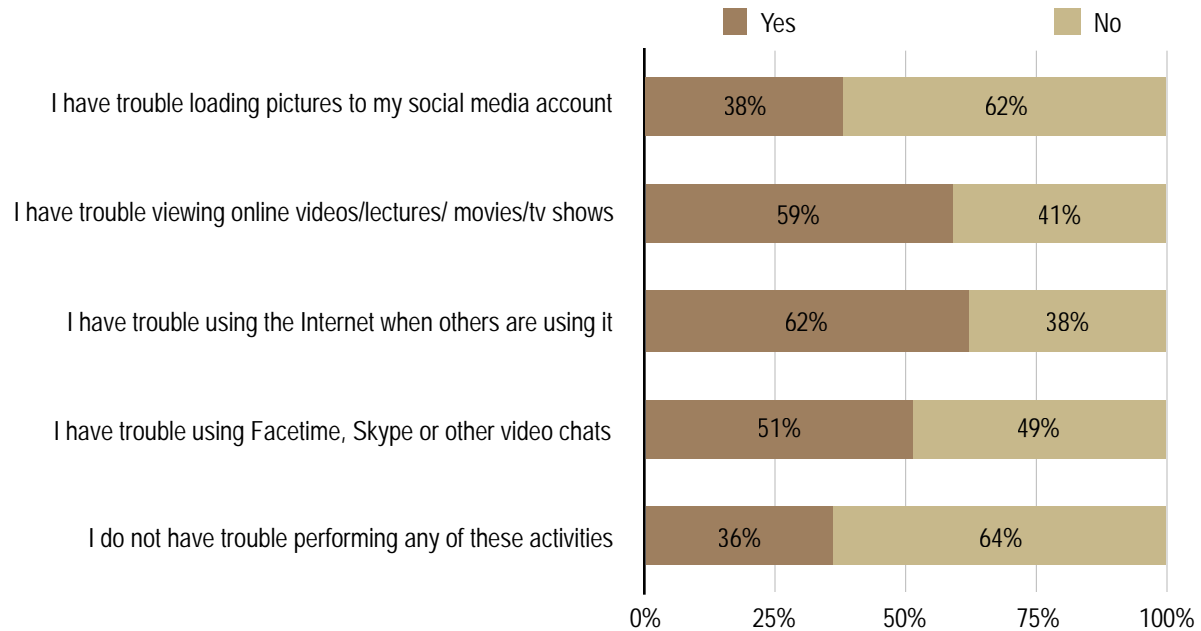| Too expensive to change	Best price available	Not interested in changing	No other options	Most reliable service available
23	32	7	90	46

8. How many devices (for example computers, cellphones, smart TVs) connect to the Internet in your household?

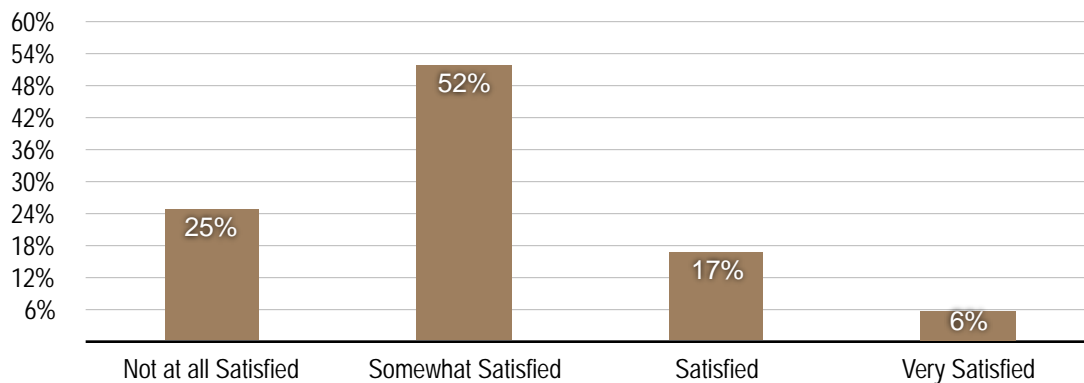| 1-2	3-4	5-6	7-8	9-10	10+
6	11	42	32	15	30
4%	8%	31%	24%	11%	22%

9. What is the speed of your Internet Connection?

Dial up only	Less than 10 Mbps download	Between 10 Mbps and 25 Mbps	Greater than 25 Mbps download	I don't know
0	27	53	48	28
0%	17%	34%	31%	18%

10. Select the Items you agree with below:

Statement	Yes	No
I have trouble loading pictures to my social media account	38%	62%
I have trouble viewing online videos/lectures/ movies/tv shows	59%	41%
I have trouble using the Internet when others are using it	62%	38%
I have trouble using Facetime, Skype or other video chats	51%	49%
I do not have trouble performing any of these activities	36%	64%

11. How satisfied are you with the speed and reliability of your Internet Service?

Not at all Satisfied	Somewhat Satisfied	Satisfied	Very Satisfied
39	80	27	9

12. Please select all that apply to your current Internet provider:

Can not rely on service	Slow or poor technical support	Price is unreasonable for the service I receive	Poor customer service	I am satisfied with my service provider
42	45	103	37	28
28%	30%	68%	25%	19%

13. Select all items you use the Internet for now:

Email	155	100%
Access news and current evens	146	94%
Homework / Schoolwork	69	45%
Use a VPN (Virtual Private Network) for work or school	62	40%
Download or listen to music or audio books online	124	80%
VoIP	82	53%
Online Backup (files, photos, music)	107	69%
Telemedicine, tele-health	20	13%
Online gaming	49	32%
Maintaining a Web presence, blog, or social media	84	54%
Shopping	150	97%
Online banking	146	94%
Social netowrking	132	85%
Smart TV	101	65%
Other	10	6%

Other uses for the Internet

- At home business
- Connecting to work. Completing work after hours.
- I am a NYT bestselling author, and our poor Internet service is an ongoing source of frustration and has cost me work. Uploading and downloading files takes hours; there are many times when I have no Internet access at all. It is a terrible situation and we've considered moving because of it.
- I work in a virtual environment from home, so my internet is my livelihood
- If available would use for smart home gadgets and video surveillance.
- Investing, federal and state tax filings, weather, research, video-conferences, job-searches, maps and driving directions
- Netflix, Hulu
- research
- Roku/Netflix
- Telecommuting
- Video Streaming
- Work (career and volunteer), music production.

14. High speed, affordable Internet influences where I choose to live?

No 44% Yes 56%
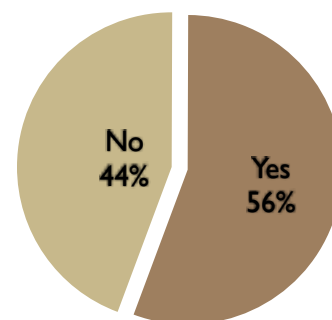
15. What would you be willing to pay for a faster, higher quality Internet access ?

$10 to 20	$21 to $40	$41 to $60	$61 to $80	More than $80/ month	I don't know
7	18	50	29	20	30
5%	12%	32%	19%	13%	19%

16. Does anyone in your household use / need the Internet to complete school assignments or job training course work?
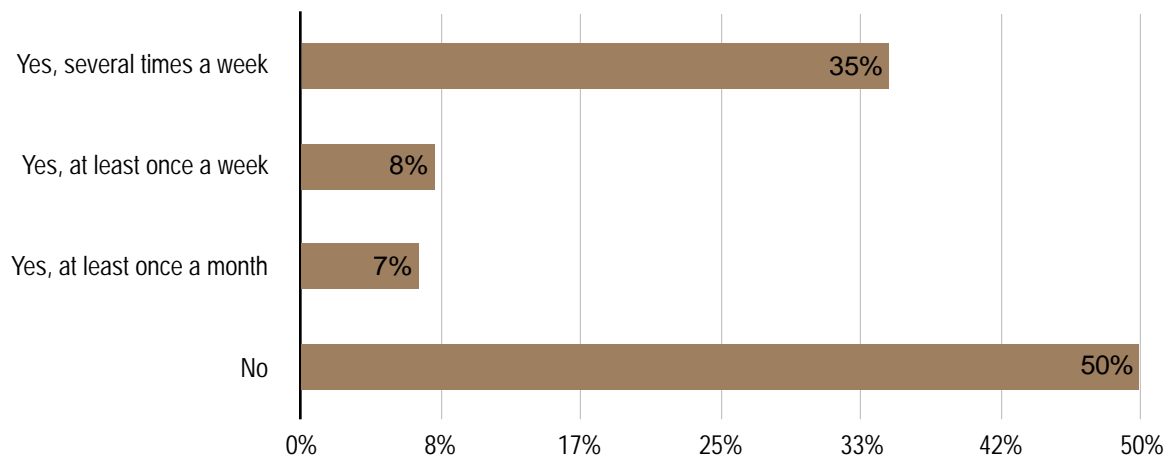
Yes, several times a week	54
Yes, at least once a week	13
Yes, at least once a month	11
No	77

17. Who is your Internet Service provider?

Blank	35	22%
Charter	1	1%
FairPoint	26	16%

Hughes Net	1	1%
Spectrum	91	57%
Straight Talk	1	1%
Verizon	3	2%
WiValley	1	1%

18. Who is your cable/satellite TV provider?

Blank	24	15%
Charter	1	1%
DirecTV	22	14%
Dish Network	7	4%
Fairpoint	1	1%
NA	12	8%
None	31	19%
Spectrum	61	38%

19. What kind of telephone service do you have at home?

Landline only, no cellphone service	Cellphone service only	Landline and cellphone service
4	75	76
3%	48%	49%

20. Do you work from home?
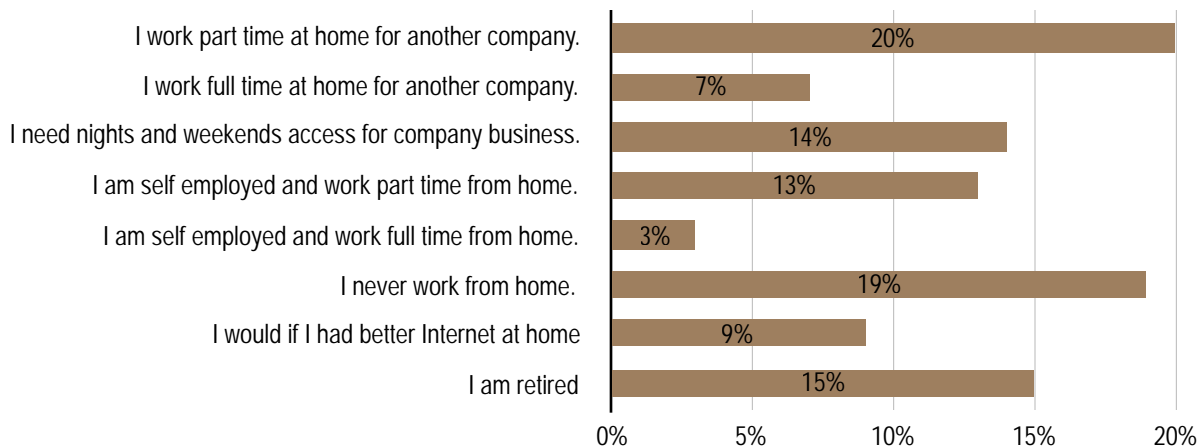
21. Any Other Comments:

There was a very large response to this question, and many residents provided detailed answers. Please see below for this data.

ADDITIONAL RESIDENTIAL COMMENTS

- #15 could include this option: "I am satisfied with my present service and would not be willing to pay more for a faster /higher quality connection."
- A good step toward providing broadband would be requiring the local ISPs to provide transparent pricing.
- And I work full time elsewhere.
- As an IT consultant who works full-time from home, availability and quality of internet service was the number one factor in what location within Keene I chose to purchase my property. For example, look only slightly outside Keene to areas such as Westmoreland or Chesterfield and very quickly the choice of internet service drops from cable based, to DSL/Dial-up or Satellite - all of which are vastly inferior services. There is little to no choice as to what provider to use here in Keene. Anyone who requires a reasonable speed internet service is automatically restricted in their choice to one major provider: Time Warner Cable/Spectrum. There are no other options, unless being prepared to pay business rates for increased internet service. TwC/Spectrum have a monopoly in this city and I for one would like to see more choice and as a result, competition. Ideally we should be embracing newer technologies such as Fiber based services. If such a thing were technically possible to achieve, I have no doubt it would show Keene as progressive and forward-thinking and have a positive effect on business and commerce in our fine city.
- As it happens, I submitted a letter to both Senator Hassan and Representative Kuster just today to complain about the abysmal services we receive from Hughes Net. I honestly believe that they are stealing from us by using alleged Usage Fees that we can't verify. They charge by usage, and they bump usage figures dishonestly as there are no regulatory authorities that will prevent this. We tried Fairpoint, but their service was even worse than we had heard about. (We moved from downtown Keene, where we had Spectrum, to the outskirts of Keene on Hurricane Road where internet provider options are terrible.) Please, please, some help is desperately needed!
- Cable has been extremely reliable since we moved here in 2004. The value has been adequate, and recently improved with Spectrum. I'm not sure what the city has in mind, but I'm certainly not interested in paying any more money for service. The current market offerings seem satisfactory.
- Choice, Choice, Competition - actual competition not Fairpoint vs Spectrum. Reliable fiber at a reasonable price would be a top priority.
- cranky03431@gmail.com
- Currently with Spectrum. Have TV/Phone/internet bundle. $80 pm. WAS with Time Warner. Everything WAS fine. Spectrum call this a 'legacy service' and keep the same package as TW - EXCEPT: $7.50 has now been added to the bill monthly with no adequate explanation. During the last month our internet speed has been DECREASED whilst at the same time we receive regular emails encouraging us to upgrade. Upgrading would cost around $50 a month extra. We are resisting, but feel we will be eventually forced to upgrade to receive an adequate internet speed. Additionally, the emails keep offering us this "special deal as we are a qualified existing customer", except this deal is open to everyone. VERY upset at being 'blackmailed' this way, and that Spectrum are a monopoly in our area. The lack of competition is not beneficial to the residents.
- David Stone
- Don't like the pricing and more monopoly that Spectrum has in this region. We need more competition.
- Don't use this issue as a way to increase our property tax. I know this may not be related to property taxes; but, the "authorities" have found a way to raise our property taxes beyond belief using some very questionable approaches. If you don't want retirees to live here, just tell us to get the Hell out.
- For the love of God get this city hooked up with fiber optic connections, Google fiber or otherwise
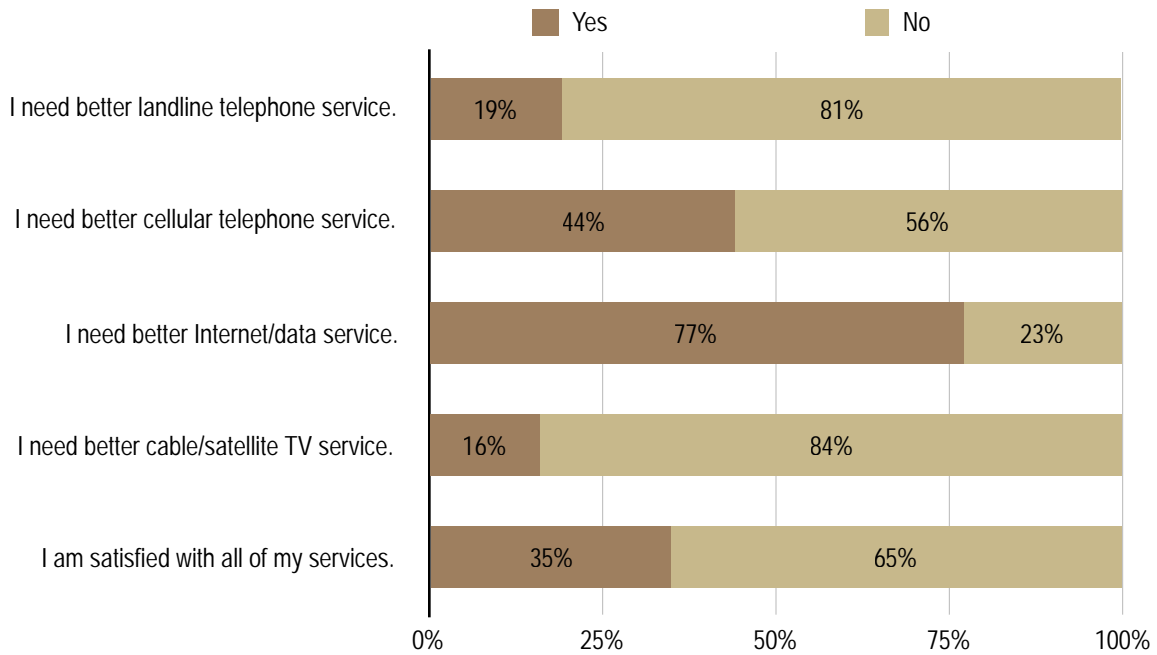
- Friends visiting us from other parts of New England, who might otherwise consider moving to Keene or a city like Keene, are shocked to discover that there is no broadband at my house. They'd never consider moving here once they realize how inadequately the City is positioned to be a home to members of the creative and entrepreneurial class who can work from anywhere, and are interested in leaving Boston and the surrounding suburbs, for example, for a smaller New England town with many options for outdoor recreation. The lack of broadband infrastructure in Keene is troubling, and will have a deleterious effect on future economic growth.
- High speed DSL availability is limited and expensive and is an inhibitor to economic growth.
- I am interested in symmetrical fiber-optic Gigabit internet. I am curious if this survey will lead to research into a municipal option?
- I applaud any efforts the City takes to improve the internet accesses available in the city. There are only two options currently, one of which is provided by one of the most hated companies in America which I will not subscribe with. There are many reasons that customers find to dislike that company, and I encourage the city to find ways to break the monopoly hold that company has on the city. Of course, the first would be to *not* provide additional extensions to the monopoly, or rather franchise, agreement.
- I have a continual need for good internet as I manage two websites for my work. Additionally, I occasionally work remotely because my workplace is an hour's drive away.
- I have to keep the landline cause cellphone reception is spotty at best and downright unreliable.
- I only receive internet service from Spectrum (formerly time warner), no TV or phone. The price is too high for internet-only service, and they jump the price by quite a lot every year.
- I wish there was competition for spectrum, eg Xfinity or other. the prices are too high because there is no real competition other than satellite,
- I would like to view the results of this survey,
- I would never, ever use satellite service again, if I could help it.
- Internet is inconsistent. Lately, slower and sometimes barely working at times.
- Internet is used for non-profit volunteer work.
- It took 5 weeks for my internet connection to be installed. I have been waiting for 3+ weeks for a land line and they tell me that they do not knows when it will be available for my address. Meanwhile I do not have cellphone access from the house and have to drive to the end of the driveway to get service. I am hoping that no one breaks into my home or that some other emergency occurs as I will not be able to call for help. Very wrong!
- Keene needs more options that Spectrum and 2satellite providers which are not local. Fair point stinks as an email provider..
- Keene needs to graduate from cable and dish to true high-speed service like FIOS. Efforts need to be made to get such systems into neighborhoods and stop playing games with boundaries and politics. The Internet as we know it is approaching 20 years old, now. It's time to allow more and better competition.
- Keene, including rural areas of Keene, need to be in the modern age for communication, business interaction, and speedy access to information.
- My husband and I both work from home at least part of the time. I think we have the fastest internet available where we live. Not every provider is available.'
- Question 19: Cellphone (poor signal) and VOiP from Spectrum
- Question 20 should allow multiple answers. Cable company refuses to run line down Daniel's Hill and Langley Road due to subscriber density.
- Spectrum is awful
- Spectrum refuses to live by the terms of the Franchise Agreement, despite repeated requests for service from our neighborhood and strong advocacy on our behalf by both the City and Senator Hassan.
- Thank you for the survey.
- The lack of broadband internet on my road is a source of great frustration for my neighbors and I. Several homes remain on the market in part because prospective buyers are deterred by the lack of broadband. I would not have bought my home had I known that broadband was not available to me. I actually didn't real-

ize that broadband wasn't universally available in Keene when I purchased my home, as I have never experienced that before.

- The service is great, but it's very expensive and choice of provides in keene is very limited. I would like to change because of the price, but feel there are no realistic alternatives.

- The speed offerings at my residence are inadequate. I would expect at least 50Mbps down and 50Mbps up. There is no provider offering this speed at my location.

- There is a problem with your survey and text overlaps the text box on q17 so I can't answer it. I use TWC for internet. You might want to fix that extremely critical part of your web survey...

- Though our DSL is supposed to supply 1.5 mb, even that is intermittent. No cable service available.

- Time Warner/Spectrum needs some competition other than the satellite companies. TV, phone, and internet all seem overpriced to me.

- Very sketchy internet. 3mb download.   Quits at weird times.

- We are constantly resetting the modem to get internet to work. Support tech comes out says it's fixed when it's not and we are back to the same situation. Resetting the modem.

- We pay for the fastest we can get but it's still not as fast as they claim when tested.

- We pay high property taxes and have been very frustrated at the lack of access to reliable, consistent, uninterrupted internet services. I recently travelled to Peru and Africa, and discovered our internet access, services and infrastructure are comparable and at times not as state of the art as third-world countries.

- We were unaware when we moved to this house 12 years ago that cable was not available. We would NOT have chosen to move here if we had known that -- I never would have imagined that in this day and age, parts of a CITY would be inaccessible as far as cable. We have tried everything -- initially we tried satellite Internet through our TV provider (terrible), then went with a local satellite provider which was also unsatisfactory, now we have Internet through the phone lines, but given that the phone lines themselves are old and worn, that is also unreliable and slow. Everyone assumes that people have access to decent Internet today!! I have many times driven to Panera in the middle of the night to sit in the parking lot and attach and send a file because 6 hours of waiting for it to attach at home didn't work. A neighbor said when she travels to remote places in Africa, she has better cable than we do on Hurricane Road. PLEASE PLEASE do something to allow us to stay here! We are the helpers in this community -- we donate to library expansions, church steeples, BBBS, the United Way -- we want to improve this community but we won't stay if something as simple as reliable Internet is unavailable to us. Thank you for conducting this survey. I truly hope it results in meaningful action.

Appendix B: Business Survey Results

1. Select the items you agree with below:

Legend: Yes (dark), No (light)

Item	Yes	No
I need better landline telephone service.	19%	81%
I need better cellular telephone service.	44%	56%
I need better Internet/data service.	77%	23%
I need better cable/satellite TV service.	16%	84%
I am satisfied with all of my services.	35%	65%

2. Is the Internet essential to your business?

Yes	No
31	1
97%	3%

3. How important do you think Internet technology will be for the success of your business over the next five years?

Very important	Somewhat important	Not important
32	0	0
100%	0%	0%

Very Important
100%
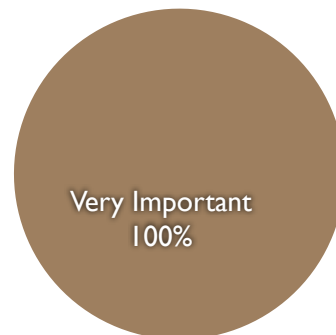
4a. Total number of employees:

Total number of employees	396
Average number of employees per establishment	12

4b. Total number of Internet users:

Total number of computer users	1207
Average number of computer users per establishment	38

5. If you are a business, what type? (select all that apply)

Agriculture / Forestry	0	0%
Retail / Wholesale	11	34%
Professional / Office	8	25%
Goverment	1	3%
Educational	3	9%
Medical	2	6%
Non-Profit	1	3%
Manufacturing	2	6%
Restaurant / food Services	2	6%
Communication/ Technology	4	13%
Construction / Maintenance/ Repair	0	0%
Other	8	25%

Other types of businesses

- Cyber security
- Dance and Fitness
- Financial Services.
- Online retail specially computer product(s).
- Online training, software development
- Real Estate
- Software Development Office for an Information Aggregation Business
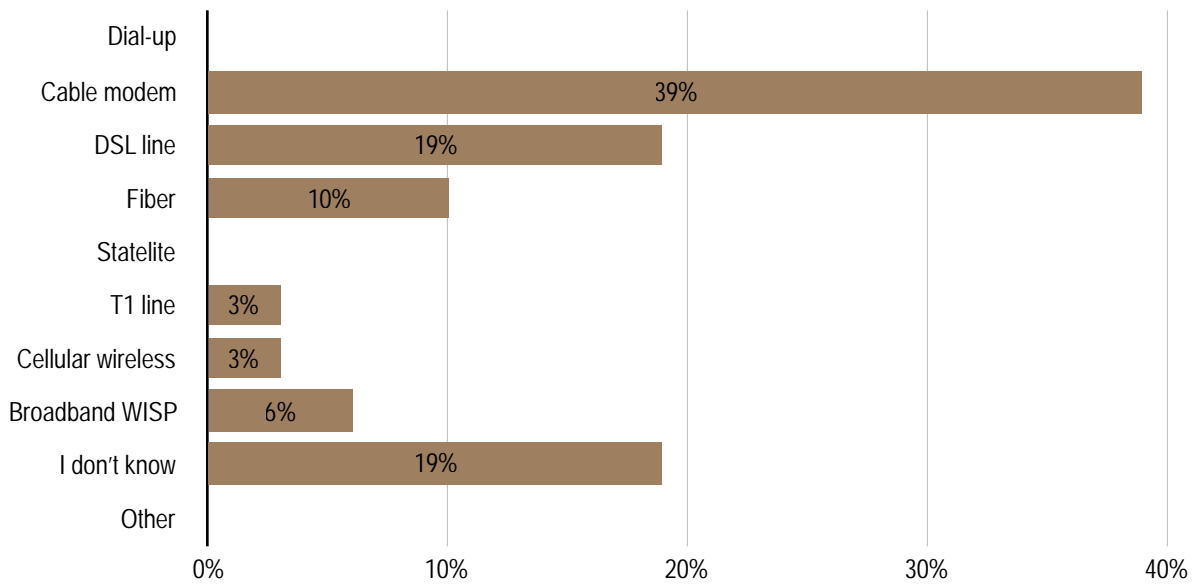- Technology Consulting

6. Is this a home-based business?

Yes	No
3	28
10%	90%

7. How much do you pay now for Internet access each month? If you select 'No Internet', please skip to question 13.

No Internet	$0 to $50	$51 to $100	$101 to $150	$151 to $300	$301 to $500	$501 to $1000	$1001 to $5000	$5000+	I don't know
0	1	11	4	8	2	2	0	0	3
0%	3%	35%	13%	26%	6%	6%	0%	0%	10%

8. What type of Internet do you have?

Dial-up	Cable modem	DSL line	Fiber	Statelite	T1 line	Cellular wireless	Broadband WISP	I don't know	Other
0	12	6	3	0	1	1	2	6	0

Other Types of Internet

- Supposed to be high speed. Pay for it. It's slow speed. Very slow
- Verizon Jet Pack
- We have two separate connections - Genesis and Century Link and that still isn't sufficient data speed
- Plus Cell Phone Internet through T-Mobile
- Local Wireless

## 9. Based on the type of Internet you selected above, why do you still have it?
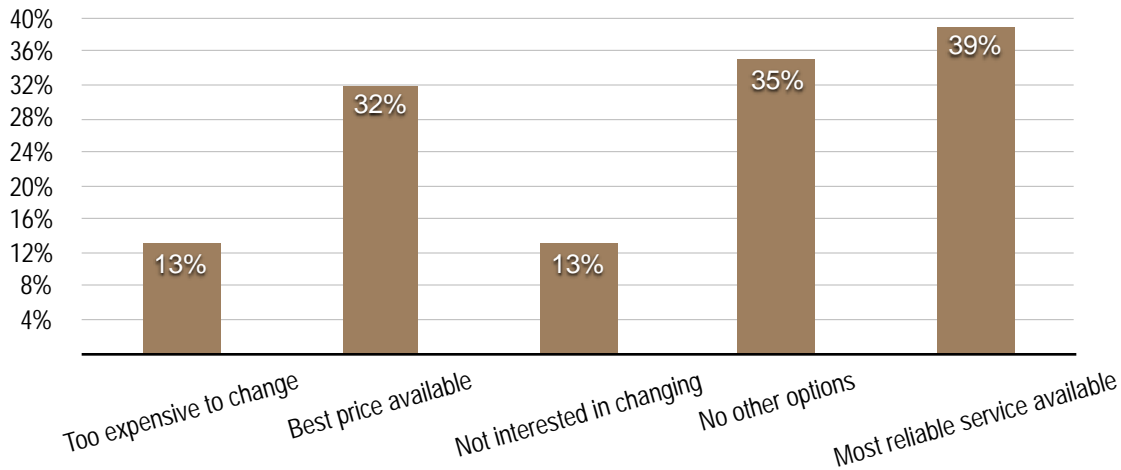
Too expensive to change	Best price available	Not interested in changing	No other options	Most reliable service available
4	10	4	11	12

10. What is the speed of your Internet connection? (A Gigabit is 1000 Megabits (Mbps))

Dial-up only	56-512 k	512 k -1 Mbps	1-5 Mbps	5-10 Mbps	10-50 Mbps	50-100 Mbps	100+ Mbps	Gigabit	I don't know
0	0	0	2	3	10	8	0	0	9
0%	0%	0%	6%	9%	31%	25%	0%	0%	28%

11. How Satisfied are you with the speed and reliability of your Internet service?
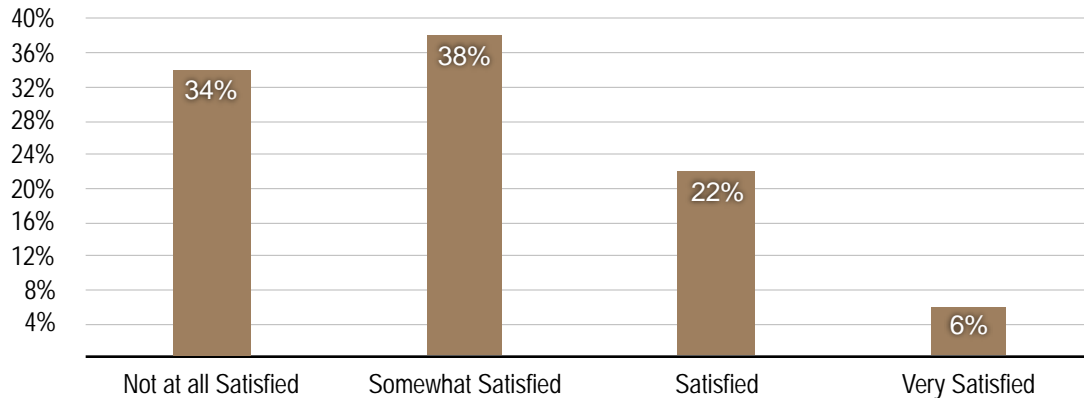
Not at all Satisfied	Somewhat Satisfied	Satisfied	Very satisfied
11	12	7	2

12. How important is a redundant or second Internet connection to your business?

Not Important	Somewhat Importabt	Very Important
11	12	9
34%	38%	28%

13. Please select all that apply to your current Internet provider:

Can not rely on service	Slow or poor technical support	Price is unreasonable for the service I receive	Poor customer service	The speed I want is not available at my business location	I am satisfied with my Internet provider
6	10	9	6	12	10
21%	34%	31%	21%	41%	34%

14 . Select all the items you use the Internet for now:

Email	32	100%
Communication between headquarters and remote sites	21	66%

VoIP Internet phone (Vonage, Skype, etc.)	17	53%
Online Backup (files, photos, music)	24	75%
Transfer large files	23	72%
Monitor / control security, alarms, health, processes, etc.	15	47%
Processing credit card / debit card transactions	21	66%
Ordering / managing inventory	18	56%
Maintaining a Web presence, blog, or social media	30	94%
Receiving and processing online orders	23	72%
Cloud-based business, accounting or other services	17	53%
Smart TV	8	25%
Other	1	3%

Other Uses for the Internet

- Online educational programs, certifications, technical software like solid works and mastercam

15. Briefly state what you think is a affordable monthly payment for 1 Gigabit Internet speed for a business?

- $50 per month
- $75 per month
- $100 per month
- $100 per month
- $100 per month
- $100 per month
- $115 per month
- $140 per month
- $150 per month
- $150 per month
- $200 per month
- $500 per month
- $700 per month
- $200 a month
- $50-$100 per month
- $50-$100 per month

- $80-$100 per month
- In the region of our Headquarters (Chester VT), 1 Gbps from VTEL is around $80-100.
- We don't need that much speed but would like to pay about $50 for internet and phone.

16. Who is your Internet Service provider?

Blank	5	15%
FairPoint	9	27%
Sovernet	1	3%
Spectrum	12	37%
True North	1	3%
US Cellular	1	3%
Verizon	1	3%
WiValley	3	9%

17. Who is your cable/satellite TV service provider?

| Blank	DirecTV	NA	None	Spectrum
12	2	6	6	7
36%	6%	18%	18%	22%

18. What kind of telephone service do you have at home?

Landline only, no cellphone service	Cellphone service only	Landline and cellphone service
5	5	18
18%	18%	64%

19. Do you or your employees use a VPN (Virtual Private Network) to obtain remote access for your work or to a company network?

Yes	No	I Don't Know
12	15	2
41%	52%	7%

20. Do you or your employees need or want to work from home?
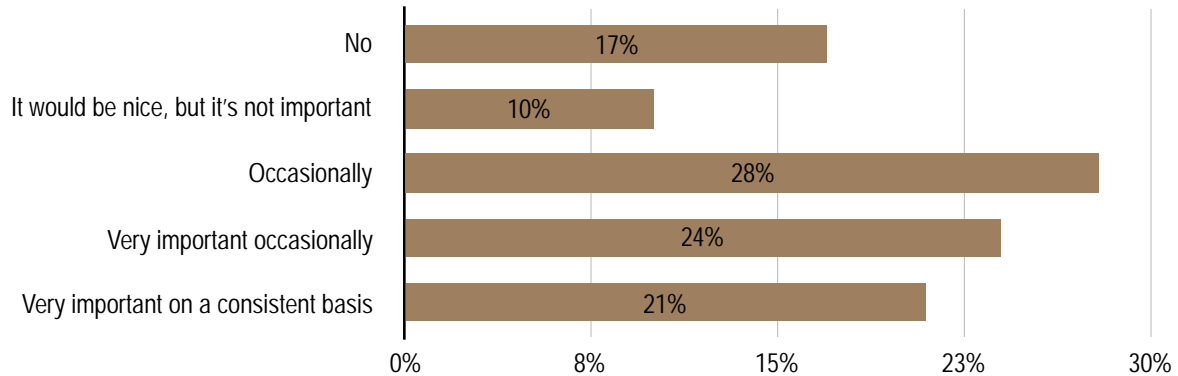
	No	It would be nice, but it's not important	Occasionally	Very important occasionally	Very important on a consistent basis
	5	3	8	7	6

21. Does limited Internet access at employees' residences impact your business?

Yes	No
11	19
37%	63%

22. Do the existing Internet service options impact your business's decision to relocate or stay in the City?

Yes	No
5	25
17%	83%

If yes, briefly state why:

I work remotely for a company based in California. Without reliable internet I would have to relocate somewhere else.

In a good way!

It's a challenge to work with such slow speeds. Despite having fiber the available speeds are low and the highest speed available is extremely costly right now. Right now we have 25/25 fiber connection at $150 / month. Faster speeds at saner prices would be highly

desirable. I would have less of an issue paying $155 for what we get if we were able to get significantly faster speeds (like 1Gbps or even just 300Mbps+, but honestly anything faster would be better than we can get right now provided the price doesn't go up any further because we are already max'd out the communications budget).

The high cost, limited options and poor quality of internet connections for my business and my employees at their homes may eventually force me to move my business out of Keene. We are doubling in size every two years and the current options for office space with adequate internet connection are few and far between in Keene. Combine that with high rents and high property taxes and Keene has a lot going against it for modern companies and growing businesses.

23. Any other comments?

I fear it's too late and the attitudes of many of our local and state leaders will make it nearly impossible to correct this issue.

I think it would be helpful to have more competition for ISPs in downtown Keene. I appreciate the recent service upgrades by Spectrum and that these were provided at no extra cost.

It's gotta be affordable....

My comments and numbers above are for just me working remotely full time for a company with no offices nearby.

Not internet related, but if you have not received any current feedback on the parking meter replacement system, you should put out another survey. My customers absolutely hate it. They find it confusing and very inconvenient.

One of the main benefits of being located in downtown Keene was access to higher speed 100% up time was via download from a wireless system on the roof of our building (I don't remember the name of the local vendor). That system connected to our receiver and modem in our office. The other benefit was eliminating the 3 p.m. problem of internet overload which we experienced every day.

Regarding question 22, one of our main offices in Keene. It will likely stay in Keene. That does not diminish the fact that even if it is not cause for relocating internet is a critical component of infrastructure for area businesses.

The City of Keene should not spend any more money.......

We are happy with our TWC/Spectrum internet. It is a fairly good speed for the money, but in some locations (Like VT), a 1 Gbps fiber connection can be had to the home for around the same price.

We have since moved to Martell Court (just south of Hwy 101). The only way to get decent speed here is through Spectrum. There service is very reliable; I wish we had truly high speed internet in this location.

We use a US Cellular mobile modem for phone and internet. It works well when only our staff person is using it, but when board members and volunteers use it sometimes data charges can be unreasonable. We chose a mobile modem because our ED travels around the region AND works from home, and she can have access to battery powered internet modem anywhere there is US Cellular service, which is in most locations across the Monadnock region that are not too out of the way.

Appendix C: Dig Once Policy Samples

SANDY, OREGON

Sandy, Oregon made a very simple change to existing policy by adding "broadband (fiber)" to the list of requirements for new developments (e.g. water, sewer, storm drainage, etc.).

17.84.60 PUBLIC FACILITY EXTENSIONS

All development sites shall be provided with public water, sanitary sewer, broadband (fiber), and storm drainage.

MOUNT VERNON, WASHINGTON

Mount Vernon made the decision to require the installation of telecommunications conduit to all new development projects.

12.20.015 Construction standards for the regulation of use of public rights-of-way and public property.

All developments shall be required to construct and install telecommunications conduit on all streets that are affected, disturbed, constructed and/or improved by development unless otherwise approved, pending a review by the city engineer. This conduit shall be for the purpose of installing telecommunications cable, fiber optic wiring or other infrastructure as necessary.

This conduit shall be placed at horizontal and vertical locations as determined by the city engineer. The conduit shall conform to the size, shape and characteristics as determined by the city engineer based on industry standards. Once installed and accepted by the city, the conduit shall become the property of the city of Mount Vernon.

POULSBO, WASHINGTON

Poulsbo, Washington developed a policy for conduit standards that included some of the reasoning behind the new ordinance, noting that preservation and management of right of way was a government responsibility.

12.02.015 Conduit standards.

A.   Legislative Findings. The Poulsbo city council finds that:

1.   Demand for access to high-speed telecommunications services is growing. In order to fill such demand, telecommunications service providers install telecommunication lines in public rights-of-way.

2.   In other jurisdictions, the demand for access and the number of telecommunications service providers has sometimes resulted in multiple, serial excavations within the public rights-of-way. Each such excavation can and does result in traffic disruption, a weakening of pavement integrity, and a shortening of the useful life of paved surfaces.

3. The city of Poulsbo has not experienced a high demand for use of the public rights-of-way by telecommunications service providers, but in order to responsibly manage its public rights-of-way the city should anticipate such demand in the future and plan accordingly.

4. Requiring that conduit be installed in newly constructed public streets and rights-of-way in order to accommodate the anticipated future demand for access to telecommunications services will assist the city in responsibly managing its public rights-of-way by:

a. Reducing or eliminating the need for excavation within public streets and rights-of-way when telecommunications service providers seek to locate underground telecommunications facilities within such streets and rights-of-way in the future;

b. Reduce or eliminate the traffic disruption that occurs whenever excavation occurs within streets and public rights-of-way;

c. Reduce or eliminate the loss of pavement integrity and diminishment of the useful life of pavement that occurs whenever paved streets and rights-of-way are cut and excavated within; and

d. Meet the needs and desires of the public for access to high-speed telecommunications services and the needs and desires of telecommunications service providers to locate within the public streets and rights-of-way.

5. In residential areas, anticipated demand for the reasonable future can likely be met by the capacity provided by two telecommunication lines. In non-residential areas, anticipated demand is higher, but can likely be met for the reasonable future by the capacity provided by four telecommunication lines. Requiring the installation of conduit and other facilities necessary to support these lines will allow anticipated needs to be met while allowing the city to responsibly manage its rights-of-way.

B. Intent. The intent of this section is to provide for the construction of infrastructure sufficient to allow telecommunications service providers desiring to deploy communication lines in the future to do so by pulling the same through the conduit and appurtenances installed pursuant to this section and without excavating within the right-of-way. This section is not intended to require telecommunications service providers to install additional ducts or conduit pursuant the provisions of RCW 35.99.070, but is intended to require those constructing public streets, including the city and private developers, to provide and install such conduit and appurtenances as may be necessary to accommodate future telecommunications needs within public streets and rights-of-way without further excavation or disturbance.

C. Requirements—Adoption of Standards. Whenever any new public street is constructed, whether by the city as a public works project or by a private party in conjunction with development, the following shall be required:

1. In all new local access public streets serving or abutting residential development, a conduit of a sufficient diameter and containing interducts of sufficient number and diameter to accommodate a minimum of two telecommunication lines shall be installed by the party constructing the street.

2.   In all new collector or arterial public streets serving or abutting residential development, and in all new public streets serving or abutting nonresidential development, a conduit of a sufficient diameter and containing interducts of sufficient number and diameter to accommodate a minimum of four telecommunication lines shall be installed by the party constructing the street.

3.   In addition to installing conduit, the party constructing the street will be required to install such vaults and other appurtenances as may be necessary to accommodate installation and connection of telecommunication lines within the conduit.

4.   All construction and installation shall be accomplished according to construction standards adopted by the city engineer. The construction standards shall be adopted with due consideration given to existing and anticipated technologies and industry standards. The construction standards shall specify the minimum diameter of the conduit and interducts and the minimum number of interducts to meet the requirements of this section.

5.   All conduit and appurtenances installed by private parties pursuant to this section shall be conveyed and dedicated to the city with the dedication and conveyance of the public street and/or right-of-way.

6.   Any and all installation costs shall be the responsibility of the party constructing the public street.

D.   Use by Telecommunications Service Providers. Whenever conduit installed or to be installed under this section is available or will become available within a newly constructed public streets or right-of-way upon dedication, all telecommunications service providers thereafter locating telecommunication lines within such street or right-of-way shall be required to locate their communication lines within such conduit unless it can be demonstrated to the reasonable satisfaction of the city engineer that such location is not technologically feasible or reasonably practicable. Conduit capacity shall be allocated to telecommunications service providers on a first-come, first-served basis; provided, that the city may reserve capacity within such conduits for its own use; and provided further, that the city engineer may adopt additional rules for conduit allocation in order to ensure that all telecommunications service providers have reasonable access to the city's rights-of-way and that no barriers to entry or competition result from the allocation of conduit space.

E.   Fees. The city reserves the right to charge reasonable fees for the use of conduit installed pursuant to this section, to the extent consistent with and as limited by federal and state laws and regulations. Any such fees shall be established by resolution or ordinance. (Ord. 2003-25 § 1, 2003)

June 13, 2018

TO: Mayor and Keene City Council

FROM: Planning, Licenses and Development Committee

ITEM: 2.

SUBJECT: Peggy Schauffler/Country Life – Use of City Property – Sandwich Board Sign

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COUNCIL ACTION:
In City Council June 21, 2018.
More time granted.

RECOMMENDATION:
On a vote of 4-0, the Planning, Licenses and Development Committee recommends that the request from Country Life Vegetarian Restaurant for use of City property be placed on more time.

BACKGROUND:
Vice Chair Jones reported that City staff suggests placing this item on more time. Vice Chair Jones asked if the petitioner was present. Ms. Schauffler was not present.

Councilor Hansel made the following motion, seconded by Councilor Rice.

On a vote of 4-0, the Planning, Licenses and Development Committee recommends that the request from Country Life Vegetarian Restaurant for use of City property be placed on more time.

June 25, 2018

TO: Planning, Licenses and Development Committee

FROM: Kurt D. Blomquist, Emergency Management Director/Public Works Director

THROUGH: Elizabeth A. Dragon, City Manager

ITEM: 3.

SUBJECT: 2018 Pumpkin Festival - Staff Recommended Motion – Public Works Department

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RECOMMENDATION:

That a license be granted to Let It Shine, Inc. to use Downtown City rights-of-way on Sunday, October 28, 2018 to hold a "Keene Pumpkin Festival, In the HeART of Downtown Keene, NH" subject to the following provisions:

- This license is granted based upon the event scope presented to City staff during protocol meetings held to date, changes or additions to the license may require that an amended license be issued by the City Council and no changes to this license or the associated protocol documents will be accepted after September 1, 2018.
- The Petitioner agrees to absorb the cost of any City services over and above the amount of City funding allocated in the FY 19 Community Events Budget, and agrees to remit said payment within 30-days of the date of invoicing;
- The furnishing of a certificate of liability insurance in the amount of $1,000,000 naming the City of Keene as an additional insured;
- The signing of a standard revocable license and indemnification agreement and associated protocol documents;
- That the agreed upon footprint and layout for the event shall encumber Central Square, including the traveled portion of the road requiring the following road closures: Central Square, West Street from Federal Street to Central Square, Roxbury Street from Roxbury Plaza to Central Square, Washington Street from Vernon Street to Central Square, and Court Street from Winter Street to Central Square;
- That the Petitioner is permitted to place 10 porta-potties in City parking spaces located at the base of Washington Street from Friday, October 26, 2018 to Monday October 29, 2018, which will be chained together and affixed to ensure they are not vandalized while unattended overnight;
- That the actual event will be held from 1:00 PM to 7:00 PM with the times for set up and clean up to be established with City staff;
- It is the intent of City Emergency Services to review all applications for other activities requested to occur on October 28, 2018 to determine if a public safety concern exists. If a public safety concern is found to exist, said license will not be granted. This would apply to the following activities: hawkers and peddlers on private property, itinerant vendors on private property, outdoor periodic events on private property, walk-a-thons, parades, bike and foot races on public property, general uses of public property, and sidewalk obstructions and sidewalk café licenses on public property;
- That free parking be granted under the provisions of the free parking policy for City parking spaces on

Washington Street needed for storage of equipment from Friday, October 26, 2018 to Monday October 29, 2018, and spaces within the event footprint on the day of the event; and

- That the Petitioner complies with any other recommendations of City staff.

BACKGROUND:

City staff has held a series of safety protocol meetings with the applicant to determine the scope and requirements necessary to maintain public safety. At this time staff is prepared to recommend the Council move forward with a decision on granting the request from Let It Shine with the understanding that the applicant will comply with the following recommendations of City staff:

The applicant will be asked to provide a list of the individuals in charge of the various focus areas associated with running the event, including contact information and specific responsibilities. They will also be asked to submit a list of volunteers who will assist during the event and post-event, including their specific responsibilities and any other information as requested by staff. A mandatory meeting of all volunteers will be held prior to the event date and in conjunction with City staff as well. The applicant will also be responsible for a public address system adequate to cover the entire footprint, which shall be tested and approved by City Emergency Management prior to commencement of the event. In addition, the Petitioner will need to assume responsibility for full clean-up of the footprint, and return the area to the same condition that it was in prior to the event and allow the opening of all streets to traffic on the evening of October 28, 2018, with the understanding that public safety personnel will remain once the event has ended to ensure proper coverage for post event issues during clean-up activities. The applicant will be required to provide a contingent of volunteers and /or personnel from their organization adequate to carry out the set-up, operation, and post event clean-up to include one person in charge of each segment of the event, whom will be equipped with communication equipment capable of contacting the overall event coordinator. The applicant understands that failure to promptly close the event, the lack of adequate personnel and/or volunteers as determined by the Emergency Management Director or his representative, delays in opening the streets to traffic, or failure to complete final clean-up, or complete the event in the identified timeframe may result in additional costs that will be their responsibility.