Riverside Public Utilities

Fiber Business Model

Table of Contents

1. Executive Summary

Riverside Public Utilities ("RPU") has the opportunity to expand its existing fiber business to accommodate demand from stakeholders in the community. RPU's fiber business has already created community benefit by enabling providers and other public organizations to make use of its fiber services, enabling more fiber broadband services in Riverside. RPU can build the organizational capabilities to expand services; however, it should do so using an approach that first formalizes its existing fiber business and builds on this foundation to explore new ways RPU can serve Riverside's broadband needs.

This Fiber Business Model Report evaluates RPU's opportunities to expand its network to support additional broadband needs within the City of Riverside. It first surveys the broadband market in the City to understand the current environment, with the intent of finding opportunities for RPU to address deficiencies in broadband services and develop new programs to differentiate Riverside as a connected community. It then evaluates the current state of RPU's fiber business and network infrastructure to determine how it may be used to address these opportunities. Finally, the Study builds a fiber business model roadmap for RPU to (1) create a framework and formalize its existing fiber business, (2) expand its fiber business to serve more utility, municipal and community needs and (3) evaluate long-term development opportunities that build on the strengths of its existing business.

The broadband roadmap developed in this Report provides a step-by-step approach to expanding RPU's fiber services to more organizations in Riverside. This roadmap is focused on leveraging more of RPU's existing dark fiber and builds a plan to enable RPU to expand its operations to connect more organizations, which may include businesses, community anchors, broadband providers and other public organizations. Figure 1-1 provides a summary of this roadmap.

Figure 1-1: Summary of RPU Roadmap

Phase 1 Formalize RPU's Existing Fiber Business	Phase 2 tical Plan to Expand the Fiber Business	Phase 3 tegic Plan to Expand the Fiber business
1. Assign an Internal Project Manager 2. Document the Inventory of Available Assets 3. Implement a Fiber Management System 4. Review and Standardize Agreements for Fiber Leasing 5. Set Policy to Treat Fiber as a Telecom Asset, Not an Electric Asset 6. Develop Pricing Policies for Fiber Leasing 7. Publish RPU's Rates and Terms	1. Establish Achievable Goals for the Fiber Business 2. Identify Immediate Needs and Opportunities 3. Determine RPU Policies for Expanding Dark Fiber 4. Develop Pricing Policies for Expanding Dark Fiber 5. Define Operational, Staffing & Financial Requirements 6. Consider Establishing an Enterprise Fund 7. Implement Operations and Staffing 8. Increase The Inventory of Available Fiber 9. Develop the Marketing and Sales Program 10. Establish Metrics for Success	1. Evaluate the Impact of RPU's Current Fiber Business 2. Identify New Opportunities 3. Explore Additional Business Models 4. Consider Public-Private Partnerships 5. Learn from Other Organizations 6. Conduct a Feasibility Study

Following this approach, RPU's fiber business should continue to grow to serve more of the community's broadband needs. For businesses, schools, hospitals, clinics and community organizations, RPU's network may provide additional long-term connectivity solutions. RPU can also make meaningful improvements to City operations through the expansion of its network, supporting the long-term needs of public works, information technology, utilities and public safety.

Although this Report does not suggest that RPU consider providing retail services to residents or businesses at this time, its network may play a role in helping broadband providers enhance retail services. As RPU considers its business model options, opportunities to develop wholesale agreements and public-private partnerships with broadband providers may accelerate the deployment of fiber-to-the-home and related services in Riverside.

Why Should RPU Adopt an Incremental Roadmap Approach

Many other municipal providers have used an incremental approach to expanding their fiber networks into their local communities, including California cities such as Santa Monica, Loma Linda and Burbank. Outside of California hundreds of municipal providers have achieved similar successes. A few include the Cities of Danville, Virginia and Chattanooga, Tennessee.

Using an incremental approach has proven to be lower risk to these organizations than taking an "all in" approach that requires a significant capital investment and increased organizational and operational capacity.

RPU should not take larger opportunities "off the table," but rather begin by building the organizational and operational capacity needed to create a mature broadband utility, capable of pursuing these options at a later date. RPU can also learn from other communities, avoid common pitfalls and adopt best practices as it grows the fiber business. Some of these key recommendations from other municipal providers that have particular relevance to RPU and its business model approach follow.

City of Burbank

- The City of Burbank stressed the importance of being realistic in expectations for customer uptake and the price customers will pay for service.

- Using an incremental approach to buildout, it has connected 120 customers to the OneBurbank fiber network, providing business connectivity to government facilities, schools, local businesses and the entertainment industry cluster, over the past 6 years.

- Burbank's gradual approach allowed it to couple investments in fiber with other utility projects to expand the network while finding new opportunities to reduce costs.

- Burbank also stressed the importance of developing a sound marketing plan that lays out key metrics and is tracked on at least an annual basis.

- Finally, the City focused its broadband strategy on targeted economic development programs to support the entertainment industry needs within the City and tailored its services to support the high-bandwidth, high-reliability requirements of these organizations.

City of Santa Monica

- The City of Santa Monica discussed how its fiber business has grown steadily over the past 5 years and in conjunction with technology programs that reduce costs for the government itself.

- Connecting community anchors provided Santa Monica valuable anchor tenants that helped build the business case for its fiber expansions.

- The City accommodated future investment in its network by setting a policy that reinvested any excess revenues and savings that the network generated back into expanding the network.

- The City successfully markets its fiber services in Santa Monica and provides a list of "lit buildings" where fiber connections are available.

Financial Summary

RPU should expect to incur the startup and ongoing costs to expand the fiber business identified in Figure 1. Costs include program startup to formalize its fiber business and document the inventory of its fiber assets designated for broadband purposes. Annual operating costs include an estimate of incremental internal and external resources needed to manage the fiber business as well as service contracts for RPU's fiber management system. These costs should only be incurred once RPU decides to expand the fiber business, as they are program startup costs that will lead RPU to grow its fiber services.

This will place RPU in a position to begin expanding its market and customer base in the area. RPU should determine customer demand for services in conjunction with these costs so that it has a high confidence level that sufficient revenues exist to support this cost structure. This should be assessed through market research in the areas in proximity to the fiber network to determine the demand from potential customers. RPU will ultimately need to commit to funding some costs ahead of the revenues that will cover them to formalize the fiber business.

Phase 1 Expected Costs		
Activity	**Startup Cost**	**Annual Operating Cost**
Assign an internal project manager (Internal allocation - 1/2 of an FTEs time)	$0	$40,000
Policies, rate setting, contracting agreements (Internal staff & outside resources)	$50,000	$20,000
Documentation and inventory current fiber assets (Internal staff & outside resources), upfront and ongoing	$30,000	$15,000
Implement and manage ongoing support of a fiber management system	$150,000	$30,000
Total Costs for Phase 1 (Startup and Ongoing)	**$230,000**	**$105,000**

Recommendations

These start-up recommendations provide specific steps that RPU can take to begin structuring and expanding its fiber business. In addition, recommendations 5 and 6 focus on establishing policy with the City of Riverside that will support more cost effective development of broadband infrastructure in the City. Additional specific recommendations are made

throughout the report and are shown in underlined text. All of the recommendations are summarized in Section 9 of this report.

1. Immediately begin implementing Phase 1 of the Fiber Business Model Roadmap according to the proposed plan;

2. Assign an internal staff person to manage the implementation of Phase 1;

3. Engage outside resources to assist in the implementation where required;

4. Engage RPU departmental staff to support the policy development process;

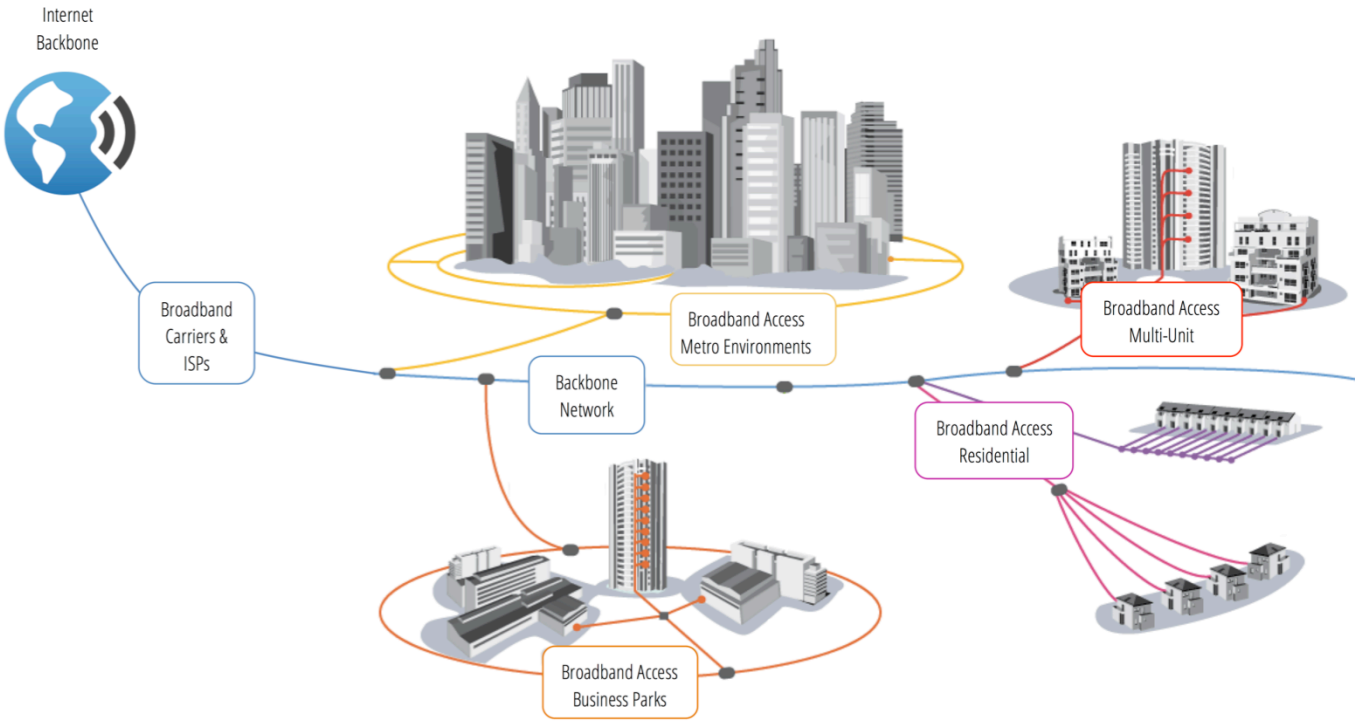
5. Work with the City of Riverside to review and update policies on conduit and fiber construction in City right-of-way; and

6. Work with the City of Riverside to explore a policy that establishes broadband development standards for new construction or redevelopment.

2. Overview of Broadband Technologies

Broadband is deployed throughout communities as wired and wireless infrastructure that carries digital signal between end users and the content they want to access. The content comes in many forms and from many locations across the world in the networks that connect the local community to the Internet backbone. Websites, television, streaming video, videoconferencing, cloud services, and even telephone service are just a few types of content that are delivered across local broadband networks. Access to this content is made available through the type of infrastructure and kinds of connections available in the local network. Robust local infrastructure results in faster, more reliable access to content. Conversely, local infrastructure that is aging and built on older technologies results in slower, less reliable access to content.

Figure 2-1: How Broadband Connects Our Communities



A. Types of Broadband Services

DSL

DSL is a wireline transmission technology that transmits data over traditional copper telephone lines already installed to homes and businesses. DSL-based broadband provides transmission speeds ranging from several hundred Kbps to millions of bits per second (Mbps). The availability and speed of your DSL service may depend on the distance from your home or business to the closest telephone company facility.

Cable

Cable modem service enables cable operators to provide broadband using the same coaxial cables that deliver pictures and sound to your TV set. Most cable modems are external devices that have two connections: one to the cable wall outlet, the other to a computer. They provide transmission speeds of 1.5 Mbps or more. Subscribers can access their cable modem service by simply turning on their computers, without dialing-up an ISP. You can still watch cable TV while using it. Transmission speeds vary depending on the type of cable modem, cable network, and traffic load. Speeds are comparable to DSL.

Wireless

Wireless broadband connects a home or business to the Internet using a radio link between the customer's location and the service provider's facility. Wireless broadband can be mobile or fixed. Wireless technologies using longer-range directional equipment provide broadband service in remote or sparsely populated areas where DSL or cable modem service would be costly to provide. Speeds are generally comparable to DSL and cable modem. An external antenna is usually required. Wireless broadband Internet access services offered over fixed networks allow consumers to access the Internet from a fixed point while stationary, and often require a direct line-of-sight between the wireless transmitter and receiver. These services have been offered using both licensed spectrum and unlicensed devices. For example, thousands of small Wireless Internet Services Providers (WISPs) provide such wireless broadband at speeds of around one Mbps using unlicensed devices, often in rural areas not served by cable or wireline broadband networks. Mobile wireless broadband services are also becoming available from mobile telephone service providers and others. These services are generally appropriate for highly mobile customers and require a special PC card with a built in antenna that plugs into a user's laptop computer. Generally, they provide lower speeds, in the range of several hundred Kbps.

Fiber to the Node (FTTN)

Fiber optic technology converts electrical signals carrying data to light and sends the light through transparent glass fibers about the diameter of a human hair. Fiber transmits data at speeds far exceeding current DSL or cable modem speeds, typically by tens or even hundreds of Mbps. Fiber to the Node technologies bring high-capacity fiber-optic cables to local service areas to connect to existing DSL equipment. Rather than bringing fiber-optic cables to every home or business, the fiber is connected to the existing DSL network to increase its capacity. It allows these networks to carry more traffic; however, often times the copper-based "last mile" DSL network, connecting homes and businesses to the local nodes is still a bottleneck and results in subscribers not able to access the true speeds of fiber-optic connections.

Fiber to the Premise (FTTP) – Next-Generation Broadband

Fiber optic technology converts electrical signals carrying data to light and sends the light through transparent glass fibers about the diameter of a human hair. Fiber transmits data at speeds far exceeding current DSL or cable modem speeds, typically by tens or even hundreds

of Mbps. The actual speed you experience will vary depending on a variety of factors, such as how close to your computer the service provider brings the fiber, and how the service provider configures the service, including the amount of bandwidth used. The same fiber providing your broadband can also simultaneously deliver voice (VoIP) and video services, including video-on-demand. Telecommunications providers sometimes offer fiber broadband in limited areas and have announced plans to expand their fiber networks and offer bundled voice, Internet access, and video services. Variations of the technology run the fiber all the way to the customer's home or business, to the curb outside, or to a location somewhere between the provider's facilities and the customer.

Figure 2-2 compares the capacity of traditional broadband technologies such as DSL, cable, and wireless to fiber-based next-generation broadband. Whereas traditional broadband technologies have an upper limit of 150Mbps, next-generation broadband that utilizes fiber-optic connections surpasses these limitations and can provide 1Gbps and greater.[1]

Figure 2-2: Comparing the Capacity of Regular Broadband to Next-Generation Broadband

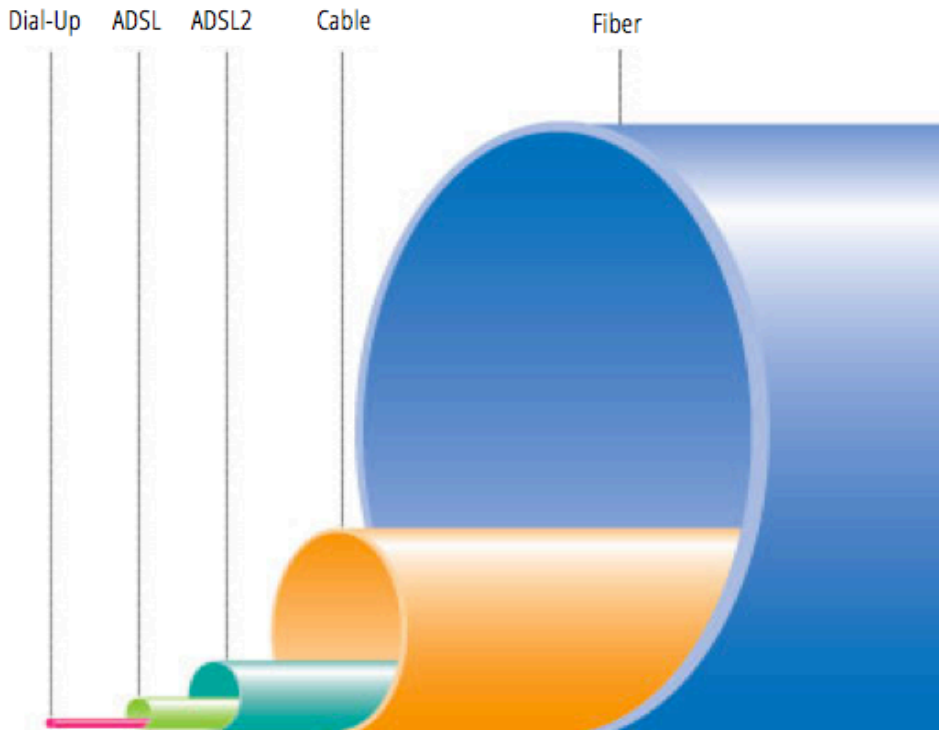
Dial-Up – 56Kbps
- Legacy Technology
- Shared Technology

ADSL – 10Mbps
- First Generation of DSL
- Shared Technology

ADSL2 – 24Mbps
- Second Generation DSL
- Shared Technology

Cable – 150Mbps
- DOCSIS 3.0
- Shared Technology

Next-Generation Fiber-Optic –
- PON, Active Ethernet
- Shared and
- Dedicated Technology



[1] Actual speed and quality of service will depend on the specific service contracted by the end user, whether using a traditional broadband service or a next-generation broadband service.

3. The Current State of Broadband in Riverside

A. Current Broadband Infrastructure

As indicated through the results of the business survey and the market analysis performed in this study, it is clear that the majority of Riverside's businesses still utilize copper-based broadband infrastructure to transmit information to the Internet; including twisted-pair copper telephone and coaxial cable networks. DSL and cable networks have provided sufficient bandwidth to small business users. However, as bandwidth needs have grown, subscribers demand more and more bandwidth out of their broadband connections to support more applications and more devices. In reaction to the growing bandwidth needs, DSL and cable networks have evolved to provide more bandwidth to homes and businesses. Broadband providers have continued to upgrade equipment and networks to make these connections faster and more reliable, however; several fundamental issues exist with copper infrastructure that pose long-term challenges to the growing bandwidth demand:

- Broadband signals degrade significantly as distances increase in copper-based networks.
- Broadband signals are susceptible to electrical interference and signal degradation in copper-based networks, particularly as they depreciate.
- Copper-based networks delivering broadband services generally utilize shared bandwidth among pools of users that results in an uneven distribution of speed to these users.

The limitations of Riverside's copper-based networks are overcome by deployment of new technologies such as fiber-optic infrastructure. The old standard of copper in local broadband networks is transitioning to fiber-optic, however; the pace of this transition is slow. Costs for deployment of fiber-optic infrastructure are extremely high, particularly in areas where no fiber-optic infrastructure exists. Providers understand that fiber-optic broadband delivers the only long-term solution to the ever-growing bandwidth needs of homes, businesses, and community anchors. Fiber-optic broadband connectivity is considerably different from its copper-based predecessor, in the following ways:

- Fiber-optic technology converts broadband data signals to light and sends the light through transparent glass fibers about the diameter of a human hair. Fiber transmits data at speeds far exceeding current DSL or cable modem speeds, typically by tens or even hundreds of Mbps.

- Actual speeds are always dependent on the services provisioned by the service provider who operates the system, however; speeds generally range from 10Mbps[2] to 100Gbps[3].
- Variations of the technology run the fiber all the way to the customer's home or business, to the curb outside, or to a location somewhere between the provider's facilities and the customer.

B. Current Service Offerings

It is important to assess the degree to which high-speed broadband infrastructure has been deployed in Riverside to understand where RPU can have the most impact for the community and minimize duplication of potential broadband overbuild. Through this process, we have identified the existence of the necessary facilities, networks, and backhaul capacity to enable expansion of high-speed broadband in Riverside. Providers have the necessary capabilities, infrastructure, and service platforms to deploy and manage services within the region and have done so in certain areas.

Fiber-optic broadband services are available in some of the City's corridors and through multiple providers. In many cases this fiber-optic infrastructure may not be available to provide services directly because of its use as backhaul to interconnect communities in the Riverside area and to connect the region to long-haul networks that connect to Internet points of presence in California and the United States.

Magellan has studied and evaluated the current state of the broadband networks in Riverside. Where information is available we have documented and inventoried network assets to define a baseline from which to evaluate the networks' capabilities, network gaps, and potentials for future applications and expansions. The analysis primarily focuses on fiber-optic facilities rather than wireless since wireless spectrum is a shared capacity (including that used for 4GLTE) such that if some users are consuming the full capacity, additional users have no access to capacity.

The broadband network in Riverside is composed of networks built by private companies such as the telephone and cable TV providers as well as the network built by RPU.

Private Broadband Inventory

A variety of companies provide broadband infrastructure in the retail markets in the greater Riverside area.

[2] Mbps stands for millions of bits per second or megabits per second and is a measure of bandwidth (the total information flow over a given time) on a telecommunications medium.

[3] GBPS stands for billions of bits per second or Gigabits per second and is a measure of bandwidth (the total information flow over a given time) on a telecommunications medium.

- AT&T is the incumbent local exchange provider in the City of Riverside. As the incumbent LEC, AT&T provides both retail services to consumers and wholesale services to other telecommunications providers. AT&T provides voice, Internet and video services. AT&T maintains DSL services and has deployed U-verse selectively throughout the community. Through discussions, Magellan was able to learn that AT&T is deploying FTTH technologies in new developments. A single community in Riverside, Atherton, has received FTTH deployment to date. AT&T Gigapower is the Gigabit fiber offering in Riverside.

  A map depicting AT&T's broadband infrastructure has been requested but was not provided.

- Charter Communications is a cable telecommunications provider serving Riverside and Riverside County. Charter maintains fiber routes throughout Riverside; however its primary service offering is delivered via coaxial cable. Charter offers voice, Internet and video services. Gigabit fiber offerings are available in Riverside through site surveys and on an individual case basis. Charter will typically allow customers to include aid to construction fees in the monthly recurring charge over a 60-month period. Charter's Riverside market will become a Comcast market if and when the merger between Comcast and TWC is finalized.

  A map depicting Charter Communications broadband infrastructure has been requested but was not provided.

- Time Warner Cable (TWC) is a cable telecommunications provider serving Riverside. TWC offers voice, Internet and video services.

- Level 3 maintains a long-haul fiber network which passes through Riverside. Riverside is considered an On-Net Market, and Level 3 maintains a presence in the Riverside County RC3 Data Center facility located in the City of Riverside.

In addition to the providers listed above, a number of additional national carriers have collocated in the Riverside County RC3 Data Center. These carriers include AT&T, Verizon, CenturyLink, Level 3, Charter, TW Telecom (now Level 3), Time Warner Communications and the City of Riverside's, Riverside Public Utilities Department.

Appendix F describes the most recent residential broadband penetration data collected and disseminated by the Federal Communications Commission (FCC), as of June 2013.

Through analysis of the market, Magellan identified a number of commercial sites by address, selected randomly in various sections of the City. Magellan's team contacted each telecommunications provider identified as operating wireline services in Riverside to determine service availability. In 3 out of 5 cases, a single provider was identified as being able to service the specific location.

The following site locations were utilized:

- Commercial Site #1 – 3610 Central Ave., Riverside, CA 92506
- Commercial Site #2 – 7889 Mission Grove Pkwy., Riverside, CA 92508
- Commercial Site #3 – 6810 Airport Dr., Riverside, CA 92504
- Commercial Site #4 – 1401 Research Park Dr., Riverside, CA 92507
- Commercial Site #5 – 3333 14th St., Riverside, CA 92501

Figure 3-1: Market Analysis – Commercial Sites 1 - 5

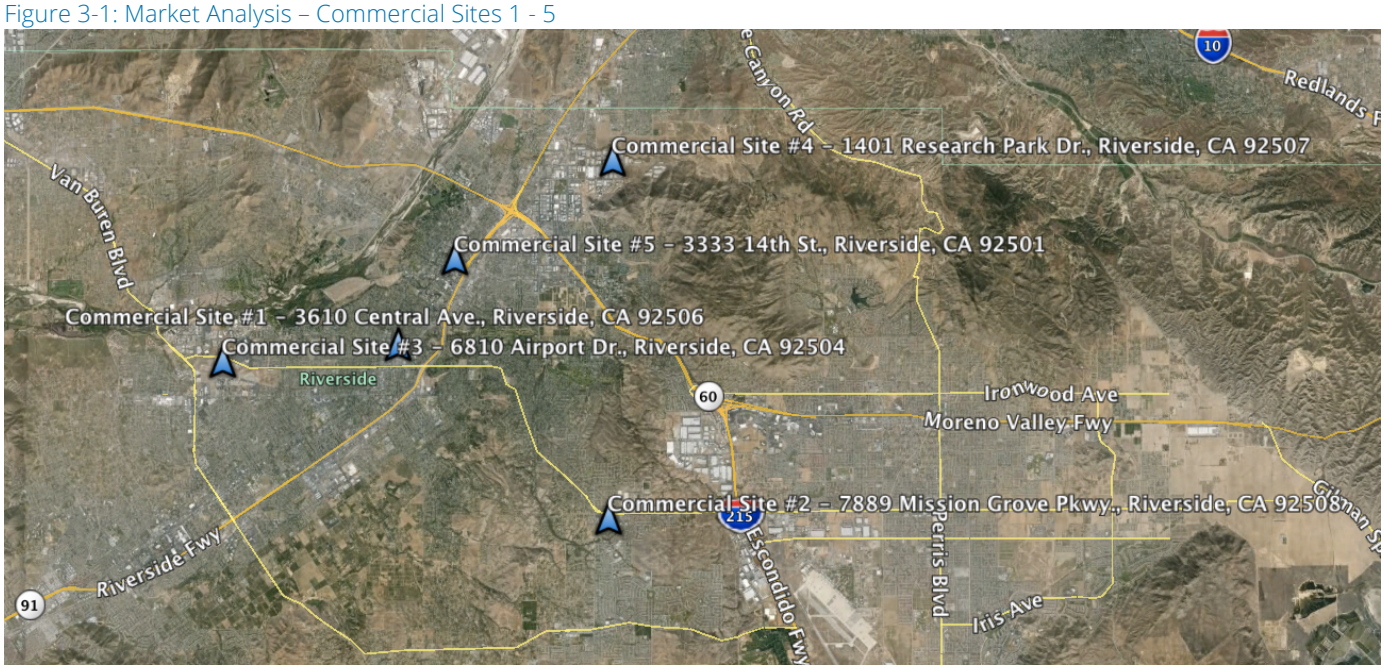


Figure 3-2: Market Analysis – Commercial Sites 1 - 5

Commercial Site #1 – 3610 Central Ave., Riverside, CA 92506		
Provider	Type of Service	Cost
Time Warner Cable	No Service	N/A
AT&T	DSL up to 6Mbps/768Kbps	$45/month
Charter	No Service	N/A
Verizon	No Service	N/A

Commercial Site #2 – 7889 Mission Grove Pkwy, Riverside, CA 92508		
Provider	Type of Service	Cost
Time Warner Cable	No Service	N/A
AT&T	DSL and U-verse up to 45Mbps/6Mbps	$90/month
Charter	No Service	N/A
Verizon	No Service	N/A

Commercial Site #3 – 6810 Airport Dr., Riverside, CA 92504		
Provider	Type of Service	Cost
Time Warner Cable	No Service	N/A
AT&T	DSL and U-verse up to 45Mbps/6Mbps	$90/month
Charter	No Service	N/A
Verizon	No Service	N/A

Commercial Site #4 – 1401 Research Park Dr., Riverside, CA 92507		
Provider	Type of Service	Cost
Time Warner Cable	Cable up to 150Mbps/50Mbps	$263/month
AT&T	DSL up to 6Mbps/768Kbps	$45/month
Charter	No Service	N/A
Verizon	No Service	N/A

Commercial Site #5 – 3333 14th St., Riverside, CA 92501		
Provider	Type of Service	Cost
Time Warner Cable	No Service	N/A
AT&T	U-verse up to 12Mbps/1.5Mbps	$75/month
Charter	Cable up to 100Mbps/7Mbps	$115/month
Verizon	No Service	N/A

Stakeholder information, survey results and market analyses indicated a number of trends in Riverside, including the following:

- Distribution of fiber-optic broadband is not consistent throughout the City; many businesses that need or want connectivity cannot get it and are relying on legacy copper infrastructure. Many businesses reported using legacy T1s as the only dedicated service offering.

- Some areas of Riverside lack any access to broadband and are left with only a dial-up option. "Poor quality and speed. Our whole area has only phone line Internet, no fiber or cable system is available."

- Lack of redundancy is an issue, and many businesses are contracting with multiple providers in order to combat the problem.

- Businesses stated that the costs of fiber-optic broadband are prohibitively expensive for small and medium businesses and the lead-times to have services installed are unreasonably long.

- Businesses stated that customer service from the incumbent providers is poor. There is an overall feeling that providers are comfortable in the market, and there is no competition to drive better service.

- Many businesses reported being dissatisfied with current speeds. "We are struggling operating our business with only a 7mb upload speed. We need affordable fiber service to function properly and to accommodate our expansion plans."
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Key Findings

- Based on the commercial locations analyzed, services are not available in all locations through each provider and in some cases only one or two providers offers service at a location.
- Fiber broadband services are available in some of the City's corridors and through multiple providers.
- Small and medium businesses have difficulty obtaining fiber broadband services at prices they can afford.
- The pricing for fiber services is comparable to that of other markets; however this does not lead to an affordably priced fiber product for Riverside businesses.

4. Broadband Demand

A. Business & Economic Development

Numerous studies demonstrate the link between broadband and economic development. A study by the Public Policy Institute of California recently demonstrated that availability of broadband in a community creates a positive influence on job growth. It found that broadband expansion is partly responsible for expansion of current businesses and drives employment growth. [4] Cities that maintain high-speed, high quality broadband networks report higher levels of economic development recruitment success and better retention than in cities with average services.

Accessible, affordable and reliable broadband services are a key economic development tool to attract and retain businesses in Riverside. In many cases, bandwidth consumption outpaces the broadband speeds local businesses are able to purchase and upgrading is often times not an option due to the prices businesses are able to afford as well as other IT related factors. When these broadband services cannot "keep up" with business needs, businesses lose productivity and efficiency affecting their bottom line and making them less competitive with regions that have more widely deployed high-speed broadband services at more affordable prices. This will eventually result in a less competitive business market from an economic perspective. It also leads to retention issues as businesses that are not able to gain efficiencies with their existing broadband services will, in many cases, move operations to communities that have more availability of these services.

Over 60% of Riverside's GDP is produced by businesses with less than 50 employees. Small and medium businesses need high-quality broadband to grow and compete.

Riverside's business market is predominately made up of small to medium sized businesses. This segment of the market often has a limited budget for broadband services, which limits options. In many cases, these businesses reported taking services from two different providers, i.e., DSL from AT&T and cable service from Charter to enable more stable connectivity. Businesses reported doing so because they could not

[4] Does Broadband Boost Local Economic Development. Jed Kolko. 2010. http://www.ppic.org/content/pubs/report/R_110JKR.pdf

rely on a single connection to maintain their connectivity needs. This doubles the costs of broadband services for this segment of the businesses in Riverside.

Magellan Advisors and RPU conducted an online survey of businesses regarding broadband uses and needs. Out of 128 businesses surveyed, 75% were small and medium businesses with 50 or fewer employees. Businesses in these four categories represented the majority of the respondents:

- Professional and scientific;
- Finance and insurance;
- Healthcare and social assistance; and,
- Educational services.

Businesses reported that Internet services were important to their operations and the majority reported that interruptions in their Internet services were detrimental to their businesses. Of the 128 businesses that reported, 27% reported that their Internet services were not currently meeting their needs due to inadequate speed or insufficient reliability. Of that 27%, about half had not upgraded because services were not available and half had not upgraded because the price was too high.

Further details from the survey of businesses include:

- Two-thirds of respondents (67%) were small businesses with 25 or fewer employees, while 16% were large businesses with over 50 employees.

- Seventy four percent of businesses have experienced moderate, severe, or total disruption of their business from Internet problems with reliability and speed.

- 27% of businesses state current Internet services were insufficient for their business needs, and a further 16% were not sure that current Internet services were sufficient.
    - Explanatory responses are: "We struggle with getting fast enough Internet and also the overall affordability", "It goes down a lot", "Not fast enough, unreliable and availability of options", "Tech park has no WIFI", and "We need an affordable fiber service in our area to support high upload speeds".

- Businesses provided additional comments including:
    - "No available fiber services."
    - "Cable has not been available, however it is supposed to be coming very soon to my complex. I have signed a letter of intent with Charter."
    - "Currently have the current highest speed offered by provider."
    - "I believe we have the best services that are offered."
    - "We moved our business because of poor services in August 2014."
    - "Need to take the time to look into switching."

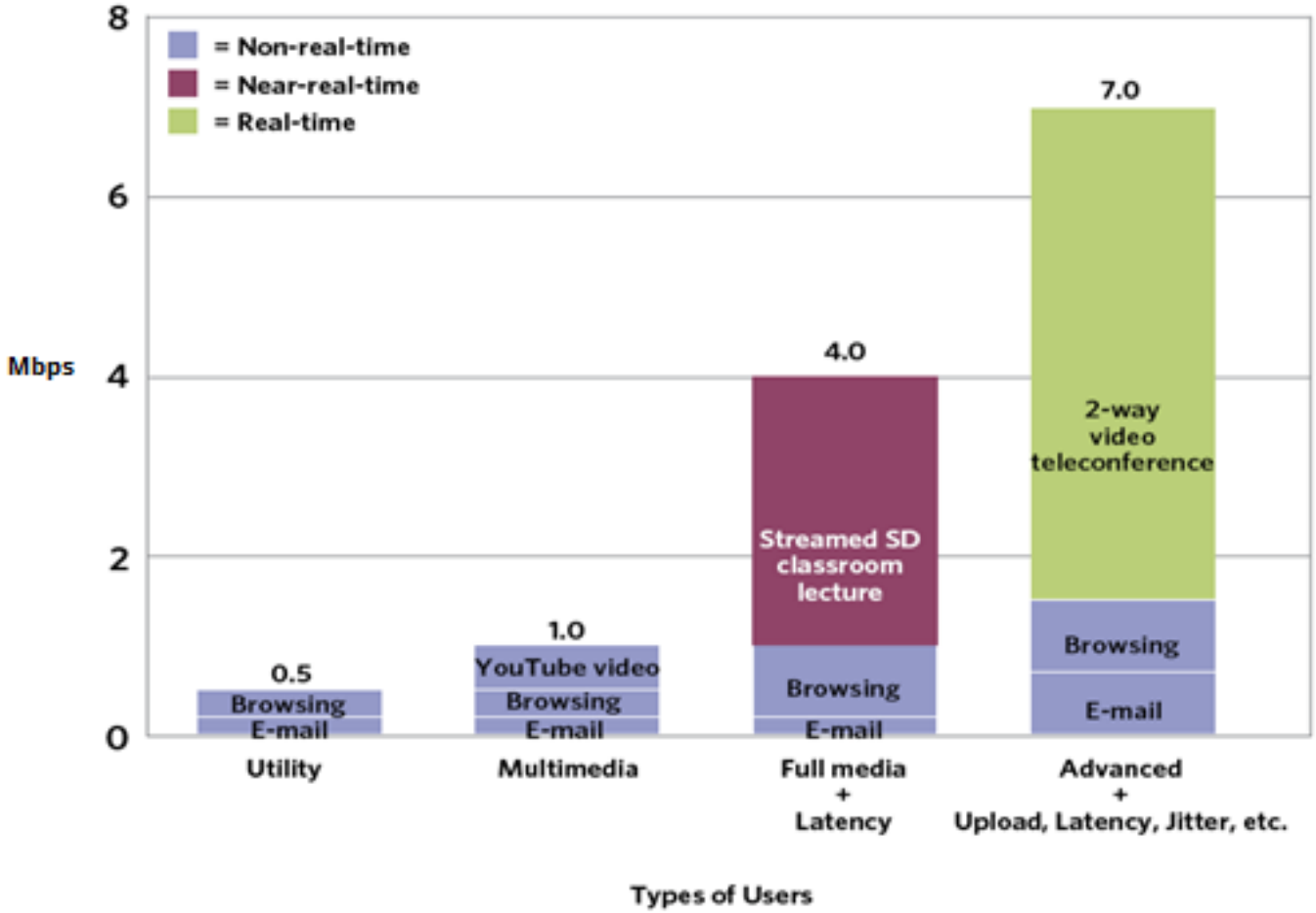
- "In the process."
- "I am not the decision maker."
- "Not my choice, handled by the main office."
- "FIOS not available for our address."
- "Evaluating pricing."

B. Education

Educational organizations are a major user of broadband in Riverside and their needs continue to grow. These include K-12 schools, community colleges, and higher education. Online applications used by these organizations require not only high-bandwidth broadband, but also services that meet strict quality and performance requirements to support real-time video and voice applications such as distance learning and teleconferencing. In addition, educational institutions are utilizing more online content to support their curricula, from sources such as YouTube, Vimeo, and Facebook.

Figure 4-1 illustrates the bandwidth requirements per student for common educational applications and the quality and performance requirements of these applications. Basic educational tools, such as web browsing and YouTube consume up to about 1 Mbps per student. However, moving up to more advanced educational technologies such as streamed classroom lectures and 2-way video teleconferences use significantly more bandwidth per student, 4 Mbps and 7 Mbps, when combined with the basic educational tools. In addition, these advanced tools require not only more bandwidth but also strict broadband quality metrics that allow them to function properly, such as low latency and higher upload speeds.

Figure 4-1: Bandwidth Requirements of Educational Technologies per Student[5]



Riverside is serviced by two distinct School Districts, the Alvord Unified School District and the Riverside Unified School District. The Riverside County Office of Education oversees education for the entire County of Riverside, which includes 23 school districts, 4 community colleges and 4 charter schools with a total student population in excess of 500,000 students countywide, a portion of whom are inside RPU's service territory. The Riverside County Office of Education and each Unified School District participate in the E-Rate program. E-Rate is the commonly used name for the Schools and Libraries Program of the Universal Service Fund, which is administered by the Universal Service Administrative Company (USAC) under the direction of the Federal Communications Commission (FCC). The program provides discounts to assist schools and libraries in the United States to obtain affordable telecommunications and Internet access. It is one of four support programs funded through a Universal Service fee charged to companies that provide interstate and/or international telecommunications services.

[5] National Broadband Plan. "Current State of the Ecosystem" http://www.broadband.gov/plan/3-current-state-of-the-ecosystem/. Accessed June 2014.

The Riverside County Office of Education ("RCOE") utilizes multiple service providers to meet the needs of the entire County. Services include multiple 1Gbps rings from Sunesys, long-haul connections from Frontier, Verizon and others, and 10Gbps Internet connections from the California Education Network Information Center (CENIC)[6] and the K12HSN**.** The RCOE plans to upgrade its connections 40 Gbps and 100 Gbps in the next few years. A main RCOE office, the RCOE data center and about 30 supporting sites are located within Riverside. The RCOE Chief Information Officer has expressed interest in RPU's plans to build out its fiber network and would entertain options for dark fiber or lit transport services if pricing and service levels were commensurate with what the school district receives today. The RCOE is an E-Rate participant and currently receives a 54% subsidy on its Internet and telecommunications services, which includes its fiber connectivity between facilities.

The Alvord Unified School District has 23 schools and over 19,000 students. The District services areas of Riverside, Corona and unincorporated areas of Riverside County. The district receives E-Rate subsidies between 82% and 84% on its Internet and telecommunications services. The District currently contracts with Sunesys for fiber connectivity and also owns fiber assets connecting some facilities. Internet is currently provided by AT&T at 250 Mbps, however the District plans to upgrade to 1 Gbps this coming year and 10 Gbps in two years. Alvord also mentioned that the Smart Riverside WiFi program was beneficial to the district and community and wished these services were maintained.

The Riverside Unified School District maintains over 46 schools with a total student population of 44,000 students. The District uses multiple providers for Internet and telecommunications services, including AT&T, Sunesys and CENIC. The district participates in the E-Rate program and receives subsidies of 75% on its Internet and telecommunications services. Wireless access is available at every campus and the District has so far deployed over 30,000 tablet type devices to students, teachers and administrators. The District also reports that over 10,000 students take 1, 2 or 3 courses virtually through the Riverside Virtual School program. Some students are eligible for a tablet with wireless Internet service if they are unable to afford Internet service at home. The District currently utilizes a 2 Gbps Internet circuit through the RCOE and maintains fiber connectivity between its locations through a 7-year contract with Sunesys. The University of California Riverside ("UCR") also shares the need for high-speed broadband infrastructure to support its multiple locations throughout the City. UCR is a long-term customer of RPU's fiber service, connecting the main campus to C-Cert, the Museum of Photography and Arts Center, and to the UC Path Center. UCR also maintains a connection to the RC3 data center. UCR maintains high bandwidth 10 Gbps connections on/off campus and 100 Gbps through CENIC. Connections to off campus facilities utilize RPU dark fiber. Dark fiber access is a major input for UCR when selecting new facilities. UCR is growing extensively and has been purchasing apartments off campus for student housing. In some cases, UCR has built fiber to these locations to connect students back to campus.

6 CENIC operates the California Research and Education Network http/::cenic.org:

Strong economic activity through technology transfer is occurring at the School of Medical Research, according to University administration. "Big Data" research and development is focused in the Healthcare, Medical Research, Engineering and Bio Technology fields. The Medical School currently maintains 80 residency students at a number of the regional hospitals, including, Riverside Community Hospital, Riverside County Medical Hospital, Desert Regional Medical Center, Kaiser Hospital System, Southwest Health System and San Bernadenes. UCR is looking to establish itself as a Top 25 Research University, which means it must attract more public and research oriented funds. Additional broadband needs will grow over the coming years as the University attracts several hundred additional research faculty and hundreds of millions of dollars in additional research. UCR envisions much of this growth occurring in the community off campus. Dark fiber would ideally connect the additional facilities that will be required to support this growth.

C. Healthcare

Broadband is crucial for Riverside's healthcare providers that are interested in meaningfully leveraging electronic health records, as many of the capabilities of health IT such as telehealth and electronic exchange of health care information, require high performance broadband capability. As a general guide, the FCC has released minimum recommended broadband speeds for healthcare organizations, as part of its Healthcare Connect program. These broadband requirements demonstrate a growing trend for healthcare organizations illustrating the need for more broadband to support their operations.

Single Physician Practice – 4Mbps

- Supports practice management functions, email, and web browsing
- Allows simultaneous use of electronic health record (EHR) and high-quality video consultations
- Enables non real-time image downloads
- Enables remote monitoring

Small Physician Practice (2-4 physicians) – 10Mbps

- Supports practice management functions, email, and web browsing
- Allows simultaneous use of EHR and high-quality video consultations
- Enables non real-time image downloads
- Enables remote monitoring
- Makes possible use of HD video consultations

Nursing home – 10Mbps

- Supports facility management functions, email, and web browsing
- Allows simultaneous use of EHR and high-quality video consultations

- Enables non real-time image downloads
- Enables remote monitoring
- Makes possible use of HD video consultations

Rural Health Clinic (approximately 5 physicians) – 10Mbps

- Supports clinic management functions, email, and web browsing
- Allows simultaneous use of EHR and high-quality video consultations
- Enables non real-time image downloads
- Enables remote monitoring
- Makes possible use of HD video consultations

Clinic/Large Physician Practice (5-25 physicians) – 25Mbps

- Supports clinic management functions, email, and web browsing
- Allows simultaneous use of EHR and high-quality video consultations
- Enables real-time image transfer
- Enables remote monitoring
- Makes possible use of HD video consultations

Hospital – 100Mbps

- Supports hospital management functions, email, and web browsing
- Allows simultaneous use of EHR and high-quality video consultations
- Enables real-time image transfer
- Enables continuous remote monitoring
- Makes possible use of HD video consultations

Academic/Large Medical Center – 1Gbps (1,000Mbps)

- Supports hospital management functions, email, and web browsing
- Allows simultaneous use of EHR and high-quality video consultations
- Enables real-time image transfer

Riverside Medical Clinic is a multispecialty medical group servicing the greater Riverside area. The organization consists of 160 providers, 700 employees and several facilities in Riverside. Riverside Medical Clinic is expanding and is exploring the potential to build a second clinical facility in Riverside. The group's doctors are very mobile, leveraging IPads and laptops with VPN software. Telemedicine and Telehealth initiatives are currently being planned. Riverside Medical Center currently contracts with AT&T for Internet and fiber connectivity services. They maintain a 500 Mbps connection, which is shared for the Clinic's Internet and wide area networking services. Most remote facilities have 100 Mbps connections while one site has a 25 Mbps connection. The Clinic maintains a 5-year contract with AT&T and spends about $9,000 per month for these services.

The organization's patient volume is growing by about 8% annually. This growth has led the group to begin leveraging technology more. The Clinic is beginning to use mobile devices that

store records electronically to their electronic medical records system. The group is also exploring collaboration with UCR for video conferencing applications. In discussions with the leadership at Riverside Medical Clinic, they showed interest in using RPU fiber; however, on the condition that RPU could meet the same service level agreements, quality of service and redundancy that they receive today from their current provider.

UCR Medical School ("UCR Med") is the newest University of California School of Medicine. UCR Med has residency programs into many of the areas healthcare providers and facilities. UCR Med also conducts extensive research in the areas of healthcare and biotechnology.

D. Public Safety

Broadband technology and infrastructure is critical to the success of our first responders because it provides them with enhanced situational awareness in emergencies. By leveraging broadband networks, public safety organizations can gain access to site information, video surveillance data, medical information or patient records, and other information that would be useful in an emergency. These networks also support and improve 9-1-1 Public Safety Answering Points (PSAPs) response time and efficiency by establishing a foundation for transmission of voice, data, or video to the responding entity.

New broadband technologies give first responders new tools to save lives. These tools include:

- Next-Generation Radio Systems;
- Advanced Security Camera Systems;
- Gunshot Detection Systems;
- Chemical, Biological, Radiological, Nuclear, and Explosives Sensor Systems;
- Body-Worn Cameras; and Next-Generation Wireless Data Systems.

The Riverside Police Department and Fire Department's primary needs included more connectivity at facilities and throughout the City in general. There is a number of City facilities such as Fire Station 9 and 10 that lack fiber connectivity, and are therefore reliant on private provider connections with VPN overlay. In addition, the need for greater wireless connectivity throughout the City has been communicated by these departments. During interviews, the Police Department discussed the effect of shutting down the SmartRiverside Wi-Fi network. Due to the removal of the Wi-Fi network, the operation has become more dependent on private carrier 3G/4G services for police vehicles and PTP/PTMP wireless solutions to support surveillance camera technology.

E. Community Support

In order for a community to thrive and grow, community support organizations must be in place. Organizations such as local chambers of commerce, human services organizations, churches, and other organizations that help connect people to the services they need in the community. These organizations traditionally access the needs and resources available in the

community and collect the data necessary to help fill the gaps in services and investigate opportunities to solve community problems and issues.

Broadband plays a vital role in helping these types of organizations fulfill their missions. Whether it is as simple as a community church streaming their weekly service or the local chamber of commerce advertising their latest event through their web presence and email, broadband equips these organizations with one of the most critical communication tools necessary to ensure they are successful in their support roles.

Broadband availability inspires these organizations to be innovative in their use of technology and brings a higher level of welfare to the communities they serve. Take for example All Saints Church in rural Norfolk County, UK. The church is utilizing its spire (the tallest structure in the area) to deliver wireless Internet service to the surrounding community. Now, in a community that was lucky to see speeds up to 1 Mbps, now speeds of over 8 Mbps are not uncommon. This community support organization has brought broadband service into an area that was previously underserved and is helping to bridge the digital divide that plagues many communities around the globe.

F. Smart City Innovation

Broadband networks become key drivers of efficiency and innovation as more and more municipal applications are enabled online. As they expand online services, broadband will become an even more critical component of the daily operations to serve communities. Applications migrated to a community network enjoy greater availability and increased bandwidths over what has traditionally been available; creating a more effective and efficient municipal organization. High-speed, reliable broadband enables these organizations to:

- Improve operational efficiencies;
- Reduce direct and indirect costs;
- Enable new interactions with citizens and businesses;
- Respond more quickly to the local community;
- Ensure better preparedness in times of emergency;
- Provide enhancements to public safety;
- Provide more information to citizens and businesses;
- Better serve the local community

Municipal fiber is capable of much more than just providing broadband services. It can provide a publicly owned communications infrastructure that can be used for additional public benefits, including enhanced municipal utilities, new e-government applications, technology collaboration, and infrastructure sharing programs. In addition, a municipally owned network can provide a platform for long-term innovation of Smart City technologies and applications, ranging from smart homes to energy conservation and management to green building programs. While the initial goal of this infrastructure is to enhance local

broadband services, it will become a long-term asset to support Smart City programs that increase efficiency, lower cost, reduce environmental impact, and enhance quality of life.

Smart City Innovations through Municipal Fiber Networks

Broadband Services

- Common backbone for all anchors
    - County & City
    - Schools
    - Libraries
    - Hospitals
    - Clinics
    - Public Safety
    - Community Support
- Interconnection with service providers
- WiFi in public centers

IT Collaboration

- E-Government applications
- Bulk Internet purchasing
- Application sharing
- Disaster recovery
- EOC communications

Public Safety Applications

- Video monitoring
- First responder support
- Collaboration with State & Federal agencies
- FirstNET preparedness

Future Energy & Utility Management

- Smart Grid & Demand Response
- Automated Meter Reading
- Advanced Metering Infrastructure
- SCADA communications and control

Key Findings

- Some of Riverside's small and medium businesses are not receiving the broadband services they need to be competitive.
- Although some of Riverside's community anchors are well-served with broadband services, other anchors are not receiving sufficient broadband services to meet their needs.

5. Current State of RPU's Fiber Infrastructure

RPU owns and operates a substantial fiber optic network that supports RPU's electric department operations. Over the years, the fiber network has been extended to provide network access and communications services for other City of Riverside Municipal Departments and external entities including Charter Communications, AT&T, and UC Riverside to name a few.

These third-party entities are able to utilize RPU's fiber pursuant to a Fiber Use License Agreement between the City of Riverside and each entity. Agreements are multi-year in most cases. The agreements are for lease of dark fiber; no services or individualized capacity is provided. Currently RPU maintains agreements with 4 third-party entities and the City of Riverside. RPU's license fee, as stated in Agreement, Section 3: Compensation, is calculated at a base cost for individual fibers, for example, $30 per fiber, per mile, per month. RPU currently provides dark fiber allocations for each dark fiber customer with segments that connect Point A and Point Z locations throughout the fiber network. All fiber route distances are calculated using optical time domain reflectometer measurement (OTDR), rounded to the nearest one-tenth mile. RPU's current dark fiber customers and revenues are as summarized below in Figure 5-1.

Figure 5-1: Summary of Current RPU Revenue from Dark Fiber Agreements (FY 2014/2015)

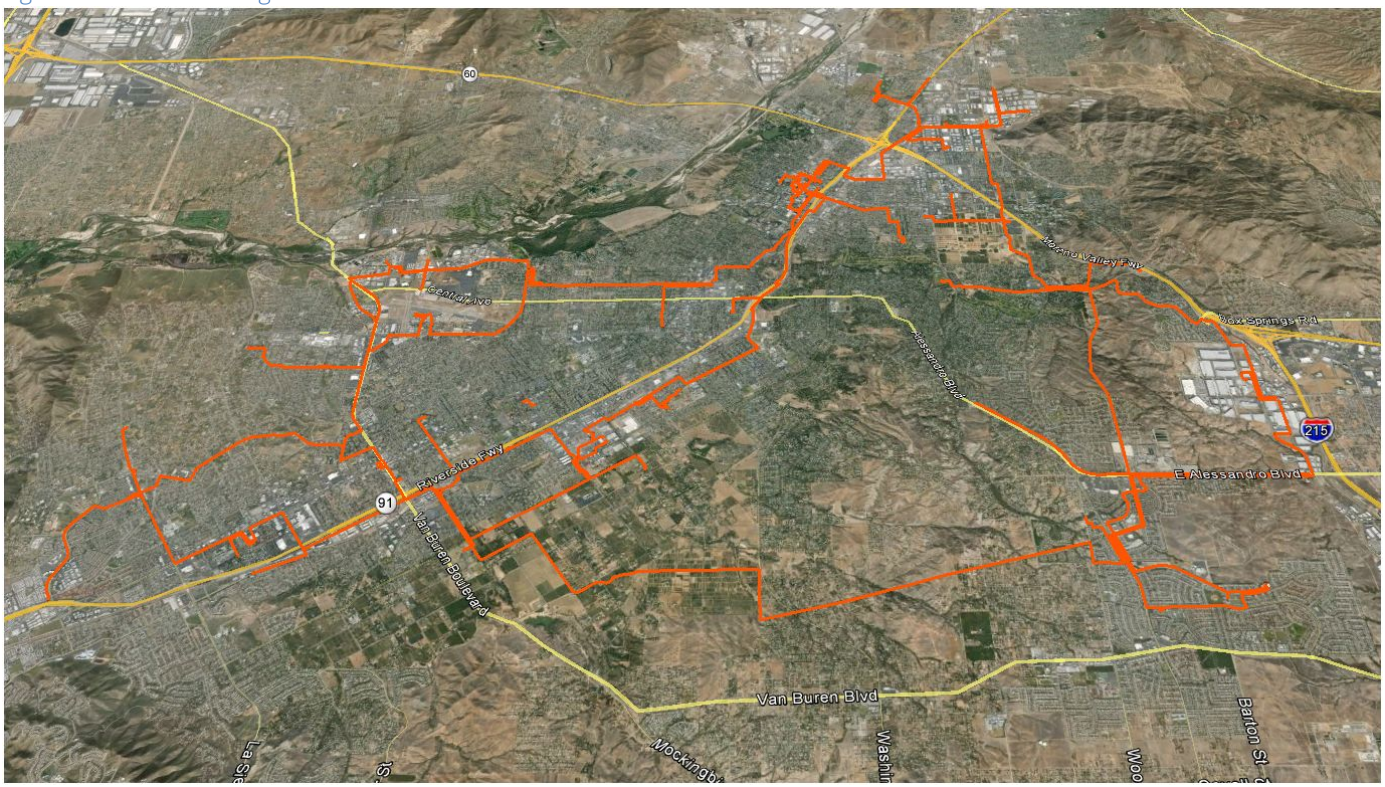
Third Party Entity	Annual Revenue
City of Riverside – City Departments	$404,898
UC Regents	$20,784
California Baptist	$1,954
Charter	$11,798
TelePacific	$13,349
UC Riverside	**$1,800**
Total Annual Revenue	**$454,582**

Several fiber routes within the RPU network lack capacity to be effective at delivering broadband infrastructure to areas of the City. For instance, in FOC-25 and FOC-62, Leidos had identified between 1 and 3 available fiber strands in each segment. While many other segments contain more available capacity than those previously stated, the current fiber infrastructure will not scale to provide sufficient capacity for major broadband deployment.

As stated in the Utility Technology Strategic Plan Preliminary Communications Network Design Report prepared by Leidos in December 2013, dark fiber strands are utilized to interconnect each customer. Most RPU internal communications utilize fiber strands to create a SONET network that reserves bandwidth for utility applications. The simplicity of this model comes with a tradeoff as RPU is quite close to exhausting its fiber capacity in some locations.

While the current RPU fiber network can be utilized in a new broadband business model, its ability to be an effective tool to deliver broadband services will be minimal. RPU will have to make the decision to either deploy more fiber strands or to multiplex network traffic into fewer fiber strands. As RPU begins to analyze the business model options for deploying a broadband enterprise, they will have several choices to utilize this existing network, they include transitioning third-party entities to a "lit" managed service offering, overbuilding the current routes adding additional fiber capacity, or by introducing a platform that increases the capabilities of the current fiber by introducing WDM (multiplexing) technologies.

Figure 5-2: RPU's Existing Fiber Network



In addition to the existing fiber network, RPU has begun to install additional 2" conduit for telecommunications infrastructure whenever underground work is performed. This practice has been in place for several years and has yielded an extensive amount of open and available conduit, which can be utilized in a broadband enterprise. While most of this conduit has been deployed in what would be considered the "last-mile", it provides significant underground infrastructure, which will minimize the overall build costs going forward. Figures 5-3 and 5-4 depict the current availability of this conduit across the City of Riverside and more specifically in the City's Manufacturing Park.

Figure 5-3: RPU's Open and Available 2" Conduit Depicted in Red (Detailed GIS shapefiles also included)

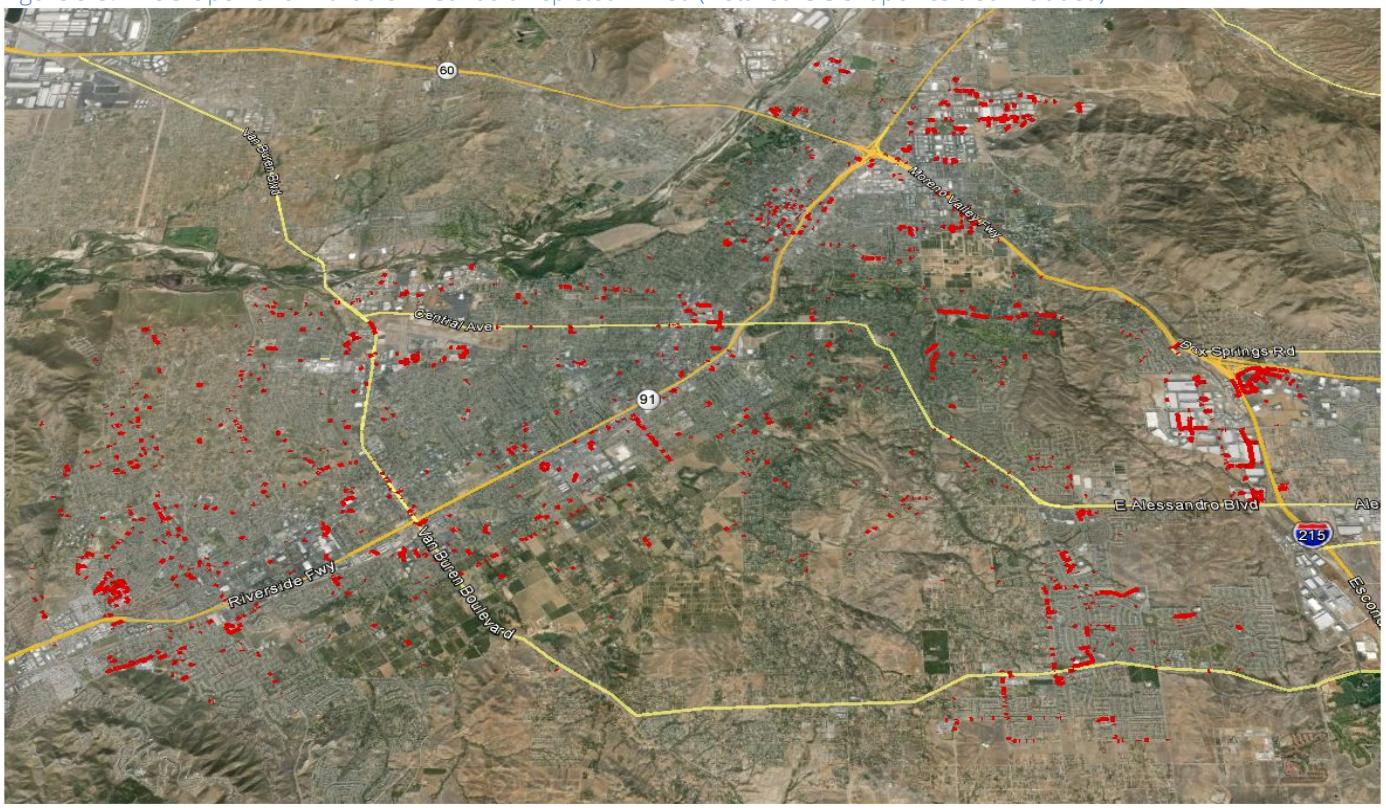
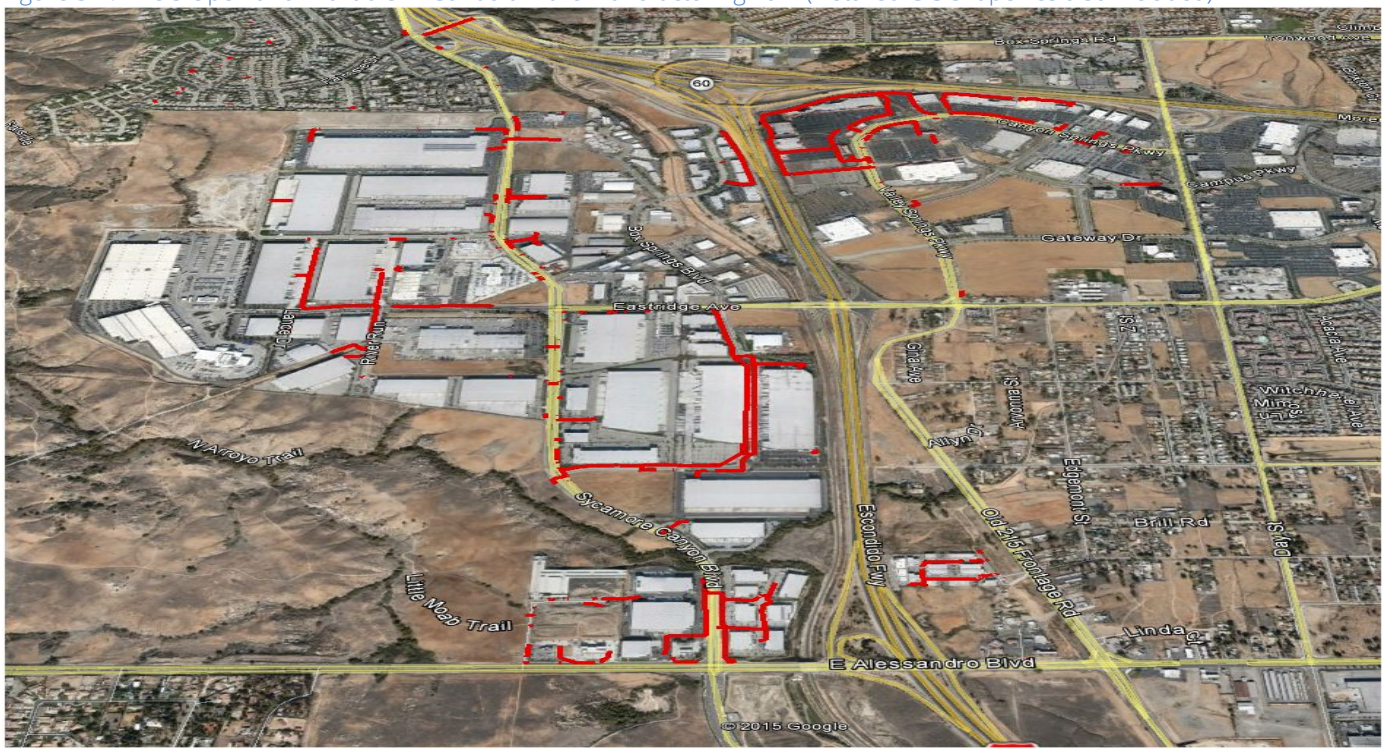


Figure 5-4: RPU's Open and Available 2" Conduit in the Manufacturing Park (Detailed GIS shapefiles also included)



6. Current Issues with RPU's Network

RPU's current environment creates several challenges to the utility expanding its network to provide wholesale commercial broadband services. The network has traditionally been built and managed using many electric utility standards and best practices that are important to maintain the fidelity and security of SCADA communications; however inject significant cost into expansion and operation of the network for broadband purposes. Electric utility standards for fiber-optic communications are more tightly governed than those for broadband communications. These controls impact the total cost to install and maintain fiber-optic communications in RPU's organization and hamper the ability of the utility to expand its fiber-optic network for commercial purposes. Prior to deployment of any commercial broadband services, Magellan recommends that RPU re-evaluate its fiber-optic placement, construction, operations and management to align these functions around providing commercial broadband services. The sections below identify key aspects that RPU should consider to reduce the costs of fiber-optic construction, operations and management.

Costs for Construction

RPU's current construction placement methods result in a significantly higher cost for underground conduit construction than is found in the telecom industry today. Magellan reviewed RPU's current contract rates for underground conduit construction and found that they were up to $130 per foot, or $686,400 per mile of installed conduit. The quoted rate was to install 2" underground conduit in City right of way using saw cutting construction techniques with full restoration.

At this rate, significant expansion of RPU's broadband services cannot be realized financially. The cost recovery for new network expansion is beyond what businesses and service providers will be able to afford in their monthly rates. For example, a half mile, dark fiber extension from RPU's current network to a commercial parcel would cost RPU $343,200 in upfront conduit construction costs, before installation of fiber and provision of actual service. Amortized over 10 years, a business would be required to pay $2,860 per month to recover RPU's cost before the cost of service was added to the customer's bill. The total bill to the customer, assuming that service costs were $500 per month for a 100 Megabit Internet service[7] would be $3,360 per month, which is significantly more than most businesses are capable of paying today and more than the current market will bear.

Construction costs are the single most important driver of affordable broadband services to the end-user; therefore, RPU must work to reduce these construction costs in the following ways:

[7] Competitive rate for 100 Megabit Internet connection was provided by a local competitive access provider in the Riverside area.

1. Change its underground construction standards allowing for directional boring of broadband utilities. This should apply for RPU and commercial broadband providers in the area as they are also burdened with these obstacles, which inhibits their opportunities to serve Riverside businesses.

2. Consider releasing an RFI/RFQ for underground construction that invites new construction techniques that will reduce RPU's cost exposure to building new infrastructure.

Industry best practices for underground construction include directional boring and micro trenching. Saw cutting through roadways is the most costly and "last resort" when other techniques are available in the project.

Directional boring is the most commonly used method of installing underground pipes, conduits and cables in a shallow arc along a prescribed bore path by using a surface-launched drilling rig, with minimal impact on the surrounding area. Directional boring is used when trenching or excavating is not practical. It is suitable for a variety of soil conditions and jobs including road, landscape and river crossings. Installation lengths up to 6,500 feet have been completed, and diameters up to 47 inches have been installed in shorter runs. Magellan received quotes from a local contractor[8] in Southern California and found that RPU could expect rates around $50 per foot for directional boring.

Micro-trenching is a low-impact deployment methodology in which fiber and conduit are inserted into a slot-cut trench less than 3/4 inch wide and between 9 and 12 inches deep – without damaging or disrupting existing infrastructure. In fact, when the trench is properly reinstated and backfilled with a cold asphalt material, restoration is nearly undetectable as disturbance to the ground is minimal. The cost savings, speed of deployment and reduction in resources over conventional trenching are compelling in areas where micro trenching can be applied. Micro trenching costs are variable but considerably lower than current saw cutting techniques being used by RPU. Actual per foot costs will depend on the particular project within the RPU area.

RPU's current cost structure for new underground construction reduces the utility's options for development of feasible fiber business models. For example, Figures 6-1demonstratea the impact of RPU's current construction costs on the feasibility of deploying new fiber infrastructure into several focus areas of the City. Figure 6-1 provides a breakdown of total construction costs under the current rate structure versus a standard commercial rate structure for fiber construction. Construction costs are more than double using RPU's current cost structure. Improving RPU's cost structure for underground construction may expand the utility's broadband opportunities in Riverside.

[8] Magellan received quotes from Henkels & McCoy, Inc. a local Design/Build contractor that manages significant fiber construction projects in Southern California.

Figure 6-1: Comparing RPU's Current Cost Structure to Commercial Cost Structure to Build New Fiber Infrastructure

	Riverwalk Tech Park	Innovation Corridor	Hunter Park Tech Corridor	Manufacturing Park	Total
RPU Current Contract & Placement Method	$713,855	$9,109,803	$7,322,237	$4,413,857	$21,559,753
Commercial Contract Rate & Placement Method	$349,455	$4,333,083	$3,302,157	$2,019,297	$10,003,093

** Commercial contract rate & placement method provided by Henkels & McCoy, Inc. for Southern California region, Jan 2015*

Electric & Broadband Asset Separation

RPU's current fiber-optic network has been built predominately to facilitate electric utility SCADA communications and resultantly, has been co-located within many of RPU's electric assets, including vaults and substations. This presents an issue for broadband expansion because of the staff and contractors who are allowed to work within these environments. Currently, RPU dispatches Qualified Electrical Worker (QEW) staff and contractors to work on RPU's fiber network because they are trained in industry safety standards for working in an energized high voltage environment.

Expanding RPU's network for commercial broadband services would not require QEWs unless broadband fiber assets were commingled with RPU's electric utility fiber assets. RPU should focus on separation of fiber for broadband purposes and electric utility purposes wherever possible. Today, Magellan understands that these resources are intertwined to some degree. Fiber is routed through high-voltage electric vaults and terminated within RPU's substations. The more separation that RPU can create will help to drive down the cost of new commercial broadband deployments for the utility.

Using QEWs to deploy and manage the proposed fiber expansion would increase the cost of installation and maintenance to RPU as QEWs are not required to install and manage fiber-optic communications for broadband purposes. Therefore, RPU should focus on two factors that may reduce commercial broadband expansion costs:

a. Isolate broadband fiber assets from electric utility fiber assets wherever possible and minimize the commingling of these two systems.

b. Utilize telecom qualified workers to install and manage fiber-optic assets for the commercial broadband purposes, including expansion of the dark fiber network, and feeder/distribution networks when applicable.

Key Findings

- RPU's fiber network has extensive reach throughout the City of Riverside but has limited capacity available in some areas of the City.
- In contrast to many commercial broadband networks, RPU's network was built to support the needs of the electric utility, not commercial broadband services.
- RPU's fiber assets are commingled with electric utility assets and require specialized personnel and systems to access these resources.
- However, the available conduit and fiber in RPU's network can be utilized for commercial broadband services.
- Several technical options also exist that would enable RPU's network to be used for significantly more broadband options, but it would require an investment of up to $1 million in new equipment to enable Dense Wavelength Division Multiplexing (DWDM) on the network. DWDM would allow RPU to reclaim fiber strands that are currently utilized.

7. Opportunity Assessment

A. What Impact Can RPU Have on Local Broadband?

The primary objectives of employing RPU's fiber optic network, broadband-friendly public policies, and strategic investments are to improve access and availability of broadband services in Riverside. These tools are utilized to increase the supply of broadband infrastructure that is available to serve Riverside's businesses, residents, and community anchors. A number of benefits can be realized by expanding access and availability of broadband in Riverside, including:

Improving Affordability

By leveraging broadband assets that are already available within the City, the amount of new broadband construction is limited, reducing the investments necessary to provide services to subscribers. The cost of new broadband construction within the City may range from $100,000 - $250,000 per mile of fiber-optic infrastructure, depending on the location. In places where the City already has available conduit and fiber-optic infrastructure, "overbuilding" may not be necessary by broadband service providers, which will help them reduce their total costs to provide services to end users. In some cases, costs for broadband construction are directly passed on to end users in the fees collected by broadband service providers. In other cases, these costs become part of a broadband service provider's total cost of services from which standard rates for residential and business broadband services are derived. In both cases, the costs for broadband construction increase broadband service providers' "bottom line." Reducing these costs where feasible can positively impact costs for these providers and in turn, can lower the rates paid by subscribers.

Enhancing Economic Development

Increasing the availability of fiber based services into the main business corridors and parks will allow RPU, the City and its local partners to enhance the economic development message regarding Riverside's broadband capabilities. Through the deployment of fiber distribution technology, RPU can designate these areas as being "On-Net", allowing any business moving to Riverside to quickly recognize that fiber services are available from a number of national carriers. This concept, partnered with a Data Center facility would provide the message that a business can locate in any business center such as Downtown, the Innovation Corridor or one of the many business/tech parks in Riverside and they'll have next-generation broadband availability.

Increasing Adoption

Broadband adoption is influenced by two key factors; relevancy, and affordability. RPU has the opportunity to improve affordability by leveraging its fiber-optic network and making measured investments in additional infrastructure. Affordability and adoption of broadband services are

positively correlated. As affordability increases, so does adoption. RPU can positively influence adoption by negotiating agreements with broadband service providers to provide "lifeline" Internet services at low costs for disadvantaged residents, small businesses and other targeted populations in exchange for discounted use of its broadband assets. These incentive programs can help broadband service providers deploy more quickly and at lower costs in exchange for their participation in such lifeline programs.

Improving Public Efficiency and Effectiveness

Leveraging the Utility's broadband assets to connect more public institutions throughout the community creates the opportunity to establish collaborative technology programs across multiple organizations. Establishing institutional access to RPU's conduit and dark fiber networks would create a high-speed, inter-governmental backbone through which these organizations could collaborate with one another on information technology and communications projects. Connecting schools, libraries, local government, public safety, and community organizations to one another could facilitate the sharing of technology resources among the organizations connected. Some of the potential benefits may include cost reductions through joint volume purchasing agreements, application sharing, and improvements to emergency operations and communications.

Reducing Taxpayer Spend

Improving public efficiency and effectiveness should reduce the costs of government to the local taxpayer. If employed effectively, RPU's broadband initiatives can become a tool that facilitates cost reductions, not only for the City and RPU itself but also for other public organizations across the City, including schools, libraries and other community organizations. An inter-governmental network connecting these public organizations should consolidate the purchasing power of all agencies for common information technology and communications services, resulting in lower overall costs. The network can also "futureproof" the connectivity needs of these public agencies and protect them from cost increases, as they require additional bandwidth.

Reducing Lead Times for Installation

The time to install and activate end users' broadband services is significantly determined by the availability of infrastructure in the area. Businesses are negatively impacted by fiber construction lead-times that may result in delays to activate their services. 30 days is the typical industry standard lead-time for activation of fiber-optic broadband services, without a provision for special construction. In many cases, the lead-time may double or triple depending on how much additional fiber construction is necessary to reach the end user's location. RPU's conduit and dark fiber infrastructure can be used to supplement existing broadband service provider infrastructure to reduce these lead times by utilizing this existing infrastructure.

Supporting Reliability and Performance

RPU's broadband assets can be used to support the reliability and performance of broadband services across Riverside. These assets can be employed to provide new physical route diversity to the networks of existing broadband service providers and increase capacity in existing routes. They can be used to increase backhaul capacity in areas of the City that are near or at their limit and equip more commercial towers with dark fiber connectivity, increasing the bandwidth available to mobile carriers serving Riverside's wireless needs. Community anchors can utilize these assets to achieve significant upgrades in speed and connectivity between their facilities as well as diversity for their primary connectivity.

B. Opportunity Matrix

Type	Organization	Short-Term	Long-Term
Municipal	Public Works (Traffic Management)	Connect more signals/cameras through existing fiber	Expand RPU's fiber network to interconnect all signals/cameras
	Public Safety	Provide access for surveillance cameras.	Deploy wireless services strategically throughout Riverside
	Information Technology	Continue to provide WAN services to City Sites	Provide additional network access to support City initiatives
Education	Riverside County Office of Education	Work with RCOE to determine feasibility of RPU providing connectivity	Expand RPU's fiber network to provide transport connectivity to RCOE locations
	Riverside & Alvord Unified School Districts	Work with RUSD to determine the feasibility of RPU providing connectivity	Expand RPU's fiber network to provide transport connectivity to RUSD & AUSD locations
	University of California at Riverside	Develop plan to expand access to UCR & Medical School locations where required	Expand dark fiber access to UCR and the Medical School
Healthcare	Riverside Hospitals	Work with area hospitals to identify connectivity requirements for the medical community	Provide alternate lit transport offering to affiliated doctors' offices and supporting facilities
	Riverside's Doctor's Offices	Provide connectivity to local hospitals for access to shared services	Provide "local" lit service offering for access to partnering facilities
	UCR Medical School	Provide dark fiber access selectively to locations off campus	Expand lit service offerings to key locations off campus
Business & Economic Development	Economic Development Department	Identify fiber service areas throughout Riverside	Market Riverside's commercial and industrial districts as being "On-net" with multiple fiber broadband providers
	Riverside Businesses	Access a new fiber based broadband infrastructure to access broadband providers	Enable competition among broadband providers, bringing new advanced service offerings at competitive prices.
	Broadband Providers	Provide access to a new fiber based broadband infrastructure.	Access to a new customers using a demand aggregation/open-access methodology

Municipal

Magellan's meeting with municipal stakeholders uncovered some potential opportunities for RPU to expand the fiber services it current provides to various City departments. Among these were the City's public safety, information technology and public works (traffic management) departments. Interviews with departmental personnel identified mid to long-term technology initiatives that would require the use of RPU's fiber resources and future network expansion. These include the deployment of fiber to traffic signals, cameras, wireless access points and other facilities owned by the City. The information below provides detail on these initiatives.

Public Safety

The City's Public Safety departments, Police and Fire have both identified greater connectivity as a general need to support their respective operations. There are multiple sites that still lack fiber connectivity and the loss of SmartRiverside Wi-Fi has been a detriment. As RPU moves into expanding its broadband enterprise through greater deployment of connectivity solutions, these needs should be addressed more easily as fiber distribution technologies are used to provide more ubiquitous coverage throughout identified areas of the City.

Public Works & Traffic Management

The City's Traffic Management group maintains about 400 signals across the City. The majority of these are not connected by fiber, rather they are connected using a combination of City-owned WiMax radios, copper-based DSL connections and a few that utilize the department's own fiber network. About 200 signals are controlled manually by traffic management staff, which requires a resource to be dispatched to each signal to manage timing and control. The Traffic Management group indicated that they would like to have all signals connected to fiber, which would give them more control and faster response times to manage these resources. This would also facilitate the implementation of more traffic cameras at intersections that could be utilized by both Traffic Management and Public Safety to monitor public roadways.

Although RPU's fiber network would not provide coverage for every signal, the majority are in close proximity of RPU's network and could be interconnected to the traffic management center using a sound network topology. Public Works will also receive a $1.8 million transportation grant to construct fiber throughout the downtown corridor along Magnolia Street to interconnect a significant number of signals. RPU is already planning to share conduit in this project and install its own fiber cable in addition to the cable funded through the transportation grant. Further, as RPU considers the expansion of its network for broadband purposes, it should coordinate these projects with Traffic Management to ensure they have the opportunity to connect more signals and cameras.

Within the four corridors planned for fiber expansion, there are a number of signals that could be connected to the network through the planned fiber routes. Traffic Management should be included in the planning process for these network buildouts to ensure this new infrastructure incorporates their needs as well. This would allow RPU to continue connecting Traffic

Management's assets while expanding its network for broadband purposes. This would achieve multiple tiers of benefits for the City for both the municipality itself and the community.

Information Technology

The City's IT Department maintains the City's enterprise network and WAN that interconnects the various City sites and facilities. The City currently utilizes extensive RPU fiber to interconnect City facilities and contracts with providers for upstream Internet services.

The City of Riverside and SmartRiverside in partnership with a private provider deployed Wi-Fi services throughout the City. This service provided wireless access to City departments, public safety and the public. While the program was successful for a number of years, the costs for maintaining and ultimately upgrading the system was too costly. The SmartRiverside Wi-Fi network has subsequently been shut down, and its impacts felt by many. An expanded RPU network would allow the potential to deploy new Wi-Fi services in specific areas of the City. This concept is being piloted now, as IT is deploying 802.11ac at a City park. While this type of deployment has a clear municipal use, the infrastructure can also be utilized for free Internet access in support of addressing the City's digital divide.

Additionally, the IT Department has stated that network redundancy is a top issue for the City. There are several City sites that require redundant WAN service or fiber paths; however access to fiber in some of the potential segments is at capacity and therefor unavailable.

Education

RPU has an opportunity to provide broadband services to the various educational institutions throughout Riverside, including K-12 and Higher Education. The Riverside County of Education, Riverside Unified School District, Alvord Unified School District and the University of California Riverside all have high-speed broadband requirements that RPU may be able to serve. While UCR has an existing relationship with RPU through long-term fiber agreements, there is an opportunity to continue to serve the University as they grow and expand off campus. RPU also has the opportunity to become an E-Rate service provider, which would enable the Utility to become a potential broadband provider of transport services for the Riverside County of Education and the Unified Schools Districts. The E-Rate program provides telecommunications subsidies to Schools and Libraries. In these cases, RPU would qualify to be a provider of services for these entities and would effectively capture the local telecommunications spend as well as the Federal governments subsidy.

Riverside County Office of Education

The Riverside County Office of Education (RCOE) provides leadership and administration for the multiple Unified School Districts throughout Riverside County. In many cases, the RCOE provides shared services, network infrastructure and connectivity solutions to the USDs. The RCOE is a large organization that supports over 300 buildings in Riverside County with over 2,000 employees. 30 buildings are maintained within the City of Riverside alone.

RPU has the potential to provide transport services to the RCOE in the future, specifically for those facilities within RPU's fiber footprint. In addition, if RPU registers to become an E-Rate provider of services, it could offer lit transport solutions to those facilities that qualify for E-Rate subsidies, thereby accessing Federal E-Rate dollars.

Riverside & Alvord Unified School Districts

The Riverside and Alvord Unified School Districts both service the City of Riverside. While both districts currently have fiber connectivity to interconnect their facilities, there may be future opportunities to provide varying types of network access as the districts experience growth.

In both cases, the need for public Wi-Fi access, specifically to replace the SmartRiverside wireless network were discussed. There is a significant and rapidly growing number of students in the district that are considered "at-risk", and who may not have access to Internet in the home. Both districts are working to deploy devices, which students can take home. As curriculum and interactive learning tools are being deployed digitally, the need for ubiquitous access whether at school, home or in the community is paramount. Neither district can confirm whether a lifeline Internet services program is available in market.

University of California at Riverside

The University of California at Riverside currently leases dark fiber from RPU to connect the main campus to a number of facilities off campus, located throughout the Riverside community. UCR currently maintains fiber connections through RPU to service its C-Cert Research Facility, the Museum of Photography and Arts Center, UC Path Center and to the County's RC3 data center.

The UCR main campus is built out, and future growth will be targeted to commercial districts throughout Riverside. UCR likes to "control the fiber and the electronics on each end," as this gives them the ability to deploy bandwidth as needed. Most sites are connected at 10Gbps to the main campus. UCR is a node on the CENIC network and is upgrading is connection to 100Gbps.

While it appears that UCR supports RPU's efforts to expand broadband, it feels as though it must control the fiber, and therefor will be unlikely to migrate to a lit transport services platform.

Healthcare

Riverside's major hospital systems currently maintain access to high-speed broadband services but outside of these organizations, few healthcare providers maintain this type of access. Doctor's offices, clinics and imaging centers all have growing broadband needs to ensure they stay connected as their organizations transition to the digital healthcare environment. For

these smaller organizations, high-speed broadband becomes a critical need to fulfill their mission and to ensure long-term success.

An expansion of RPU's broadband infrastructure will provide the medical community with a new "local" option for transport services, able to provide connectivity to hospitals, clinics, imaging centers, healthcare learning facilities and doctor's offices. Today, these organizations utilize RPU dark fiber, provider managed services fiber offerings and a multitude of copper networks delivering services over traditional cable and DSL platforms. RPU would be able to provide an all fiber offering to entities within the potential deployment areas, offering more bandwidth at competitive rates.

Riverside Hospitals

Riverside Hospitals would be able to utilize RPU's network to collaborate with other healthcare providers throughout the region. This new local choice for fiber connectivity will allow the various healthcare partners in the area to connect back to the hospital system that may provide a shared services platform including imaging and electronic medical records systems.

Riverside's Doctor's Offices

A locally sourced fiber alternative would allow remote healthcare offices, clinics, imaging centers and hospitals to interconnect at speeds of 10Mbps and up to 10Gbps allowing for full integration of health IT applications and services. In addition, it would allow local management of network traffic, whereas today, electronic medical records may have to travel outside of the region because of how private providers route their network traffic. RPU's network could also be utilized by the local doctor's offices to connect to multiple providers, increasing their ability to access competitive services.

UCR Medical School

UCR maintains clinical and residency programs in all regional hospitals throughout the area. In addition, UCR is conducting research in Big Data as it concerns healthcare and medical research. A new local fiber system could provide required connections to industry clusters that may begin to develop around UCR in support of these technologies being developed on campus. This type of access would support and foster greater collaboration as sufficient bandwidth and services are unavailable today in many areas around the City.

Business and Economic Development

An RPU investment in broadband infrastructure will provide an alternative fiber based telecommunications infrastructure to all businesses and anchors within the fiber deployment zones that have been identified. This will provide new infrastructure to small, medium and large businesses that is otherwise non-existent today. Deploying fiber distribution technology throughout the downtown corridor, business, and industrial and technology parks will enable the City to classify these areas as being On-net. For economic development organizations and businesses, this message indicates that fiber services are available throughout these identified

areas and that several providers are able to reach significant numbers of subscribers that are otherwise inaccessible.

Economic Development Organizations

An RPU broadband network would allow the City of Riverside and more specifically the economic development organizations to market Riverside as an On-net City with fiber service availability in the identified fiber service areas. For a business looking to locate in Riverside, it would be able to locate inside one of these fiber service areas ensuring fiber connectivity is available – no questions asked. Additionally, it would have the ability to contract with one or multiple providers accessible through this infrastructure. For the City and economic development groups, a new tool could be added to the portfolio of economic development incentives. The City and RPU could partner to offer fiber connectivity and bandwidth in an economic development incentive package.

Riverside Businesses

For Riverside Businesses, the RPU deployment of broadband infrastructure would have the greatest impact. As evident from our research, businesses in Riverside currently experience issues trying to contract for affordable fiber based connectivity solutions. In addition, many businesses only have a single provider as an option, while others may have two providers to choose from. An RPU fiber based network would allow businesses to access fiber capacity that is otherwise out of reach in today's market. This network would also provide businesses with an option to contract for services from multiple providers, thereby increasing service levels and reducing prices through the introduction of a competitive telecommunications environment.

Broadband Providers

RPU's investment in broadband infrastructure will provide broadband providers with access to a new set of customers that today may be unattainable. While Riverside has a number of providers that own and operate wireline infrastructure throughout the region, there is another set of providers located in Riverside that would welcome a new fiber alternative. RPU's ability to aggregate demand on its network will provide great value to partnering providers. While RPU would own and operate the broadband infrastructure, it would be the provider's responsibility to provide retail services and to support their customers.

8. Roadmap for RPU's Fiber Business

Magellan's discussions with RPU's management team helped to scope the potential opportunities for development of the fiber business model roadmap. Magellan built consensus with the RPU project team that the fiber business model should:

- Begin by formalizing its existing fiber business;
- Be grounded on RPU's core competencies and organizational capabilities;
- Utilize a "crawl, walk, run" methodology that minimizes risk and maximizes value to RPU and the Riverside community;
- Find near-term opportunities to demonstrate RPU's abilities to execute, build capacity and expand;
- Measure the success of its fiber business at each stage and react accordingly;
- Evaluate a range of long-term business options as RPU's fiber business matures.

The proposed fiber business model roadmap reflects this approach.

A. Phase 1: Formalize RPU's Existing Fiber Business

1. Assign an Internal Project Manager

RPU should designate an internal project manager who is responsible for managing the fiber business. This position should have an operational role in managing the fiber business and implementing the steps outlined in Phase 1.

2. Document the Inventory of Available Assets

This Study has evaluated RPU's underground conduit and fiber that is available to expand its fiber business. It has found that RPU's availability of dark fiber is limited in some areas of the City and RPU should "earmark" a portion of remaining fiber for commercial use. Documenting this inventory and establishing a "set aside" for leasing should be done to memorialize capacity dedicated for broadband applications and ensure it's available in the event that the need arises.

3. Implement a Fiber Management System

As RPU considers utilizing its fiber infrastructure for commercial broadband purposes, the importance of documentation and record keeping for the network becomes more critical. RPU will need to maintain accurate documentation of its existing network and document new network construction in Riverside and how new network facilities are integrated into the current network. Magellan recommends that RPU establish a fiber management system to accurately document, track and report on the fiber designated for broadband applications. The previously completed Leidos Report also recommended that RPU implement a fiber management system to track its electric utility fiber assets. A single fiber management system should be capable of managing both sets of assets;

however, RPU should ensure that the system is designed to track telecommunications attributes of fiber.

Several vendors offer fiber management systems particularly well suited for municipal fiber networks. Costs for these software packages will depend on the features that RPU requires and the professional services RPU selects for implementation and integration. Each software vendor uses ESRI GIS as its mapping foundation. Magellan suggests that RPU set aside an initial budget of $100,000 for the implementation, which includes the software license, professional integration services and the first year's software maintenance agreement. Magellan also suggests an annual budget of $15,000 for the annual software maintenance contract. Further, RPU should establish a staff person to manage the fiber management system. This resource should:

1. Assign an internal resource to manage deployment of the fiber management system;
2. Gather the inventory of RPU's existing conduit and fiber;
3. Evaluate fiber management software and select best option;
4. Procure vendor's professional services to assist with integration of RPU's inventory data into the system and conduct training;
5. Develop fiber nomenclature, labeling and conventions for RPU's assets, and
6. Complete integration of RPU's data and publish the inventory as RPU's "commercial broadband assets"

Fiber Management System Software Providers

OSPInSight – www.ospinsight.com

OSPInSight is an intuitive and user-friendly network management system that enables and empowers an organization with network intelligence. You can store valuable and minutely detailed information about every aspect of your fiber optic networks more quickly and easily than any other GIS based network-modeling system. Your organization is empowered with instant and easy access to specific and cumulative network data retrieved from a relational database and displayed in customizable tabular and graphical formats.

Enghouse Netdesigner – www.enghousenetworks.com

Enghouse's NetDesigner solution is complemented by the world's leading ESRI GIS platform and has been widely deployed by service providers that are building high speed fiber to the home (FTTH), fiber to the tower (FTTT), cable, copper and wireless LTE broadband networks.

4. Review and Standardize Agreements for Fiber Leasing

RPU should standardize its fiber leasing policies to formalize the commercial use of dark fiber. This includes standard agreements for dark fiber and conduit leasing for RPU's

existing infrastructure. RPU should develop the core agreements necessary to formalize its current dark fiber leasing program, including:

1. Develop a standard Master Services Agreement for leasing infrastructure to private organizations, including an industry standard service level agreement and acceptable use policy;
2. Develop a standard Inter-Local agreement for leasing infrastructure to public organizations, including an industry standard service level agreement and acceptable use policy;
3. Review existing contracts, and where possible introduce new agreements to customers on expiration of existing contracts.

5. Set Policy to Treat Fiber as a Telecom Asset, Not an Electric Asset

RPU should develop policies that consider its commercial fiber a telecom asset rather than an electric utility asset, at an operational level. This Study found that RPU's costs for construction and management of fiber are considerably higher than other municipal fiber networks because these assets have been developed within the electric utility environment, requiring specialized labor in many cases. RPU should set policy that separates these assets where possible, particularly for any new fiber constructed as its fiber business.

Construction practices for commercial fiber should be based on telecom standards rather than electric utility standards. Utilizing these standards should enable RPU to significantly lower its costs of construction and operations of new commercial fiber. Key tasks include:

1. Review RPU's current construction practices for dark fiber;
2. Develop a new set of guidelines for fiber construction based on telecom standards;
3. Solicit bids from local fiber contractors to receive pricing on fiber construction.

6. Develop Pricing Policies for Fiber Leasing

RPU needs a standard rate schedule for leasing its dark fiber to ensure the utility is providing these services at competitive rates and covering all of its costs. The rate schedule should provide normalized rates across its fiber business to ensure pricing consistency to the market. RPU should assign cost proportionally to the allocation of its network that is used for commercial broadband purposes. Rates should be designed based on a "cost plus" model to account for network costs plus a margin that RPU seeks to gain for leasing these services. RPU should also maintain flexibility in its rate schedule to offer promotions and incentives in conjunction with economic development programs in Riverside. Key tasks include:

1. Document RPU's existing cost structure for fiber leasing, accounting for its one-time and ongoing costs;

2. Build a "cost plus" rate schedule using a per foot/per strand model for dark fiber leasing;
3. Develop leasing terms for 1, 3, 5 and 10 years with discounts applied to longer lease terms.
4. If rates will be formally adopted by the RPU Board, build in provisions to adjust rates in special cases to accommodate the competitive marketplace.

7. Publish RPU's Rates and Terms

RPU should have its standardized rates available to the market in Riverside, focused on broadband providers and public organizations. The rate schedule should contain the relevant rates for fiber strand leasing, one-time charges, monthly charges and terms. RPU should also set a disclaimer on its rate schedule that any "special construction" of new fiber beyond its existing network will be subject to individual case basis, or "ICB" pricing. Key tasks include:

1. Establish and approve the standardized rate schedule;
2. Approve terms and conditions for leasing dark fiber;
3. Consider what information to publish, where and to whom.

B. Phase 2: Tactical Plan to Expand the Fiber Business

Restructuring and formalizing its current business will enable RPU to create a firm foundation to begin expanding its current services. This tactical plan provides a step by step approach that RPU should utilize to expand its dark fiber services to commercial and community anchor customers.

1. Establish Achievable Goals for the Fiber Business

The business plan should focus on short to mid-term achievable goals for expanding RPU's current fiber business. The goals should emphasize utilization of RPU's current dark fiber new extensions to provide additional connectivity to public organizations and private broadband providers. It should also seek opportunities to provide more connectivity to the electric utility's sites and support more municipal applications for the City. Goals should be centered on supporting RPU's and the community's needs.

2. Identify Immediate Needs and Opportunities

RPU should review the broadband needs and opportunities that Magellan identified in this Study to determine how RPU's network could be expanded to meet these needs. This provides a solid base of information that RPU can use to investigate these opportunities further. In addition, RPU should identify high priorities for fiber connectivity and develop a plan to immediately address these needs.

3. Determine RPU Policies for Expanding Dark Fiber

RPU will need to implement a policy that determines the conditions under which it will

expand dark fiber beyond its existing network. The policy should establish criteria to evaluate the revenues and costs to RPU, the benefits to the electric utility and the benefits to the community, as follows:

1. Determine the total revenues, costs, payback and return to RPU;
2. Determine the economic development opportunities for the fiber expansion;
    a. Assess the value of the opportunity to maintain or grow electric utility load;
    b. Assess the value to the City for job creation and retention;
3. Determine other community benefits to be achieved;
4. Set criteria to warrant the expansion under the above criteria.

4. Develop Pricing Policies for Expanding Dark Fiber

RPU will require a new pricing scheme for expanding its dark fiber network to more customers. The telecom industry uses ICB or "Individual Case Basis" pricing for fiber connectivity that requires new construction. ICB pricing will vary depending on the cost of constructing new fiber to reach the customer. ICB pricing will include "service costs" for the current portion of RPU's network utilized in the connection plus "extension costs" for the costs to cover new construction to reach the customer. RPU should consider that broadband providers and businesses may become customers of RPU, depending on whether RPU intends to simply wholesale its fiber to providers or provide it directly to end-users. RPU should be prepared to accommodate both options in its business plan.

Service costs will generally be set as a fixed monthly charge. The extension costs will be a variable charge that the customer can either pay upfront or amortize over a period of time. The latter will require RPU to "finance" the construction costs over a reasonable period of time, based on RPU's policy to recover its initial capital outlay. The telecom industry generally seeks a 20 – 36 month payback period on the initial capital outlay. RPU should be prepared to support this payback period at a minimum, as customers will generally prefer amortizing these costs than paying them upfront.

The recommended pricing policy for expansion of the fiber enterprise uses a different approach than the current adopted RPU policies provide for water and electric infrastructure. Under those service rules, customers are responsible for all upfront infrastructure costs to receive service. That model will likely not be feasible in the fiber business marketplace, where incumbent providers "front" the capital for system extensions and recover over short amortization periods. This model does create a certain level of risk and should be evaluated in that light.

RPU should also consider how to influence pricing based on the benefits that will be received by the electric utility, city and community (presented in section 2.C). RPU should work with the electric utility and City to determine what incentive programs it may offer to support community and RPU goals.

5. Define Operational, Staffing & Financial Requirements

The tactical business plan should address the incremental requirements for RPU moving from its current fiber business into an expanded operation. As RPU "commercializes" more of its network, it will be met with additional needs to fund expansion, manage customer services and maintain the network. RPU should define what staffing and systems will be needed to expand its fiber business, addressing these key operational functions and determining RPU's resources needed to proceed into this business model. RPU should expect that new funding is required for network expansion and operations. RPU should build a fiber business financial plan that enumerates the projected revenues and costs attributed with the fiber expansion.

6. Consider Establishing an Enterprise Fund

As RPU develops an organizational structure for the fiber business, it should consider whether or not to establish the fiber business as an enterprise fund. RPU should understand financial and regulatory implications of operating as an enterprise fund and determine whether it should implement this structure or remain a part of the electric utility.

7. Implement Operations and Staffing

Once RPU has fulfilled the preliminary planning tasks, it should staff the key positions that will be responsible for implementing the business plan. These positions should execute the sales and marketing plan and operations plan for RPU's fiber business. This team should develop the timeline for launch of RPU's fiber business and hold responsibility for the project implementation, in conjunction with other RPU departments and outside consultants. These staff persons should be charged with the following tasks:

1. Setting project implementation goals and timelines;
2. Creating product definitions for RPU's fiber products;
3. Applying RPU's rate policies to fiber products;
4. Building the go-to-market plan for fiber products;
5. Executing the operations plan and defining standard operating procedures, including:
    a. Sales and order process for on-boarding new customers;
    b. Design/build process for new fiber extensions;
    c. Integration with current RPU network;
    d. Provisioning, testing and activation process for turning up new customers
    e. Customer management and monitoring;
    f. Fault and troubleshooting;
    g. Standard and emergency maintenance;
    h. Customer billing;
    i. Accounting, reporting and compliance.

8. Increase the Inventory of Available Fiber

RPU should identify any unused dark fiber assets that it can re-allocate to the fiber business. At the time of this Study, Riverside IT was evaluating a project to add multiplexers onto RPU's existing dark fibers to increase the capacity. This could reclaim dark fiber strands to be used in the fiber business. RPU should look at these types of opportunities to re-allocate as much dark fiber to the new business as possible.

9. Develop the Marketing and Sales Program

RPU's existing network should be used as a "jumping off point" to identify new opportunities for fiber connectivity. RPU should analyze potential users of fiber within close proximity to its network. A few thousand businesses are within 1,500 feet of RPU's current network. This should become RPU's first target market. Within this target market, RPU should be able to limit its costs for new construction and provide standardized competitive rates for fiber connectivity. RPU may want to analyze the success of this limited deployment program before moving into a larger market. It should also define the metrics for success in the limited deployment, considering the uptake of customers, costs for construction, revenue generated and the benefits received by end-users.

10. Establish Metrics for Success

RPU should establish key metrics that measure the success of its fiber expansion program. These metrics should consider the operating results of the program after the first few years and the benefits received by the community. Based on the results, RPU should consider whether to expand its current fiber business, continue to operate using the existing model or revise its business strategy.

C. Phase 3: Strategic Expansion of the Fiber Business

RPU should evaluate its Phase 1 and Phase 2 deployments to assess whether its desired goals and objectives have been attained. If the results have been positive to date, RPU should analyze additional options to further expand its fiber business, identifying potential opportunities and business models that could bring additional value to RPU's business and the greater Riverside community.

1. Evaluate the Impact of RPU's Current Fiber Business

Phase 3 focuses on identifying new opportunities for RPU based on its success in formalizing the fiber business (Phase 1) and expanding it (Phase 2) to provide dark fiber services to customers. First, RPU should assess the performance of its fiber business to date.

- Has RPU been successful in expanding its business and operations?
- Has financial performance been acceptable?
- What difficulties has it encountered along the way?
- Did the services meet the expectations and have customers been satisfied with

the value delivered?

- Has the fiber business supported growing electric utility load?
- What "soft benefits" to economic development and the Riverside community been received by RPU's fiber business?
- What additional opportunities does RPU see to differentiate Riverside as a community based on expansion of the fiber business?

Answering these questions will help RPU to determine if it should evaluate additional plans to expand the fiber business, continue to operate in its current state or revisit its business strategy.

2. Identify New Opportunities

RPU should work with the City and other local stakeholders to determine what additional opportunities RPU's network could create for Riverside. As RPU's fiber business matures over Phase 1 and 2, it will build capacity to consider these additional opportunities that may support community needs for economic development, education, healthcare, municipal and residents.

3. Explore Additional Business Models

Several business model options should be evaluated to determine what benefits could be realized by expanding RPU's fiber business. Phases 1 and 2 limit financial risk to the organization by expanding fiber connectivity in cases where clear revenue opportunities exist. This initial approach is designed to solidify RPU's current fiber business and enable it to build momentum while gaining subject matter expertise and organizational capacity.

With this growth, additional opportunities may require RPU to "step outside" its existing current operations and evaluate a range of additional business models to accommodate these needs. These business models are explained in more detail in Appendix E.

4. Consider Public-Private Partnerships

Public-private partnerships (P3s) are an emerging trend that has started to accelerate the deployment of fiber broadband services, particularly for residential and business services. P3s marry the public sector's capacity to build infrastructure and the private sector's experience providing broadband services. P3s often include shared risk and shared reward among the parties; shared risk in co-investment between public and private partners and shared reward in sharing of revenues between the partners. RPU should evaluate the potential for a P3 collaboration in expansion of its fiber offering. This process could include a release of an RFI that would solicit interest in potential P3 opportunities as well as direct feedback into how a P3 could be structured. The RFI should be made available to all providers including the incumbents currently serving the Riverside community.

5. Learn from Other Organizations

This Report provides information from other cities and public utilities that have deployed broadband networks. As RPU evaluates other ways to expand its fiber business, it should learn from peer communities that have implemented these projects. These projects provide important lessons learned and best practices to help RPU understand how these organizations grew their operations. Each community implements broadband differently, which should provide RPU valuable insight on a range of business models, from passive networks that continue to provide simply dark fiber, to open access networks that provide wholesale capacity to retail providers that deliver residential and business services. A summary of preliminary research on other agency fiber deployments is included in Section 10 of this report.

6. Conduct a Feasibility Study

Before determining the path forward, RPU should determine what goals it will achieve by implementing other business models and what conditions exist that warrant RPU expanding its fiber business. As RPU evaluates additional business model options, it should consider the increasing levels of risk and reward that are commensurate with them. In most cases, these options will require RPU some level of investment and sunk cost to enable RPU to expand its service offerings. As a result, RPU may want to conduct a feasibility study to explore these options in detail. The feasibility study should determine the business case to expand RPU's fiber business.

The feasibility study should evaluate a range of business model options. It should provide in-depth business, operational, organizational and financial analysis of these business models to allow RPU to make informed decisions on whether it should expand the fiber business, based on the costs, benefits and risks.

9. Appendix A – Summary of Recommendations

Section 5. Current State of RPU's Fiber Infrastructure

- As RPU considers the expansion of its network for broadband purposes, it should coordinate these projects with Traffic Management to ensure they have the opportunity to connect more signals and cameras.
- Utilize telecom qualified workers to install and manage fiber-optic assets for the commercial broadband purposes, including expansion of the dark fiber network, and feeder/distribution networks when applicable.

Section 6. Current Issues with RPU's Network

- Isolate broadband fiber assets from electric utility fiber assets wherever possible and minimize the commingling of these two systems;
- Utilize telecom qualified workers to install and manage fiber-optic assets for the commercial broadband purposes, including expansion of the dark fiber network, and feeder/distribution networks when applicable.

Section 8. Roadmap for RPU's Fiber Business

- Formalize the existing fiber business;
    - Be grounded on RPU's core competencies and organizational capacities;
    - Utilize a "crawl, walk, run" methodology that minimizes risk and maximizes value to RPU and the Riverside community;
    - Find near-term opportunities to demonstrate RPU's abilities to execute, build capacity and expand;
    - Measure the success of its fiber business at each stage and react accordingly;
    - Evaluate a range of long-term business options as RPU's fiber business matures.

A. Phase 1: Formalize RPU's Existing Fiber Business

- RPU should designate an internal project manager who is responsible for managing the fiber business;
- RPU should document their inventory and establish a "set aside" for leasing should be done to memorialize capacity dedicated for broadband applications and ensure it's available in the event that the need arises;

- RPU should establish a fiber management system to accurately document, track and report on the fiber designated for broadband applications;
    - RPU should establish a staff person to manage the fiber management system;
    - RPU should standardize its fiber leasing policies to formalize the commercial use of dark fiber;
- RPU should develop the core agreements necessary to formalize its current dark fiber leasing program, including:
    - Develop a standard Master Services Agreement for leasing infrastructure to private organizations, including an industry standard service level agreement and acceptable use policy;
    - Develop a standard Inter-Local agreement for leasing infrastructure to public organizations, including an industry standard service level agreement and acceptable use policy;
    - Review existing contracts, and where possible introduce new agreements to customers on expiration of existing contracts.
- RPU should develop policies that consider its commercial fiber a telecom asset rather than an electric utility asset, at an operational level;
- RPU should set policy that separates these assets where possible, particularly for any new fiber constructed as its fiber business;
- RPU should develop a standard rate schedule for leasing its dark fiber to ensure the utility is providing these services at competitive rates and covering all of its costs;
- RPU should have its standardized rates available to the market in Riverside, focused on broadband providers and public organizations;

B. Phase 2: Tactical Plan to Expand the Fiber Business

- RPU will need to implement a policy that determines the conditions under which it will expand dark fiber beyond its existing network;
- RPU will require a new pricing scheme for expanding its dark fiber network to more customers;
- RPU should define what staffing and systems will be needed to expand its fiber business, addressing these key operational functions and determining RPU's resources needed to proceed into this business model;
- As RPU develops an organizational structure for the fiber business, it should consider whether or not to establish the fiber business as an enterprise fund;
- Once RPU has fulfilled the preliminary planning tasks, it should staff the key positions that will be responsible for implementing the business plan;
- RPU should identify any unused dark fiber assets that it can re-allocate to the fiber business;
- RPU should analyze potential users of fiber within close proximity to its network;
- RPU should establish key metrics that measure the success of its fiber expansion program;

C. Phase 3: Strategic Expansion of the Fiber Business

- RPU should work with the City and other local stakeholders to determine what additional opportunities RPU's network could create for Riverside;
- Several business model options should be evaluated to determine what benefits could be realized by expanding RPU's fiber business;
- As RPU evaluates other ways to expand its fiber business, it should learn from peer communities that have implemented these projects;
- As RPU evaluates additional business model options, it should consider the increasing levels of risk and reward that are commensurate with them;
- RPU may want to conduct a feasibility study to explore additional options in detail;
    - The feasibility study should evaluate a range of business model options. It should provide in-depth business, operational, organizational and financial analysis of these business models to allow RPU to make informed decisions on whether it should expand the fiber business, based on the costs, benefits and risks.

10. Appendix B – Benchmarking Analysis

Magellan's team performed a benchmarking analysis through a series of interviews and meetings with other municipalities and municipally owned utilities that have made strategic investments in community broadband infrastructure. These investments have been supported through various business models. The following organizations have been included in the analysis:

Organization	Business Model
Chattanooga EPB, TN	Direct Provider
City of Loma Linda, CA	Direct Provider
City of Burbank, CA	Direct Provider
City of Danville, VA	Open-Access Provider (Wholesale)
City of Santa Monica, CA	Open-Access Provider (Wholesale)

Chattanooga, TN

The Chattanooga EPB announced in 2009 that it would build a high-speed fiber optic network to every home and business in the Chattanooga, TN market. Today 62,000 homes and 5,000 businesses are connected to the network offering gigabit speeds.

Goals

The Chattanooga public utility, EPB set the following initial goals for the network:

- Modernize the electric utility business;
- Provide unserved constituents another broadband choice that would influence economic development; and,
- Generate enough revenue from triple-play subscribers to help pay for the network build out.

EPB feels it has been successful reaching its primary goals as is evident from the milestones listed below:

- EPB has realized operating cost savings of $10.5 million to EPB, and $50 million to the community in reduced power outages;
- EPB currently has 62,000 residential customers, 5,000 business customers;
- EPB Fiber Optics earnings have enabled it to pay $83 million to EPB since the network launched in 2009 through to July 1, 2013; and,
- EPB has realized an ARPU of $110 from the residential market.

It is helpful to look at EPB Fiber's business trajectory over the years since it launched. 18 months after launch, EPB Fiber had its first profitable month. Two years after launch, it had 30,000 residential customers (many for triple-play subscriptions) and 1,300 business customers. Revenues were sustaining operations three years after launch.

Initial Funding

The initial investment for the network was $300 million. EPB funded its network through issuing a 25-year bond, which it is on track to pay off by 2033, and from a Department of Energy grant of $111 million.

Business Model

EPB Fiber places business models for municipal and public utility-owned networks into two categories: a) those that want to sell to a limited number of business subscribers each month (four – eight), and likely will price these services in the $700 per month and above range; b) those that plan to sell to a much higher number of businesses and possibly to homes, and for less money per subscriber (in the $200 - $500 per month range.)

EPB decided early it was definitely in the latter category. Technically, EPB positions itself as an open-access network and other providers are allowed to sell services over the network. However, they determined that they wanted to be a retail provider as well and the goal of their retail business is to sell to a significant number of businesses and organizations within its market. EPB has a direct sales force that pursues business subscriber sales. EPB is very protective of information about staff size, service pricing and financial data, but has offered to speak one-on-one with Riverside staff if this is desired.

Recommendations from Chattanooga

Most small ISPs are undercapitalized and not able to support an aggressive marketing effort to drive the number of subscriber the wholesale operation needs to prosper. This puts the business model at risk unless the network operator has many anchor tenants. Open-access providers should not co-brand with ISPs and use standard language in contracts that the large incumbents use in typical telecommunications services contracts.

Loma Linda, CA

Loma Linda's Connected Community fiber network started as a fiber-to-the-new-homes project for this town of 21,000 residents. The City Council passed an ordinance requiring that all developers building homes in the Town must include fiber-optic cabling on the properties. This was a sound strategy; however, the city discovered that the retrofitting existing homes would

cost significantly more than cabling new homes. The city has since shifted to a business-focused sales strategy.

Goals

In 2005, Connected Community's goal was to build a FTTH network covering the 7.5 square-mile town and generate a 70% - 75% take rate for $30 per month Internet-only service at 10Mbps (symmetrical) to all new houses being built in 2007 or later ($50 per month for 15Mbps symmetrical). The low revenue per subscriber makes it cost prohibitive to wire pre-2007 homes as these costs are $1,200-$1,800 per home.

Currently Connected Community has a 50% take rate on its network today. There are currently 400 residential subscribers and 40 business subscribers on the network. Subscriber churn is very low. When the next 3,000 homes begin construction next year, Connected Community expects to meet the original take rate goal, as well as be able to sell triple-play to homes built before 2007. Higher monthly revenue from triple-play subscriptions will enable the city to recoup its investment in the older homes more quickly.

Connected Community also had economic development goals to:

- Increase the number of hospitality facilities;
- Service visitors and other transient populations;
- Boost the financial health of existing medical facilities; and,
- Increase the number of healthcare facilities.

Initial Funding

The initial investment was a $3 million loan from the California Redevelopment Agency. The terms of the loan dictate that as long as the city makes its interest payments interest but does not generate a profit from operation of the network, repayment of the principal is not required.

Business Model

Connected Community uses a retail business model. The City shifted from residential Internet services in 2009 and began selling Internet services primarily to businesses and healthcare organizations. The City's main financial goal was to break even through subscriber sales, fiber and conduit leasing, providing outsourced Internet support service for companies and data center sales. The City maintains 3 staff that oversee the operation of the network currently.

The network generates about $1.1 million in annual revenue, which covers its operating costs. The network helped attract two hotels to town, which generate $600,000 per

year in various local taxes. It also helped attract a Veteran's Administration clinic to the City that has brought 1,500 jobs to Loma Linda.

Burbank, CA

The City of Burbank is maximizing unused assets in its municipal power utility's fiber network to offer ultra-high-speed connectivity to all city facilities as well as businesses. Media companies are an important industry in Burbank and the City has utilized its network to support their transition to the electronic world. ONE Burbank is a key reason Burbank remains the "Media Capital of the World."

Burbank Water & Power ("BWP") created ONE Burbank to deliver services to local government and school district facilities, as well as sell services to primarily entertainment industry businesses. ONE Burbank's fiber network covers approximately 17 square miles. The network offers services from 20Mbps to 1Gbps symmetrical speeds.

ONE Burbank soon will begin an initiative to deliver WiFi services citywide, targeting the 15% of Burbank's population that does not have access to the Internet. It will provide a "best effort" service, capitalizing on the strong WiFi infrastructure that the City built to support its automated meter reading needs.

Goals

BWP built the first fiber infrastructure in 1986 to interconnect the Burbank Water and Power utility with the city's IT department. The primary goal was to connect all city facilities to improve communications capabilities and reduce cost. BWP expanded this effort to the local business community by offering excess capacity in its dark fiber network to entertainment industry businesses in 1997.

In 2009, the city began modernizing much of the infrastructure that facilitated its internal operations. Three goals emerged from this effort:

- The modernization of BWP's smart grid;
- The augmentation of utility operations and reduction of costs without increases to the ratepayers; and,
- The goal to "Provide more, better, and for less;" launching a program of symmetrical Internet services for the entertainment industry and other core businesses.

BWP believes it has succeeded in improving its internal operations and boosting its local economy by providing high-quality broadband services that support the retention and recruitment of entertainment businesses in Burbank.

BWP is generating 3-4 new customers per month, and have 120 customers to date. ONE Burbank also has expanded service to the Burbank Unified School District.

Initial Funding

Upgrading the fiber network was part of the City's overall infrastructure modernization effort that cost $68 million, but it is difficult to separate out all of the funding that was specifically spent preparing the network for commercial sales.

Business Model

ONE Burbank uses a retail model to provide services directly to business customers. The City has allocated all of its operations personnel in single organizational structure. No staff has been specifically allocated to ONE Burbank. BWP estimates that operations of the ONE Burbank network requires 5-6 full-time equivalents.

ONE Burbank's revenue is approximately $3.4 million annually. ONE Burbank strives to increase revenues at 10% - 12% per year. Revenue from business services pays operating expenses and contributes to cash reserves.

ONE Burbank charges $225 per dark fiber mile plus the cost of construction for fiber connections from the existing network to customers' premises. Transport services, or lit fiber services, include buildout costs in the monthly fees that customers pay for services.

Recommendations from Burbank

BWP determines its annual budget by using an estimated projection of revenue and costs that is tracked every month. ONE Burbank evaluated the incumbent's approach to marketing its Metro Ethernet services in the local area. These services were similar to those offered by Burbank. Burbank realized it could offer these services for considerably less. Burbank mentioned to "be realistic" regarding customer take rates and the prices that customers will pay for service. This marketing plan should lay out the key markets that the utility wants to target and the plan should be reviewed annually to track the success of the program.

Danville, VA

Danville's public utility deployed an open-access fiber network named nDanville and comprised of 175 miles of fiber that covers Danville's 45 square miles. The network passes more than 1,000 business locations including five business parks within the City. Customers have access to 100Mbps Internet connection, or by special request 1Gbps and 10Gbps connections if required. nDanville also offers retail cable services.

Goals

Danville's public utility built its network to serve to improve municipal and utility communications as well as serve the City's schools with improved connectivity.. The key objectives for expansion of to citizens and businesses were to:

- Bring high-quality broadband connections and high-speed Internet service to local businesses;
- Improve the local economy while reducing unemployment by retaining and attracting key companies; and,
- Maintain cost competitive services compared to other metropolitan areas.

nDanville reported great success meeting their goals. The network has served schools needs for 10 years, currently providing them with gigabit connectivity. Most city agencies and facilities have also benefitted from improved communications and higher reliability. Besides tech and renewable energies companies, advanced manufacturing has benefited from nDanville's broadband services, as evidenced by IKEA setting up its first U.S. manufacturing facility, in part because of nDanville's high-quality broadband services. The City attributes a reduction in unemployment and improvement in economic output to the nDanville network.

Initial Funding

The initial 80-mile fiber network was built for $2.5 million. It was funded through a loan from the Electric Fund of Danville Utilities. This telecom fund was kept separate from the rest of the utility's funds to eliminate any ratepayer exposure. The loan was repaid with interest within three years. Over the following years, $15 million was invested into expanding the network in staggered amounts over time that came from operating revenues.

Business Model

nDanville considered providing retail services to businesses using its network but decided that open-access wholesale was the preferred option. Since implementing the open-access network, nDanville has attract two Internet Service Providers to operate on its network. The utility has approximately 350 business subscribers that primarily utilize point-to-point services. Some public Internet connections have also been established. Many of the current businesses subscribers have used the network to replace their aging T-1 lines with more reliable fiber access. nDanville stated that the take rates fluctuate. Residential subscribers account for 70% of cable services while businesses account for 30%.

ISPs set final retail pricing to end subscribers. Wholesale open-access prices charged by nDanville to ISPs are:

- 128K lifeline services - $9.99 per month;
- 10Mbps symmetrical - $465 per month;
- 18Mbps download/5Mbps upload - $100per month;
- 1Gbps - $2,500 per month; and,
- 10Gbps - $5,000 per month.

Only when an ISP gets customers does nDanville start billing them. In addition to wholesale open-access fees, nDanvillle shares revenue with ISPs who utilize the network. 20% of gross revenues are paid to nDanville while the ISP keeps 80%. Businesses are billed directly by nDanville for point-to-point transport services on the network. nDanville negotiates pricing with local businesses directly for these services. The network also serves 25 city and county schools that fund Internet access through the FCC's E-Rate program. nDanville has established itself as an E-Rate provider. nDanville successfully bid and won E-Rate contracts to provide these services on a continued basis. The network currently generates $1.5 million per year. $800,000 is utilized to cover operating expenses while nDanville contributes $300,000 per year to the city's general fund. Surplus revenues fund capital projects for network expansion.

nDanville has two FTEs dedicated to maintaining the network. Utility management, technical support, operations and daytime customer service are tasks handled by nDanville staff. Contract firms handle construction, splicing, other infrastructure work and after-hours customer and technical support. With these contractors, nDanville can accommodate customer growth.

nDanville struggles to manage its ISP retailers and market the services available to the community. nDanville has utilized mailers, newspaper ads and website promotions. However, some ISPs have difficulty marketing their services to the community. nDanville has difficulty attract more ISPs because of transport costs that are required to reach the nDanville network. Providers without local facilities are forced to buy transport into Danville to interconnect with the nDanville network. These costs can be considerable depending on where these ISPs are located. Danville's market is also relatively small, which results in a limited market share for new providers that are evaluating the nDanville network.

Recommendations from Danville

One particular customer story reflects a strategy Riverside should consider. Danville was successful in providing access to a particular healthcare customer which helped drive development of the local industry. The Danville Regional Medical Center is one of the largest employers in the area. They have several clinics that transmit large amounts of data between offices. nDanville's network has supported these large data needs as more of the Medical Center's operations were moved online. The Center has expanded over the past several years, opened a new facility and partnered with the Virginia

College of Osteopathic Medicine for its residency program. This subsequently draws a notable number of younger professionals to the area that hopefully will stay and, in time, start their own practices.

Santa Monica, CA

The network covers approximately eight square miles of Santa Monica and soon will be delivering up to 100Gbps per second of symmetrical broadband access. Prices for services are negotiated for each business customer individually.

Goals

Santa Monica's CityNet fiber network had five goals:

- Lower costs of Internet access for the City and schools;
- Centralize or integrate municipal services through core data systems;
- Establish free WiFi in 35 public hot zones as well as distribute 375 computers in kiosks and libraries in town for free access;
- Nurture existing businesses, attract new businesses, support startups and VC and incubators; and,
- Create an environment for other incumbents to invest in city infrastructure. The city has no plans to provide residential service to its 90,000 people.

The City Information Services ("IS") Department currently maintains CityNet. The City reports achieving its initial goals in the project. In the first year of operations, the network saved the City $750,000, which per City Council's direction, was mandated to stay within the IS department. This amount represents a 35% savings on the City's communication costs. In addition, new fiber extensions were built to businesses needing high-speed Internet services, services that the local incumbent could not provide at an affordable price.

Initial Funding

Santa Monica initially employed CityNet, the municipal fiber network, to replace the City's aging communications infrastructure. Secondarily, the network became a platform to deploy business class fiber services. As the network accumulated business customers, surplus revenues were utilize to reinvest in network expansion, driving more fiber deployments to local businesses. The City was also able to receive transportation grants to finance a portion of the CityNet buildout.

Business Model

CityNet utilizes a wholesale open-access model and has attracted Verizon FiOS, AT&T, and five other broadband providers to offer services over the network. CityNet sets rates for ISPs that utilize the network. CityNet staff manages sales and marketing

activities for the network and utilizes a revenue sharing model with ISPs and generally receives 10% of gross profits.

126 businesses are currently connected to CityNet and approximately 5 additional ones are added on a monthly basis. CityNet has also been successful with its MDU strategy. Facing high vacancy rates, the the City encouraged property owners to install fiber cabling into their buildings as a way to entice tenants to occupy commercial properties. CityNet heavily discounted the cost of installing, operating and maintaining fiber infrastructure into buildings if the owners passed that savings directly to potential tenants and aggressively marketed the gigabit broadband service. The City reported increases in tax revenues and commercial property values for parcels that were equipped with fiber.

When Santa Monica launched CityNet in 2002, only the City's CIO and one staff member managed the system. Currently four dedicated FTEs are managing the network. Staffing also includes 15% of the CIO's time, 10% of a manager's time and a part time network engineer. Two additional FTEs work in technical support during regular business hours to troubleshoot and resolve customer issues.

Recommendations from Santa Monica

Santa Monica reported that focusing on the local market was an important aspect of expanding broadband access. After determining the market strategy, the City identified buildout areas by potential customers, future developments and the construction environment. Fiber utilized to connect City facilities was also leveraged to reduce buildout costs for local businesses in proximity to these existing network resources.

11. Appendix C – Data Center Considerations

Considerations for Creating a Data Center Business

The data center (or colocation facility), which could be owned and operated by RPU, or a leased facility, should be located centrally in the Riverside service area and provide termination points for all of RPU's fiber-optic cables and interconnection points for all services and service providers. The data center should be a hardened; carrier grade facility constructed of concrete, fiberglass, and steel and provides a controlled environment for operation of sensitive telecom equipment and facilities. The data center can be sized specifically to the needs of RPU and potential partners. RPU can also entertain the concept of collocating within the Riverside County RC3 Data Center, which contains a number of existing regional and national carriers.

RPU's backbone fiber would terminate inside the data center onto fiber termination frames. Inside plant intra-facility cable bundles (IFC) are utilized to interconnect fiber termination frames with RPU's network equipment. These fibers terminate customer connections directly on core/distribution equipment, either utilizing 100Mbps, 1Gbps or 10Gbps Ethernet ports.

The opportunity to construct a data center in Riverside is one that must be examined as they can provide a significant boost to both the technological infrastructure in the community as well as the local economy. Data center facilities are being built throughout the United States and globally to provide secure facilities for computing and networking environments. These facilities are very expensive projects that bring tons of value to the regions where they are ultimately located. Most data centers, by design, consume vast amounts of energy and are not very efficient. This energy consumption is used to power servers, storage, and networking infrastructure which supplies consumer, business, and government access to the Internet and other services on the World Wide Web. This infrastructure is a crucial component and plays a very large part in our modern economy as we know it.

Regions that have been successful in their recruitment of data centers benefit in a vast number of ways. First, data center's large consumption of energy means that local electric utilities gain a large consumer of resources that are consistent from month to month; power utilization in data centers do not fluctuate as is the case with normal businesses. Second, large investments are required to construct and operate a data center facility. These investments are then funneled into the local job market creating construction jobs initially and converting to professional positions once operational. Finally, these facilities hit the local government tax rolls and produce property tax revenue commensurate with the value of the facility and the equipment located in the facility. Data Centers also typically bring high-speed broadband infrastructure into the region, as this type of connectivity is paramount to the success of a data center facility.

For RPU the concept of investment in a municipal data center facility may be an excellent companion project to consider as RPU continues to analyze opportunities to begin providing broadband services to the region. This facility could provide data center space for RPU's various utilities IT operations, its broadband services operations, and the City of Riverside Enterprise IT group. In addition, regional community anchor institutions could utilize this facility as well to host their infrastructure, or at minimum, as a potential disaster recovery site or as a part of their business continuity efforts.

Municipal data centers throughout the United States have been successful. The City of Rochelle, Illinois built a 3,000 square foot data center facility and has been successfully in filling it with various types of customers. The entire facility is 9,000 square feet housing a 3,000 square feet of raised floor data center space with a total facility cost of $6.2 million. With the addition of the data center, Rochelle was able to successfully attract a number of national providers to collocate in the facility; these include Zayo, Verizon, AT&T, and Syndeo. The City of Westerville, Ohio built the WeConnect Data Center which paired their municipal fiber network with the nation's first municipally owned community data center. It too has attracted many business and community anchors to the facility as well as a series of national providers including Level 3, AT&T, Time Warner, and others.

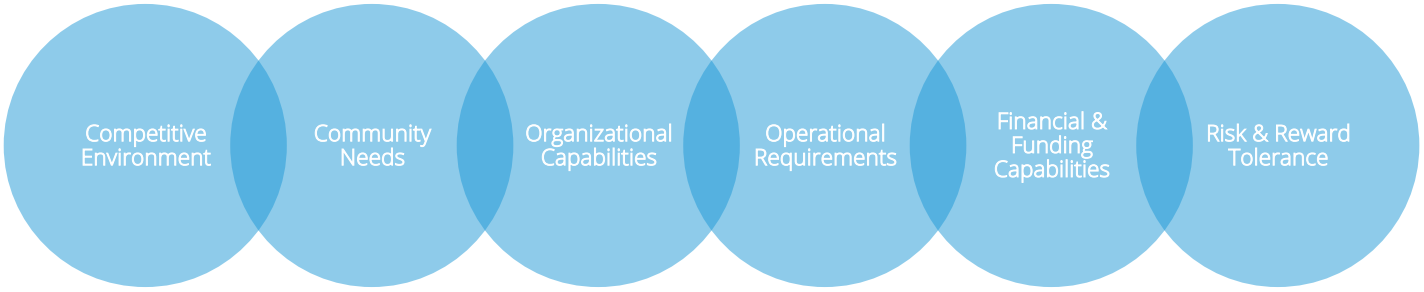
When examining potential locations for data center facilities, power availability and costs are a major concern as this can greatly affect the ongoing operational expenses of a functional data center. Affordable power and the availability of renewable energy sources are core components to successfully attracting these types of facilities to a region.

For RPU, a data center project could be a great addition to the region and could provide added value services as it grows its broadband enterprise. The City should consider conducting a data center feasibility study to ascertain whether or not a data center could be successful in the Riverside region and to understand the facility requirements as well as overall costs (both from a capital investment and operational perspective). As a potential open-access network operator, RPU could potentially add data center facility colocation and cloud services as an added value to its service offering and enriching its portfolio of advanced broadband services offered to its clients.

12. Appendix D – Broadband Business Models

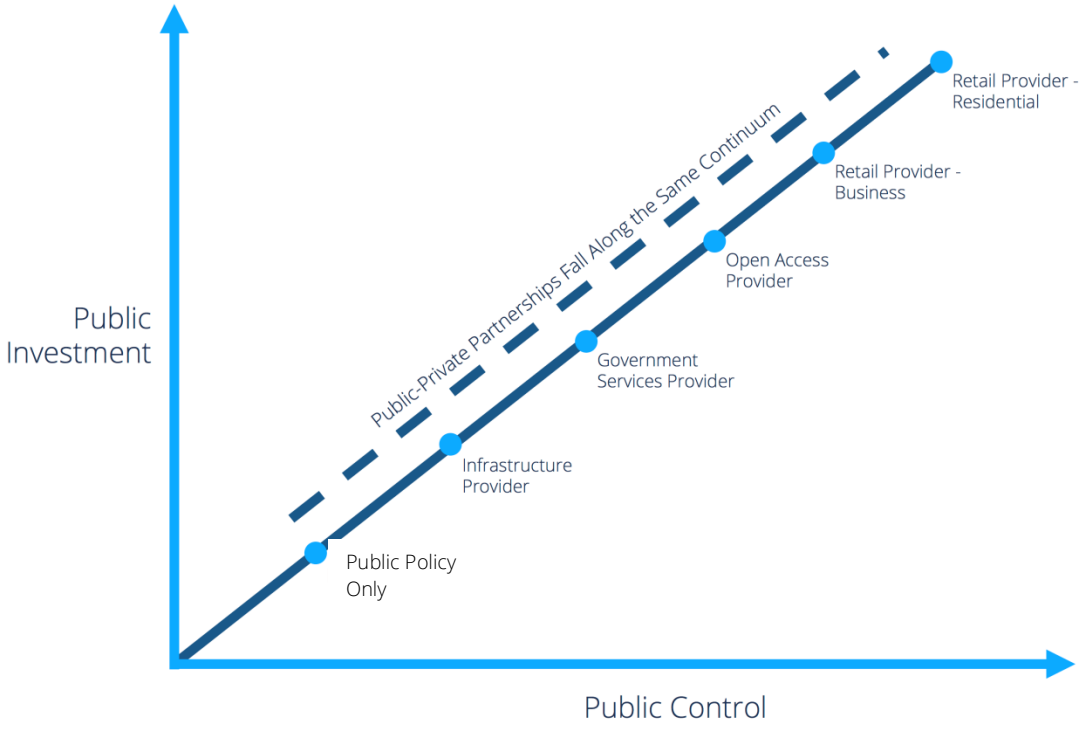
Selecting the right broadband business model for a local government depends highly on a number of factors that will dictate the most appropriate option for the organization. These include competitive and market factors that define what options fit well within the current environment, organizational and operational capabilities of the local government and financial and risk factors that determine what risks, rewards and funding commitments an organization is willing to make to a broadband initiative.

Figure 1: Inputs to Selecting the Right Broadband Business Model



The commonly implemented business models fall on a continuum that ranges from low risk, low investment options to higher risk, high investment options. Figure 1 illustrates this continuum. As a local government evaluates the various business model options along the continuum, it will encounter greater degrees of risk and reward; risk, in terms of financial, operational, and regulatory risk; reward, in terms of community benefits, revenue generation, and overall potential for profit. In addition, moving "up" the continuum also implies greater local government participation in the delivery of broadband services. Public policy and infrastructure only options are considered "passive" business models, whereby the government does not operate a broadband network versus Public Services Providers, Open Access Providers and Retail Provider Options, whereby the government operates a broadband network. Public-private partnerships are not classified as a particular business model but instead fall along the continuum because these partnerships take many forms. Local governments must determine which business models meet their organization's risk/reward tolerance to achieve the community's broadband goals.

Figure 2: Continuum of Municipal Broadband Business Models



The following table describes the key features of each broadband business model available to local governments. There are numerous variations on each business model but they generally fall into the categories represented below. In many cases, multiple options may be selected by an organization; however, in some cases, a local government will not utilize multiple models, as they may conflict for one another. For example, local governments generally utilize public policy with any of the business models, as the policies implemented by a local government will complement all of the other business model options. Conversely, a local government would not likely implement a retail model and public-private partnerships together, as these would lead to competition between the local government and one or more private partners. Following the table below is a description of each business model and examples of local governments that have implemented them.

Policy Participation Only

The City and RPU utilizes its public policy tools to influence how broadband services are likely to develop in its community. This includes permitting, right of way access, construction, fees, and franchises that regulate the cost of constructing and maintaining broadband infrastructure within its jurisdiction. This option is not considered a true business model, but

does significantly affect the local broadband environment and is therefore included as one option. Municipalities that do not wish to take a more active role in broadband development often utilize policy participation to positively impact the local broadband environment.

Example: Santa Cruz County, CA

The Santa Cruz County board of supervisors in November 2013 approved an eight-month timeline to overhaul its broadband infrastructure plans and regulations. Specific areas of focus include permitting fee reductions and a proposed "dig once" ordinance that would make it easier to install new fiber-optic cables during other work on area roads or utilities lanes. "The County will continue a focus on broadband infrastructure throughout the county to enable businesses to function in the digital era, and students and households to have high quality access to information and communication. The County will work with industry providers to develop a Broadband Master Plan in order to identify focus areas within the county that will be most suitable for gigabyte services, particularly as the Sunesys backbone line is constructed during 2014 and 2015. The County will work with service (last mile) providers to ensure that these focus areas are deemed a priority, in order to support streaming requirements, product development, job creation and online selling capability."

Infrastructure Provider

RPU leases and/or sells physical infrastructure, such as conduit, dark fiber, poles, tower space, and property to broadband service providers that need access within the community. These providers are often challenged with the capital costs required to construct this infrastructure, particularly in high cost urbanized environments. The utility infrastructure provides a cost effective alternative to providers constructing the infrastructure themselves. In these cases, municipalities generally use a utility model or enterprise fund model to develop programs to manage these infrastructure systems, and offer them to broadband service providers using standardized rate structures.

Example: City of Palo Alto, CA

In 1996, Palo Alto built a 33-mile optical fiber ring routed within the City to enable better Internet connections. "Since then, we have been licensing use of this fiber to businesses. For the past decade, this activity has shown substantial positive cash flow and is currently making in excess of $2 million a year for the city. We now have that money in the bank earmarked for more fiber investments."

Government Services Provider

If RPU becomes a government service provider, it will utilize its fiber-optic network to interconnect multiple public organizations with fiber-optic or wireless connectivity. These organizations are generally limited to the community anchors that fall within their jurisdiction, including local governments, school districts, higher educational organizations, public safety organizations, utilities, and occasionally healthcare providers. The majority of these anchors require connectivity and often, the municipal network provides higher capacity at lower costs than these organizations are able to obtain commercially. Municipal and utility networks across the country have been built to interconnect cities, counties, school districts, and utilities to one

another at lower costs and with long-term growth capabilities that support these organizations' future needs and protect them from rising costs. In these cases, government service providers may be cities, counties, or consortia that build and maintain the network. The providers utilize inter-local agreements between public agencies to establish connectivity, rates and the terms and conditions of service.

Example: Seminole County, FL

Seminole County owns and operated a 450-mile fiber-optic network that was installed over the past 20 years by the County's Public Works departments primarily to serve the needs of transportation. Since that time, the network has grown to connect the majority of the County's facilities, 5 cities within Seminole County, Seminole Community College, Seminole County Schools, and other public network to a common fiber-optic backbone. The network has saved millions of dollars in taxpayer dollars across the County and has become a long-term asset that enables the County and the other connected organizations to meet their growing connectivity needs.

Open-Access Provider

Municipalities that adopt open-access generally own a substantial fiber-optic network in their communities. Open-access allows these municipalities to "light" the fiber and equip the network with the electronics necessary to establish a "transport service" or "circuit" to service providers interconnecting with the local network. Service providers are connected from a common interconnection point with the open-access network and have access to all customers connected to that network. Open-access refers to a network that is available for any qualified service providers to utilize in order to connect their customers. It allows municipalities to provide an aggregation of local customers on a single network that they are able to compete for and provide services. The concept of open-access is designed to enable competition among service providers across an open network that is owned by the municipality. The municipality remains neutrality and non-discriminatory practices with the providers who operate on the network. The municipality establishes a standard rate structure and terms of service for use by all participating service providers.

Example: City of Palm Coast, FL

In 2006, the Palm Coast City Council approved a 5-Year fiber-optic deployment project funded at $500,000 annually for a total investment of $2.5 million. The network was developed to support growing municipal technology needs across all public organizations in the area, including city, county, public safety, and education. It was also planned to support key initiatives such as emergency operations, traffic signalization, collaboration, and video monitoring. The City utilized a phased approach to build its network using cost-reducing opportunities to invest in new fiber-optic infrastructure. As each phase was constructed, the City connected its own facilities and coordinated with other public organizations to connect them; incrementally reducing costs for all organizations connected to the broadband network. Showing a reasonable payback from each stage of investment allowed the City to continue to fund future expansion of the network. Through

deployment of this network, the City has realized a savings of nearly $1 million since 2007 and projects further annual operating savings of $350,000 annually. In addition to these savings, the City's network provides valuable new capabilities that enhance its mission of serving the residents and businesses of the community.

Retail Service Provider – Business Only

Municipalities that provide end users services to businesses customers are considered retail service providers. Most commonly, municipalities provide voice and Internet services to local businesses. In many cases, a municipality may have built a fiber network for the purposes of connecting the city's primary sites that has been expanded to connect local businesses, in effort to support local economic development needs for recruitment and retention of businesses in the City. Municipalities that provide these services are responsible for managing customers at a retail level. They manage all operational functions necessary to connect customers to the network and providing Internet and voice services. Municipalities compete directly with service providers in the local business market, which requires the municipality to manage an effective sales and marketing function in order to gain sufficient market share to operate at a break-even or better.

Example: Fort Pierce Utilities Authority

Primary FPUAnet services are Dedicated Internet Access, fiber Bandwidth Connections, E-Rate IP Links, and Dark Fiber Links. FPUAnet services also include Wireless Broadband Internet and Wireless Bandwidth Connections, which extend FPUA's fiber through wireless communications. The FPUAnet Communications mission statement is "To help promote economic development and meet the needs of our community with enhanced, reasonably priced communications alternatives. It all began around 1994, when FPUA began to build a fiber-optic network to replace leased data links between its buildings in Fort Pierce. The new optical fiber system proved more reliable and cost effective, and was built with sufficient capacity for external customers. In 2000, FPUA allocated separate fibers through which it began to offer Dark Fiber Links to other institutions. This soon expanded to include businesses and more service types.

Retail Service Provider – Business & Residential

Municipalities that provide end users services to businesses and residential customers are considered retail service providers. Most commonly, municipalities provide voice, television and Internet services to their businesses and residents through a municipally owned public utility or enterprise fund of the city. As a retail service provider that serves businesses and residents, the municipality is responsible for a significant number of operational functions, including management of its retail voice, television and Internet offerings, network operations, billing, provisioning, network construction, installation and general operations and maintenance. The municipality competes with service providers in the business and residential markets and must be effective in its sales and marketing program to gain sufficient market share to support the operation. Many municipalities that have implemented these services are

electric utilities that serve small to midsize markets. Many of these markets are rural or underserved in areas that have not received significant investments by broadband service providers. Retail service providers must comply with state and federal statutes for any regulated telecommunications services. These organizations must also comply with state statutes concerning municipal and public utility broadband providers; a set of rules has been developed in most states that govern the financing, provision, and deployment of these enterprises.

Example: Bristol Virginia Utilities (BVU OptiNet)

BVU OptiNet is a nonprofit division of BVU, launched in 2001, that provides telecommunication services to approximately 11,500 customers in areas around Southwest Virginia. OptiNet is known for its pioneering work in the area of municipal broadband throughout the area. BVU is acknowledged as the first municipal utility in the United States to deploy an all-fiber network offering the triple play of video, voice and data services. Offering digital cable, telephone service, and high-speed Internet from a remote-area utility provider makes BVU exceptional, even on a global level.

Comparison of Municipal Broadband Business Models							
	Government Passive Models			Government Active Models			
	Public Policy Only	Infrastructure Only	Public-Private Partnerships	Public Services Provider	Open Access Wholesale	Retail Provider Business-Only	Retail Provider Residential & Business
Services Provided	None	Dark Fiber Only	None	Dark Fiber, Transport, Internet, Phone	Transport	Internet & Phone	Internet, TV, Phone & Value-Added Services
Customers	None	Broadband Providers	None	Public Organizations Only	Broadband Providers	Businesses	Businesses & Residents
Funding Required	Low	Moderate	Low to High	Moderate	Moderate	High	High
Competing with Broadband Providers	No	No	No	No	No	Yes	Yes
Operational Requirements	Low	Low	Low	Low	Moderate	High	Very High
Regulatory Requirements	Low	Low	Low	Low	Moderate	High	Very High
Revenue Generation	Low	Low	Low to High	Low	Moderate	High	Very High
Operational Costs	Low	Low	Low	Low	Moderate	High	Very High
Financial Risk	Low	Low	Low	Low	Moderate	High	Very High
Execution Risk	Low	Low	Moderate	Low	Moderate	High	Very High

13. Appendix E – Open-Access Business Model Analysis

As part of its business model evaluation, RPU should evaluate becoming an open-access provider, similar to Danville, VA and Santa Monica's CityNet. Magellan believes open-access is a prime opportunity for RPU to consider because it should enable RPU to incentivize both existing and new broadband providers to serve Riverside's business and community anchor markets. Although indirectly, open-access may also positively impact the deployment and upgrade of existing residential services by providing a new source of feeder and distribution fiber network resources that could extend to Riverside's neighborhoods in partnership with residential broadband providers.

Open-access could be a long-term business model for RPU once it demonstrates success in expanding its dark fiber services. Conversely, RPU could immediately deploy open-access instead of waiting until it has expanded its dark fiber services. Either strategy could be achievable for RPU, however, deploying open access immediately poses higher risk and funding requirements for RPU and would require a business plan of its own.

Implementing dark fiber versus open-access initially becomes a question of whether broadband providers will actively utilize RPU's wholesale services and RPU's desire to quickly change the broadband environment in Riverside. If broadband providers agree to utilize RPU's wholesale services and RPU is willing to fund the buildout of fiber infrastructure and operations, RPU will have more opportunity to positively impact end user broadband speed, reliability and affordability than using dark fiber alone. However, this comes at a higher cost, with more operational requirements and greater overall financial risk to RPU. Figure 8-2 below illustrates the risk/reward trade-off as RPU moves beyond its current state today.

An open-access network provides wholesale transport services to broadband providers to reach more businesses in Riverside. Retail service providers would purchase wholesale transport, also known as Type II services, from RPU to reach end users across the RPU network. This model eliminates RPU from managing any retail services, reducing the City's financial and operational risk. It allows retail providers to use RPU's open-access network to reach more customers without the need to capitalize costly fiber infrastructure to subscribers; RPU builds extensions off of its current fiber infrastructure to individual parcels. This can incentivize broadband providers to use RPU's network by buying access from the City, in a manner similar to one provider buying access from another provider.

Employing an open-access network in Riverside may be feasible because of several key factors:

1. A market size that supports competition among multiple competitive broadband providers;

2. A broadband market that currently has multiple providers including incumbents and competitive access providers;
3. Availability of RPU fiber assets within the major thoroughfares of the City;
4. A plan to continue the expansion of this network to key corridors of the City; and,
5. A co-location facility (the RC3 Data Center) that interconnects with multiple broadband providers and is in close proximity to RPU's existing network, facilitating simple interconnection at minimal cost for all parties.

Open-access is a preferred business model for municipal and utility providers because it enables them to employ strategies that benefit the community while conserving fiber network resources within the existing network. Magellan believes that the long-term community benefits gained from RPU's open-access network have the potential to be greater than a dark fiber expansion program, for the following reasons:

1. Open-access will conserve backbone resources and utilize only a potential 12 strands of fiber on RPU's existing network, eliminating the need to increase fiber capacity, which requires a significant capital investment;
2. Open-access should increase the number of providers available to Riverside's businesses by interconnecting them to RPU's network and allowing businesses to select their provider of choice;
3. Open-access enables RPU more flexibility and control over the quality of broadband services provided to the market; and,
4. Open-access would enable greater reliability and redundancy in the broadband services provided to businesses and anchor organizations than dark fiber alone.

Services

Within the buildout areas, RPU would be responsible for designing and constructing last-mile fiber-optic connections and establishing connectivity from each commercial premise into the RC3 facility and on to the terminating carrier of choice. Businesses would select their provider of choice and "sign up" for service prior to RPU constructing any new fiber facilities. Carriers would procure wholesale transport connections from RPU to reach individual businesses and interconnect with RPU within the RC3 data center. RPU would lease wholesale transport to these carriers over a specific term and at specific rates that would enable RPU to recover its costs, upfront construction, ongoing operations and reserves, over the period.

This business model is attractive because of its low capital exposure and risk profile to RPU. RPU has few "sunk costs" beyond the capital needed to proof its current dark fiber and deploy the open-access network. Other capital costs are incremental and based on commitments from customers and broadband providers. When a broadband provider, business or public organization wants service, they will sign a service order and master services agreement with RPU before RPU commits the funding to build the last-mile fiber connection. New capital expenditures are tied to revenue streams that ensure cost recovery at a minimum and

potentially a profit for RPU. Financial details of the open-access business option are provided in Section 8 C. Financial & Funding Analysis.

The County data center (RC3) is a prime location for RPU to establish interconnection with carriers that co-locate within the facility. Seven carriers currently maintain presence in the facility, including Level3, AT&T, Centurylink, Verizon, Charter, TW Telecom and Time Warner Cable. RPU maintains fiber to the vault outside of the facility but has not terminated its fiber within the facility itself. RPU's staff mentioned that RPU was currently pulling a 96-count fiber extension into the RC3 facility in cooperation with Riverside County. Once installed, this would enable RPU to establish a dark fiber presence in the facility fairly easily and with low upfront capital costs.

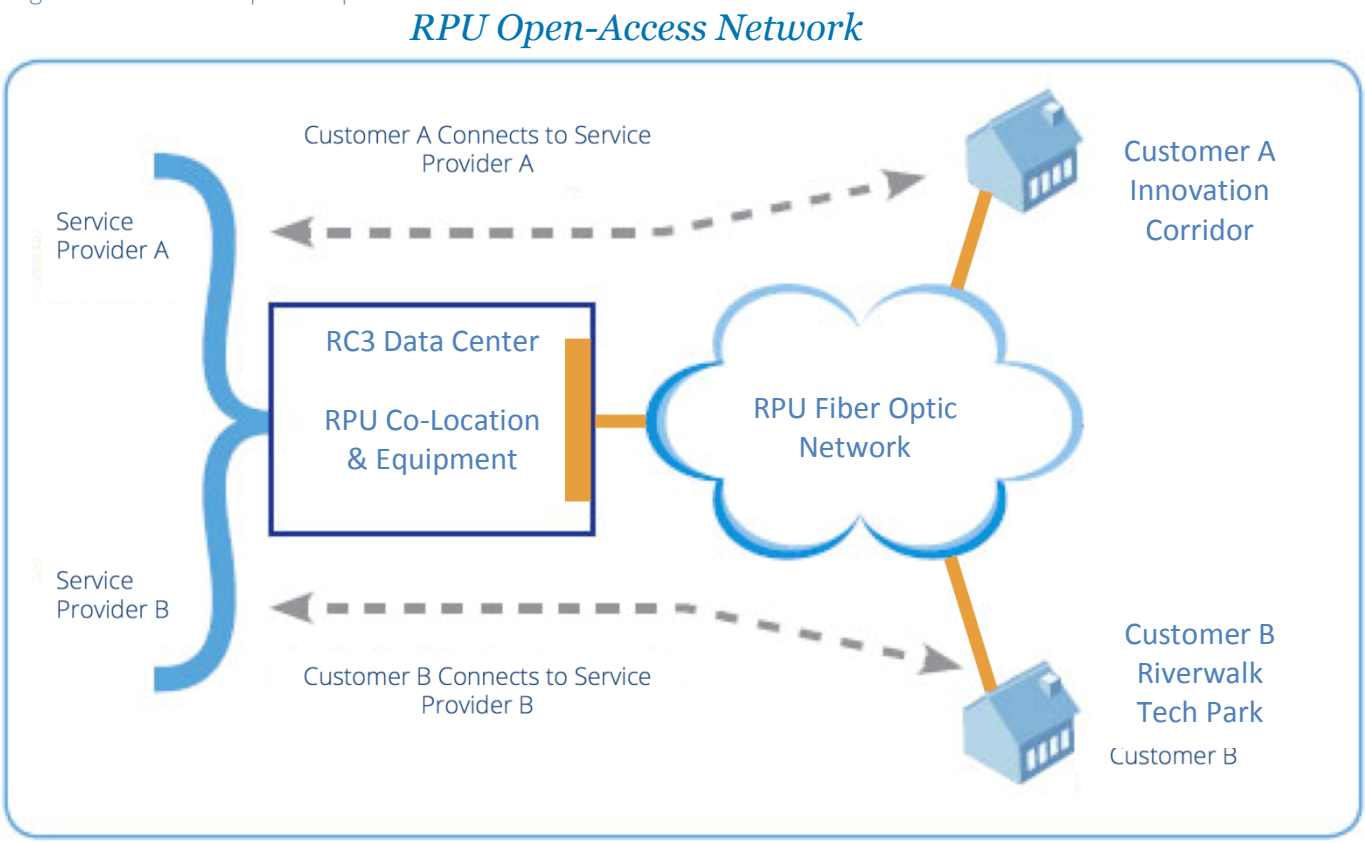
Riverside County charges approximately $17 per square foot for floor space and $59 per 1 Rack Unit (RU) for rack space. RPU could establish a single rack or a small cage to establish presence in the facility at relatively low cost, from $1,500 - $3,000 per month, depending on the size of the space required. This presence would enable RPU to cross-connect with carriers within the facility, allowing organizations connected to RPU's network to establish retail services with these carriers. RPU could facilitate this through dark fiber or open-access at its discretion; however, the preferred business model remains open-access. The County does not charge for monthly cross connect fees, a positive benefit that can keep costs down for fiber connectivity to RPU, savings, which can be passed on to subscribers.

Service providers would interconnect with the City's open-access network through a Network-to-Network Interface (NNI) with RPU's network electronics (or through dark fiber interconnection in some cases). RPU would strategically deploy field equipment, known as Optical Line Terminals ("OLTs"), in key service areas, including:

- Innovation Corridor
- Hunter Tech Park
- Riverwalk Tech Park
- Manufacturing Park
- Others To Be Determined

Equipment would connect back to the RC3 data center where RPU would maintain its point of presence and interconnect with multiple broadband providers. RPU's wholesale transport services would provide a "pipe" through which broadband providers would connect directly with customers, effectively making RPU's network transparent to the end user. Figure 8-3 illustrates the proposed open-access network.

Figure 13-1: RPU's Proposed Open-access Network



Service Areas

Magellan and RPU identified key areas for buildout of fiber infrastructure to serve business districts within the City. Based on input from the City's economic development department, analysis of business density within the City and location of RPU's existing fiber network, four areas were identified as optimal for buildout:

- Innovation Corridor
- Riverwalk Tech Park
- Hunter Tech Park
- Manufacturing Park

Figure 8-4 illustrates the number of businesses within each district and the anticipate uptake of business connections over the 10 years of the project.

Figure 13-2: Business Count and Uptake within Each Business Corridor

	Riverwalk Tech Park	Innovation Corridor	Hunter Park Tech Corridor	Manufacturing Park	Total
Businesses Passed (Access Available)	112	926	883	260	2,181
Businesses Connected (Expected Over 10 Years)	46	379	362	108	895

Figure 13-3 Proposed Service Areas (Green Shading) and Interconnection with RPU's Existing Fiber Network (Purple)

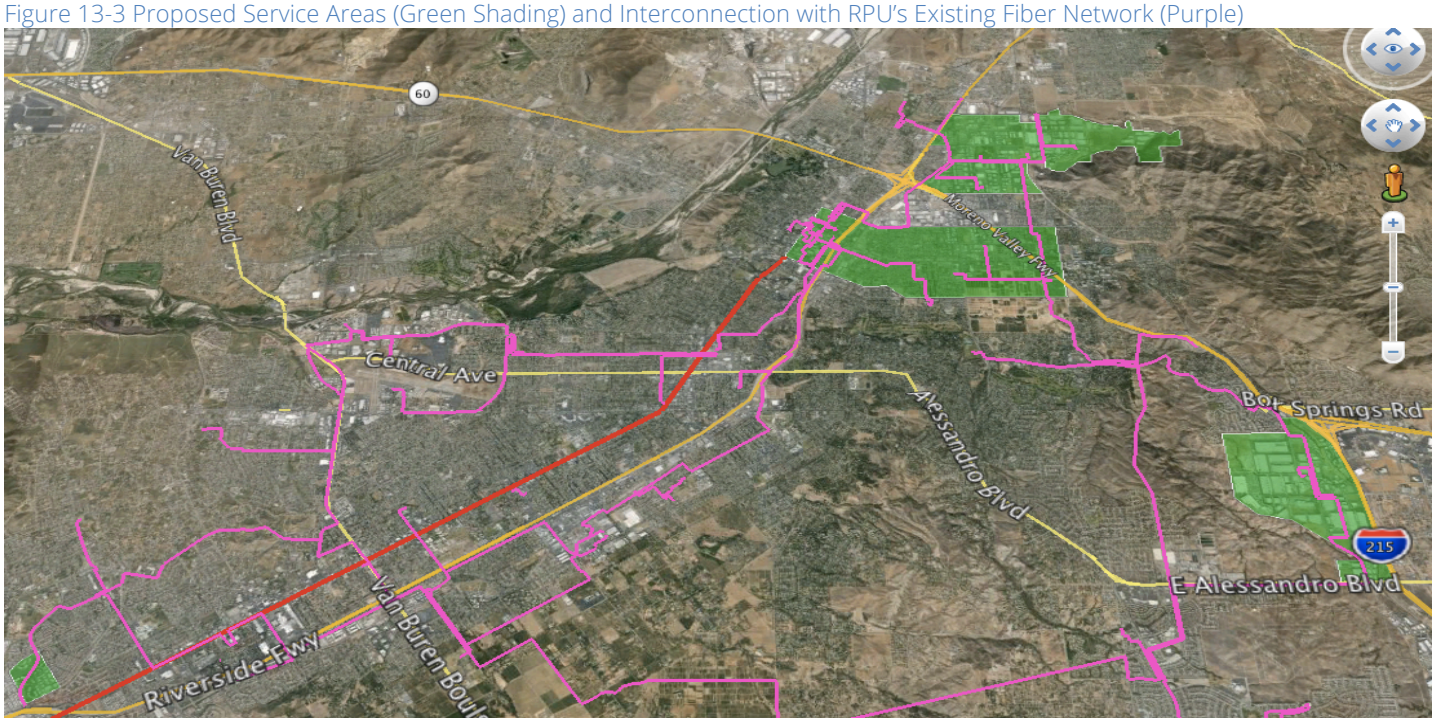


Figure 13-4: Feeder Distribution Buildout in Innovation Corridor

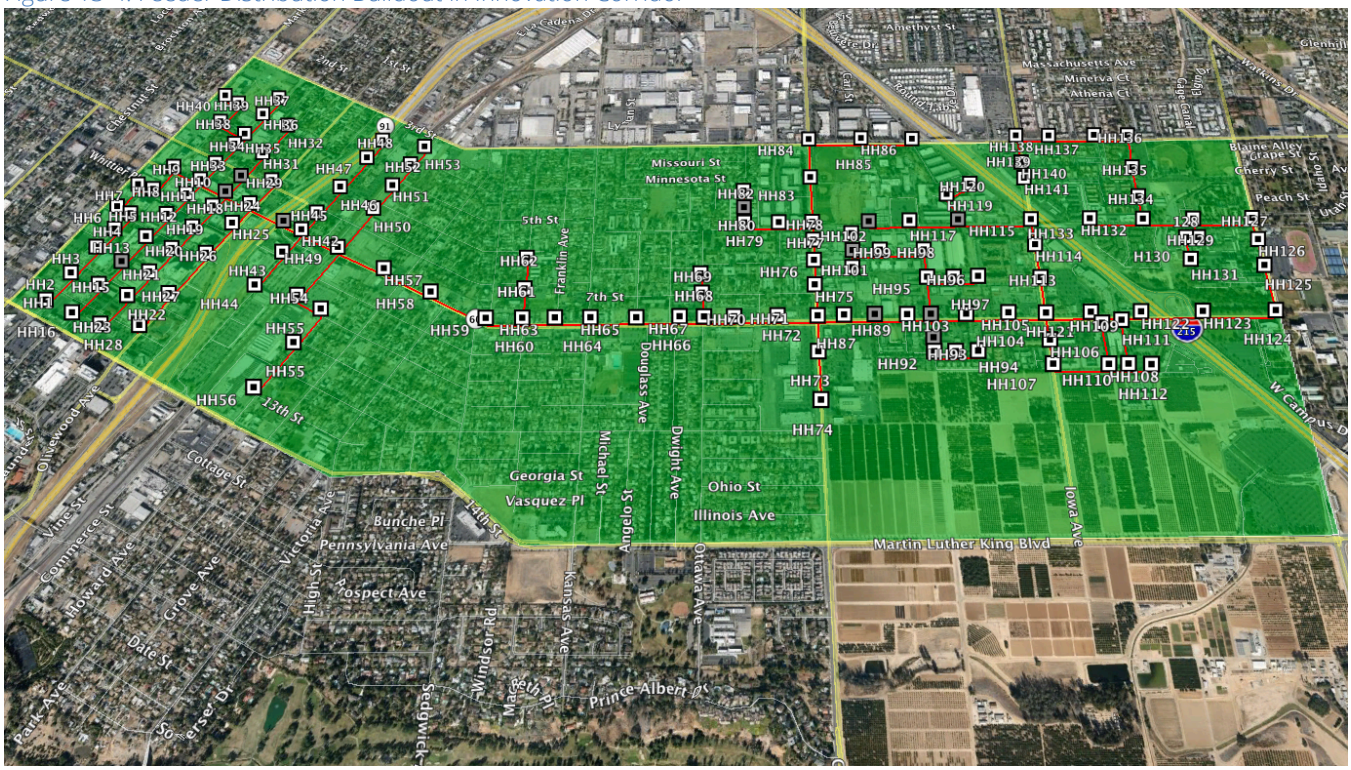


Figure 13-5: Feeder Distribution Buildout in Hunter Tech Park

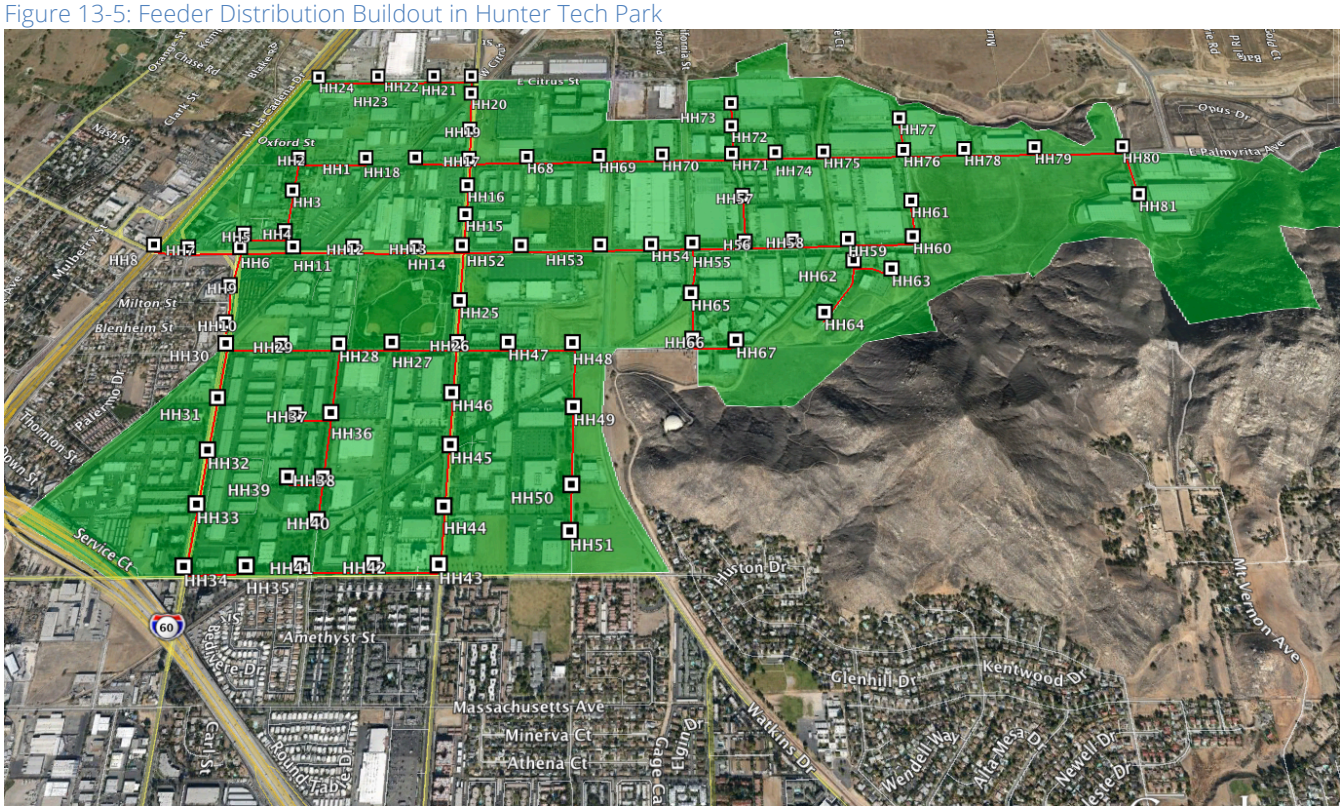


Figure 13-6: Feeder Distribution Buildout in Manufacturing Park

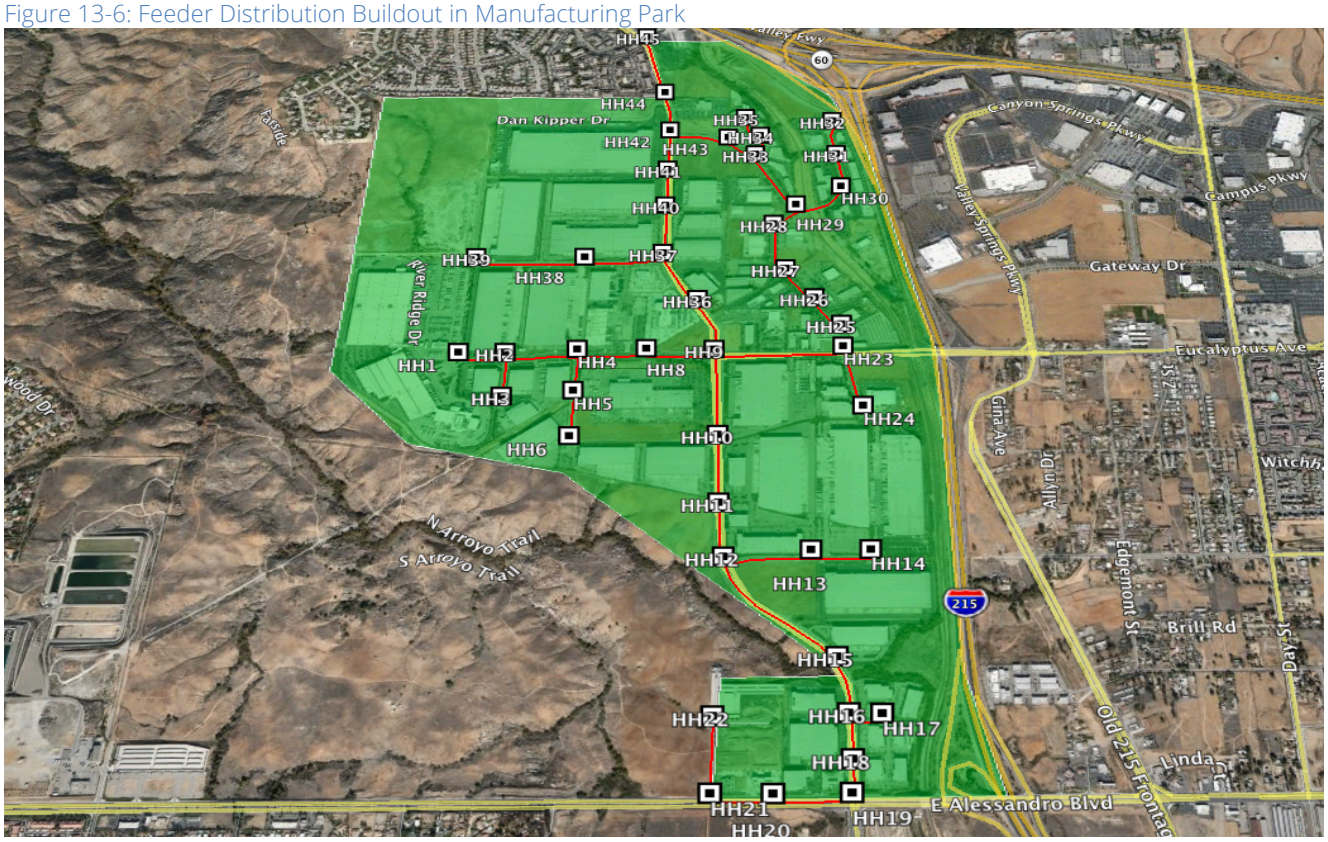


Figure 13-7: Feeder Distribution Buildout in Riverwalk Tech Park

Organizational Structure & Operations

Building an open-access network would require RPU to create an appropriate organizational and operational structure to manage wholesale telecommunications services. If RPU decides to move forward with an open-access initiative, it should consider whether to form a new communications utility separate from the electric utility and the implications of doing so. Some key considerations for RPU to evaluate in implementing an open-access network include:

- Supporting "carrier class" wholesale telecommunications services;
- Recruitment, negotiations and support of broadband provider partners;
- Operations and management responsibilities required to maintain the network;
- Staffing levels and labor requirements between current RPU operations and new FTEs; and,
- Resource allocation between RPU's potential communications utility and the electric utility.

In order for broadband providers to consider utilizing RPU's open-access network, RPU must establish Service Level Agreements (SLA) that are similar to what service providers receive in the current telecommunications industry. RPU will also need to define business and operational processes to manage the network and ensure that service providers' needs are met. Further, deployment of an open-access network requires new funding for construction of last-mile fiber, network electronics, operational support systems, and potentially new staffing or the procurement of an outsourced network operator who will manage the network on RPU's behalf. The following sections detail the necessary functions to build and operate RPU's open-access network.

Feeder & Distribution Construction

RPU will build new backbone and distribution fiber into the four business districts and make use of any existing fiber network resources that are available to reduce costs. RPU would install high-count fiber (144 – 288 count cable) in the new segments of the network connecting major thoroughfares of the business districts and smaller distribution cable (48 – 96 count cable) into the secondary streets.

Drop Fiber Construction

New service orders will generally require construction of last-mile fiber from a pedestal to a customer's premise. These will generally be direct buried drop fiber lines spliced into an Optical Network Terminal ("ONT") that is either mounted on the outside of the building or fed inside the building. In the case of large business customers and community anchors, special construction may be required to connect from the local distribution fiber network to the premise. Drop fibers will only be installed once a service order has been received and processed from a broadband provider, community anchor or local business directly.

Installation

Installation is a critical function that requires coordination between multiple parties including outside plant personnel and inside plant technicians. Installation includes the activation of customer premise equipment, coordination with broadband providers, troubleshooting with inside plant technicians, and verification of service establishment with end customers. RPU would potential be required to install an ONT for each business customer using the open-access option.

Customer Service

Customer service in open-access networks is less intensive than in cases where utilities provide retail services to end-users. For RPU, its customers will be broadband providers and a few direct business customers and community anchors. Therefore, limited customer service representatives ("CSRs" will be required to manage RPU's customers) however, CSR's will be required for the following functions and their costs have been allocated into the projected staffing plan.

CSRs would be responsible for the following operational functions:

- Order receipt from providers
- Order verification with RPU outside plant engineers
- Order entry into provisioning and billing systems
- Customer account and billing support
- Customer notifications
- Trouble notification

Network Operations

Network management through the Utility's network management systems will provide ongoing network support and monitoring of the Utility's service delivery network including core, distribution, and access networks along with all equipment necessary to manage the wholesale transport services.

Network management systems will be required to manage all configuration, addressing, customer, and management information to allow RPU staff to easily monitor and make changes to the network on a day-to-day basis. Network management systems should address the 5 key pillars of supporting a multi-service network including:

- Configuration management
- Alarm management
- Troubleshooting & Issue Resolution
- Capacity Management
- Monitoring & Reporting

During times when outages occur, it is important that RPU have effective processes in place to manage restoration of services on the network. For major outages such as fiber cuts or core equipment failures, distribution of information to the affected customers and/or service providers needs to be managed effectively. Service providers will require immediate notification of network issues and outages with periodic updates toward service restoration; the interval dictated by the severity of the outage and the service level agreement with RPU. Direct customers of the Utility such as other government organizations and community anchors also need immediate notification of outages, as these disruptions will impact their operations.

Field Services

RPU personnel will be required to maintain responsibility for the outside plant fiber-optic network and related components. Primary responsibilities of field services include:

- Managing Existing fiber-optic network operations and maintenance
- Design and construction of new fiber-optic network routes
- Documentation and records management of fiber-optic network assets
- Work order management for new construction activities
- Testing and inspection of outside plant fiber-optic components
- Capacity management on the feeder, distribution and drop fiber-optic networks
- Coordinating recovery and restoration of fiber-optic network components between RPU and broadband providers.

Direct and Indirect Staffing

Magellan worked with RPU to define actual labor costs for equivalent positions that would be required to manage the open-access broadband network. These labor costs were input into Magellan's Broadband Financial Sustainability Model to understand total staffing costs that would be required to support the open-access network. Figure 8-10 illustrates the projected staffing plan that will be required to support the network, in terms of Full Time Equivalents ("FTEs"). RPU will need to accommodate growing needs for FTEs as the network matures and RPU supports more and more customers. The staffing plan in Figure 8-10 has laid out three phases of the operation:

- Startup Phase (Years 1 – 2)
- Growth Phase (Years 3 – 5)
- Steady State (Beyond Year 5)

Figure 13-8 Open-access Provider Staffing Plan

Broadband Operational Functions	Project Phase		
	Startup Phase (Year 1-2)	Growth Phase (Year 3-5)	Steady State (Beyond Year 5)
Customer Service • Customer activations/terminations • Basic billing support • Adds/moves/changes • Customer tier 1 support • Billing system integration • Advanced billing support • Reporting • Utility tax application	0 FTE	1 FTE	2 FTE
Network Management • Routine network management and maintenance • Service quality management • Provisioning • Contractor management • Troubleshooting • Outside plant repairs and maintenance	1 FTE	2 FTE	2 FTE
Field Services • Field installations • ONT, Gateway, Set top Box Installs • Service testing • Adds/moves/changes	1 FTE	1 FTE	2 FTE
Administration • Contract Management • Financial Management • Marketing • Service Provider Management • RFP Management • Outside plant management • New construction planning and implementation • Record keeping	1 FTE	1 FTE	1 FTE
Sales • Public Awareness and Outreach • Marketing of network availability • Economic development planning • Promotional opportunities • Co-marketing with service providers	.5 FTE	1 FTE	1 FTE
Total	3.5 FTE	6 FTE	8 FTE
Customers Supported	150	700	900

C. Financial & Funding Analysis

Summary

IF RPU chooses to implement the open-access network, it would make significant upfront investments in feeder and distribution fiber infrastructure to equip the four business districts with local fiber access. The approximate cost of this infrastructure if all four districts are built out is $10 million, broken down as follows:

- Innovation Corridor: $3.8 million
- Hunter Tech Park: $3 million
- Manufacturing Park: $2 million
- Riverwalk Tech Park: $300,000

In addition, it would fund about $2 million in new fiber drop costs to individual business premises, $1 million in equipment and $3 million in operating funds necessary to float the operation until service revenues were sufficient to cover operating costs, debt service and reserves. This totals about $16 million in total funding that would be required to finance the entire open-access network, assuming that all four districts were built out over the first 2 years of the project. The financial models presented in this Plan analyze this scenario because it is important for RPU to understand the long-term financial sustainability of the project. It allows RPU to understand the long-term drivers of revenue, cost and profitability to ensure that an open-access broadband utility could grow over the long-term to serve the needs of the community, in a financially prudent way.

Magellan has used its financial model to perform an initial "acid test" on this scenario and believes that the project would be financially sustainable over a 10-year period or more. In this case, we define financially sustainable as the utility generating enough revenues over the period to pay all operating costs, debt service and fund reserve requirements, without taking on any new debt.

However, a more realistic scenario involves RPU creating a phased approach to implementing the open-access network. Rather than making a $16 million commitment in a "brand new" endeavor, a more reasonable and conservative approach is to phase the project over the first few years of operations, "test the waters" and make sure RPU's financial risk is controlled. Rather than taking an "all in" approach that risks this significant capital investment, Magellan believes the most prudent approach is to begin with a pilot project in the Innovation corridor, operate for the first year or two, measure performance and if RPU meets its goals, continue the deployment (and funding). This would follow the estimated 2 – 3 year period for Phases 1 and 2 of the roadmap as outlined in this report.

This approach will require an upfront capital investment of $4 million or less, depending on how aggressively RPU wants to deploy the open-access network into the Innovation Corridor.

With an initial $4 million of investment, RPU would have the capability of serving significant economic development needs and have the opportunity to serve a market of about 1,000 businesses, while limiting its financial risk. Using this approach, RPU could set clear metrics that measure the success of the pilot project and decide whether to continue the open-access expansion or not. In either case, the pilot itself would create a sustainable project of its own, with the potential to connect up to about 400 businesses to the network and drive economic value in the Innovation Corridor.

Subscriber Uptake

Uptake will be heavily dependent on the broadband providers utilizing RPU's network and RPU's successful marketing of the network in conjunction with the City of Riverside. Magellan's benchmarking analysis on active broadband utilities did not glean any "standard" take rates for service; however, all of the broadband utilities interviewed reported that their success was based on a combination of broadband provider and municipal engagement to drive adoption of services. Therefore, instead of setting a standard take rate to forecast subscribership on RPU's network, a range of feasible take rates was used to model low and high levels of subscribership. Magellan utilized a series of historical data from similar projects to calculate this range along with typical penetration rates for fiber overbuilders in urbanized communities.

Through this analysis, Magellan estimates that RPU can expect take rates from 25% to 45% over the first 10 years of operation. The average case yields an uptake of 35% during this period. This equates to between 600 - 900 businesses subscribing to services through RPU's network. These figures will highly depend on RPU's execution of the network, sales and marketing plan and participation of broadband providers.

A competitively priced fiber-based broadband service at similar (or slightly higher) costs is likely to generate strong subscriber demand in the four service areas. RPU's fiber-based services would provide the following benefits to all classes of subscribers using the service:

- Significant increase in downstream and upstream speeds
- Less intermittent service interruptions
- Greater reliability and less downtime

Small business broadband services in these areas are currently limited to cable, DSL and wireless. The lowest speed services available are generally priced from $50 - $100 per month. These represent the smallest businesses and those that may not require a fiber-based broadband service. Mid-tier customers pay from $100 - $250 per month and would be prime candidates for an entry-level fiber-broadband service. Larger customers pay above $250 per month and would also be prime candidates for a higher speed fiber-based service (shared) or a dedicated, enterprise class fiber-based service. Businesses that currently have fiber in these areas reported paying from $500 - $2,000 for their services.

The charts in Figures 8-11 and 8-12 show estimated uptake of the City's fiber transport over the first 10 years of the project, based on the 35% market uptake over 10 years. The major growth in the customer base should be expected in the first 5 years of operation and is important to overall cash flow and financial sustainability of the project.

Figure 13-9: Subscriber Uptake in Number of Businesses

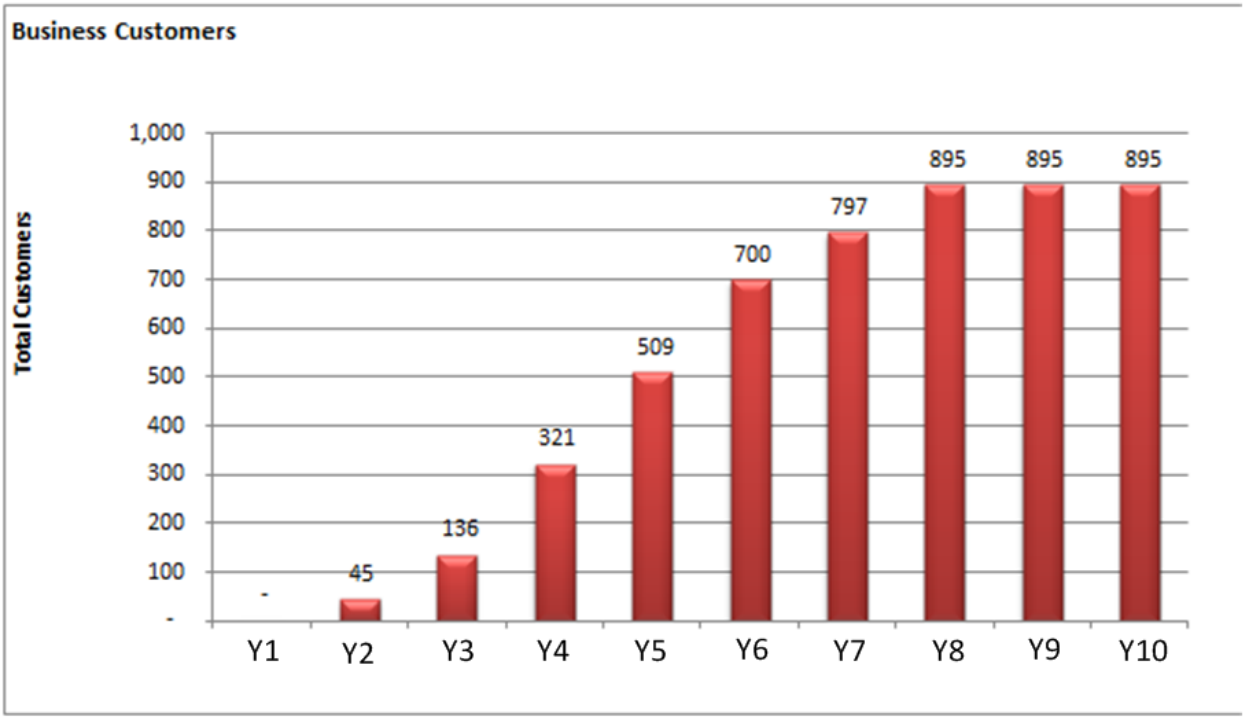
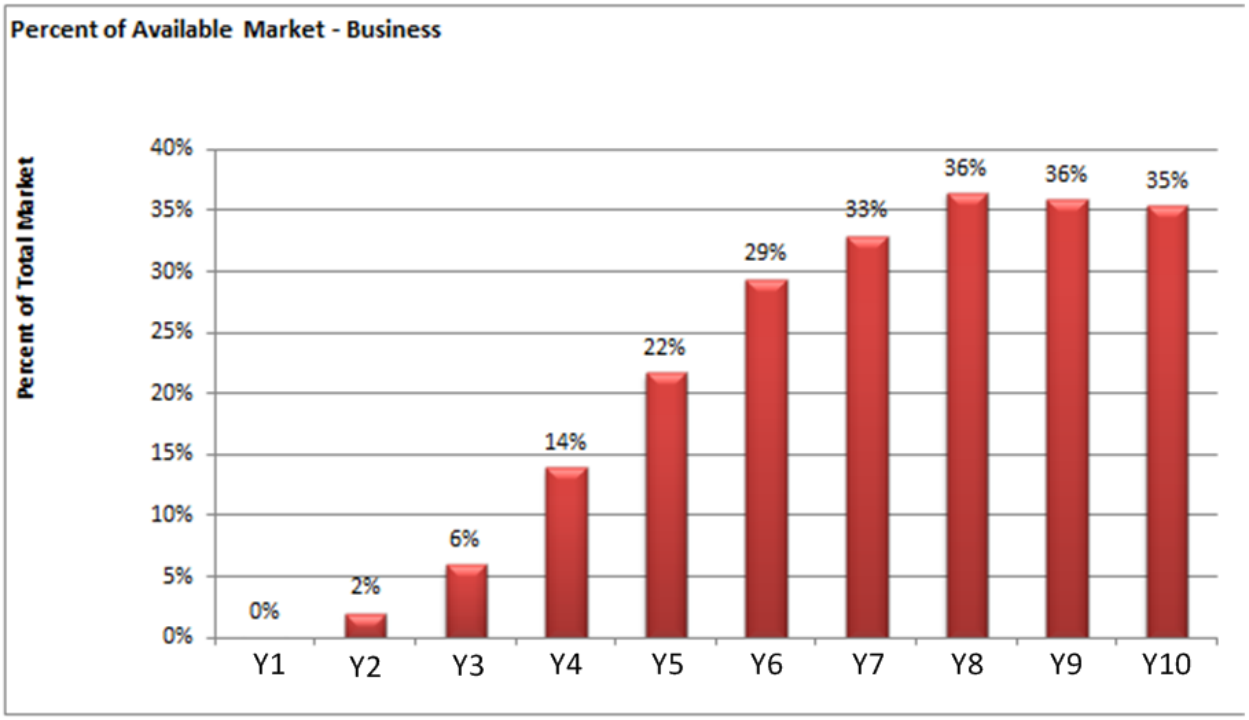


Figure 13-10: Subscriber Uptake in Available Market Percentage



Rate Structure & Revenues

Broadband providers will pay monthly recurring charges ("MRC") to RPU for wholesale transport connections based on the amount of bandwidth and type of service required by the service providers' customer. RPU may offer two types of service, a shared service and a dedicated service. The shared service is appropriate for any size of business that does not require guaranteed bandwidth at all times. Bandwidth will fluctuate with the total number of subscribers using the system at one time. However, bandwidths on RPU's open-access network will be much greater than those found in traditional shared networks, such as DSL and cable systems. The shared service is sufficient for many small and medium businesses and a few large businesses that are not sensitive to fluctuations in bandwidth. Many broadband utilities offer this service including Cedar Falls Utilities, Bristol Virginia Utilities and Lafayette Fiber.

Dedicated services provide guaranteed bandwidth to the subscriber based on the bandwidth tier purchased. A 100 Mbps service will deliver 100 Mbps to the subscriber at all times; the full bandwidth must always be available to the subscriber. Businesses that require dedicated services generally rely on their Internet services constantly for their critical operational functions and include big data companies, manufacturers, and high-tech industries. Broadband utilities that provide shared service often are able to provide dedicated service to their customers as well.

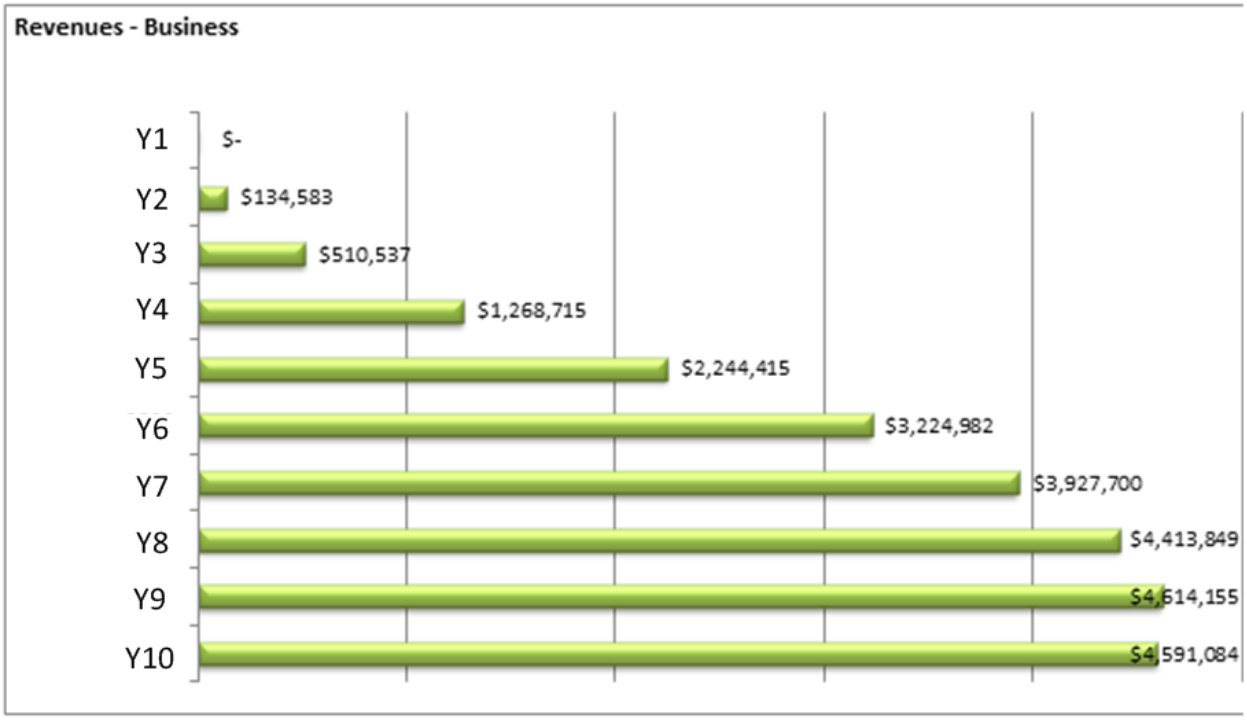
The rate table below shows projected monthly recurring charges ("MRC") that RPU would charge to broadband providers. These fees increase based on the bandwidth procured. The rate table illustrates "wholesale rates" to broadband providers versus retail rates that end users would pay. Broadband providers will add on their overhead costs and profit margin to these wholesale rates to arrive at retail prices for services. Magellan has found that on average, retail rates are anywhere from 50% - 80% higher than wholesale rates. Rates provided are only estimates and should be vetted with local broadband providers to ensure their competitiveness. The rates that RPU sets for its wholesale transport services will ultimately impact the price end users pay for their services. Therefore, RPU can positively impact broadband affordability by keeping these rates as low as possible, while still maintaining financial sustainability of the utility. The rate table also accounts for a .5% (one half percent) rate decrease each year, which is commensurate with pricing trends in the wholesale telecommunications industry.

Figure 13-11: Proposed Rate Table for Wholesale Transport Services

Business Services	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
SMB 100 Down / 10 Up	$108	$108	$107	$107	$106	$106	$105	$105	$104	$104
SMB 200 Down / 40 Up	$185	$184	$183	$182	$181	$180	$179	$179	$178	$177
SMB 300 Down / 70 Up	$218	$217	$216	$215	$213	$212	$211	$210	$209	$208
SMB 400 Down / 90 Up	$273	$271	$270	$268	$267	$266	$264	$263	$262	$261
SMB 500 Down / 100 Up	$437	$435	$432	$430	$428	$426	$424	$422	$420	$417
SMB 1000 Down / 150 Up	$546	$543	$541	$538	$535	$533	$530	$527	$525	$522
ENTERPRISE 10 Down / 10 Up	$327	$326	$324	$322	$321	$319	$318	$316	$314	$313
ENTERPRISE 50 Down / 50 Up	$546	$543	$541	$538	$535	$533	$530	$527	$525	$522
ENTERPRISE 100 Down / 100 Up	$984	$979	$974	$969	$964	$960	$955	$950	$945	$941
ENTERPRISE 200 Down / 200 Up	$1,312	$1,306	$1,299	$1,293	$1,286	$1,280	$1,273	$1,267	$1,261	$1,254
ENTERPRISE 500 Down / 500 Up	$2,078	$2,068	$2,058	$2,047	$2,037	$2,027	$2,017	$2,007	$1,997	$1,987
ENTERPRISE 1000 Down / 1000 Up	$2,845	$2,830	$2,816	$2,802	$2,788	$2,774	$2,760	$2,747	$2,733	$2,719

	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Service Revenues										
Business	$119,950	$480,981	$1,209,017	$2,184,123	$3,164,093	$3,896,953	$4,382,797	$4,614,155	$4,591,084	
Community Anchor		$100,000	$150,000	$200,000	$300,000	$400,000	$400,000	$400,000	$400,000	
Subtotal: Service Revenues	$119,950	$580,981	$1,359,017	$2,384,123	$3,464,093	$4,296,953	$4,782,797	$5,014,155	$4,991,084	
Installation Revenues										
Business	$14,633	$29,556	$59,699	$60,291	$60,890	$30,747	$31,052			
Anchor & Dedicated										
Subtotal: Install Revenues	$14,633	$29,556	$59,699	$60,291	$60,890	$30,747	$31,052			
Equipment Rental Revenues										
Business	$4,634	$13,970	$32,804	$51,732	$70,755	$80,137	$89,569	$89,122	$88,676	
Anchor & Dedicated										
Subtotal: Equip. Revenues	$4,634	$13,970	$32,804	$51,732	$70,755	$80,137	$89,569	$89,122	$88,676	
TOTAL REVENUES	**$139,216**	**$624,507**	**$1,451,519**	**$2,496,147**	**$3,595,737**	**$4,407,837**	**$4,903,418**	**$5,103,277**	**$5,079,760**	

Figure 13-12: Annual Subscriber Revenues



Major Capital & Operational Costs

Capital Costs

Total Capital Costs - $13,000,000

Feeder & Distribution Network

Feeder and distribution costs were determined using a material and labor costing method incorporating all counts from the design process into the financial plan. Magellan utilized the rates received from a local contractor, Henkels & McCoy, Inc. as the basis of the costing for the feeder and distribution network, estimated at an average of $50 per foot, resulting in a total cost of $10,000,000 for the four service areas.

Drop Fiber Network

The drop fiber network can be a large portion of the expense of implementing a FTTP network however; cost is entirely dependent on how fiber drops are constructed. For RPU micro-trenched drop may be the most cost effective method for installation. Total costs per passing were estimated at $2,735, not including the Optical Network Terminal ("ONT"). 895 drops to business subscribers totaled approximately $1,500,000.

Premise Service Equipment

Premise service equipment includes ONTs and related equipment necessary to be installed at the subscriber premises to enable the wholesale transport connection. Average ONT costs were approximately $490 per premise, yielding a total of $438,000 in costs for 895 premises.

Optical Line Terminals & Network Core

The RPU network has been designed with 4 primary node locations. The costs associated with the OLTs and necessary components such as line cards, optical interfaces, outdoor cabinets, core equipment and power come to a total of $1,070,000.

Network Management Systems

Management systems include all hardware and software necessary for RPU to manage its operations, including:

- Provisioning Systems - $50,000
- Network Management Systems - $50,000

Operating Costs

Total Operating Costs - $13,000,000

Staffing Costs (Included below)

The majority of RPU's operating costs would be borne out of staff managing the open-access network. RPU provided fully loaded staffing costs for equivalent FTEs that would be required to manage the network, as follows:

Figure 13-13: Staffing Costs

Positions	Annual Labor Rate
FTE - Customer Service Coordinator	$62,510
FTE - Accounting & Finance	$58,047
FTE - Voice Technician	$72,450
FTE - Headend Technician	$80,500
FTE - Installation Technician	$48,300
FTE - Field Services Manager	$103,500
FTE - Sales & Marketing Manager	$96,964
FTE - Communications Service Manager	$134,396
FTE - Engineering Manager	$109,250

Other Operating Costs

Other operating costs consist of outside plant fiber operations and maintenance, equipment maintenance and related costs to manage the open-access network over the 10 year period, as follows:

Figure 13-14: Other Operating Costs

Item	Cost Over 10 Years
Software Maintenance	$220,000
Facilities Maintenance	$220,000
Facilities Power and Environmental	$290,200
Miscellaneous	$316,000
Professional & Legal Fees	$875,000
Marketing Expense	$497,000
Travel & Entertainment Expense	$200,000
Office Expense	$200,000
General Utilities	$200,000
Bad Debt Expense	$316,000

Figure 13-15 Capital Costs

Capital Costs

	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Feeder & Distribution Fiber Design & Construction		$4,682,539	$5,321,454							
Fiber To The Premise Design & Construction		$75,721	$153,714	$312,040	$316,720	$321,471	$163,147	$165,594		
Premise Service Equipment		$22,020	$44,700	$90,741	$92,103	$93,484	$47,443	$48,155		
Headend Equipment		$570,000	$400,000	$25,000	$25,000	$25,000	$25,000			
Building Improvements		$50,000								
General Equipment										
Wireless Equipment										
Total		**$5,400,280**	**$5,919,869**	**$427,781**	**$433,823**	**$439,955**	**$235,590**	**$213,749**		

Figure 13-16 Direct and Indirect Staffing Costs

Direct & Indirect Staffing

	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
FTE - Customer Service Coordinator						72,466	74,640	76,879	158,371	163,122
FTE - Accounting & Finance										
FTE - Voice Technician										
FTE - Headend Technician		82,915	85,402	87,965	90,603	186,643	192,242	198,010	203,950	210,068
FTE - Installation Technician		49,749	51,241	52,779						
FTE - Field Services Manager		106,605	109,803	113,097	116,490	119,985	123,584	254,584	262,221	270,088
FTE - Sales & Marketing Manager					109,134	112,408	115,780	119,253	122,831	126,516
FTE - Communications Service Manager		69,214	71,291	73,429	151,264	155,802	160,476	165,291	170,249	175,357
Total Direct Staffing		$132,664	$136,644	$140,743	$90,603	$259,109	$266,882	$274,889	$362,321	$373,191
Total Administrative Staffing		$175,819	$181,094	$186,527	$376,888	$388,195	$399,841	$539,128	$555,302	$571,961
Total Staffing Costs		**$308,483**	**$317,738**	**$327,270**	**$467,492**	**$647,304**	**$666,723**	**$814,017**	**$917,623**	**$945,152**

Figure 13-17 Costs of Services

Cost of Services

	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Direct Staffing		$135,317	$142,164	$149,358	$98,072	$286,077	$300,553	$315,761	$424,517	$445,998
Network & Data Center Maintenance		$62,424	$64,946	$67,570	$70,300	$73,140	$76,095	$79,169	$82,367	$85,695
Software Maintenance		$20,808	$21,649	$22,523	$23,433	$24,380	$25,365	$26,390	$27,456	$28,565
Facilities Maintenance		$20,808	$21,649	$22,523	$23,433	$24,380	$25,365	$26,390	$27,456	$28,565
Facilities Power and Environmental		$20,808	$21,649	$22,523	$23,433	$24,380	$25,365	$26,390	$27,456	$28,565
Miscellaneous		$1,420	$6,497	$15,404	$27,019	$39,700	$49,639	$56,325	$59,793	$60,708
Subtotal: Cost of Services		**$261,585**	**$278,554**	**$299,901**	**$265,690**	**$472,057**	**$502,381**	**$530,423**	**$649,044**	**$678,095**

Figure 13-18 Sales and Other Costs

Sales, General & Administrative Costs

	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Indirect Staffing		$179,336	$188,410	$197,943	$407,956	$428,598	$450,285	$619,288	$650,624	$683,546
Professional & Legal Fees	$80,000	$81,600	$83,232	$84,897	$86,595	$88,326	$90,093	$91,895	$93,733	$95,607
Sales Commissions										
Marketing Expense		$51,000	$52,020	$53,060	$54,122	$55,204	$56,308	$57,434	$58,583	$59,755
Travel & Entertainment Expense		$20,400	$20,808	$21,224	$21,649	$22,082	$22,523	$22,974	$23,433	$23,902
Office Expense		$20,400	$20,808	$21,224	$21,649	$22,082	$22,523	$22,974	$23,433	$23,902
General Utilities		$20,400	$20,808	$21,224	$21,649	$22,082	$22,523	$22,974	$23,433	$23,902
Bad Debt Expense		$1,420	$6,497	$15,404	$27,019	$39,700	$49,639	$56,325	$59,793	$60,708
Subtotal: Sales, General & Administrative	**$80,000**	**$374,556**	**$392,583**	**$414,977**	**$640,637**	**$678,074**	**$713,896**	**$893,863**	**$933,033**	**$971,321**

Figure 13-19: Net Income – Open-access Network

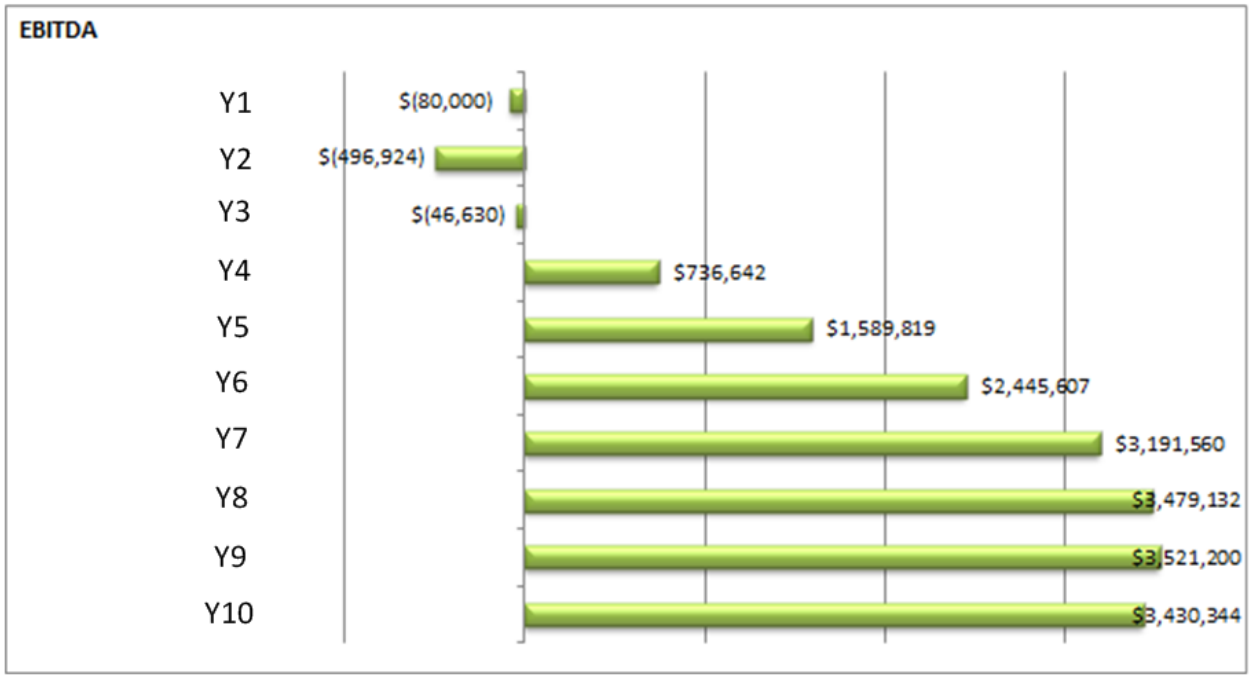
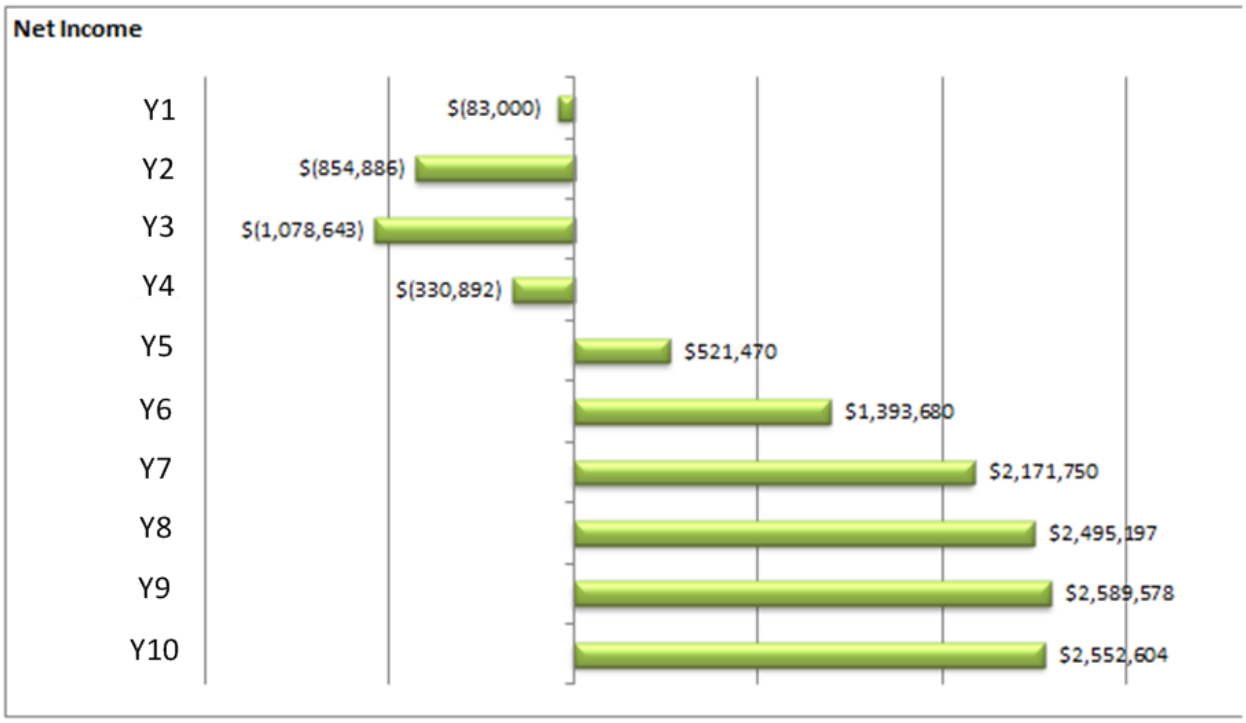


Figure 13-20: Net Income – Open-access Network



Pro Forma Statements attached as Excel file.

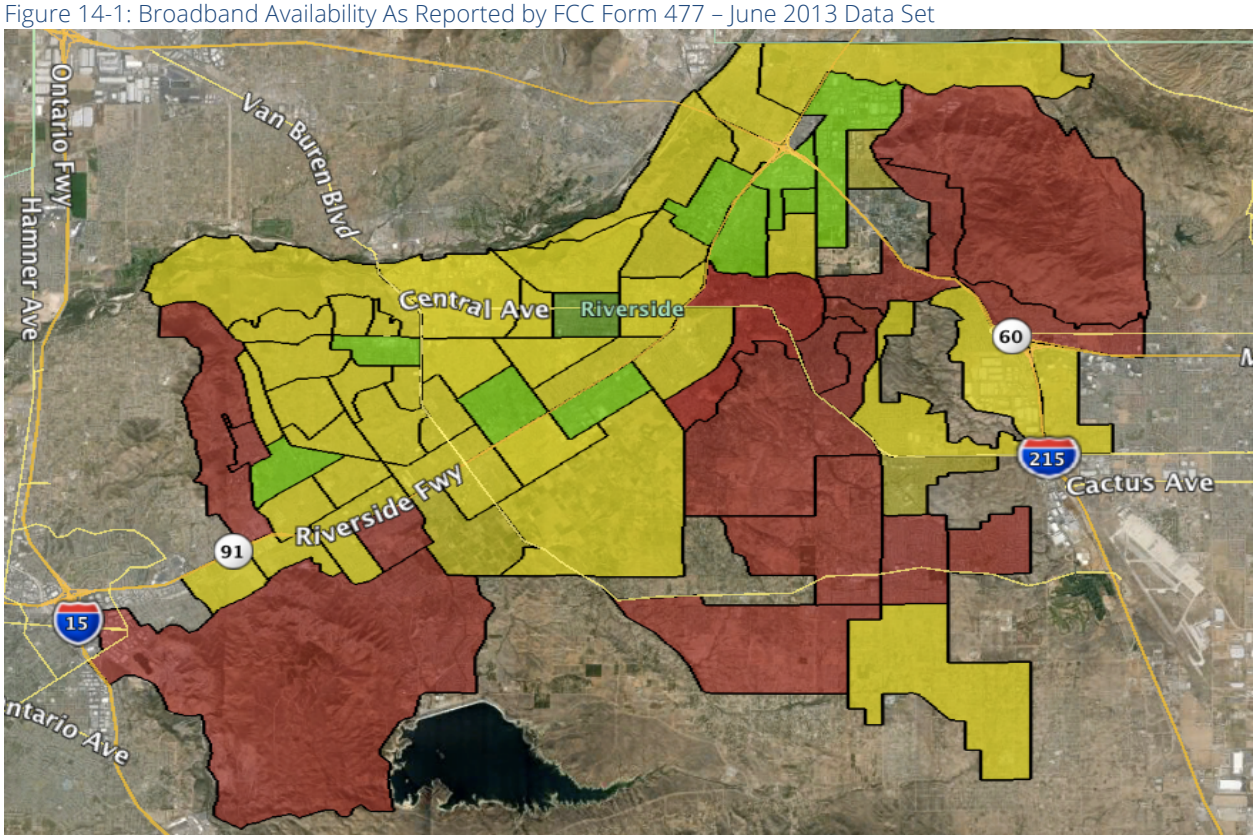
14. Appendix F – Broadband Penetration Analysis

Broadband Penetration & Availability in the City of Riverside

Broadband Penetration in Riverside Per FCC Data

Figure 14.1 illustrates the most recent residential broadband penetration data, as reported in FCC Form 477 by providers that serve the City of Riverside. Data is reported per census tract for every census tract in the City. Census tracts are shaded below to illustrate the average broadband penetration. Penetration means that amount of residential households that have subscribed to a wireline broadband service such as cable or DSL Internet service. While these penetration rates track residential households, it's usually a good representation of general broadband availability within a given census tract, inclusive of business subscribers. Tracts shaded in green exhibit 50% average penetration, tracts shaded in green exhibit 50% average penetration, census tracts in yellow exhibit 70% average penetration and census tracts in red exhibit 90% average penetration. Cities exhibit significantly higher broadband penetration whereas rural areas exhibit lower rates. The predominant reason why broadband penetration is lower in rural census tracts is due to a lack of broadband availability in these areas. The FCC data reports actual broadband lines connected, not availability of broadband services.

Figure 14-1: Broadband Availability As Reported by FCC Form 477 – June 2013 Data Set



15. Appendix G – Glossary of Terms

3G – Third Generation	The third generation of mobile broadband technology, used by smart phones, tablets, and other mobile devices to access the web.
4G – Fourth Generation	The fourth generation of mobile broadband technology, used by smart phones, tablets, and other mobile devices to access the web.
ADSL – Asymmetric Digital Subscriber Line	DSL service with a larger portion of the capacity devoted to downstream communications, less to upstream. Typically thought of as a residential service.
ADSS – All-Dieletric Self-Supporting	A type of optical fiber cable that contains no conductive metal elements.
AMR/AMI – Automatic Meter Reading/Advanced Metering Infrastructure	Electrical meters that measure more than simple consumption and an associated communication network to report the measurements.
ATM – Asynchronous Transfer Mode	A data service offering that can be used for interconnection of customer's LAN. ATM provides service from 1 Mbps to 145 Mbps utilizing Cell Relay Packets.
Bandwidth	The amount of data transmitted in a given amount of time; usually measured in bits per second, kilobits per second (kbps), and Megabits per second (Mbps).
Bit	A single unit of data, either a one or a zero. In the world of broadband, bits are used to refer to the amount of transmitted data. A kilobit (Kb) is approximately 1,000 bits. A Megabit (Mb) is approximately 1,000,000 bits. There are 8 bits in a byte (which is the unit used to measure storage space), therefore a 1 Mbps connection takes about 8 seconds to transfer 1 megabyte of data (about the size of a typical digital camera photo).
BPL – Broadband over Powerline	A technology that provides broadband service over existing electrical power lines.
BPON – Broadband Passive Optical Network	BPON is a point-to-multipoint fiber-lean architecture network system which uses passive splitters to deliver signals to multiple users. Instead of running a separate strand of fiber from the CO to every customer, BPON uses a single strand of fiber to serve up to 32 subscribers.
Broadband	A descriptive term for evolving digital technologies that provide consumers with integrated access to voice, high-speed data service, video-demand services, and interactive delivery services (e.g. DSL, Cable Internet).
CAD – Computer Aided Design	The use of computer systems to assist in the creation, modification, analysis, or optimization of a design.
CAI – Community Anchor Institutions	The National Telecommunications and Information Administration defined CAIs in its SBDD program as "Schools, libraries, medical and healthcare providers, public safety entities, community colleges and other institutions of higher education, and other community support organizations and entities". Universities, colleges, community colleges, K-12 schools, libraries, health care facilities, social service providers, public safety entities, government and municipal offices are all community anchor institutions.
CAP – Competitive Access Provider	(or "Bypass Carrier") A Company that provides network links between the customer and the Inter-Exchange Carrier or even directly to the Internet Service Provider. CAPs operate private networks independent of Local Exchange Carriers.

Cellular	A mobile communications system that uses a combination of radio transmission and conventional telephone switching to permit telephone communications to and from mobile users within a specified area.
CLEC – Competitive Local Exchange Carrier	Wireline service provider that is authorized under state and Federal rules to compete with ILECs to provide local telephone service. CLECs provide telephone services in one of three ways or a combination thereof: 1) by building or rebuilding telecommunications facilities of their own, 2) by leasing capacity from another local telephone company (typically an ILEC) and reselling it, and 3) by leasing discrete parts of the ILEC network referred to as UNEs.
CO – Central Office	A circuit switch where the phone lines in a geographical area come together, usually housed in a small building.
Coaxial Cable	A type of cable that can carry large amounts of bandwidth over long distances. Cable TV and cable modem service both utilize this technology.
CPE – Customer Premise Equipment	Any terminal and associated equipment located at a subscriber's premises and connected with a carrier's telecommunication channel at the demarcation point ("demarc").
CWDM – Coarse Wavelength Division Multiplexing	A technology similar to DWDM only utilizing less wavelengths in a more customer-facing application whereby less bandwidth is required per fiber.
Demarcation Point (“demarc”)	The point at which the public switched telephone network ends and connects with the customer's on-premises wiring.
Dial-Up	A technology that provides customers with access to the Internet over an existing telephone line.
DLEC – Data Local Exchange Carrier	DLECs deliver high-speed access to the Internet, not voice. Examples of DLECs include Covad, Northpoint and Rhythms.
Downstream	Data flowing from the Internet to a computer (Surfing the net, getting E-mail, downloading a file).
DSL – Digital Subscriber Line	The use of a copper telephone line to deliver “always on” broadband Internet service.
DSLAM – Digital Subscriber Line Access Multiplier	A piece of technology installed at a telephone company’s Central Office (CO) and connects the carrier to the subscriber loop (and ultimately the customer’s PC).
DWDM – Dense Wavelength Division Multiplexing	An optical technology used to increase bandwidth over existing fiber-optic networks. DWDM works by combining and transmitting multiple signals simultaneously at different wavelengths on the same fiber. In effect, one fiber is transformed into multiple virtual fibers.
E-Rate	A Federal program that provides subsidy for voice and data circuits as well as internal network connections to qualified schools and libraries. The subsidy is based on a percentage designated by the FCC.
EON – Ethernet Optical Network	The use of Ethernet LAN packets running over a fiber network.
EvDO – Evolution Data Only	EvDO is a wireless technology that provides data connections that are 10 times as fast as a traditional modem. This has been overtaken by 4G LTE.
FCC – Federal Communications Commission	A Federal regulatory agency that is responsible for regulating interstate and international communications by radio, television, wire, satellite and cable in all 50 states, the District of Rock Falls, and U.S. territories.
FDH – Fiber Distribution Hub	A connection and distribution point for optical fiber cables.

FTTN – Fiber to the Neighborhood	A hybrid network architecture involving optical fiber from the carrier network, terminating in a neighborhood cabinet with converts the signal from optical to electrical.
FTTP – Fiber to the premise (or FTTB – Fiber to the building)	A fiber-optic system that connects directly from the carrier network to the user premises.
GIS – Geographic Information Systems	A system designed to capture, store, manipulate, analyze, manage, and present all types of geographical data.
GPON- Gigabit-Capable Passive Optical Network	Similar to BPON, GPON allows for greater bandwidth through the use of a faster approach (up to 2.5 Gbps in current products) than BPON.
GPS – Global Positioning System	a space-based satellite navigation system that provides location and time information in all weather conditions, anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites.
GSM – Global System for Mobile Communications	This is the current radio/telephone standard developed in Europe and implemented globally except in Japan and South Korea.
HD – High Definition (Video)	Video of substantially higher resolution than standard definition.
HFC – Hybrid Fiber Coaxial	An outside plant distribution cabling concept employing both fiber-optic and coaxial cable.
ICT – Information and Communications Technology	Often used as an extended synonym for information technology (IT), but it is more specific term that stresses the role of unified communications and the integration of telecommunications, computers as well as necessary enterprise software, middleware, storage, and audio-visual systems, which enable users to access, store, transmit, and manipulate information.
IEEE – Institute of Electrical Engineers	A professional association headquartered in New York City that is dedicated to advancing technological innovation and excellence.
ILEC – Incumbent Local Exchange Carrier	The traditional wireline telephone service providers within defined geographic areas. Prior to 1996, ILECs operated as monopolies having exclusive right and responsibility for providing local and local toll telephone service within LATAs.
IP-VPN – Internet Protocol-Virtual Private Network	A software-defined network offering the appearance, functionality, and usefulness of a dedicated private network.
ISDN – Integrated Services Digital Network	An alternative method to simultaneously carry voice, data, and other traffic, using the switched telephone network.
ISP – Internet Service Provider	A company providing Internet access to consumers and businesses, acting as a bridge between customer (end-user) and infrastructure owners for dial-up, cable modem and DSL services.
ITS – Intelligent Traffic System	Advanced applications which, without embodying intelligence as such, aim to provide innovative services relating to different modes of transport and traffic management and enable various users to be better informed and make safer, more coordinated, and 'smarter' use of transport networks.
Kbps – Kilobits per second	1,000 bits per second. A measure of how fast data can be transmitted.
LAN – Local Area Network	A geographically localized network consisting of both hardware and software. The network can link workstations within a building or multiple computers with a single wireless Internet connection.
LATA – Local Access and Transport Areas	A geographic area within a divested Regional Bell Operating Company is permitted to offer exchange telecommunications and exchange access service. Calls between LATAs are often thought of as long distance service. Calls within a LATA (IntraLATA) typically include local and local toll services.
Local Loop	A generic term for the connection between the customer's premises (home, office, etc.) and the provider's serving central office. Historically, this has been a copper wire connection; but in many areas it has transitioned to fiber optic. Also, wireless options are increasingly available for local loop capacity.

MAN – Metropolitan Area Network	A high-speed intra-city network that links multiple locations with a campus, city or LATA. A MAN typically extends as far as 30 miles.
Mbps – Megabits per second	1,000,000 bits per second. A measure of how fast data can be transmitted.
MPLS – Multiprotocol Label Switching	A mechanism in high-performance telecommunications networks that directs data from one network node to the next based on short path labels rather than long network addresses, avoiding complex lookups in a routing table.
ONT – Optical Network Terminal	Used to terminate the fiber-optic line, demultiplex the signal into its component parts (voice telephone, television, and Internet), and provide power to customer telephones.
Overbuilding	The practice of building excess capacity. In this context, it involves investment in additional infrastructure projects to provide competition.
OVS – Open Video Systems	OVS is a new option for those looking to offer cable television service outside the current framework of traditional regulation. It would allow more flexibility in providing service by reducing the build out requirements of new carriers.
PON – Passive Optical Network	A Passive Optical Network consists of an optical line terminator located at the Central Office and a set of associated optical network terminals located at the customer's premise. Between them lies the optical distribution network comprised of fibers and passive splitters or couplers. In a PON network, a single piece of fiber can be run from the serving exchange out to a subdivision or office park, and then individual fiber strands to each building or serving equipment can be split from the main fiber using passive splitters / couplers. This allows for an expensive piece of fiber cable from the exchange to the customer to be shared amongst many customers, thereby dramatically lowering the overall costs of deployment for fiber to the business (FTTB) or fiber to the home (FTTH) applications.
PPP – Public-Private Partnership	A Public–Private Partnership (PPP) is a government service or private business venture that is funded and operated through a collaborative partnership between a government and one or more private sector organizations. In addition to being referred to as a PPP, they are sometimes called a P3, or P^3.
QOS – Quality of Service	QoS (Quality of Service) refers to a broad collection of networking technologies and techniques. The goal of QoS is to provide guarantees on the ability of a network to deliver predictable results, which are reflected in Service Level Agreements or SLAs. Elements of network performance within the scope of QoS often include availability (uptime), bandwidth (throughput), latency (delay), and error rate. QoS involves prioritization of network traffic.
RF – Radio Frequency	a rate of oscillation in the range of about 3 kHz to 300 GHz, which corresponds to the frequency of radio waves, and the alternating currents which carry radio signals.
Right-of-Way	A legal right of passage over land owned by another. Carriers and service providers must obtain right-of-way to dig trenches or plant poles for cable systems, and to place wireless antennae.
RMS – Resource Management System	A system used to track telecommunications assets.
RPR – Resilient Packet Ring	Also known as IEEE 802.17, is a protocol standard designed for the optimized transport of data traffic over optical fiber ring networks.
RUS – Rural Utility Service	A division of the United States Department of Agriculture, it promotes universal service in unserved and underserved areas of the country with grants, loans, and financing. Formerly known as "REA" or the Rural Electrification Administration.

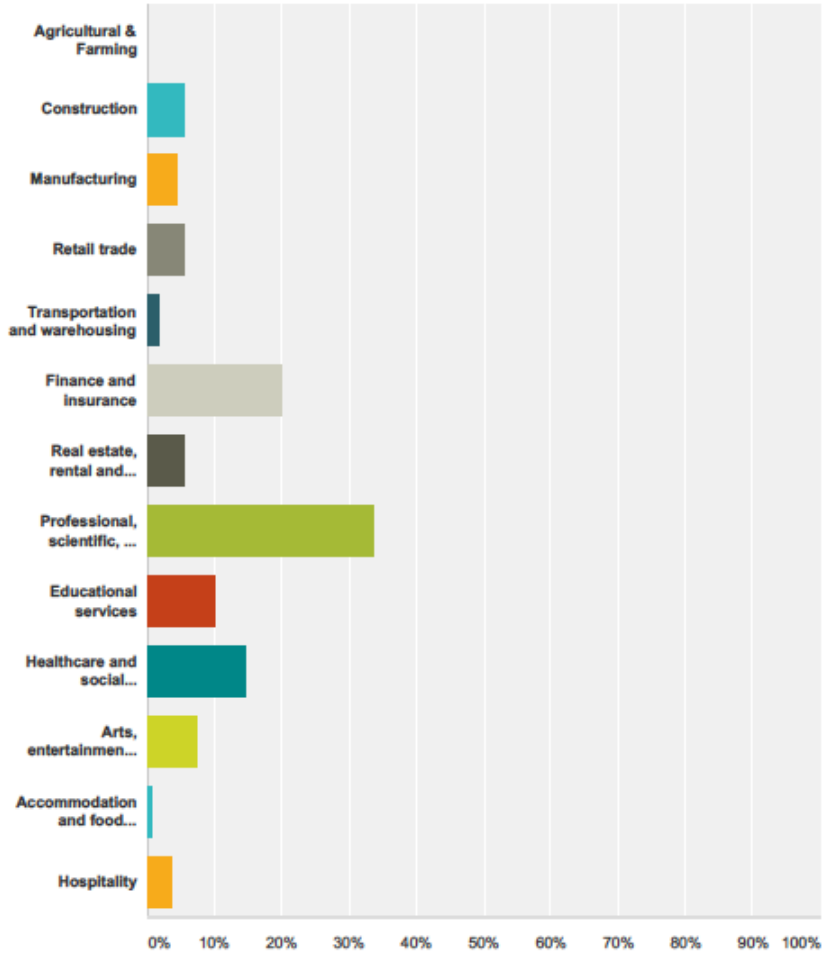
SCADA – Supervisory Control and Data Acquisition	A type of industrial control system (ICS). Industrial control systems are computer controlled systems that monitor and control industrial processes that exist in the physical world.
SNMP – Simple Network Management Protocol	An Internet-standard protocol for managing devices on IP networks.
SONET – Synchronous Optical Network	A family of fiber-optic transmission rates.
Steaming	Streamed data is any information/data that is delivered from a server to a host where the data represents information that must be delivered in real time. This could be video, audio, graphics, slide shows, web tours, combinations of these, or any other real time application.
Subscribership	Subscribership is how many customers have subscribed for a particular telecommunications service.
Switched Network	A domestic telecommunications network usually accessed by telephone, key telephone systems, private branch exchange trunks, and data arrangements.
T-1 – Trunk Level 1	A digital transmission link with a total signaling speed of 1.544 Mbps. It is a standard for digital transmission in North America.
T-3 – Trunk Level 3	28 T1 lines or 44.736 Mbps.
UNE – Unbundled Network Element	Leased portions of a carrier's (typically an ILEC's) network used by another carrier to provide service to customers. Over time, the obligation to provide UNEs has been greatly narrowed, such that the most common UNE now is the UNE-Loop.
Universal Service	The idea of providing every home in the United States with basic telephone service.
Upstream	Data flowing from your computer to the Internet (sending E-mail, uploading a file).
UPS – Uninterruptable Power Supply	An electrical apparatus that provides emergency power to a load when the input power source, typically main power, fails.
USAC – Universal Service Administrative Company	An independent American nonprofit corporation designated as the administrator of the Federal Universal Service Fund (USF) by the Federal Communications Commission.
VDSL – Very High Data Rate Digital Subscriber Line	A developing digital subscriber line (DSL) technology providing data transmission faster than ADSL over a single flat untwisted or twisted pair of copper wires (up to 52 Mbit/s downstream and 16 Mbit/s upstream), and on coaxial cable (up to 85 Mbit/s down and upstream); using the frequency band from 25 kHz to 12 MHz.
Video on Demand	A service that allows users to remotely choose a movie from a digital library whenever they like and be able to pause, fast-forward, and rewind their selection.
VLAN – Virtual Local Area Network	In computer networking, a single layer-2 network may be partitioned to create multiple distinct broadcast domains, which are mutually isolated so that packets can only pass between them via one or more routers; such a domain is referred to as a Virtual Local Area Network, Virtual LAN or VLAN.
VoIP – Voice over Internet Protocol	An application that employs a data network (using a broadband connection) to transmit voice conversations using Internet Protocol.
VPN – Virtual Private Network	A virtual private network (VPN) extends a private network across a public network, such as the Internet. It enables a computer to send and receive data across shared or public networks as if it were directly connected to the private network, while benefitting from the functionality, security and management policies of the private network. This is done by establishing a virtual point-to-point connection through the use of dedicated connections, encryption, or a combination of the two.

WAN – Wide Area Network	A network that covers a broad area (i.e., any telecommunications network that links across metropolitan, regional, or national boundaries) using private or public network transports.
WiFi	WiFi is a popular technology that allows an electronic device to exchange data or connect to the Internet wirelessly using radio waves. The Wi-Fi Alliance defines Wi-Fi as any "wireless local area network (WLAN) products that are based on the Institute of Electrical and Electronics Engineers' (IEEE) 802.11 standards".
WiMax	WiMax is a wireless technology that provides high-throughput broadband connections over long distances. WiMax can be used for a number of applications, including “last mile” broadband connections, hotspot and cellular backhaul, and high speed enterprise connectivity for businesses.
Wireless	Telephone service transmitted via cellular, PCS, satellite, or other technologies that do not require the telephone to be connected to a land-based line.
Wireless Internet	1) Internet applications and access using mobile devices such as cell phones and palm devices. 2) Broadband Internet service provided via wireless connection, such as satellite or tower transmitters.
Wireline	Service based on infrastructure on or near the ground, such as copper telephone wires or coaxial cable underground or on telephone poles.

16. Appendix H – Riverside Business Survey Results

Q4 Which industry would you classify your business under? Check all that apply.

Answered: 110 Skipped: 18



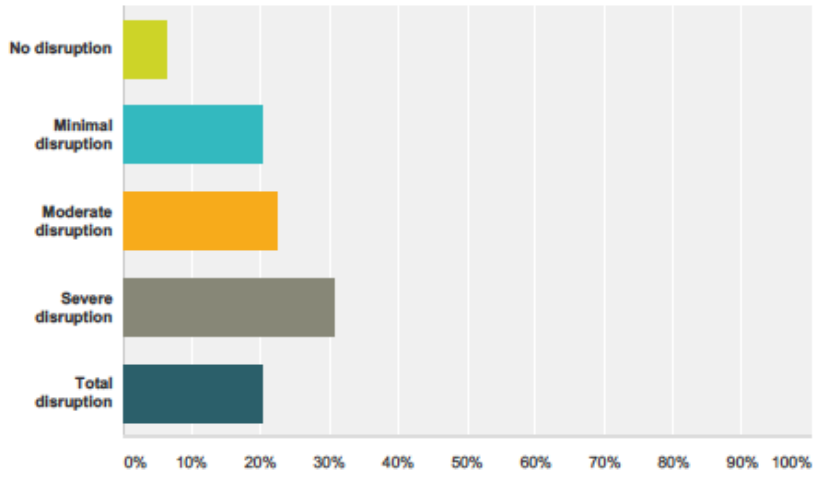
Answer Choices	Responses	
Agricultural & Farming	0.00%	0
Construction	5.45%	6
Manufacturing	4.55%	5
Retail trade	5.45%	6
Transportation and warehousing	1.82%	2

Finance and insurance	**20.00%**	22
Real estate, rental and leasing	**5.45%**	6
Professional, scientific, and technical services	**33.64%**	37
Educational services	**10.00%**	11
Healthcare and social assistance	**14.55%**	16
Arts, entertainment, and recreation	**7.27%**	8
Accommodation and food services	**0.91%**	1
Hospitality	**3.64%**	4
Total Respondents: 110		

#	Other (please specify)	Date
1	Telecomm	11/18/2014 2:23 PM
2	Nonprofit	11/18/2014 2:14 PM
3	Business service	11/18/2014 1:50 PM
4	Wmwd	11/18/2014 1:43 PM
5	Business Non Profit 501 (c) 6	11/18/2014 1:09 PM
6	Live to Give	11/18/2014 12:40 PM
7	Fine Art	10/30/2014 6:53 PM
8	Service	10/29/2014 3:16 PM
9	I ensure as an Iranian responsible US citizen serve humanity	10/29/2014 11:06 AM
10	consultation	10/28/2014 11:40 PM
11	Public affairs	10/28/2014 7:54 PM
12	Spa/HairSalon	10/22/2014 2:00 PM
13	auto collision repair	10/21/2014 10:35 AM
14	Military Officers, Active, Retired, Former & Surviving Spouses	10/20/2014 6:50 PM
15	Human Service/Deaf Advocacy Agency	10/20/2014 5:03 PM
16	Local Government	10/20/2014 4:45 PM
17	powerwashing	10/20/2014 4:39 PM
18	wholesale warehouse	10/19/2014 10:34 AM
19	NA	10/18/2014 5:19 PM
20	Nonprofit / foundation	10/17/2014 6:05 PM
21	BANKING	10/17/2014 12:52 PM
22	Non-profit Senior services	10/17/2014 11:44 AM
23	Service	10/17/2014 1:25 AM
24	Non-profit	10/16/2014 6:29 PM

Q5 What kind of impact do Internet problems including reliability and speed have on your business?

Answered: 124 Skipped: 4

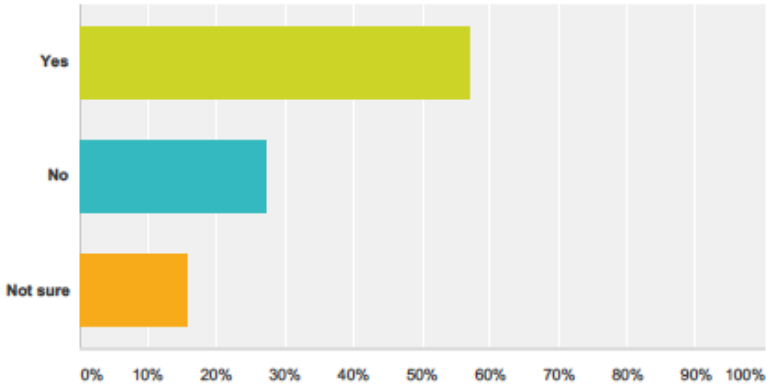


Answer Choices	Responses	
No disruption	6.45%	8
Minimal disruption	20.16%	25
Moderate disruption	22.58%	28
Severe disruption	30.65%	38
Total disruption	20.16%	25
Total		124

#	Other (please explain)	Date
1	We are struggling operating our busines with only a 7mb upload speed availble. We need affordable fiber service to function propertly and to accomidate our expansion plans.	11/20/2014 1:35 PM
2	slow dial up	11/18/2014 1:50 PM
3	Poor quality & speed. Our whole area has only phone line internet no fuber or cable system available.	11/18/2014 1:20 PM
4	Our phones are tied to eat and we utilize Google Dox	10/29/2014 3:16 PM
5	All estimating and management systems are web based	10/21/2014 10:35 AM
6	Disrupts email contact with members.	10/20/2014 6:50 PM
7	NA	10/18/2014 5:19 PM

Q6 Are your current Internet services fulfilling all of your business needs?

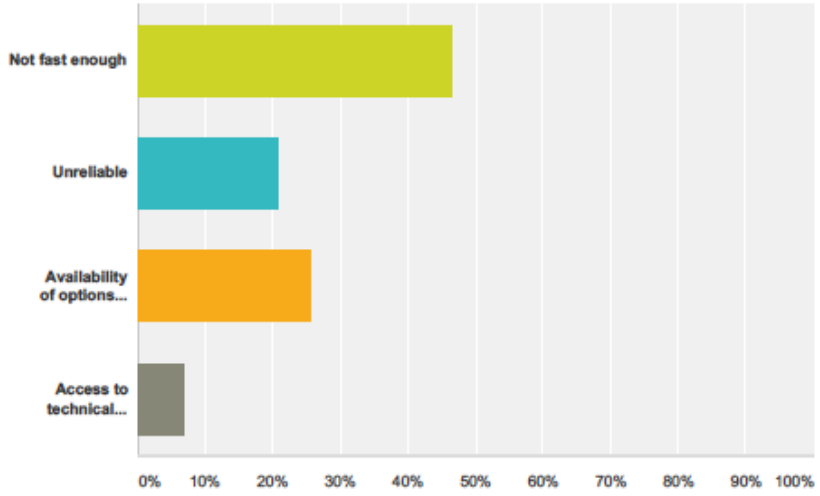
Answered: 121 Skipped: 7



Answer Choices	Responses	
Yes	57.02%	69
No	27.27%	33
Not sure	15.70%	19
Total		121

Q7 If you answered "no" to Question 6, in what way is your Internet insufficient?

Answered: 43 Skipped: 85

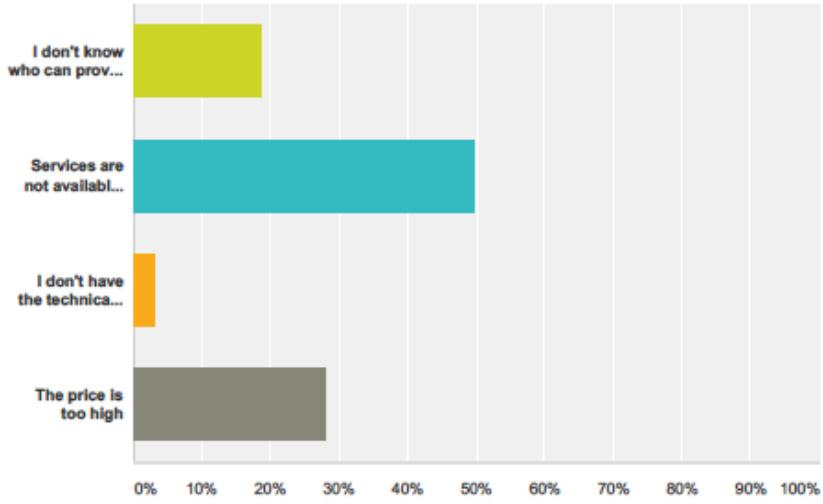


Answer Choices	Responses	
Not fast enough	46.51%	20
Unreliable	20.93%	9
Availability of options (service type, bandwidth)	25.58%	11
Access to technical support	6.98%	3
Total		43

#	Other (please explain)	Date
1	We need an affordable fiber service in our area to support high upload speeds.	11/20/2014 1:35 PM
2	N/A	11/18/2014 2:23 PM
3	bundled w/phone, etc., difficult to understand	11/18/2014 1:38 PM
4	It goes down a lot.	10/29/2014 3:16 PM
5	We WANT Verizon FIOS but are told not available	10/21/2014 10:35 AM
6	TECH PARK HAS NO WIFI...	10/20/2014 5:04 PM
7	N/A	10/20/2014 4:45 PM
8	Not fast enough, unreliable AND availability options	10/20/2014 3:03 PM
9	NA	10/18/2014 5:19 PM
10	WE WOULD LIKE TO OFFER WI FI IN OUR BUILDING BUT WE'RE HAVING A HARD TIME GETTING PROPER SERVICE IN OUR AREA AND WE'RE CONSIDERED A "TECH PARK"	10/17/2014 11:47 AM

Q8 If you answered "No", to Question 6, why haven't you upgraded your Internet services?

Answered: 32 Skipped: 96



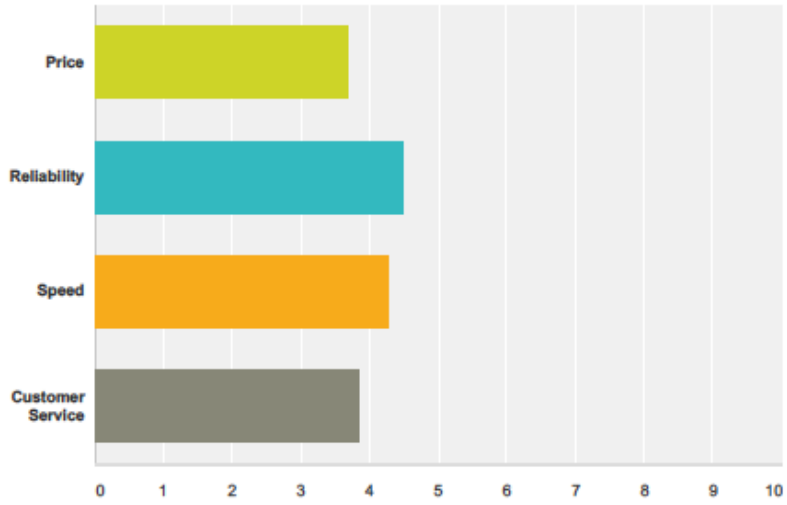
Answer Choices	Responses	
I don't know who can provide services in my area	18.75%	6
Services are not available in my area	50.00%	16
I don't have the technical skills necessary	3.13%	1
The price is too high	28.13%	9
Total		32

#	Other (please explain)	Date
1	No affordable fiber service (Verizon Fios, At&t U-Verse)	11/20/2014 1:35 PM
2	I am not the decision maker	11/18/2014 2:56 PM
3	In process	11/18/2014 2:55 PM
4	Not my choice - handles bmain office	11/18/2014 2:40 PM
5	N/A	11/18/2014 2:23 PM
6	We moved our business because poor servie in August 2014	11/18/2014 1:54 PM
7	I believe we have the best services offered	10/29/2014 3:16 PM
8	need to take the time to look into switching	10/29/2014 12:39 AM
9	FIOS not available for our address	10/21/2014 10:35 AM
10	IT handles	10/20/2014 6:14 PM

11	N/A	10/20/2014 4:45 PM
12	NA	10/18/2014 5:19 PM
13	Cable has not been avialable, however it is supposed to be coming very soon to my complex. I have signed a letter of intent with Charter.	10/17/2014 3:53 PM
14	Evaluating pricing	10/16/2014 6:29 PM
15	switching everything is a hassle and there are terms to cancel. Plus you have to have the new service up before you can cancel the old	10/16/2014 6:09 PM
16	Currently have the current highest speed offered by provider	10/16/2014 6:07 PM

Q9 Please rate your current Internet services (5 = most important, 1 = least important):

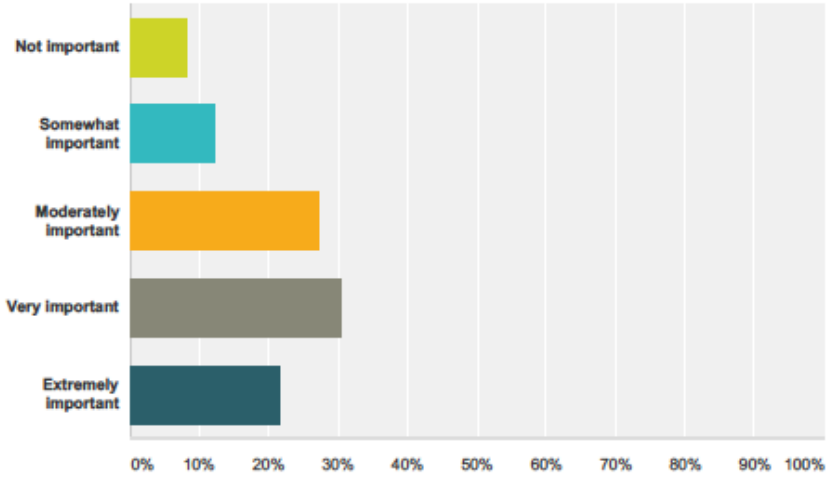
Answered: 119 Skipped: 9



	1	2	3	4	5	Total	Weighted Average
Price	5.08% 6	4.24% 5	31.36% 37	35.59% 42	23.73% 28	118	3.69
Reliability	0.85% 1	2.54% 3	10.17% 12	20.34% 24	66.10% 78	118	4.48
Speed	2.56% 3	4.27% 5	12.82% 15	22.22% 26	58.12% 68	117	4.29
Customer Service	5.13% 6	10.26% 12	18.80% 22	27.35% 32	38.46% 45	117	3.84

Q10 Having multiple choices of Internet and broadband providers for my business is _____.

Answered: 121 Skipped: 7



Answer Choices	Responses	
Not important	8.26%	10
Somewhat important	12.40%	15
Moderately important	27.27%	33
Very important	30.58%	37
Extremely important	21.49%	26
Total		121

17. Appendix I – Public Policy Sample Documents

Under Separate Cover