Regular Workshop – January 19, 2016
Agenda Item 7

Agenda Item:	Fiber Optic Presentation and Discussion
Presenter:	Town Manager and Staff
Summary:	As part of the Gulf of Mexico Drive Utility Undergrounding Project, a fiber optic backbone of dark fiber was included in the voter approved referendum. IT Director Jason Keen and consultants, Magellan Advisors, will present details regarding the potential uses and benefits of a community owned fiber optic network. This item will be presented at the January 19, 2016 Regular Workshop Meeting. Consultants from Magellan Advisors will be present for the discussion and questions.
Attachments:	1-12-16 Memo, IT Director to Manager; PowerPoint Presentation.
Recommended Action:	None, informational only.

M E M O R A N D U M

Date: January 12, 2016

TO: Dave Bullock, Town Manager

FROM: Jason Keen, IT Director

SUBJECT: Fiber Optic Presentation and Discussion

The Town of Longboat Key recently approved the undergrounding of utilities and installation of a fiber optic backbone along Gulf of Mexico Dr. The next phase of the project poses the opportunity to install the fiber optic backbone throughout the neighborhoods.

The Town has contracted with Magellan Advisors to develop an Opportunity Assessment outlining the potential uses and benefits that could be realized by the deployment of a community owned fiber optic network. The Town has a once in a lifetime opportunity to deploy fiber optic infrastructure at a significant savings in coordination with the undergrounding of other utilities on the island.

In this first presentation Magellan will discuss the trends in the broadband/telecommunications industry, the range of possibilities for use of the network, and various business models the Town could consider to bring new fiber based high-speed Internet services to its residents, businesses and community anchors. Another report with more Town-specific analysis will be finalized in the coming weeks.

Please don't hesitate to contact me if you have any questions.

Broadband Infrastructure Assessment

Town of Longboat Key

Prepared by: Magellan Advisors

Released: January 19, 2016

DRAFT

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1. EXECUTIVE SUMMARY

1.1 DEMOGRAPHICS

The Town of Longboat Key is a barrier island located off Florida's west coast, between the Sarasota Bay and Gulf of Mexico. Spanning two counties, the town lies in Manatee and Sarasota counties. The area of Longboat Key is 16.0 square miles, with 11.9 square miles being water.

According to the 2010 Census, 6,888 people call Longboat Key, FL home and during the peak tourist season, the town entertains a vacationing population of approximately 22,000 guests. Data shows that 67% of individuals in Longboat Key are over the age of 65 and 4% are under 18 years old. In addition, average household and family size in Longboat Key is two people. Statistics also illuminate an educated and generally wealthy population, 57% of residents have a bachelor's degree or higher and median family income is $307,983.

There are 8,814 housing units in Longboat Key, 70% of which are in multi-unit structures. The median value of owner occupied housing units is $605,600. Many of the remaining single family homes are upwards of 45 years old; however, in recent years numerous of these homes have been purchased, demolished, and new, ornate homes with values in the millions have been built in their place. The economy is generally made up of vacation and hospitality industries focused on serving the influx of visitors in season and catering to those who own a 2nd, 3rd, or beyond homes.

While a number of the residents live on the island year round, many are "snowbirds" or people who spend a great deal of time during the winter months in Florida, to "run to the sun" from areas of the country that are snowy and cold. In addition, some notable celebrities and athletes have lived on the island such as: Maria Sharapova, a Russian tennis player; Lou Bender, pioneer pro-basketball player and successful attorney; Joe Perry, lead guitarist for Aerosmith; and Lee Scott, former CEO of Walmart.

1.2 BROADBAND NEEDS OF THE RESIDENTS OF LONGBOAT KEY, FL

The Town of Longboat Key and its residents view high-speed broadband and its related infrastructure as a necessity, understanding that broadband services will drive major areas of its citizens lives for decades to come. Longboat Key has a significant opportunity to take advantage of major utility undergrounding efforts that are currently planned for the island, allowing the town to build a state of the art network at a significant savings over traditional construction methods. This network will drive efficiencies in government, education, and healthcare, while

enhancing economic development opportunities. At the same time, the network will introduce a new Internet and entertainment platform to drive a superior digital quality of life.

A majority of residents of Longboat Key are educated, upper middle to upper class, retired, and many do not have children living in the home. Inferences can be made about individuals within these demographics regarding Internet and broadband use. A population of educated, wealthy individuals will demand more regarding Internet services in their area. These individuals may need to have reliable connectivity in the home due to: employment, recreation, social media, video streaming, or the Internet of Things (IoT) being used in the home. Whether it be staying connected professionally while away from their company headquarters; sending and receiving videos of children or grandchildren; downloading movies at a rapid pace; or adding Internet based appliances to their home; these residents and consumers will continue to demand more from their Internet and broadband access. When planning for the residents of an area, it is important to understand the demographics and interests of the consumer. The demographics – education and wealth – could play a large part in what the residents in Longboat Key deem as valuable regarding high-speed Internet and broadband connectivity. When making the decision regarding high-speed Internet for a community, certain articles should be taken into consideration:

The Connected Executive

In today's age, executives require high-speed Internet to stay connected and to continue to be productive when away from their corporate office. "According to Reuters online, about one in five workers around the world telecommute frequently, and nearly 10 percent work from home every day. Plus, according to a new Census report, an additional 4.2 million professionals worked from home at least one day a week."[1] With tools like groupware, virtual private conferencing, and video conferencing it is possible for companies to connect with their employees over long distances. However, to use these applications to stay connected, high-speed Internet access is vital. It is common for a business person to include high-speed Internet and broadband in the equation when making the decision to purchase a home or vacation property. The availability of high-speed Internet and broadband could assist in the attraction of this type of individual to live in the Town of Longboat Key.

[1] http://www.bandwidthplace.com/home-office-internet/

Healthcare

As previously stated, 67% of the population of Longboat Key is over the age for retirement. According to a survey conducted in 2015 by Accenture[2], "there is growing demand among tech-savvy seniors (67%) who want to access healthcare services from home, but the majority (66%) are worried today's technology isn't sufficient to do so." These individuals place a high value on quality healthcare, cutting edge technology for the administration of healthcare, and services related to healthcare. Whether it is the physicians' access to technology in the operating room, electronic medical records, or online navigation of healthcare, the aging population of Longboat Key will see significant use of technology in delivery of healthcare services.

Quality of Life

"The numbers being forecast for the Internet of Things (IoT) are truly mind-boggling. Business Insider Intelligence finds that the number of everyday and enterprise devices that will soon be connected to the Internet — from parking meters to home thermostats — will be huge…1.9 billion devices today, and 9 billion by 2018, according to Business Insider estimates, roughly equal to the number of smartphones, smart TVs, tablets, wearable computers, and PCs *combined*."[3] Home owners are constantly adding new automated devices such as: Nest to control your air conditioning in your home; Pentair to control your pool temperature and settings; and even crock pot appliances, all of which can be controlled from your smart phone or wireless device. However, these products and innovations require bandwidth, bandwidth which many older Internet connections can not handle.

Job Growth and Retention

Businesses and organizations, large and small, require Internet access to be viable and productive in today's economy. If the organization providing the product or service can not acquire Internet service of great capacity and at a fair cost, the organization may very well search for a different location to operate. When customers book hotel stays, dine at restaurants, or attend business meetings they demand Wi-Fi access. Internet service to businesses, and their customers alike, are of great importance to attracting and retaining organizations in a city or town.

[2] https://newsroom.accenture.com/industries/health-public-service/tech-savvy-seniors-want-online-options-to-access-care-from-home-accenture-survey-shows.htm
[3] http://www.businessinsider.com/growth-in-the-internet-of-things-market-2-2014-2

2. TRENDS IN BROADBAND

2.1 NATIONAL TRENDS

The FCC assesses broadband progress annually in its Broadband Progress Report, as required by the Telecommunications Act of 1996. The proceeding for the 2016 Broadband Progress Report is currently pending and the FCC will finalize the report in January 2016.[4] In writing this report the FCC adopts benchmarks and criteria to assess consumer broadband. In the 2015 Report, the FCC increased the speed benchmark for what constitutes "advanced telecommunications capability" that "enables users to originate and receive high-quality voice, data, graphics, and video communications using any technology" as required by Section 706 of the Telecommunications Act of 1996.[5] The FCC found, based on its analysis of consumer usage, that the speed benchmark for fixed landline broadband is a minimum of 25 Mbps download speed, and 3 Mbps upload speed.[6] The FCC also sought comment on the adoption of a minimum speed benchmark for mobile broadband services for the first time, suggesting a minimum speed benchmark of 10 Mbps download and 1 Mbps upload to be considered "broadband".[7] Using only the fixed broadband metric for assessment (since a mobile broadband metric has not yet been adopted) FCC Chairman Wheeler has made the following findings from the data:[8]

- Approximately 34 million Americans still lack access to fixed broadband at the benchmark speed;
- A persistent urban-rural divide has left 39% of the rural population without access to fixed broadband at the minimum speed, while only 4% of the urban population lacks such access. However, this is an improvement over previous years (2012: 55%; 2013: 53%)

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[4] In the Matter of Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, as Amended by the Broadband Data Improvement Act; GN Docket No. 15-191, Eleventh Broadband Progress Notice of Inquiry, August 7, 2015.

[5] Id., at paragraph 19.

[6] Id., at paragraphs 23 – 25.

[7] Id., at paragraphs 27 – 30.

[8] Id., Fact Sheet: 2016 Broadband Progress Report; Chairman's Draft.

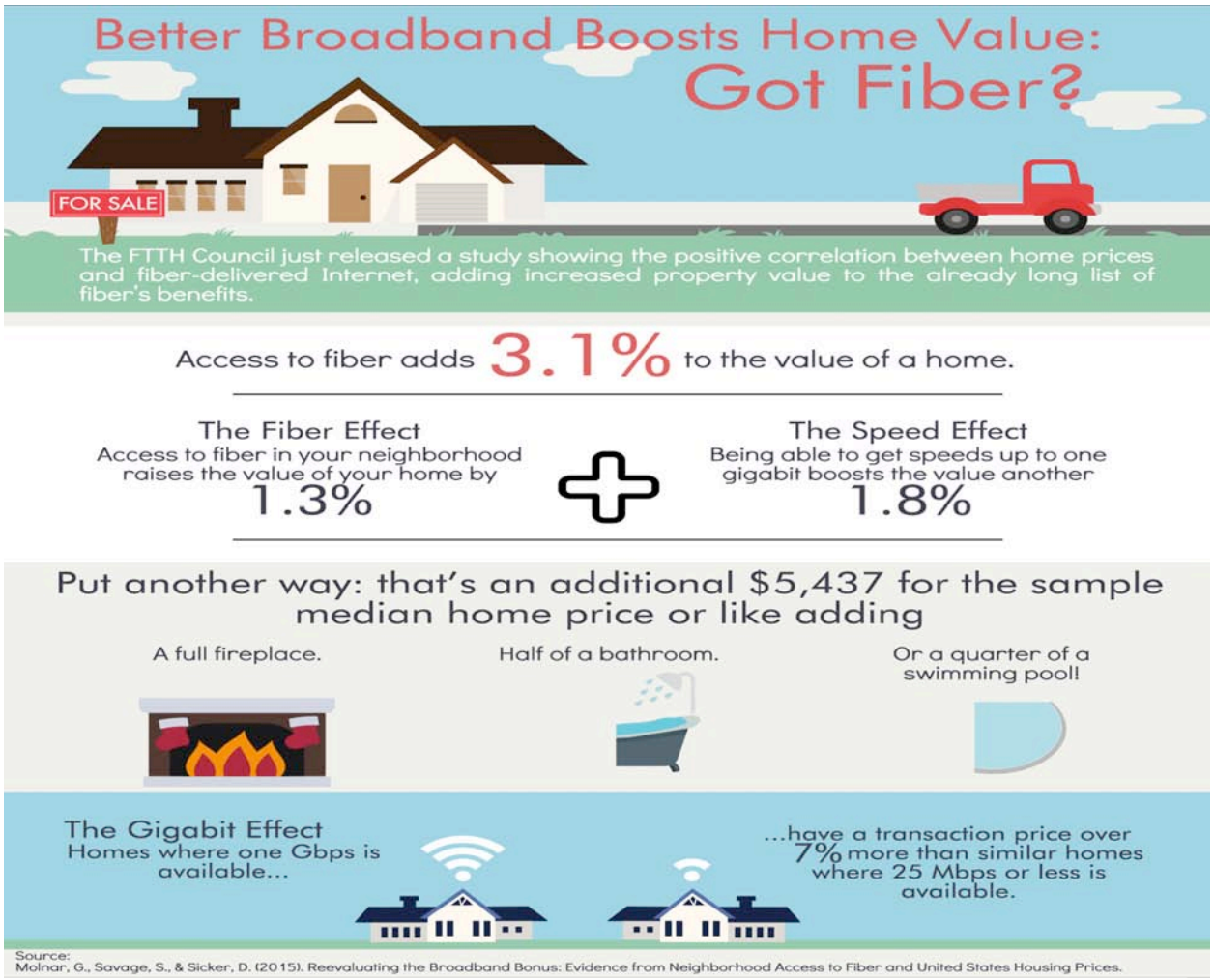
- Fixed and mobile broadband services offer distinct functions meeting both complementary and distinct needs;
- Fixed broadband offers high speed, high capacity connections capable of supporting bandwidth-intensive uses, such as streaming video by multiple users;
- Mobile devices provide broadband access on the go and are especially useful for real-time two-way interactions, mapping applications, and social media. But consumers who rely solely on mobile broadband tend to perform a more limited range of tasks and are significantly more likely to incur additional usage fees or forgo use of the Internet.

"In recent years, we've been hearing that high-speed broadband is good for home values – and conversely that a lack of broadband can depress home values and/or make homes harder to sell. But until now there has been little or no scientific research to back up those assertions. " [9] "A 2015 white paper by the Fiber to the Home Council Americas goes even further, citing data from the University of Colorado at Boulder. Apparently, not only does a fiber connection add an average of 3.1 percent to a property's value, but valuations are increased by an additional 1.8 percent when comparing areas with connectivity speeds of 100 Mbps with those that support 1 Gbps or more." [10] In the past, proximity to roads, buildings, and easy parking determined the value of property. In today's business and real estate, proximity to viable and reliable Internet access, namely fiber, could increase property value in greater terms. '"The evidence is mounting: investment in fiber improves the economic performance of a community as well as its quality of life," said FTTH Council President and CEO Heather Burnett Gold. "Around the United States, leaders at the local level have started to think about how their community's Internet infrastructure is a catalyst for economic, educational, and governmental innovation."'[11]

Figure 1 below demonstrates how the Town of Longboat Key could add real estate value for the residents, further adding capital and personal power for the population of Longboat Key.

[9] http://www.telecompetitor.com/broadband-and-home-values-ftth-council-study-looks-at-fiber-impact/
[10] https://www.atlantech.net/blog/why-fiber-has-more-impact-on-real-estate-value-than-physical-location
[11] http://www.ftthannual.org/blog/study-shows-home-values-up-3.1-with-access-to-fiber

Figure 1: Broadband boosts home value



A recent Pew Research Center report, "Home Broadband 2015"[12], contains similar conclusions and additional insights and new findings, as follows:

- Home broadband adoption seems to to have plateaued, at 67% of Americans, down slightly from 70% in in 2013. It is unclear whether this statistically significant difference represents a "blip" or not. The decline in rural adoption is larger, from 60% in 2013 to 55%.
- This downturn takes place at the same time there is an increase in "smart-phone only" adults. Smart phone adoption is at parity with home broadband adoption (68% v. 67%).
- 15% of American adults are "cord cutters" – those that have abandoned pay cable or satellite TV. Cord cutters cite the availability of content televised from the Internet as one factor.
- Those who are smartphone-dependent face distinct challenges: more likely to run up against data-cap limits; cancel or suspend service due to financial constraints; and challenged in key tasks such as filling out job applications and writing cover letters.
- "The monthly cost of broadband service is now cited by a plurality of non-adopters as the most important reason for not having a home broadband subscription."[13]
- "69% of Americans indicate that not having a home high-speed Internet connection would be a major disadvantage to finding a job, getting health information, or accessing other key information – up from 56% who said this in 2010."[14]
- "65% of non-adopters say that lacking home broadband service is a major disadvantage" when it comes to looking for job opportunities, accessing government information and services, following the news, learning new things, or getting health information. This is up from 48% who said so in 2010.[15]
- "Among non-adopters, price sensitivity – where the monthly cost of service is the chief barrier to adoption – is the most prominent among those who have had service in the past, and/or are interested in getting it in the future."[16]

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[12] Pew Research Center, December 21, 2015, "Home Broadband 2015"; Available at: http://www.pewinternet.org/2015/12/21/2015/Home-Broadband-2015/

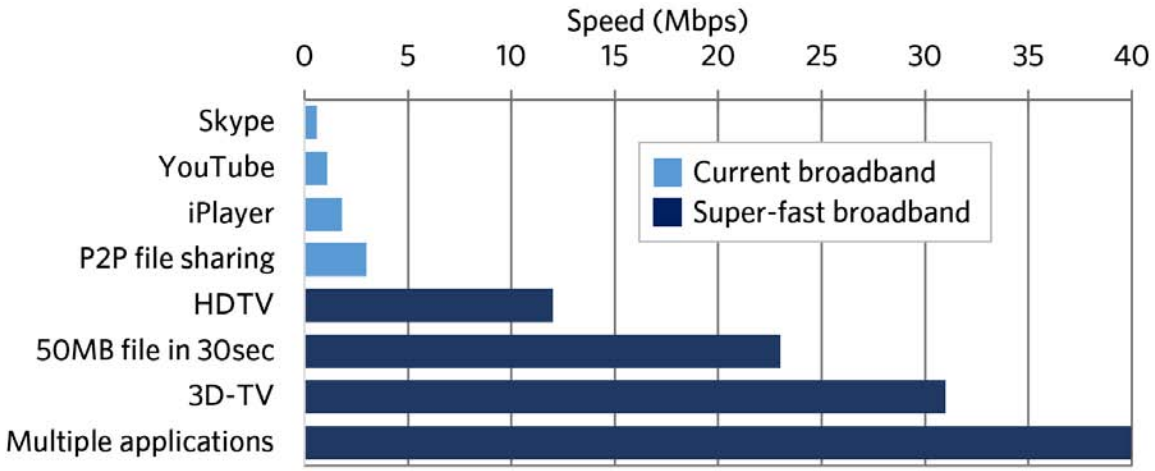
[13] Id, at page 4.
[14] Id, at page 4.
[15] Id., at page 5.
[16] Id., at page 7.

2.2 BANDWIDTH TRENDS

Broadband technologies have evolved to carry more and more data because of the advancements in online applications and the growth in the number of online devices. According to a new report by Gartner, "As it becomes cheaper to fit sensors to consumer products, the number of smart devices in a typical home in developed countries could grow to over 500 by 2022, …. smart devices, which make up the so-called Internet of Things (IoT), where wearables and sensors constantly exchange information, to be updated automatically with new features." [17] While many of these devices have not made it mainstream, "tech geeks" and the wealthy are more likely to invest in and try out these options, where the everyday consumer may not have the knowledge or means to do so. This technology, and wave of the future, may be in reach and of interest to the residents of Longboat Key, where the population is rich with educated individuals who have the capital to invest in these products.

Every application requires a certain amount of bandwidth on a broadband connection to function properly. As time has progressed, we have witnessed significantly more devices, each with hundreds of possible applications, and significantly more bandwidth used by those applications. Figure 2 illustrates the bandwidth requirements of common applications and the impact of multiple applications running across a broadband connection.

Figure 2: Broadband Application Speed Requirements



Today, broadband subscribers across every user class are utilizing more online applications, and particularly those that consume larger amounts of high-quality bandwidth. As the adoption of the Internet of Things (IoT) increases, these demands will escalate dramatically. Figure 3 illustrates broadband demand for applications today and the increases in broadband that are necessary to accommodate this demand. Broadband subscribers make heavy use of the core

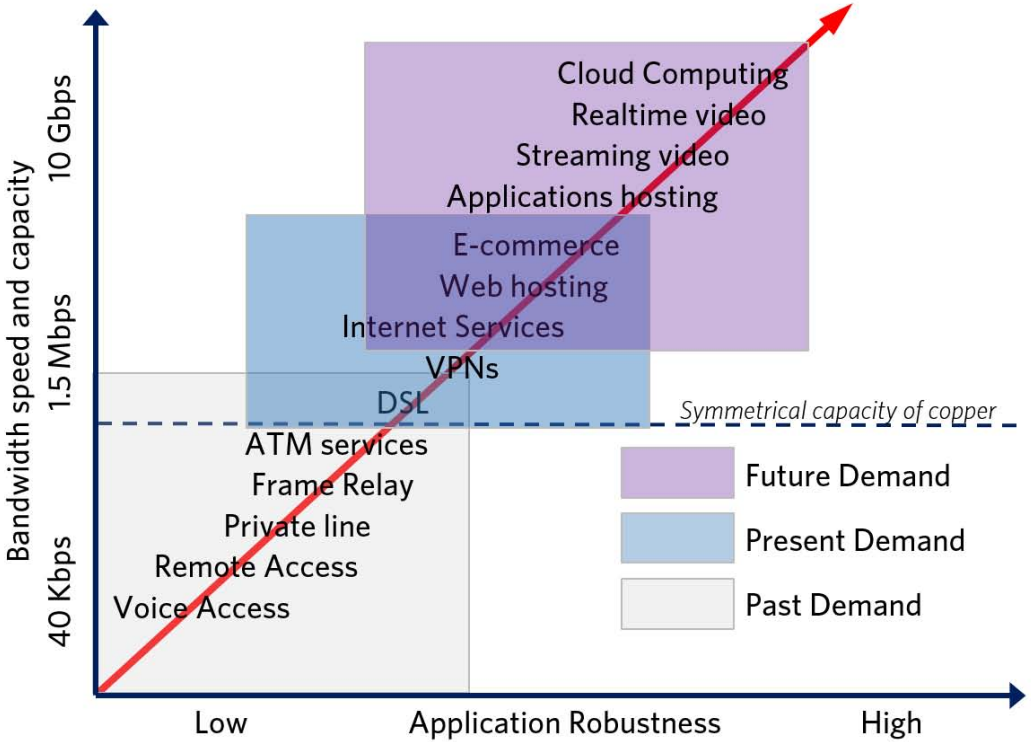
[17] http://www.techgoondu.com/2014/09/13/gartner-over-500-smart-devices-per-home-by-2022/

Internet functions of Internet browsing, web hosting, e-commerce, virtual private network connectivity, and voice services.

However, subscribers are consuming more real time video and streaming applications, which require significant bandwidth, reliability, and performance from their broadband connections. We are still early in the evolution of Internet video applications and these are expected to grow significantly over the next 10 years, replacing much of the text-based Internet.

In addition, the myriad of cloud services is driving the need for more symmetrical[18] broadband as real time and cloud applications require additional bandwidth, both in download speed and upload speed. As more of these applications are deployed, broadband connections will need to accommodate the increased bandwidth load. Many times these applications synchronize in real time, meaning that they are always consuming bandwidth at a constant rate rather than only when the user is actively engaging the application.

Figure 3: Growth in Application Bandwidth Demand

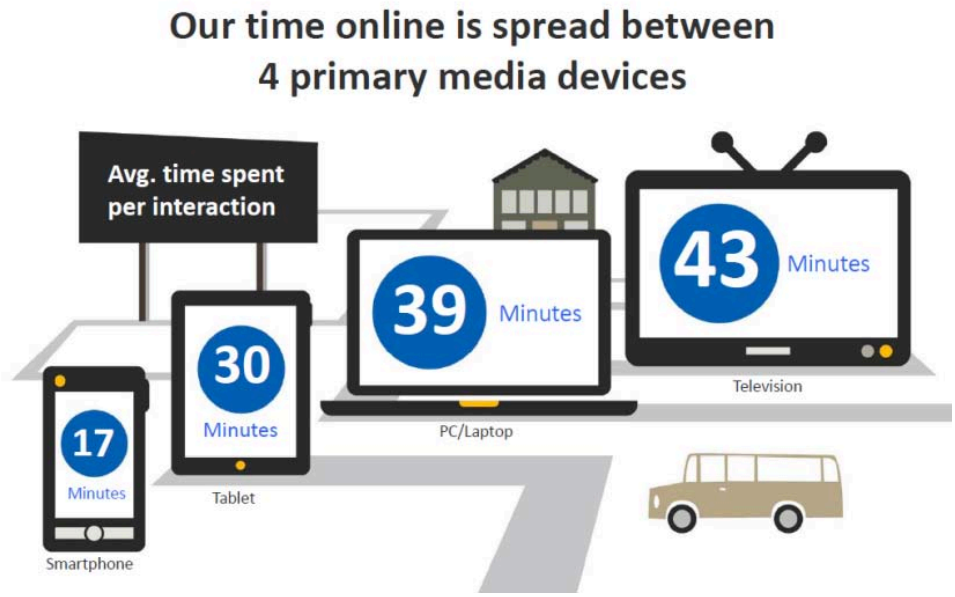


[18] *Symmetrical broadband connections provide equal download and upload speeds, such as 10 Mbps down, 10 Mbps up, instead of traditional asymmetrical broadband services that provide unequal speeds, such as 10 Mbps down and 2 Mbps up.*

The proliferation of devices is also driving the need for more bandwidth as more devices in the home, businesses, and public places all access existing broadband connections. A report published in 2012 demonstrates the amount of time the average user spends with their devices across each type of device, and how users interact with multiple devices simultaneously. Although the study's primary goals were to gain a deep understanding of consumer media behavior over a 24-hour period,[19] an important implied finding is that users are spending significantly more time with their devices, devices that all require broadband connections. As these devices all vie for bandwidth on a users' broadband connections, the demand for more bandwidth to support more applications grow.

These demands also extend to many devices inside the home that are now being connected to the Internet and using our broadband connections. Many multimedia entertainment systems, thermostats, irrigation systems, food storage and preparation areas, and security and monitoring systems are now connected to the Internet, consuming even more home broadband bandwidth. The explosion of Internet-connected home devices will lead to increased use of residential broadband connections, as "always-on" technologies are constantly connected to the Internet.

Figure 4: The Proliferation of Broadband-Connected Devices



[19] *The New Multi-Screen World. Understanding Cross-Platform Consumer Behavior" Google 2012. think.withgoogle.com/databoard/media/pdfs/the-new-multi-screen-world-study_research-studies.pdf*

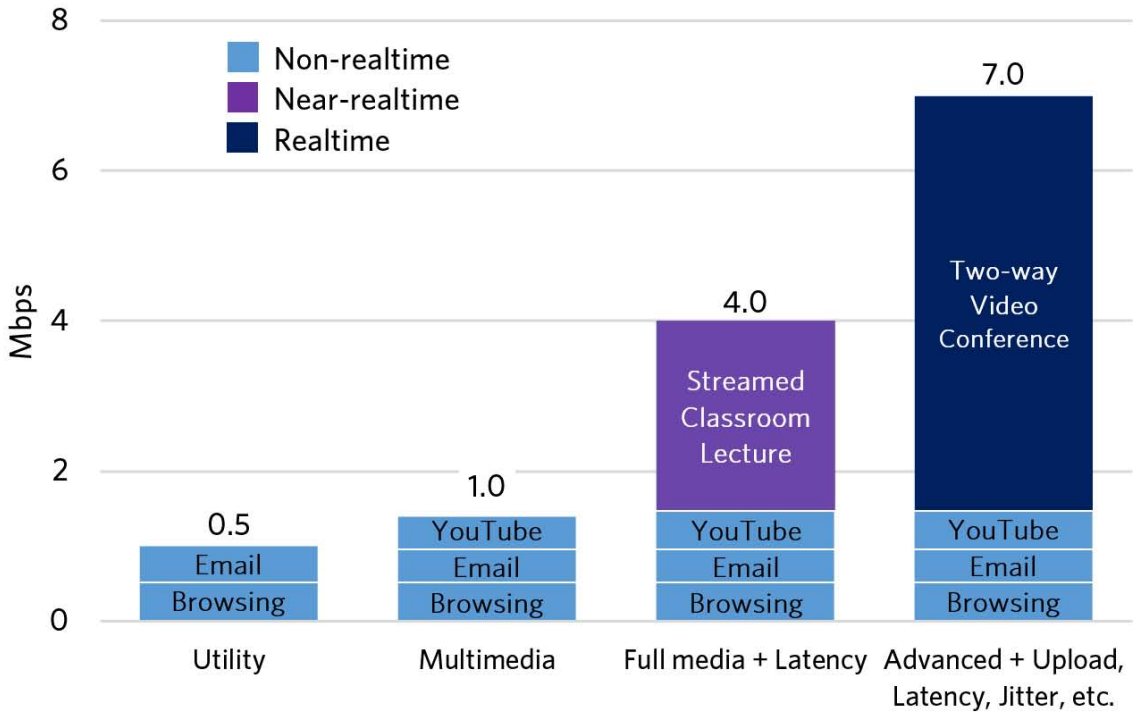
Education

Online applications used by educational organizations require high-bandwidth broadband, with services that meet strict quality and performance requirements to support real-time video and voice applications such as distance learning and teleconferencing. Today's teaching resources incorporate multimedia – sound, graphics, video, and data, while the use of online textbooks is continuing to expand.

In response to increased demand, many states have instituted requirements for online testing, creating an even greater need for high-quality broadband services. Additionally, educational institutions are utilizing more online content to support their lesson plans, from streaming sources such as YouTube, TeacherTube, Vimeo, and Facebook.

Figure 5 illustrates the bandwidth requirements per student for common educational applications along with 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 that use significantly more bandwidth per student, 4Mbps and 7Mbps, 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 5: Bandwidth Demands for Educational Technologies per Student



In addition to high-speed Internet needs of traditional brick and mortar schools, the residents of Longboat Key would see value in real time online educational platforms. Executives or retirees may engage in courses through online universities as students or professors. Creation of and participation in streamed online lectures require reliable, high-speed Internet access and significant bandwidth.

Healthcare

Broadband is crucial for Longboat Key's healthcare providers as they begin to leverage electronic medical records and other important capabilities of health IT, such as telehealth and electronic exchange of healthcare information. Each of these healthcare applications requires high performance broadband capability. Healthcare facilities currently maintain access to high-speed broadband services but beyond these organizations, the healthcare providers that have access to this type of service is unknown. 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 provide for long-term success.

As a guide, the FCC has released minimum recommended broadband speeds for healthcare organizations, as part of its Healthcare Connect program. These speeds identified by Healthcare Connections should be considered minimum requirements and Longboat Key's healthcare organizations should have access to more bandwidth if needed. [20]

Future needs of healthcare providers in Longboat Key will continue to grow. As a guide, the FCC has released minimum recommended broadband speeds for healthcare organizations, as part of its Healthcare Connect program. These speeds identified by Healthcare Connect should be considered minimum requirements and Longboat Key's healthcare organizations should have access to more bandwidth if needed.

[20] http://gcn.com/articles/2015/08/21/virginia-health-broadband.aspx

Single Physician Practice – 4 megabits per second (Mbps)

- 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) – 10 Mbps

- 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 – 10 Mbps

- 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) – 10 Mbps

- 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) – 25 Mbps

- 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 – 100 Mbps

- 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 – 1,000 Mbps

- 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

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.

Government and Public Safety

We live in a changing world where public safety agencies must address new threats and challenges both natural and man-made. Emergency Services departments such as Police and Fire have a requirement of mobile broadband access while in the field. These groups require consistent access to law enforcement and national crime data and must be able to access these systems in real time in a mobile environment.

As we look into the future, it is no longer enough for first responders to rely on a push-to-talk voice network for situational awareness. Police, fire, and emergency medical services play the

central roles in emergency response. Mobile technology capable of sending and receiving bandwidth-intensive information can help first responders do their jobs much more effectively. These emergency response organizations need broadband networks that let them share streaming real-time video, detailed maps and blueprints, high resolution photographs, and other files that today's public safety and commercial wireless networks cannot handle, especially during major events or catastrophes.

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;
- Next-generation wireless systems;
- Body-worn cameras;
- Chemical, biological, radiological, nuclear, and explosives sensor systems; and
- License Plate Recognition camera systems

Smart Community Innovations through Municipal Fiber Networks

As communities invest in fiber infrastructure, they are constructing foundational communications infrastructure required to support a multitude of technology based initiatives that require connectivity. These initiatives can include broadband services, collaboration opportunities, public safety applications, and future energy and utility management functions and features as outlined below.

Broadband Services

- Common backbone for all anchors
- City
- Schools
- Libraries
- Hospitals
- Clinics
- Public Safety
- Community Support
- Interconnection with service providers
- Wi-Fi 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 and federal agencies
- FirstNET preparedness

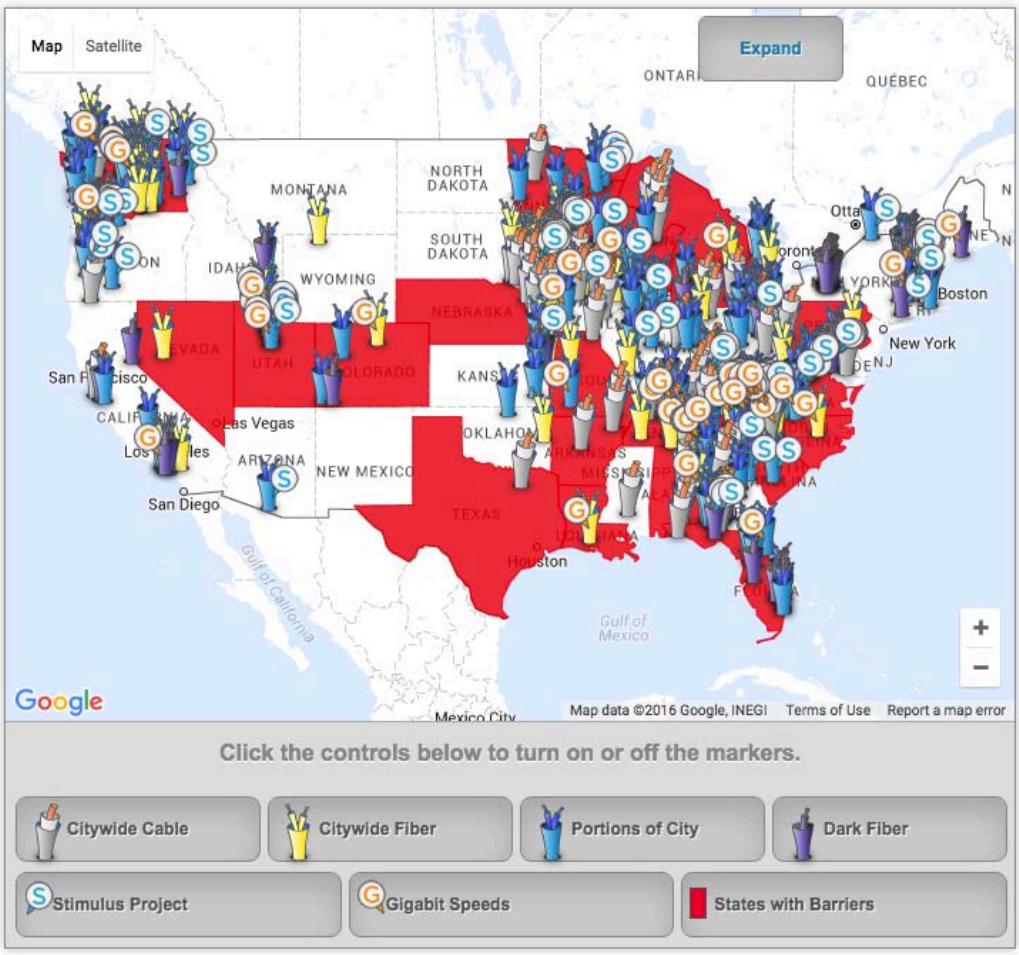
Future Energy and Utility Management

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

2.3 MUNICIPAL BROADBAND TRENDS

More and more communities are seeing the benefits of a community owned broadband network. As of October 2015, there are currently 450 communities across the U.S. with some variation of a community owned network. Figure 6 displays the current trends in municipal broadband across the country.

Figure 6: Current Trends in Municipal Broadband[21]



- 83 communities with a publicly owned FTTH network reaching most or all of the community.
- 77 communities with a publicly owned cable network reaching most or all of the community.
- Over 185 communities with some publicly owned fiber service available to parts of the community.
- Over 115 communities with publicly owned dark fiber available.
- Over 50 communities in 19 states with a publicly owned network offering at least 1 Gigabit services.

[21] http://www.muninetworks.org/communitymap

3. LONGBOAT KEY FIBER-OPTIC NETWORK BACKGROUND

The Town of Longboat Key has been working with FPL for the last several years conceptualizing the undergrounding of utilities along the islands main corridor, Gulf of Mexico Drive, as well as undergrounding of the utilities in the town's neighborhoods. FPL manages two different programs that focus on ways to improve the reliability of utility facilities. These are the FPL Hardening Project and the FPL Undergrounding Incentive Program.

The hurricanes of 2004 and 2005 caused FPL and the Florida Public Service Commission to look at ways to improve the reliability of the utility facilities. FPL presented a plan called STORM SECURE to increase the design standards for overhead lines for resisting wind loads. The extreme wind loading criteria typically requires new larger poles that are much stronger or installation of additional poles in an existing line.

FPL's Undergrounding Incentive Program is a provision of the FPL STORM SECURE plan which provides a financial incentive to municipalities of up to 25% of the standard FPL charge to convert existing overhead facilities to underground facilities. The fee is primarily composed of the cost for the new underground facilities less the cost of the equivalent new overhead facilities. The increase in overhead costs and the 25% incentive provides a significant cost reduction to the municipalities.

In order for the Town of Longboat Key to take advantage of these opportunities, the town would be responsible for funding a significant amount of the project funds. This funding requires the town to "go to the voters" through referendum to decide whether the town should issue bonds or notes to finance the undergrounding of the overhead utilities along Gulf of Mexico Drive and the undergrounding of the remaining overhead areas (Neighborhood/Side Streets).

The Town of Longboat Key is utilizing a Two-Step Approach to approve the projects. The undergrounding of utilities on Gulf of Mexico Drive was approved by the Longboat Key voters on November 3, 2015 during the general election. The second phase of the project, undergrounding of remaining overhead areas will be before the voters in March of 2016.

Municipalities across the State of Florida are taking advantage of FPL's Undergrounding Incentive Program as there are several advantages associated with the undergrounding of utilities. As of August 2015, these municipalities include: Miami Beach, Ft. Lauderdale, Hollywood, Pompano Beach, Gulf Stream, Lake Worth, Collier County, Bonita Springs, Charlotte County, Ft. Myers, Holly Hill, Daytona Beach, Palm Beach, Jupiter, Jupiter inlet Colony, Jupiter Island, and Sewalls Point, to name a few.

The Town of Longboat Key leadership understands the importance of broadband infrastructure in the town, and has worked with FPL to include underground conduit and fiber infrastructure to provide the foundation for a Longboat Key owned community broadband network.

4. LONGBOAT KEY OPPORTUNITY ASSESSMENT

The Town of Longboat Key has a significant opportunity to build a state of the art fiber-optic network throughout the island. This network would be capable of driving efficiencies for the municipal and utility operations of the town, while providing great value to the community. The project has been envisioned and planned in three distinct phases.

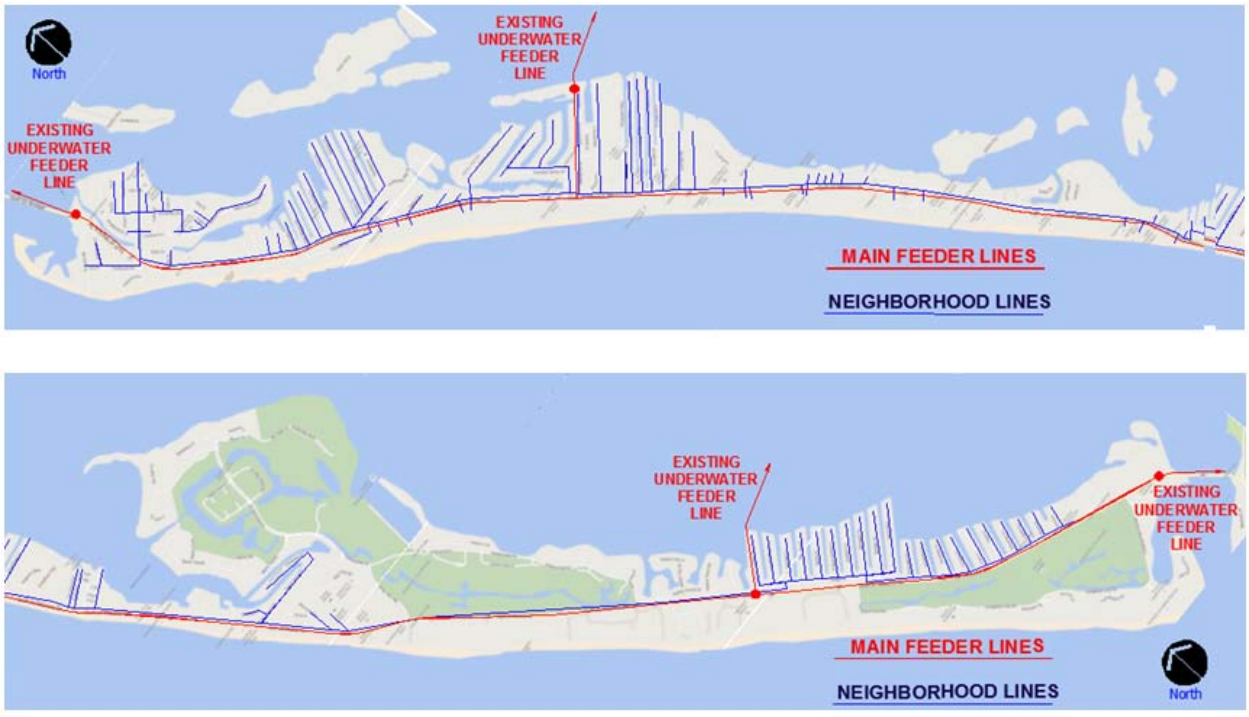
Phase 1: Undergrounding of the Gulf of Mexico Drive corridor.

Phase 2: Undergrounding of the neighborhood streets.

Phase 3: Undergrounding of conduit and fiber-optic cable in the neighborhoods that already have undergrounded utilities.

Figure 7 depicts both underground projects that are planned. The red lines represent Gulf of Mexico Drive segment and the blue lines represent the neighborhood segments.

Figure 7: Planned Underground Projects



Gulf of Mexico Drive Undergrounding

The Gulf of Mexico Drive (GMD) phase of this project includes approximately 10 miles of conduit and fiber placement along the eastern right-of-way of GMD. This undergrounding will provide a community owned conduit and fiber system that can be leveraged for decades. While it doesn't reach into the neighborhoods directly, it provides the necessary backbone that

will interconnect Longboat Key to both Sarasota and Manatee Counties, ultimately connecting the island to the Internet backbone through a regional data center located on the mainland. The GMD backbone is required to provide basic network connectivity throughout the island and will enable connectivity deeper into the island's neighborhoods when paired with the neighborhood undergrounding efforts.

Neighborhood Undergrounding

The neighborhood grounding efforts will bring high-speed broadband infrastructure to every home, business, and community anchor on the island. While the drop fiber (connection to the premise) is not included in this effort, it will allow any home or commercial property access to the network. This portion of the network will bring great value to the community as it provides the last mile connectivity, drop excluded, that will allow residents and businesses the ability to leverage the network and to receive service if they so choose. In addition to undergrounding of all utilities in the neighborhoods, the town has decided to include the undergrounding of conduit and fiber for those areas of the town (approximately 30%) that already have underground utilities. This will provide a full feeder/distribution network on 100% of the island.

5. POTENTIAL BROADBAND USES

5.1 MUNICIPAL OPERATIONS

For Longboat Key, development of a community broadband network will enable the town to own an asset that could have long-term positive impacts for the town and its surrounding community. Owning a community broadband network may allow Longboat Key to improve internal operations, while increasing efficiencies and reducing costs. Municipalities are using these broadband networks across the US for various functions. Developing a community broadband network will allow Longboat Key to use its network to benefit the town in the following ways:

1. Reduce overall telecommunications costs for Longboat Key and protect the town from future telecommunications cost increases. The fiber-optic network will permanently remove a significant amount of recurring operating costs for the town.
2. "Future proof" Longboat Key's long-term communications needs, utilizing a technology platform that will provide greater efficiency, flexibility, and security.
3. Develop a high-speed communications platform that will supplement Longboat Key's existing wireless/cable services, increasing speed and functionality while allowing Longboat Key to enable new high-bandwidth services such as surveillance, automated meter reading, Voice over IP.
4. Provide enhancements to public safety and disaster recovery services utilizing a high-speed communications platform.
5. Enable new online services and communications between departments throughout the town.
6. Enable communications and programs between government organizations in Longboat Key through an inter-connected communications network.

Connectivity to Facilities

A. Increased Bandwidth and Performance for New Town Applications

As municipal operations become electronic and web-based, the town will require an infrastructure that supports the requirements of these applications. Efficiencies gained in network-based applications will only be possible if Longboat Key has a high-speed, high-availability network. Moving toward cloud-based services will also require a network that can handle significant bandwidth needed for future services. Furthermore, new Voice over Internet Protocol (VoIP) applications or additional Voice over IP growth will require a high performance wide area network (WAN) with low latency, packet loss, and jitter.

B. Redundancy

As Longboat Key becomes more reliant on the network for its operations, a network that provides a higher level of redundancy is critical. Implementation of a town-owned network will provide an enhanced level of redundancy for town operations.

It will be difficult to introduce redundant fiber routes or a "ring" architecture into the design as the physical layout and shape of the island do not support this option. True redundancy would only be gained by leaving the island to the north and south and connecting to facilities through Manatee and Sarasota counties. The network would be best served by interconnecting the routes in a common data center facility. The town could also lease dark fiber or lit service to create a ring architecture.

C. Disaster Recovery Preparedness

In general, fiber-optic based municipal broadband networks provide a valuable asset to communities in times of emergency. For Longboat Key, an underground fiber-optic backbone, owned and operated by the town, would provide stable communications during natural disasters as these networks are generally unaffected by environmental conditions. This would enable public safety, emergency operations, administration, utilities, and other departments to maintain communications and share information during emergency events. It would also provide a key asset that Longboat Key's EOC could utilize for communications with the counties, neighboring cities, and other government entities in the area.

Water/ Wastewater Assets

There are several functions within the water/wastewater/stormwater utility that would benefit from the implementation of a municipal broadband network

A. SCADA connectivity to water/wastewater/stormwater sites

Supervisory Control and Data Acquisition (SCADA) connectivity to Longboat Key's pump and lift stations, tanks, and other water resources would provide direct fiber-optic capacity to these locations, allowing the Utilities Department to manage all of its water/wastewater/stormwater assets on a single, secure, and integrated network. Generally, for security purposes, there is a need to separate SCADA communications from other traffic on a municipal network. A town-owned network would allow for the Utilities Department to maintain this separation through individual strands of fiber dedicated to the Utilities Department, providing physical segmentation from other municipal networks. An underground fiber-optic network would also provide highly secure and redundant communications to the utility in the event of natural disasters, enabling the utility to maintain connectivity to its water/wastewater/stormwater resources in emergencies. The town would also be able to add further capabilities to these sites, including surveillance cameras, sensors, or other network based components.

B. Automated Meter Reading (AMR)

A community broadband network will allow the town to support AMR initiatives by establishing a backbone network for AMR data transport. The combination of a fiber-optic network infrastructure with wireless technology would provide the necessary components to transport data from customer meters back to the utility billing application, providing a true end-to-end AMR system.

A municipally owned network would also permit this traffic to be segmented from other applications on the network, ensuring that the AMR system maintains the high security requirements of SCADA and Utility resources.

Public Safety/ Surveillance

For public safety organizations such as the Town of Longboat Key Police Department, a community broadband network would provide a fiber network which can be used to meet its needs as a provider of law enforcement and first responder services.

The Town of Longboat Key's community broadband network will allow the integration of applications such as video surveillance, license plate recognition, sensors, and high-speed wireless at little to no additional cost for the transport of this valuable data.

A. Surveillance Cameras

Law enforcement agencies have long used video surveillance systems as both a means of capturing evidence of crimes in action as well as deterrence. Surveillance systems can be either passive (recorded) or active (monitored) or a combination of the two. Both types of systems have benefits and unique data transport requirements that are dependent on such features as frame rates, video resolution, and retention periods.

The town could leverage its community broadband network to create a system that provides ubiquitous video surveillance along with wireless components to transport data to central monitoring stations (police dispatch, traffic monitoring, etc.) and provide a higher level of security and safety to the residents of Longboat Key.

B. License Plate Recognition Cameras

Advanced License Plate Recognition (ALPR) is a mass surveillance method that uses optical character recognition on images to read vehicle registration plates. They can use existing closed-circuit television or road-rule enforcement cameras, or ones specifically designed for the task. This technology is used by various police forces as well as a method of electronic toll connection on pay-per-use roads and cataloging the movements of traffic or individuals. The Town of Longboat Key currently maintains multiple ALPR cameras which are located at the north and south entrances to the island. A fiber-optic network would increase the effectiveness of the cameras, by providing real-time high-speed access, as today's solution is operating using cellular service.

Fiber-optic infrastructure from the town's community broadband network would be a significant benefit for reducing the deployment costs and increasing the reliability of ALPR technology. ALPR can be used to store the images captured by the cameras as well as the text from the license plate, with some configurable to store a photograph of the driver. Systems commonly use infrared lighting to allow the camera to take the picture at any time of the day.

Mobile ALPR use is widespread among US law enforcement agencies at the city, county, state, and federal level. According to a 2012 report by the Police Executive Research Forum, approximately 71% of all US police departments utilize some form of ALPR. Mobile ALPR is becoming a significant component of municipal predictive policing strategies and intelligence gathering, as well as for recovery of stolen vehicles, identification of wanted felons, and revenue collection from individuals who are delinquent on city or state taxes or fines, or

monitoring for "Amber Alerts". Successfully recognized plates may be matched against databases including "wanted person", "protection order", missing person, gang member, known and suspected terrorist, supervised release, immigration violator, and National Sex Offender lists. In addition to the real-time processing of license plate numbers, ALPR systems in the US collect (and can indefinitely store) data from each license plate capture. Images, dates, times, and GPS coordinates can be stockpiled and can help place a suspect at a scene, aid in witness identification, pattern recognition, or the tracking of individuals.

C. Sensors

Sensors and surveillance technologies include a wide range of systems, devices, and practices used by law enforcement and first responders to monitor and detect people, places, actions, or features. These technologies are predominantly electronic or optical and often interface with humans or network servers. The most utilized sensor is the video surveillance camera. However, new sensor technology has greatly expanded the options and tools available to police, corrections, and investigative officers, examples include: infrared and low-light vision cameras, body-worn cameras as part of a personal area network (PAN), gun shot detectors, chemical and biological detectors, and intelligent video surveillance systems.

i. Intelligent Video Surveillance

Intelligent Video Surveillance (IVS) takes traditional video surveillance to the next level. IVS is a solution where a video surveillance system captures video and automatically performs an analysis on the video. Video analysis techniques can include tasks such as motion and audio detection, camera tampering detection, people and vehicle counting, license plate recognition, dwelling, and virtual fencing. Applications that receive the raw video data and perform the analysis are known as Video Content Analysis or Video Analytics systems.

Not surprisingly, IVS systems require an enormous storage capacity to house the vast quantity of high-resolution video data necessary to exploit the power of IVS technology as well as a very robust network to transport the raw video footage back to the IVS servers.

ii. Gunshot Detection System

Gunshot detection systems use acoustic, optical, electro-optical, or other sensing technologies to identify, discriminate, and report gunshots to law enforcement immediately after a shot has been fired. A gunshot detection system is comprised of sensors to detect the gunshot, transmitters to relay a message to the law enforcement or public safety dispatch center, and a terminal to receive and display the message. When a signal arrives, the dispatcher decides whether or not to send a unit to respond to the signal. Gunshot detection systems cannot detect shots that are fired indoors or that are blocked by a building or other obstruction. The

systems may be in boxes mounted on poles, camouflaged as birdhouses or rooftop vents, or otherwise obscurely located.

Integration with camera systems that point in the direction of gunfire when detected is also a possibility and would be supported by Longboat Key's network.

iii. Chemical, Biological, Radiological, Nuclear, and Explosive Sensors (CBRNE)

Post 9/11, law enforcement and public safety agencies continue to face new challenges unlike any other they have faced prior. The potential use of chemical, biological, radiological, nuclear, and explosives (CBRNE) as weapons of mass destruction has not only become a source of fear but also has become a real part of the terrorist threat. Law enforcement agencies must be prepared to not only respond to these events but also implement countermeasures to detect these types of weapon agents prior to their use.

A CBRNE system would operate much like a Gunshot Detection system in that it would require field deployed sensor apparatus that would be connected either directly or wirelessly to Longboat Key's network. A CBRNE system would alert central dispatch upon detection of a CBRNE agent allowing law enforcement and public safety to respond appropriately.

D. High-Speed Wireless

When utilizing the term Wireless it is important to understand that wireless encompasses more than simply Wi-Fi. Although Wi-Fi is the most well-known component of a public safety high-speed wireless system, it is just that, a single component of an overall system. As public safety technology advances and new applications and tools are implemented by the town, they will create a high demand for bandwidth on the network. The core fiber-optic network will be the backbone infrastructure for all wireless communications systems; aggregating all wireless communication data and transporting it back to the central data center.

Although the importance of communications and technology for first responders and law enforcement cannot be understated, it is widely-known that interoperability of communications and technology is one of their greatest challenges. Although, through the adoption of standards, things have gotten better and communications have improved, there still remains a large gap where more improvements are necessary. In many cases, first responders in the same jurisdiction utilizing communications equipment from the same vendor are not able to talk to each other. This issue has been around for many years but became most evident during the terrorist attacks of September 11, 2001. Due to these failures, measures were taken to improve interoperability, however their effectiveness was limited in nature.

Intelligent Traffic Systems

Intelligent Traffic Systems (ITS) are a conglomeration of synergistic advanced traffic control and analysis applications that provide information to traffic managers and engineers in an effort to improve traffic efficiency and facilitate safer, coordinated, and more intelligent decisions around traffic management.

In addition to the well-known benefits of ITS, it also offers more intangible benefits such as reduced fuel consumption, reduced travel times, delay reductions, higher travel speeds, improved traffic flow, and greater traveler satisfaction.

Collaboration between Communities

There are opportunities for Longboat Key to collaborate with other local government organizations in the area. Fiber-optic interconnections with the counties of Manatee and Sarasota could enable an additional connection between the counties, a connection to the Manatee County fire station, as well as a redundant route for the counties. A community broadband network interconnecting governmental organizations could easily enable sharing of resources between multiple organizations and potentially enable consolidation of services between organizations to reduce costs or even generate revenue for the town.

Smart Communities

With a fiber network, Longboat Key can take advantage of emerging technologies to enhance the well-being and efficiency of its community, reducing costs and resource consumption while more effectively engaging its citizens. Smart Communities are more efficient at responding to local and national challenges, and are able to position themselves to be more successful than other communities that do not leverage these new technologies.

Through the implementation of a wireless sensor network, which utilizes a fiber network infrastructure as a platform, Longboat Key can take advantage of the rising popularity of the "Internet of Things" - technologies that monitor components of the area's infrastructure in real time such as traffic networks, energy systems, and street lighting. By actively monitoring these systems in real time, the region can proactively adjust delivery of services to meet the needs of the community while reducing costs through optimized efficiency.

A. Smart Grid Utilities and Advanced Metering Infrastructure

Smart Grid technology allows for two-way communication between the utility and its customers, with networked sensors along the transmission lines making the grid smart. Like the Internet, the Smart Grid consists of controls, computers, automation, and new technologies

and equipment working together, but in this case, these technologies work with the electrical grid to respond digitally to our quickly changing electricity demands.

Advanced Metering Infrastructure (AMI) is an integrated system of smart meters, communications networks, and data management systems that enables two-way communication between utilities and customers. Customer systems include in-home displays, home area networks, energy management systems, and other customer-side-of-the-meter equipment that enable smart grid functions in residential, commercial, and industrial facilities.

The Smart Grid represents an unprecedented opportunity to move the energy industry into a new era of reliability, availability, and efficiency that will contribute to our economic and environment health. Smart Grid Utilities and AMI are highly reliant on high-speed communications and can be supported through community-owned fiber infrastructure.

B. Smart Trash Containers

Smart trash containers are an emerging technology successfully implemented in communities around the world. These systems rely on embedding refuse containers with wireless sensor technology to monitor and remotely alert when the containers are at capacity and need to be emptied. By alerting only when a container is full, this saves the staff time by not having to check or empty containers that are empty or only partially full. Additionally, data can be collected with regard to the rate the containers are reaching capacity and thus allow the waste management service providers to adjust their service in real time to better meet the needs of the community.

C. Smart Street Lighting Systems

The businesses and residents of Longboat Key can benefit from the implementation of a Smart Street Lighting system. These systems employ high efficiency Light Emitting Diode (LED) technology to replace traditional incandescent bulbs. In power savings alone, LEDs have demonstrated to be 90% more energy efficient than traditional bulbs; however, simply replacing the existing bulbs with LEDs does not create an intelligent lighting system. The “smart” components refer to the system being able to adapt in real time to the movements of pedestrians, cyclists, and automobiles. These systems dim when no activity is detected and brighten when people or vehicles are present. Additionally, smart street systems may transmit data, creating useful “Li-Fi” networks that can provide greater and more efficient coverage than current “Wi-Fi” networks.

D. Street Temperature & Air Quality Sensors

By establishing an air quality monitoring system, the Town of Longboat Key can enhance their understanding of the quality of life within the community. Relationships between air pollutants and human health can be discovered by combining the data of air quality and health outcomes. By establishing early warning thresholds, health risks to the community can be reduced. Many studies on air quality monitoring employ expensive instrumentation to measure variations of air pollution on a large scale and covering vast geographic regions. The newer trend is to establish street-level monitoring systems that can report on areas that are more specific and generate more granular and accurate data.

Establishing a street-level monitoring system of air quality can assist in exploring fine-scale relationships between air pollutants and people. The sensors of a street-level monitoring system can capture fine-scale spatial-temporal variations of air quality and the information gathered can help local leaders gain a more realistic view of the quality of life in Longboat Key.

5.2 COMMUNITY USES

Education

Education is increasingly reliant on high speed broadband. In K-12 education, there is a push for online testing, web browsing tools, and the use of devices for each student. Online classes, YouTube, streamed classroom lectures, and 2-way teleconferences are driving demand in higher education. All of this combined makes education one of the largest users of broadband in a given city or town.

A. Video

There is a growing push to include video with online course offerings, especially in science courses. There is a face-to-face component for the instruction, in addition to online materials and testing. Adding to bandwidth needs, more content is being delivered in high definition.

B. 1-1 or BYOD Initiatives

Throughout the US school districts are creating bring-your-own-device (BYOD) or one-to-one initiatives, where all students have a laptop or IPad to use at the same time in a classroom. Having all students connected and online at the same time extraordinarily increases bandwidth needs. These initiatives therefore rely heavily on reliable, secure connections.

Healthcare

Broadband is crucial for Longboat Key's healthcare providers as they begin to leverage electronic medical records and other important capabilities of health IT, such as telehealth and electronic exchange of health care information. Each of these healthcare applications requires high performance broadband capability. Longboat Key's hospitals and other healthcare facilities currently maintain access to high-speed broadband services but beyond these organizations, the healthcare providers that have access to this type of service is unknown. 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 provide for long-term success.

A. Big Data Opportunities

Sciences, such as environmental health and biotech, and research in the computation of aggregated inputs and data point, the burgeoning fields of robotics and holographic visualization are all growing. As "big data" research, simulation labs, and curriculum are growing in importance, as are the importance of joint collaborations.

B. Telehealth

Remote aspects of healthcare, both monitoring and acute care, increase demand on bandwidth through the use of robotics and haptic devices. All Telehealth fields are growing, including teletherapy and telepsychiatry, with universities and colleges needing real time access to licensed counselors for interventions. Policies in remote imaging, cardiology, and transmission of Electronic Health Records are expected to increase demands further with needs for low latency becoming increasingly critical.

"Aging in place" is a term used to describe seniors living in the place of their choice for as long as possible, while getting the services they require and all needs met without moving in with children or being placed in a nursing or assisted living facility. New gadgets and technological advancements have been made to make "aging in place" easier and more attainable for the growing population of seniors. Home-based telehealth, or home health monitoring solutions, keep physicians in touch with patients and monitor their health without visiting an office. There have been other advances including but not limited to fall detection systems, wearable sensors that collect real time health data, and stove guards.[22] Reliable, high-speed Internet

[22] http://aginginplace.com

access is required for these new technological advances, and the retirees of Longboat Key would see value in being able to utilize these products and services.

Economic Development

Accessible, affordable, and reliable broadband service is a key economic development tool to attract and retain businesses in Longboat Key. 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 having more widely deployed and affordable broadband services. 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.

Reducing Taxpayer Spend

Improving public efficiency and effectiveness should reduce the costs of government to the local taxpayer. If employed effectively, the town's broadband initiatives can become a tool that facilitates cost reductions, not only for the town itself but also for other public organizations across the town, 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.

Supporting Reliability and Performance

The town's community broadband network can be used to support the reliability and performance of broadband services across Longboat Key. 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 town that are near, or at their limit, and equip more commercial cellular assets with dark fiber connectivity, increasing the bandwidth available to mobile carriers serving Longboat Key'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.

Improved Cellular – Distributed Antennae Systems

A Distributed Antenna System, or DAS, is a network of smaller, spatially separated antenna nodes connected to a common source via a transport network that provides wireless service within a geographic area or structure. DAS antenna elevations are generally at or below the clutter level of nearby trees and buildings. A DAS network splits the transmitted signal among several smaller antennas. DAS networks are effective in areas with difficult topography, structural impediments (e.g. buildings, or within buildings), or in locations where, for a variety of reasons, it is not optimal to build traditional cell tower or monopole infrastructure. DAS is also becoming the preferred infrastructure for high bandwidth mobile voice and data services. As speeds continue to increase and more mobile voice and data services are available, DAS networks are proven to scale more cost effectively than traditional tower infrastructure-based networks. For Longboat Key, DAS infrastructure could be deployed throughout the island as a means of enabling ubiquitous wireless for current and future applications. Because DAS can be accommodated on smaller tower infrastructure consisting of monopoles, utility poles, street lighting, and rooftops, an array of these smaller structures will increase the delivery of cellular services that are otherwise lacking today.

Fiber-to-the-Home (FTTH)

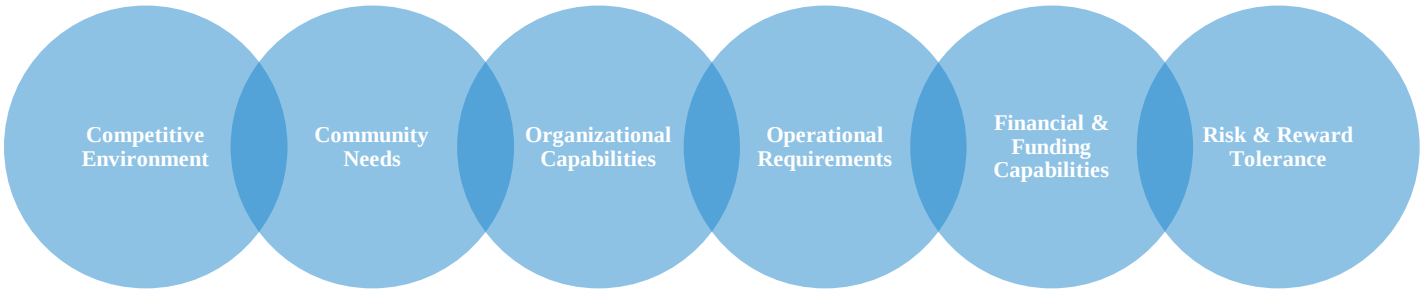
The Town of Longboat Key's community broadband network will facilitate the delivery of Fiber-to-the-Home (FTTH) services to businesses and residents throughout the community. FTTH is the delivery of high-speed Internet access, television, telephone, and wireless service over a single system. The fiber-optic network will be designed to provide a medium to transport all content simultaneously to end users, without bandwidth limitations. Residents and businesses will receive the latest entertainment and content in an integrated service offering that combines Smart Home technologies, communications services, and entertainment offerings. Residents of Longboat Key must have the same quality of services in their homes that they receive in their businesses. Longboat Key's network will allow residents to receive up to 1 Gbps broadband service, if required. This is an important marketing aspect for Longboat Key and although most residents do not need these staggering speeds today, applications of the future will require significant bandwidth and 1 Gbps to the home will quickly become a reality for many residents. Understanding this, the Longboat Key network will be designed to support this critical feature, allowing the community to scale appropriately with the latest technologies available to residents. Longboat Key’s FTTH network will ensure that 1 Gbps service is available to all residents across the community. Layered on top of this broadband infrastructure will be the latest content from HD and Super-HD television networks, online video streaming services, and Smart-TV enabled content providers. Broadband Internet service will also be provided on top of FTTH connections to residents, enabling high-performance Internet access to homes

across the community and integration with Internet-based Smart Home applications. In addition, advanced voice services will be enabled through the FTTH connection, enabling home phone service for residents who want to maintain land line telephones in their residences.

6. MUNICIPAL 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 8: 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 8 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.

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. Next, is a description of each business model and examples of local governments that have implemented them.

6.1 POLICY PARTICIPATION ONLY

Public policy tools influence how broadband services are likely to develop in the 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."*

6.2 INFRASTRUCTURE PROVIDER

Municipalities lease and/or sell 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."

6.3 GOVERNMENT SERVICES PROVIDER

Municipalities that become a government service provider will utilize a 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 department 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.

6.4 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 retains 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 $2 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, while generating over $500,000 annually in new outside revenue generated from use of the network.

6.5 RETAIL SERVICE PROVIDER – BUSINESS ONLY

Municipalities that provide end users services to business 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.

6.6 RETAIL SERVICE PROVIDER – BUSINESS & RESIDENTIAL

Municipalities that provide end user 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.

6.7 PUBLIC PRIVATE PARTNERSHIP

A broadband public-private partnership is a negotiated contract between a public and private entity to fulfill certain obligations to expand broadband services in a given area. In recent years, PPPs have been increasingly implemented as more municipalities employ public broadband and utility infrastructure in conjunction with private broadband providers. PPPs leverage public broadband assets, such as fiber, conduit, poles, facilities with private broadband provider assets, and expertise to increase the availability and access to broadband services. Municipalities forgo “getting into the business” of providing retail services and instead, make

targeted investments in their broadband infrastructure, and make it available to private broadband providers with the goal of enhancing their communities. In this type of model, the town would be considered an Infrastructure Provider who maintains permanent ownership interest in the broadband infrastructure (e.g., conduit and perhaps dark fiber) that is funded by the town for a "piece of the action", generally a negotiated revenue share paid by the provider.

Example: The Town of Jupiter, FL

In 2013, the Town of Jupiter completed construction of its initial fiber ring, which was planned to interconnect city facilities at 1 Gbps and 10 Gbps speeds. Previous to this, AT&T provided 50 Mbps connections between the town's facilities at $75 thousand annually. The town constructed its ring for $400 thousand and expects a nearly 5-year payback on this investment.

Since completion of the town's ring, the town has been working with a national service provider to form a Public Private Partnership to deploy fiber to the business and fiber to the home services throughout the Jupiter town limits. Fiber end user services are currently unavailable in Jupiter; this agreement would introduce them for the first time.

Under the initial agreement, the town would build out the broadband infrastructure and would connect the commercial and residential structures to the network at its cost. The network would remain under ownership of the town, and the partner provider would use the network to deliver fiber based telecommunications services to the town's constituents. For its investment, the town would receive a revenue share of gross profits generated off the network. Under this agreement, the town would receive a revenue stream from its investment and would bring a faster, competitively priced service to its constituents.

Example: The Covenant of Rancho Santa Fe, CA

The Covenant of Rancho Santa Fe (RSF) was established in 1928 as a country residential community located in San Diego County, CA. Today it is one of the most exclusive, beautiful and desired rural communities in the country. The community includes a world class golf course and over 1,800 homes with an average home price of approximately $3 million. Rancho Santa Fe is home to many famous people including movie stars, politicians, sports figures, and corporate executives/CEOs. Several years ago, RSF requested an upgrade to its telecommunications facilities, specifically asking for a FTTH build. Its incumbent providers agreed, however requested that RSF pay the capital required to build out the network which was estimated at $20 million at the time. The RSF Board declined their offer, and instead undertook a FTTH Feasibility Study that outlined the options available to bring fiber based service offerings to its community. Since the study was completed, RSF has

decided to self fund the buildout, maintaining long-term ownership of this very important community asset, and has embarked on the process to develop a Public Private Partnership. RSF has identified numerous potential partners that would operate the network while providing its residents, businesses, and anchors with state of the art fiber based telecommunications services. RSF is currently negotiating the partnership with the selected partner and the network is due to be operational in 2017/2018.

Figure 9: Comparison of Municipal Broadband Business Models

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

End of Agenda Item