**HIGHLANDS COUNTY BOARD OF COUNTY COMMISSIONERS**
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Sebring, FL 33870
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# REQUEST FOR INFORMATION

## RFI No: 22-011   Title: County Broadband Service

**Deadline for Questions:**   Monday, January 17, 2022 at 5:00 PM

**County Response to RFI:**   Friday, January 21, 2022 4:00 PM

**Submission Deadline:**   Friday, January 28, 2022 by 4:00 PM

**Advertised Date:** January 4, 2022 and January 11, 2022

**REQUEST FOR INFORMATION (RFI)**

The Board of County Commissioners ("County"), Highlands County, Sebring, Florida, a political subdivision of the State of Florida, has issued this Requests for Information (RFI) for informational and planning purposes. The county plans to partner with firm(s) to create and implement a countywide broadband strategy to improve capability, capacity, availability of Broadband, and to help meet needs in under-served and un-served parts of the County. The County will be seeking a financially sustainable business model that furthers the County's final goal of ensuring that all residents and businesses – starting with underserved and unserved areas – have access to affordable, market-leading broadband services that can easily and inexpensively scale to provide higher-speed services as demand for broadband increases.

The County is requesting information regarding the services described.

An RFI is not a method of procurement. Responses to an RFI are not offers and shall not be accepted by the County to form a binding Contract. This RFI and responses to it shall not result in the execution of a Contract with the County.

By submitting a response to this RFI, a vendor is not prohibited from responding to any related subsequent solicitation. This RFI may be used for purposes of determining how to competitively procure a commodity or contractual service, determining what solicitation process to use, or researching general, special, and/or technical specifications for a project or solicitation. The County reserves the right to utilize the information gathered through the RFI process to develop a scope of services, which may be incorporated into a solicitation or contract using a statutorily approved method of procurement.

All interested vendors are invited to participate in the RFI by submitting a written response as indicated in this RFI document. The information provided as a result of this RFI is intended to be used to develop a future solicitation that utilize the technologies described herein.

The County reserves the right to use or reject any information supplied in response to this RFI.

1. **PROJECT BACKGROUND**
The County has completed a Feasibility Review and Report of Community Broadband

Network, which is attached for review in Attachment A. The County has allocated $4.5 million in Federal American Recue Plan Act (ARPA) funding for the first phase of broadband expansion implementation. This RFI is to understand responder's approach to the County's final goal, high speed broadband access to every structure in the county, but also how the responder would pursue the final goal within this first phase of funding allocation.

The County is seeking information on providing and improving high-speed internet connectivity for governmental, commercial, and residential needs by leveraging a Community Broadband Network (CBN) that, at a minimum, utilizes fiber-optic infrastructure as its core communication technique to increase capacity and consistency of broadband services across the County.

The respondent's approach to a future RFP must show a financially sustainable business model that furthers the County's final goal of ensuring that all residents and businesses – starting with underserved and unserved areas – have access to affordable, market-leading broadband services that can easily and inexpensively scale to provide higher-speed services as demand for broadband increases.

The County has initiated this RFI to identify the best manner to select a provider of high-speed internet connectivity for governmental, commercial, and residential needs leveraging a Community Broadband Network (CBN) that, at a minimum, utilizes fiber-optic infrastructure as its core communication technique to increase capacity and consistency of broadband services across the County

The County seeks input from potential partners regarding the terms and conditions under which they would participate in such a project. The County seeks partners who will consider a variety of business models that share technological and operational responsibilities and financial risk between the partners and the County in innovative ways. The County is open to creative solutions that will maximize investment while providing reliable and high-quality services to meet its citizens' needs.

## 2. <u>GENERAL HIGHLANDS COUNTY INFORMATION</u>

Located in the center of the sunshine state, Highlands County, Florida encompasses 1,029 square miles of the state's heartland, and is home to three growing municipalities: the cities of Avon Park and Sebring, and the Town of Lake Placid. Per data from the U.S. Census Bureau, the County has a growing population of over 106,000 people (population estimate, July 1, 2019) which is a 7.5 percent population change from April 1, 2010 (estimate base) to July 1, 2019, and as of 2010 97.2 population per square mile. Per 2015-2019 Census data, in the County there are 41,740 households with 2.43 persons per household. 83 percent of those households (33,392) have a computer. In addition, 74.3 percent (31,012) have a broadband internet subscription, but that still leaves at least 25 percent of households unserved, and of the 74.3 percent with existing broadband subscriptions – a decent portion are certainly underserved.

Florida has one of the most extensive multi-modal infrastructures in the world, and Highlands County is strategically located in the center of it all. Within a 2-hour radius,

Highlands County businesses and residents can access 10 international and commercial airports, 8 deep water seaports, three major interstates, and the Florida Turnpike. The County's inland location provides ample room for growth and miles of uncongested routes outside of Florida's metro areas. U.S. Highway 27 is the County's main north/south connector, with access directly to Interstate 4 to the north and South Florida markets to the south. U.S. Highway 98 and State Roads 64, 66, and 70 are east/west connectors that link to Florida's Turnpike and Interstates 95 and 75. More than 86 percent of Florida's population is located within a 2-hour radius, that's more than 18 million people.

The County's central location makes the area primed to quickly receive, produce, and distribute goods regionally and globally. Highlands County's economic history is deeply rooted in agriculture with immense areas of citrus groves, ranches and other agricultural uses that are interspersed throughout the community and in some instances segmenting residential and commercial concentrations. As such, sections of broadband service are located within inconsistent pockets around the County and within the municipalities. Agriculture is still the County's fourth largest industry based on employment.

Healthcare is the County's largest industry by employment with two hospital systems and three campuses spanning the community, as well as several assisted living and retirement facilities. Five of the County's top ten private businesses are in the Health and Social Service industry. Electronic records and tele-health are very important factors in this industry throughout the County.

The County targets specific industries for economic growth and diversification including manufacturing, logistics and distribution, value-added agriculture, professional services, aviation, and tourism. Sufficient access to broadband is imperative to recruit and expand these businesses to grow the economy, create job opportunities, increase prosperity, and add to the tax base. Access to broadband is necessary for these businesses as these industries continue to evolve into more sophisticated processes.

It is also imperative that public services throughout the County have sufficient access to broadband to continue to serve the community successfully. This includes County government, emergency management, municipalities, the Sheriff's Office, the School Board of Highlands County and South Florida State College. Students need to be able to adequately complete homework, most of which is online based, as well as learn from home in situations such as the pandemic. Many of the County's students do not have sufficient access to broadband, which impedes their education and can negatively impact the community's future talent and their opportunities.

In addition, as the global workplace continues to transition to work from home opportunities, the County's residents need to have access to these opportunities as well through adequate and reliable internet. With expanded and available internet access, the County can also recruit individuals that want to utilize the opportunity to work from home, but in a less expensive, less crowded community.

Overall, broadband infrastructure, is just as important – if not more – than all other forms of infrastructure to ensure the County can continue to operate and grow to its fullest

potential. Indications are that the local appetite and need for greater and more uniformly available broadband services both now, and in the future, cannot be met with current service levels.

3. **STATEMENT OF NEED**

3.1 County's Vision

Highlands County envisions superior community communications infrastructure for the County's residents and businesses, for the 21st century and beyond. Broadband is critical infrastructure – just like roads, water, sewer, and electricity. Every home, business, nonprofit organization, government entity, and educational institution should have the opportunity to connect. Providing equal and affordable access to communication infrastructure and service is essential to promoting equal opportunity in business, education, employment, healthcare, and all other aspects of day-to-day life.

The County is rural, but a community of activity and progress, with steady population growth and an expanding local economy. The County is dedicated to collaborating with its talented residents, businesses, institutions, and organizations to advance Highlands' standing in the regional, state, and national economy through a commitment to developing robust institutional and residential connectivity.

Currently, access to reliable broadband connectivity in the County is sporadic, and many consumers must settle for minimal speeds at disproportionate pricing. Additionally, expansive portions of the County are unserved and underserved, creating large opportunity gaps for some of the most vulnerable members of the community.

Countywide broadband is an important driver of lowering business costs, attracting and retaining highly skilled residents, and creating sustainable new jobs in an entrepreneurial economy based on innovation, creativity, and local talent. Robust residential and institutional connectivity will also expand opportunities for local students in K-12 and beyond and enable more open government and civic engagement.

**3.2 Project Goals**

The County's final goals and the strategy will be developed based on these service goals being met competently and efficiently – while keeping in mind the initial phase within the current budget of $4.5 million via the County's American Recue Plan Act (ARPA) allocation:

1. Provide broadband to every Highlands County home, business, public facility, and private institution to enable residents, workers, and visitors the opportunity to access affordable, high-speed broadband connections to the Internet and other networks – starting with unserved and underserved portions of the County.
2. Offer non-discriminatory services and speeds that do not impose caps or limits on one use of data over another and is otherwise unavailable to customers starting with unserved and underserved parts of the County.

3. Ideally, suggest a network development approach that includes open access, where the network is open to multiple service providers in addition to the respondent.
4. Consider innovative models, such as, but not limited to:
    a. Leasing County-built and/or owned dark fiber to provide services
    b. Partnering with the County to construct and operate an FTTP network
    c. DBFOM – design, build, finance, operate and maintain
    d. EPCM – engineer, procure, construct, and manage
5. Respond to the current and future needs of the County's businesses and residents by providing a scalable solution for increased capacity or technological needs and advancements
6. Provide cost-effective services for price-sensitive customers and flexible pricing plans
7. Identify a partner that has experience in and will assist with identifying and perusing additional public or private funding for project continuation, including but not limited to, applying for state or federal grants/programs

For the network to have the intended economic and quality of place impacts, the County considers both cost and availability of service to be important. The County encourages responses that address both to maximize adoption of service.

## 4. <u>RFI RESPONSE REQUIREMENT</u>

Responses to this RFI shall include the following:

A. The vendor's complete name, address, telephone number, email address, and the vendor's point of contact for this RFI.

B. Any Response must be received no later than **January 28, 2022 at 4:00 p.m.**

C. The vendor's history and experience in design, implementation of install and operation of the Broadband system in previously un-served and under-served communities.

D. Please provide feedback on the Feasibility Review and Report of Community Broadband Network (CBN) for Highlands County, Attachment A. The CBN report provided a conceptual model for how to approach the broadband short falls within Highlands County. This model suggests establishing a series of Rings and Links throughout the county.

E. Please respond to the following questions:

1. In your professional opinion and experience, does this conceptual model represent the best course of action for achieving a Community Broadband Network to service Highlands County?

2. Do you have other recommendations or suggestions that you would be willing to share that might be more productive/efficient in achieving a County wide Broadband solution?

3. The State's Office of Broadband is unveiling a broadband mapping software through Geo Partners for local communities to utilize to identify service levels across the county. What methods of best practices can be used to identify which areas of the County are unserved and underserved, and where to target first for the initial phase within the allocated budget.

4. What kind of network so you think service partners would like to see? How can we use these technologies to meet the County's goals? What approach can be used to interconnect with the existing internet and other public networks? What are best practices to perform network management? What sort of facility (or facilities) would be required for network electronics? What fiber resources would be needed to provide the desired levels of service?

5. As Highlands County looks to partner with a provider on this project, what, if any, are potential requirements, including but not limited to financial, would the County need to meet for this to be attractive to a service provider?

6. What would be an ideal business approach for service partners on this type of project?

7. What are the main areas for Risk to this project and what can the County do to mitigate such risks?

8. What service options should the County plan to offer over this network? What download/upload or symmetrical speeds should be offered and guaranteed to end-users? How can we plan to be prepared for scalable future speeds to keep up with increased needs and technology trends? How should residential and business offerings differ, if at all?

9. Under current cost conditions, is the conceptual budget provided in the report a good planning/budget number?

10. Would a Service Partnership model like this in the Highlands County area be of interest to your firm?

11. Is there any other feedback concerning the Feasibility Review and Report, or any other ideas or suggestions that you would like to share?

5. **INFORMATION EFFECT**

The County will use the information gained from this RFI to determine the best way to proceed and develop the appropriate procurement process to address the effective and efficient method of procurement.

6. **QUESTIONS AND RESPONSES**

Written questions are invited and may be submitted in writing via e-mail, or mail **until 5:00 P.M. EST, January 17, 2022.** Questions MUST be received by the Procurement Manager (listed on page 1) on or before this date and time to ensure they are answered. Written responses to questions will be posted on the Vendor Registry no later than January 21, 2022 at 4:00 PM.

7. **WRITTEN RESPONSES TO RFI**

Written responses to this RFI must be submitted to the Procurement Manager by **4:00 P.M. EST, January 28, 2022**. Vendors may e-mail, submit on Vendor Registry electronic submittal site, mail or hand-deliver their response. If sent by mail or hand delivery, please send to the attention of the Procurement Manager at the address listed on Page 1. The County reserves the right to use any information supplied in any manner.

After the County has received all responses to this RFI, the County, in its sole discretion, shall determine if a meeting with respondents is necessary to clarify the information received. In the event that the County decides to hold a meeting, the respondent(s) will be notified via email.

8. **PROPIETARY INFORMATION**

Any portion of the submitted response which is asserted to be exempt from disclosure under Chapter 119, Florida Statutes, shall be clearly marked "exempt", "confidential", or "trade secret" (as applicable) and shall also contain the statutory basis for such claim on every page containing such exempt information. Pages containing trade secrets shall be marked "trade secret as defined in Section 812.081, Florida Statutes". Failure to segregate and identify such portions shall constitute a waiver of any claimed exemption and the Commission will provide such records in response to public records requests without notifying the respondent. Designating material simply as "proprietary" will not necessarily protect it from disclosure under Chapter 119, Florida Statutes. An entire response should not be considered "trade secret".

PLEASE NOTE: Any submitted material that is not clearly marked as stated in Proprietary Information, is subject to Florida Statute 119, Public Records.

9. **VENDOR COST**

Vendors are responsible for all costs associated with preparing a response to this RFI. Highlands County will not be responsible for any vendor costs associated with preparing a response to this RFI.

**THIS IS <u>NOT</u> A COMPETITIVE SOLICITATION IN ACCORDANCE WITH S. 287.057(1) F.S. PLEASE DO NOT ATTEMPT TO SUBMIT A BID, PROPOSAL OR OTHER PRESENTATION.**

# Attachment A

# Feasibility Review & Report
of
# Community Broadband Network (CBN)

for



# Highlands County Board of County Commissioners

By

# Precision Contracting Services, Inc.

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# 1.    Introduction

Highlands County Florida Economic Development recognizes the deficiencies of current private broadband providers and the need for improved broadband capability, capacity and availability to advance not only economic development within the county, but all the additional benefits to businesses, residents, and institutions from a Community Broadband Network (CBN).

The Digital Revolution (also known as the Third Industrial Revolution) is the shift from mechanical and analog electronic technology to digital electronics, which began in the latter half of the 20th century, with the adoption and proliferation of digital computers and digital record-keeping, that continues advancing in capability.

From the early 1990s, technology enthusiasts predicted that the rapid spread of the Internet and how super-computing would generate new efficiencies, innovations and economies of scale. But the promised revolution in e-business and e-commerce stalled with the dot-com bubble, although the world's digital footprint continued its exponential expansion.

Total international bandwidth stands at 466 Tbps (terabits) in 2021, although internet bandwidth rose last year by only 26% in 2020, which was the lowest annual growth rate seen in at least 15 years which had a compound annual rate of 28% between 2015 and 2019. The spread of cloud computing, artificial intelligence, and billions of digitally connected devices are taking things to an entirely new level. As reported on https://www.internetlivestats.com/ in June 2021, there are over 4.9B internet users sending over 220B e-mails/day, posting over 600M tweets and 6M blogs while performing over 6B Google searches/day. It is clear, the ***digital economy has finally arrived***.

Fiber-optic technology is the de facto standard for broadband.  The capabilities of fiber-optic technology far exceed that of any other transmission techniques, both wired and wireless, yet has its challenges in cost of deployment compared to wireless techniques.

Highlands County engaged Precision Contracting Services, (PCS) to review and report on the current and available broadband capabilities within the County and provide guidance for evaluating a fiber-optic Community Broadband Network (CBN).  PCS has a 30+ year proven track record of evaluating, designing, constructing and maintaining fiber optic broadband networks across the southeastern United States. PCS's focus and expertise is largely centered around fiber-optic technologies and the clear knowledge private communication companies will invest in infrastructure that generates a financial return on investment unless that investment is mitigated by the granting or sourcing of some charitable or governmental organization.

Broadband is generally defined as the transmission of information by various technologies and frequencies enabling multiple messages to be communicated simultaneously, preferably with the benefit of a "high-speed network" increasing the amount and consistency of those simultaneous message transfers.

Although there are various techniques of both cabled and wireless broadband transmission technologies, only fiber-optics delivers the capacity and consistency for a futureproof broadband network given the physical limitations with other cabled and all wireless delivery techniques.

Having an understanding of broadband technologies and the limitations of existing Highlands County broadband providers, the county-initiated fiber-optic deployments supporting internal agency communication needs by executing a short-term lease agreement with a broadband provider that subsidized their fiber optic deployment. Having experienced the benefits of an all-fiber-optic broadband network; but also recognizing private providers will only place infrastructure where it generates a financial return; PCS believes the county would have no continued benefit from the invested funds after the lease expires. Highlands County engaged PCS to review their existing leased optical network and evaluate the potential for conversion and expansion for their currently unsupported and growing internal communication needs while also seeking to leverage those investments for the benefit of all county businesses and residents.

PCS reviewed data provided by Highlands County, the State of Florida, the US Census Bureau, the Federal Communication Commission (FCC), and other open sources in our feasibility review report to address the exponential growth in bandwidth requirement for communities, industries, businesses and residents.

Although PCS includes public data on all forms of broadband delivery, the engagement was limited to the feasibility of deploying a fiber-optic (FO) based Community Broadband Network supporting governmental communication requirements that could be leveraged for improving broadband for economic benefit of the public at large.

PCS

# 2.    Feasibility Review & Report Summary

Highlands County seeks to improve the high-speed connectivity for governmental, commercial, and residential needs by leveraging a Community Broadband Network (CBN) that, at a minimum, utilizes fiber-optic infrastructure as its core communication technique to increase capacity and consistency of broadband across the county.

## *Goals of Community Broadband Network Feasibility Review*

Review current county FO network needs for replacement, retirement and expansion. Evaluate the current private provider broadband deliveries within the county. Review potential inter-governmental agency connectivity to leverage investments. Provide county maps and budgets for phased optical infrastructure. Report on potential funding sources for the County to pursue.

## *Community Broadband Network Technology Review*

Thousands of county/municipal governments across the US have deployed fiber-optic networks to meet the needs of their communities in this digital revolution by leveraging multiple governmental levels, agencies and departments funding sources to mitigate the costs of this broadband utility.  CBNs are rapidly being recognized as critical in meeting and expanding required services of constitutional department services, clerk and court services, municipal utility services, transportation efficiency and safety, public safety (police, fire, rescue), economic opportunity, educational equality, integrated lighting efficiency and overall smart community connectivity resulting in the greening of regions deploying optical networks.

High-speed broadband internet enables our new normal, which is why it is considered "The Fourth Utility"—broadband is essential for citizens to effectively participate in society. Like electricity in the 1930s, many rural communities lack basic internet connection. But the truth is, both rural and urban communities struggle with bandwidth needs, provider options, and affordability. This means that whole communities, regardless of location, are missing out on economic, educational, and social opportunities. "Reliable high-speed broadband is one of the greatest influencers on a community's quality of life," said Fred Ellermeier, vice president of Black & Veatch's telecommunications business. "It's also a chief indicator of which businesses and industries stay competitive."

Broadband technology choices depend on a number of factors. These may include whether you are located in an urban or rural area, how broadband Internet access is packaged with other services (such as voice telephone and home entertainment), price, and availability. Broadband references include several high-speed transmission technologies:  Wired (Digital Subscriber Line (DSL) over twisted pair copper, coaxial, fiber-optics), Wireless (Wireless Fidelity (Wifi), Cellular, Satellite), Broadband over Powerlines (BPL).

A summary of broadband in the US can be found on the FCC website for review.
https://www.fcc.gov/reports-research/reports/measuring-broadband-america/measuring-fixed-broadband-tenth-report

The term broadband commonly refers to high-speed Internet access that is "always on and faster" than legacy dial-up access methods.  Fiber to the user is considered the best form of broadband delivery since it uses light to transmit data and does not have the limitations of copper and wireless methods. Having a fiber broadband connection to the Internet is considered winning the lottery in terms of connectivity.

## Benefits of a Highlands County Fiber-Optic Community Broadband Network

**Governmental Connectivity -** Building on recent investment in fiber-optic infrastructure and recognized benefits of leased fiber-optic paths, Highlands County should take the lead with the multiple public entities to achieve greater broadband delivery, improving responsiveness to constituents and reducing application costs across a fiber-connected community.

Establishing interlocal agreements that support shared ownership and/or utilization of pathways, conduit, fiber and wireless network infrastructure would create a Community Broadband Network (CBN). Stakeholders would be Highlands County, Lake Placid, Sebring, Avon Park, and State Agencies, where these public organizations would have access to core optical network connectivity with very high capacity that can be easily upgraded without additional passive infrastructure investment, virtually future-proofing the CBN connectivity while reducing annual operational expenses.

Eliminating current leased services to multiple Governmental addresses allows the county several benefits from reducing provider costs by aggregating leased internet bandwidth to fewer facilities, allowing the governmental entity to control its "intra-network bandwidth" between facilities as well as reducing the risks of managing those multiple "physical connections" with additional security firewall devices.

**Educational Connectivity -** Connecting public and private, state/local schools, libraries and private community organizations to one another allows sharing of technology resources among these sites, thereby enhancing services while reducing the cost of delivery. When connected to a Community Broadband Network also facilitates connection to public safety facilities that provide greater coordination of public safety resource officers, and additional security demanded today.

Educational institutions for all age groups benefit from broadband connectivity with even greater focus on distance learning, remote education, resource sharing, and advanced technical training tools that all demand interactive multimedia supporting real-time, audio/video, graphics replication, and digital media.

Fiber-optic broadband connectivity that have been adopted by school districts across the US over the last 30 years offers virtually unlimited bandwidth and additional security not available from other broadband delivery methods.

**Healthcare Networks -** Community Broadband Networks facilitate enhanced healthcare services within the community. Hospital, clinics, health facilities, and even physician offices to participate in a closed "intra-net" facilitating better coordination and cooperation from providers in the local healthcare system supporting advanced imaging, interactive data monitoring and true audio/video conferenced procedures where the low latency of fiber-optic broadband is critical.

Electronic medical records are expanding exponentially where internet access to cloud hosted medical solutions continue to drive bandwidth demand for aging communities. Today's senior populations are utilizing numerous home health applications where a reliable broadband platform is critical to these monitoring solutions allowing seniors to stay in their homes longer. This dynamic is putting more emphasis on investment in community broadband where implementation of these services mitigates some of the growing financial burden on community health care facilities.

**Smart Community Networks -** A fiber-optic broadband network would be the backbone for programs, applications, and solutions that increase efficiency, lower costs, minimize environmental impacts and enhance the overall quality of life by providing advanced technological capabilities.

Communities with fiber-optic broadband networks experience virtually limitless bandwidth, reliable broadband enabling public and private organizations to improve efficiency and functionality of services offered to residents while mitigating cost increases.

Smart Communities utilize broadband to support such things as:

- **Smart Buildings**: Connected sensors, meters, and software to monitor and control a range of building functions, including lighting, energy, water, HVAC, communications, video monitoring, intrusion detection, elevator monitoring, and fire safety in Building Management Systems (BMS).

- **Connected Vehicles**: Connected sensors, cameras and controllers within a transportation network that is interactive with pedestrians, cyclists, divers and autonomous vehicles fostering improved safety of all by advanced incident modeling and communication.

- **Community Health and Human Services**: Transform the delivery of essential human health and education services.

- **Energy**: Connected energy monitoring and management systems focused on conservation and optimization from such systems as low energy consuming and programmable (LED) lighting deployments, electric vehicle (EV) charging stations, and renewable energy generation implementation.

- **Digital City Services**: Real-time, interactive alert, information and advertising communication services designed to increase citizen engagement, employee productivity, citizen satisfaction, and cost reduction, often delivered via smartphones.

- **Mobility and Logistics**: Provides safer, more efficient transportation and parking. While this can ease commuting times for individuals, the macro cost savings and potential revenue sources are substantial for local governments.

- **Public Safety**: Advanced communication, monitoring, and application interaction focused on improved public safety, more rapid and specific responses, elimination of duplicated efforts, security of property, and more efficient resource utilization.

- **Smart Payments and Finance**: Operational efficiency from implementing digital disbursements and collections.

- **Telecommunications**: Reference to adequate broadband infrastructure for business and community development that are requirements for Smart Communities.

- **Waste Management**: Collect and process efficiently, recovering materials that have value, while benefitting public health and the environment through zero waste efforts.

- **Water and Wastewater**: Where it takes water to produce electricity, and electricity to pump water, the Smart City provides for production of both energy and water.

- **Agriculture and Farming**: According the FCC's 2018 broadband Deployment Report, satellite broadband may not be fully sufficient for next-generation precision agriculture technologies due to the unpredictability of service caused by high latency, capacity limitations, and costs for securing high volumes of data flows, especially when time-sensitive information is required to support on-farm operation and quickly respond to market conditions.

**Economic Development -** PCS's team met with the Highlands County economic development who emphasized several new development and growth areas around the county where fiber-optic broadband was identified as a critical need for development partners.

Access to high-speed Internet is a critical economic requirement for communities looking to attract and retain businesses. Every business around the world experienced the effect of broadband on their operations addressing COVID-19 impacts throughout 2020. Those businesses

with sufficient residential broadband to allow employee remote connectivity to office or cloud-based applications kept many businesses from bankruptcy while also learning more about their operational efficiencies that will be modeled or mitigated for future success.

The demands placed on rural broadband providers and the inconsistent delivery of rural broadband service was highlighted in 2020, further driving community broadband networks to help rural communities compete with urban communities. Communities that invest in a CBN are able to support areas/parcels designated for economic development allowing any business moving to Highlands County to recognize that fiber services are readily available and prevalent at competitive rates.

**Private community broadband –** Fiber-optic networks are expensive to deploy and maintenance costs should not be ignored either. An entirely underground fiber-optic broadband network can run between $125,000 - 225,000/mile inclusive of permits/fees, engineering, materials, construction, project management, inspection and closeout, let alone moves, adds, changes, breaks, fixes, and recurring underground utility locates. Any entity considering a broadband network must realize the costs and value the benefits to make a rational decision. Yet those costs are not always direct, and the indirect costs of not deploying what is now considered the 4th utility are also substantial and not fixed given the opportunity cost of not acting in some manner to improve broadband within the county.

 Communities with fiber-optic broadband networks have an asset that can be leveraged for revenue generation, cost-sharing, cost recovery, swap for service, or other financial opportunities to mitigate the cost of deployment. Each CBN should consider several factors affecting their strategy and approach to expanding broadband to private providers, including:

- Political will
- State regulatory requirements
- Economic development focus
- Competitive environment
- Potential legal challenges from incumbent local exchange carrier (ILEC), Community Antennae Television (CATV) and other Internet Service Providers (ISP)
- Opportunity cost of funding
- Federal regulatory requirements
- Lack of existing broadband services
- Financial capabilities

When any form of public supported broadband delivery is considered, an enterprise fund or utility is best suited to operate an open platform utility delivery and administration. We recommend against Highlands County considering to utilize any CBN to become a broadband provider to users. Becoming a Competitive Local Exchange Carrier (CLEC) or ISP has substantial quality of service (QOS) and service level agreement (SLA) requirements that Governments are not positioned for.

# 3.   Highlands County Broadband Market and Needs

"53% of Americans Say their Internet Has Been Essential During the COVID-19 Outbreak", Pew Research Center, April 2020

PCS reviewed data provided by existing broadband providers of their current broadband connectivity, needs, goals and issues. We reviewed county education, government, healthcare, small business, social services, and utility data. The reviews covered the types of Internet provided by current carriers and costs for these services with comparable rural demographic statistics.

We then focused on developing a fiber optic Community Broadband Network architecture and budget supporting Highlands County, Lake Placid, Avon Park and Sebring's facilities that could be supported with wireless expansion off county towers to achieve additional rural connectivity to mitigate the high capital cost of fiber optic deployment. The fiber optic infrastructure reviewed would support open-source network backhaul for the county or private carriers wishing to implement private FTTX solutions for both commercial and residential broadband.

**Stakeholders' Current Broadband Situation**

Highlands County has been able to connect localized facilities in two areas of the county by combining owned infrastructure and leasing infrastructure from Xfinity (Comcast) at an annual value of $330,000/year. The multi-year lease agreement has no ability to maintain the optical network upon completion; therefore, county staff is planning ahead to avoid similar expenditure when the funds could be used to deploy an owned infrastructure.

Note: existing fiber representation - from county
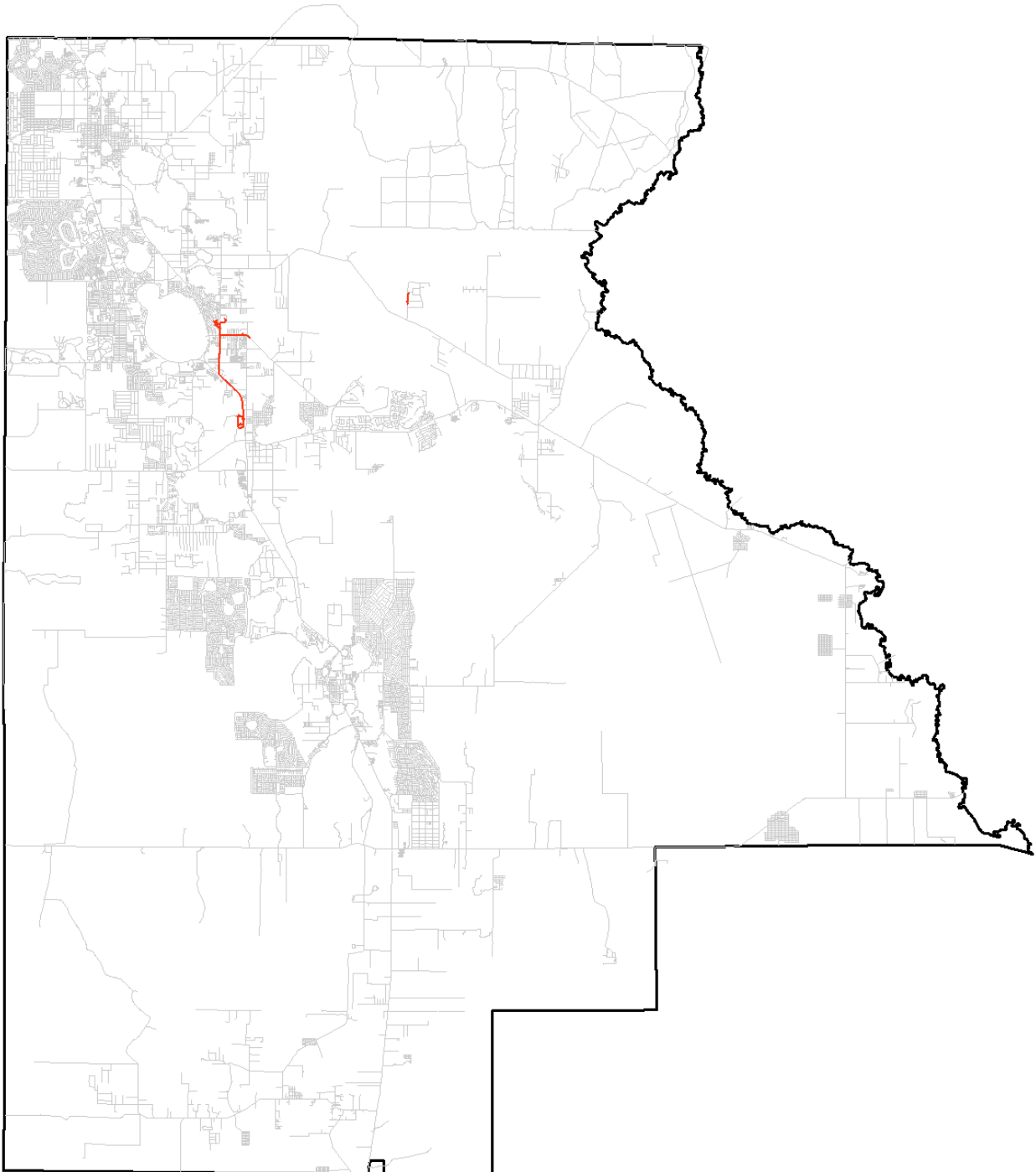


Sites within Avon Park (23), Sebring (19) and Lake Placid (8) have not disclosed current optical broadband connection data outside that shared with the County but have expressed interest in

a shared fiber optic utility to increase capacity, network control and the current broadband delivery of leased fiber, DSL and HFC broadband expenses for capital improvements.

Stakeholders noted redundancy remains an issue and recent fiber cuts in combination with hurricane impacts highlight the need for additional fiber optic network routes. All stakeholders noted that connectivity in the northern county is limited and challenging and the need exists for greater network infrastructure in the region.

Highlands' broadband is a complete dichotomy with the US 27 urban area corridor having access to >25Mb broadband whereas the rural areas are mostly limited to legacy DSL and satellite options.

- According to the U.S Census Bureau, Highlands County has an estimated population of approximately 105,000 and an average annual population growth rate of approximately 1.20% - Highlands County is growing, but it's needs for a county wide broadband network are growing exponentially.
- According to the U.S Census Bureau's data from 2016-2019, there are approximately 41,740 households in Highlands County, with a median 2.43 persons per home.
- The U.S Census Bureau also estimates that 83.0% of homes within the county have a computer and only 74.3% of homes have an internet subscription.
- The U.S Census Bureau's current data suggests only 29% of residents, or approximately 32,000 residents, have broadband of at least 25Mbps.
- That leaves approximately 30,000 homes and approximately 78,000 people within the county WITHOUT sufficient speed to be considered "high speed broadband" access of 25Mbps by the FCC.
- 6 main providers (Xfinity-Comcast, Lumen-CenturyLink, Rapid Systems, HughesNet, ViaSat, and Home Town Network) in Highlands County offer at least 25Mbps with only one (Comcast) offering 1GBps and one (CenturyLink) offering 100Mbps. – source Broadbandnow.com


- Note: basic Broadband speeds are considered 25mb/s upload and 3mb/s download.

US Department of Commerce
National Telecommunications & Information Administration
United States Census Data 2019 – Highlands County, FL

| | NTIA Data 2019 | | Ookla's Speed Test | | | |
|---|---|---|---|---|---|---|
| | Location / Census Tract | Population | Download (Mbps) | Upload (Mbps) | Homes w/o Internet | Homes w/o IP Device |
| 1 | 12055961602 | 1,318 | 22.56 | 4.74 | 20.7% | 15.9% |
| 2 | 12055961400 | 6,053 | 23.97 | 5.41 | 17.2% | 15.0% |
| 3 | 12055980000 | 35 | 8.57 | 4.67 | 0.0% | 0.0% |
| 4 | 12055961700 | 6,505 | 28.17 | 5.56 | 35.4% | 30.1% |
| 5 | 12055961500 | 6,050 | 29.34 | 5.74 | 19.4% | 15.0% |
| 6 | 12055961200 | 5,099 | 29.6 | 6.16 | 27.1% | 26.0% |
| 7 | 12055961000 | 4,796 | 8.95 | 1.57 | 34.7% | 24.6% |
| 8 | 12055980200 | 9 | 23.7 | 17.82 | 0.0% | 0.0% |
| 9 | 12055960900 | 2,607 | 29.75 | 5.89 | 26.4% | 18.5% |
| 10 | 12055960103 | 4,875 | 23.73 | 3.76 | 21.5% | 14.5% |
| 11 | 12055960102 | 1,587 | 49.19 | 6.24 | 30.1% | 21.5% |
| 12 | 12055960101 | 2,851 | 32.14 | 5.44 | 11.4% | 10.3% |
| 13 | 12055960400 | 7,756 | 28.55 | 5.56 | 17.7% | 12.7% |
| 14 | 12055960501 | 1,333 | 26.01 | 4.29 | 34.1% | 31.7% |
| 15 | 12055980100 | 95 | 0 | 0 | 0.0% | 0.0% |
| 16 | 1205598000 | 85 | 0 | 0 | 0.0% | 0.0% |
| | **Average speeds** | | **22.764** | **5.178** | | |
| | **Population affected** | **51,054** | | | | |
| | **Est. county population** | **105,000** | | | | |
| | **Est county population in survey** | **49%** | | | | |

Note: graph showing breakdown of areas around Highlands County download/upload speeds tested by Ooka's speed test. Ookla® is the global leader in mobile and broadband network intelligence, testing applications and technology. Speedtest®, Ookla's flagship network testing platform, collects hundreds of millions of measurements about the performance and quality of networks around the world each day.

PCS

With poor capacity and low competition in the rural areas, the bandwidth available does not meet the FCC's definition of broadband.

**Business and Economic Development**

Highlands County's economic development team, in addition to county leadership and commissioners, are a future-focused group who understand the need for high-speed, reliable, redundant, and affordable connectivity for all current and future businesses and business growth throughout the county. Generally, the larger commercial entities have highspeed broadband in excess of federal minimums of 25Mbps, but entities off the US27 corridor struggle with any wired availability and subsequent wireless or satellite broadband service. All county commercial entities would benefit greatly from an open-source optical backbone and/or a full Community Partner FTTB offering.

- According to researchers at the University of Colorado Boulder and Carnegie Mellon University, faster Internet speeds increase your home's value.
- Specifically, researchers found availability of gigabit speeds adds 3.1% to the value of your home compared to standard broadband of 25 Mbps availability.
- The median home price in this county is approximately $175,000 (according to Zillow), that's an extra $5,400 and even 100 Mbps availability adds 1.8%, or $3,150 in value.
- Being able to offer high speeds is a major driving factor when people are buying homes or looking for a place to run a business. Counties offering only low-end broadband speeds are at a major disadvantage when attracting potential new residents and businesses.
- A county wide broadband network will allow for the providers within Highlands County the ability to push these higher broadband speeds, thus raising property values and attracting new residents and businesses to the area.

**Education**

The COVID-19 pandemic impacted education more than all operations within the county highlighting the need for high speed connected facilities to deliver content, but the challenges of residents to have sufficient capacity, speed and reliability for effective distance learning.

All schools reviewed have high speed bandwidth to the school, networked through the facility and delivered across WiFi inside the buildings. The challenges come from the inability to reach

all community residents via free community platform to bridge the digital divide and facilitate localized student/teacher interactive classes.

**Healthcare**

AdventHealth and HCA Healthcare operate regional healthcare networks including hospitals and medical clinics across the County and have national platforms and broadband agreements. While currently connected, these entities would benefit form a Community Broadband Network to improve connectivity and telemedicine practices.

The COVID-19 impact had greater impact on the administrative staff's ability to connect from home to support non-medical services. The lack of access in the community was noticed when staff moved to remote workforce.

**Utilities**

Duke Energy and Glades Electric are the largest providers of power in Highlands County. Each of those entities have internal optical networks for inhouse electricity command and control but do not offer broadband services from either their optical capacity or broadband over power.

FPL, a subsidiary of NextEra, is a minority provider of power within the County. Given this limitation, it is unlikely NextCity Networks, also a NextEra subsidiary, would be focusing any near-term smart community, all optical infrastructure model for consideration. NextCity sees the rural broadband solutions as a mix of fiber, cellular and wireless solutions including the possibility of CBRS (Citizens Broadband Radio Service) and/or LTE. They have grant writing staff working with communities in filing for federal and state dollars that expedite the deployment of rural fiber optic network. Similar to current leased optics, any arrangement with NextCity would not resolve the recurring lease expense and limited network control issues. PCS recommends that Highlands County meet with them to understand NextCity's business model and explore any possibility of a partnership or common use of current or future assets to help expand broadband opportunities in the county.

# 4.  Incumbent Broadband Service Providers

Highlands County's broadband coverage is provided by a variety of wired, wireless and even satellite broadband providers. Despite the variety of providers, territories are defined and rarely overlap or compete.

**Xfinity (Comcast)** provides service along the US27 corridor in Avon Park, Sebring and Lake Placid. Xfinity business internet plans, advertised as guaranteed bandwidth, ranges from 35Mbps of $108/month to 100Mbps at $178.40/month to 1Gbps at $288/month. Residential triple play of bundled TV/Internet/Phone start at $50/month for 10Mbps, 1 phone line and basic CATV package that escalates rapidly with video package options.

**Lumen (CenturyLink)** offers wired DSL service through Highlands County and advertises fiber optic connectivity but inquiry to their sales engineering group could not disclose where those services are available. As is the case with all legacy ILEC firms, they offer multiple triple play (voice, TV and data) capacities and prices.

**Rapid Systems** is wireless internet provider in Highlands County and across the central 11 counties in Florida. Rapid advertises 3 basic speed packages from 10/2Mbps to 15/3Mbps and 25/5Mbps (down/up) from $149 to $249/month. Wireless services are clustered from existing tower sites and no detailed coverage maps are publicly available.  While wireless offers advantages in rapid deployment and cost savings for those users within coverage areas radiating from towers, it is highly susceptible to atmospheric and weather interruption. There is no latency disclosed and they advertise their wireless as 40% faster than fiber up to 1Gbps, which is incorrect.

**HughesNet** is a satellite communication provider offering broadband in Highlands County, but with lower speeds up to 25Mbps and data caps before escalation. All HughesNet plans are advertised as 25 Mbps download speed with different data caps. The plans range from 10 GB data cap for $69.99 after promo discount to 50 GB data cap for $149.99 per month. Offers are for a 2-year contract. Typically satellite providers are challenged with latency issues which detract from real time connectivity needs required for education and governmental video conferencing and residential gaming applications.

**ViaSat** is also a satellite communications provider in Highlands County. It advertises speeds up to 100 Mbps download with 3 Mbps upload. All plans come with a cap for monthly data usage, that along with latency issues does not make satellite communications a viable solution for Governmental users. Residential limits range from 12 Mbps to 150 GB of data cap for $60.00 to $200 per month.  Latency is advertised at .5 seconds for a round trip.
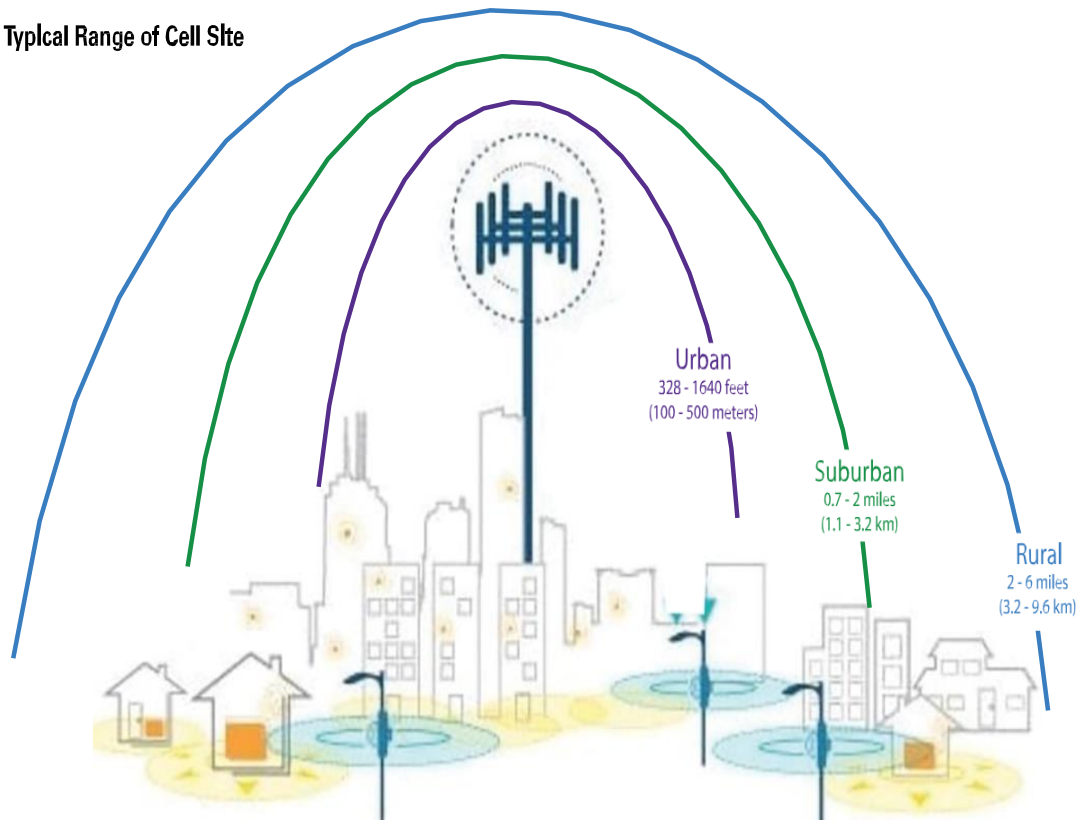
## Cellular Providers - The 5G Challenge

The main challenges of supporting 5G providers are related to the use of FR2 mmWave (Frequency Range 2, millimeter-Wave) spectrum and increased bitrates. Cellular wireless signal's range is limited by factors of radio frequency propagation and link budget. mmWaves suffer faster attenuation (signal loss over the distance traveled). They also will not penetrate most building materials. This means there will need to be more nodes in a given geographic area to provide the promised coverage and performance.

**Cellular Factors impacting range include:**

- Height of antenna (line of site propagation)
- Frequency of signal used (attenuation)
- Timing limitations of technology
- Power of the transmitter
- Data rate of subscriber device
- Directional characteristics of antennas

- Reflection and absorption by buildings and vegetation
- Local geography
- Weather conditions
- Regulations

**Typical Range of Cell Site**

**Urban**
328 - 1640 feet
(100 - 500 meters)

**Suburban**
0.7 - 2 miles
(1.1 - 3.2 km)

**Rural**
2 - 6 miles
(3.2 - 9.6 km)

**PCS**

## Satellite Providers - Starlink

Current hopes for Rural broadband include considerations for other satellite providers currently under development include Starlink. In 2020, Cartesian Consulting, a specialist firm focused on the global telecommunications, media, and technology (TMT) industries noted the new FCC RDOF Requirements for "broadband service" at actual speeds of at least 100 Mbps downstream and 20 Mbps upstream over the previously recognized 25/3 standard.

It is the FCC's goal that any subscriber should be able to receive 100 Mbps in peak hours, accounting for the expected usage of other users on the network. So, we must consider average bandwidth requirements per subscriber at peak hours, and allow for some headroom capacity from the average, for extreme cases. Cartesian modeling indicates that Starlink's fleet would not have enough capacity to meet expected demand, particularly in the Eastern US, even given favorable assumptions.

# 5.     Community Broadband Network - Conceptual

### *Network Infrastructure*

The conceptual CBN would leverage FDOT, Highlands County and all city road rights of way to facilitate the CBN deployment of an underground pathway, backbone (trunk) fiber optic cables (96-144 Fibers), with smaller stakeholder distribution ring cables (48 Fibers), and individual Stakeholder site lateral (drop) connection cables (12-24 Fibers), with future expansion option using a mixture of cellular/radio/wireless infrastructure to create an open-source access network.

The fiber optic CBN infrastructure would be designed as a carrier-class network, with diversity, redundancy, resiliency to most Florida environmental and physical hazards, and capable of provisioning various services independently and transparently for multiple customer networks.

Any cellular/radio/wireless links would be designed as links from the fiber CBN network as a backbone/distribution network to connect critical sites or clients. Nodes on the network, connected via fiber and wireless links, serve one of three functional roles in the network: access, aggregation, or interconnection.

Each stakeholder would participate in funding as a pro-rata share of their fiber allocation to the total. The basis of the budget for each phase is based on an estimated average rate of $166,500/Mile of deployed infrastructure covering design, engineering, permitting, procurement, construction, inspection, termination, testing, network activation, GPS/GIS mapping and final close out documentation.

The metro routes shown reflect city distribution connections to major governmental buildings, schools, hospitals, businesses and other areas of interest to the long-haul networks.

***Conceptual Budget:***

| Phase 1 - Rings | miles | | Phase 2 - County Drop Sites | miles | |
|---|---|---|---|---|---|
| Avon Ring + Links Total | 22.60 | $3,762,900 | Schools (Public + Private) | 11.38 | $1,895,199 |
| | | | County building drops | 18.47 | $3,075,047 |
| Sebring Ring + Links Total | 52.95 | $8,816,175 | Hospital Drops | 1.16 | $192,358 |
| | | | Avon Drops | 4.22 | $703,368 |
| Lake Placid Drops Total | 58.50 | $9,740,250 | Sebring Drops | 5.38 | $895,568 |
| includes run down to Venus | | | Lake Placid Drops | 2.96 | $492,247 |
| Total Phase 1 cost | 134.05 | $22,319,325 | Total phase 2 cost | 43.57 | $7,253,787 |

*Conceptual Maps:*

Avon Park ring and links
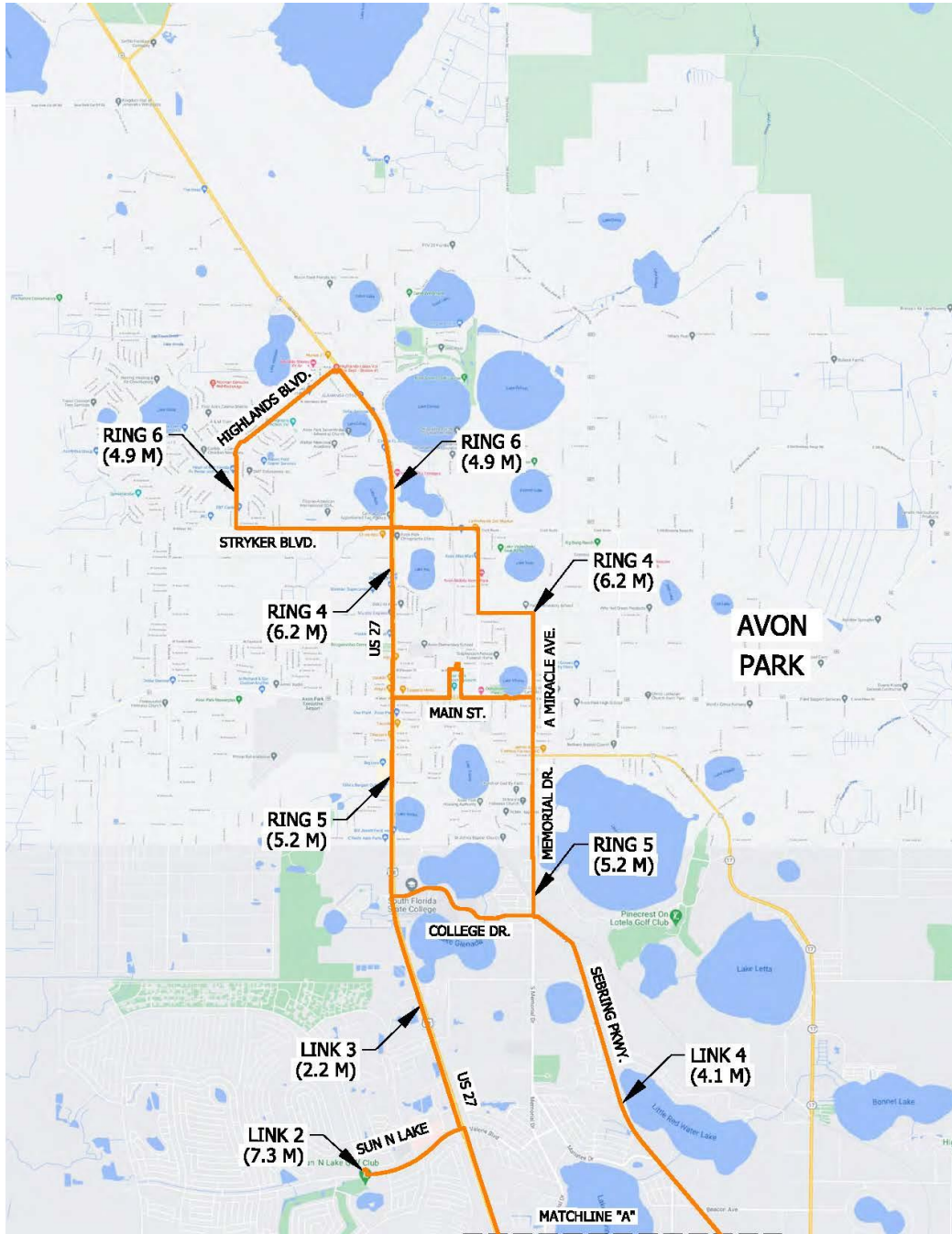


- City of Avon Park distribution connections are approximately 4.0 miles
- Estimated ROM budget for Avon Park distribution rings are approximately $675K
- County facility sites are approximately 16.5 miles throughout the County CBN
- Estimated ROM budget for county distribution rings is approximately $2.7M

Sebring ring and links



- City of Sebring distribution connections are approximately 5.4 miles
- Estimated ROM budget for Sebring distribution rings is approximately $890K
- School District & Educational Institutions are approximately 11.4 miles throughout the County CBN
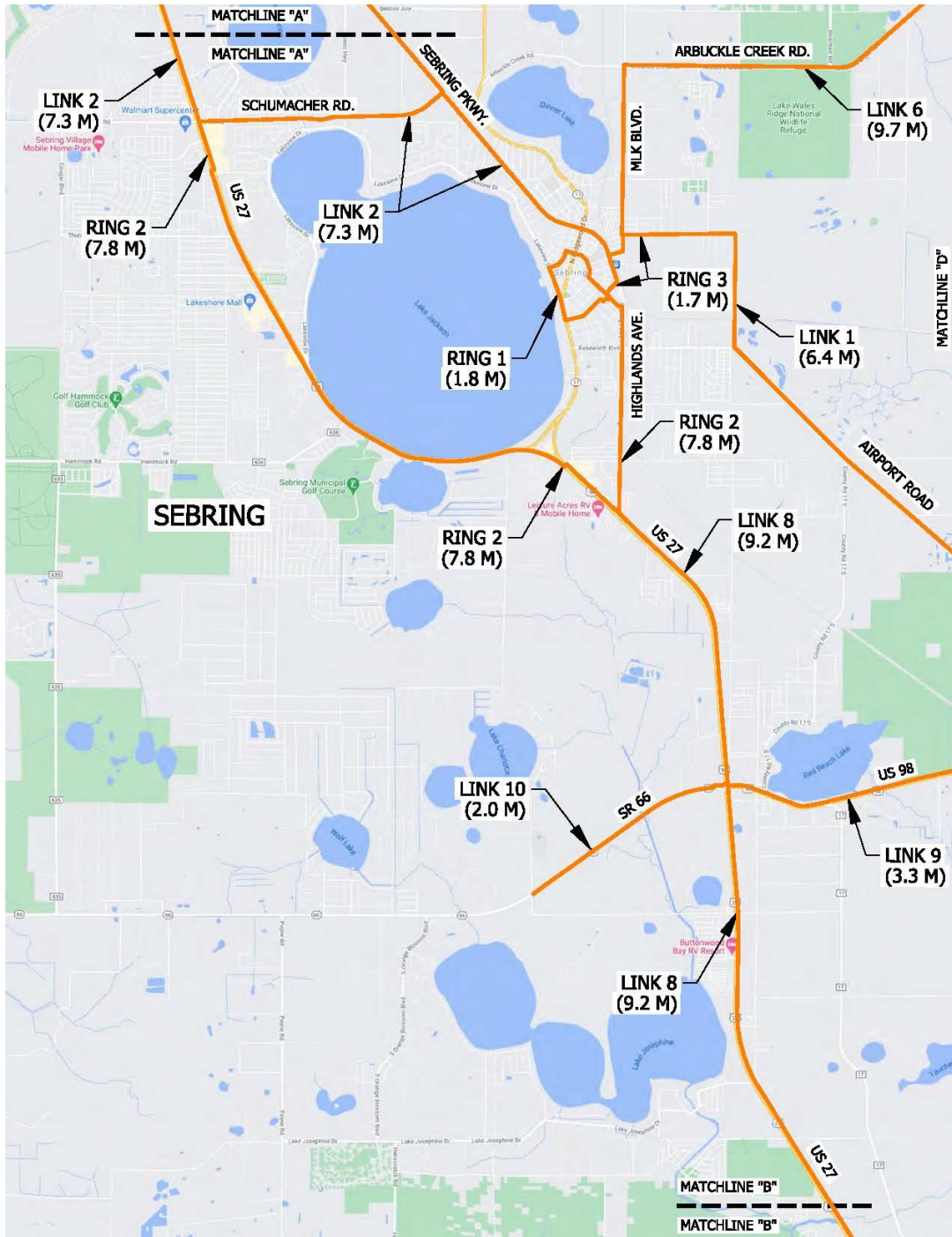- Estimated ROM budget for School Board Distribution Rings approximately $1.9M
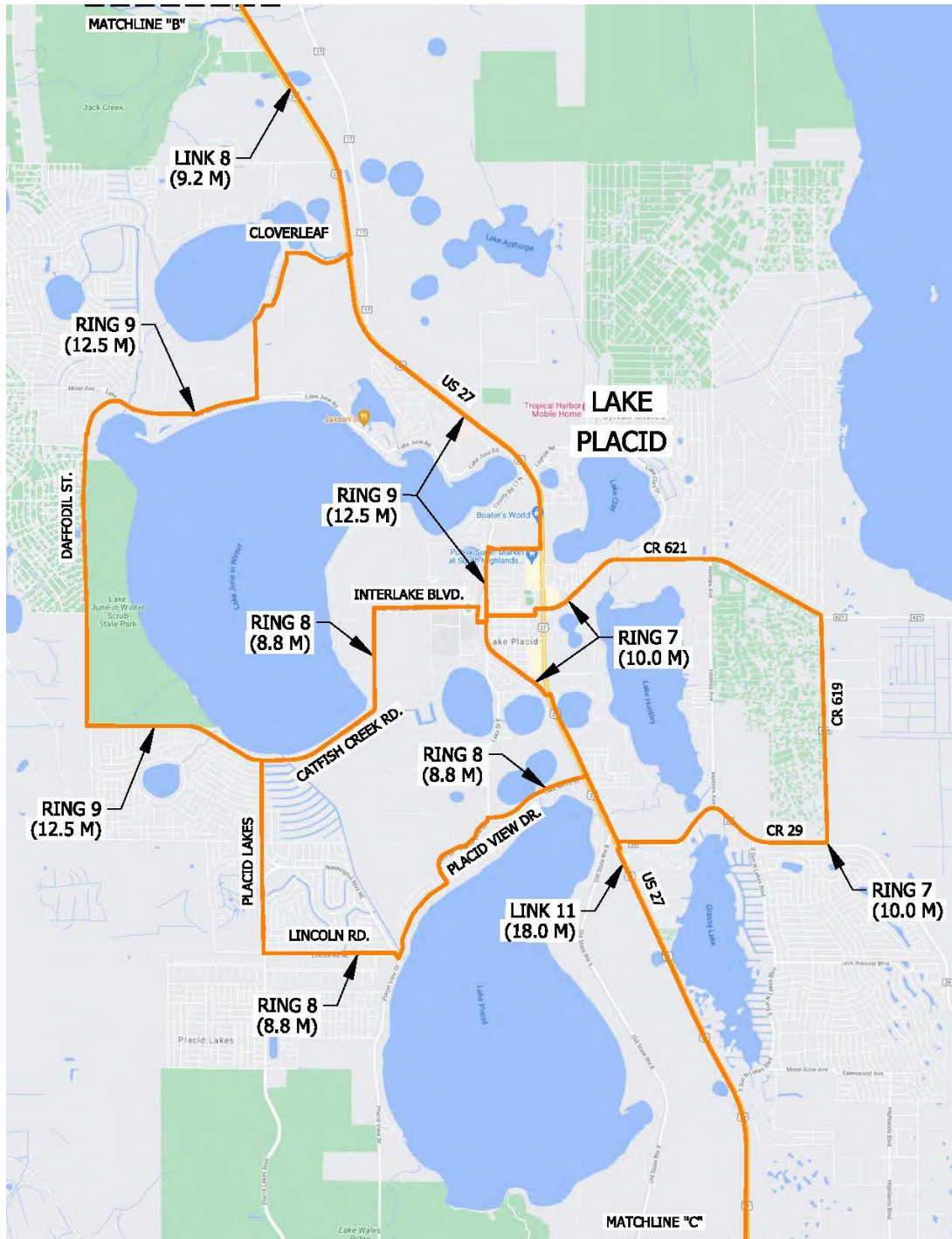
Lake Placid ring and links



- City of Lake Placid distribution connections are approximately 3.0 miles
- Estimated ROM budget for Lake Placid distribution rings is approximately $490K
- Hospital/Clinical connections are approximately 1.4 miles throughout the County CBN
- Estimated ROM budget for Hospital/ Clinical Distribution Rings is approximately $200K

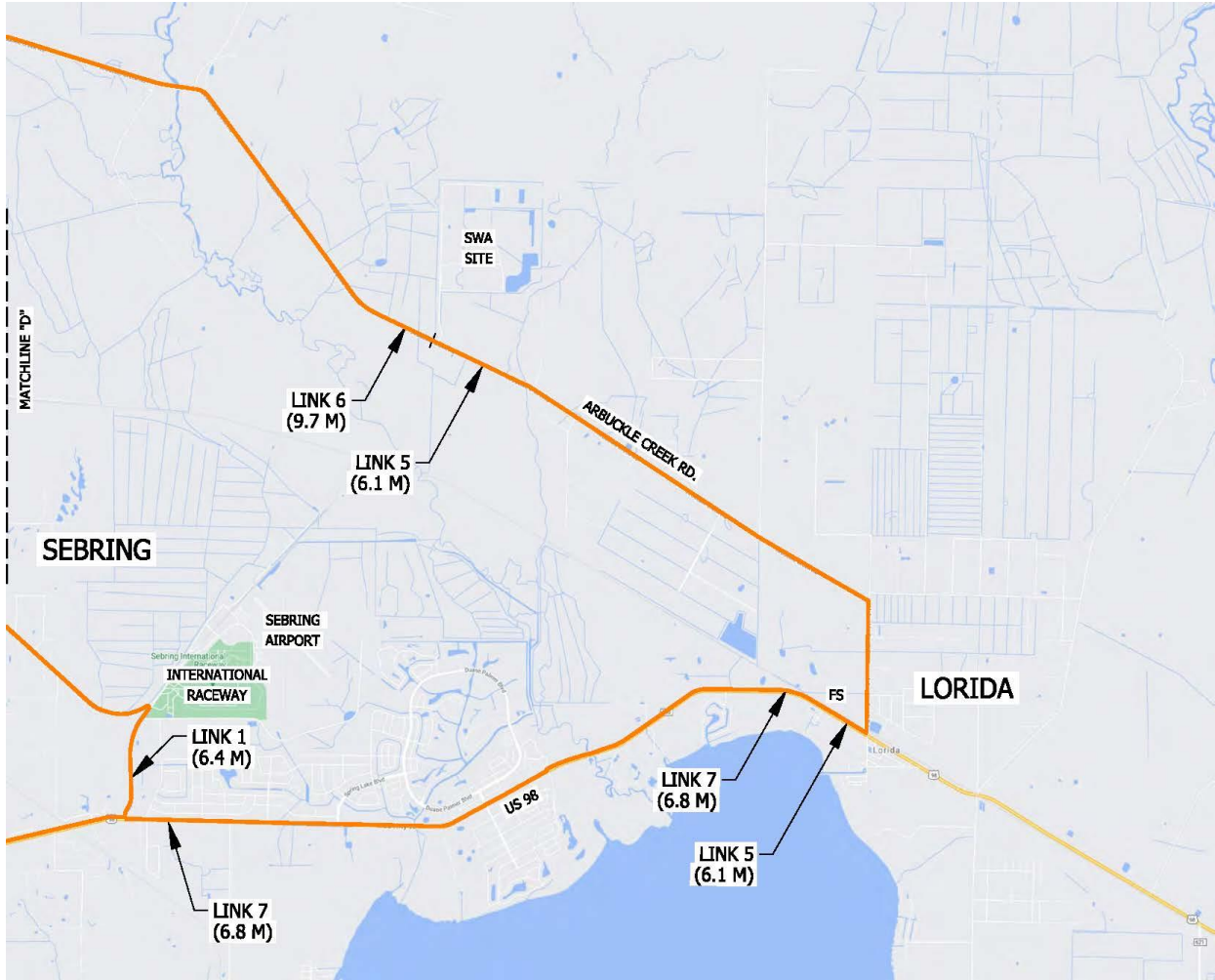County East Rings

County South Links



MATCHLINE "C"

SR 70

LINK 11
(18.0 M)

US 27

Archbold
Biological Station

Archbold

Lake Wales
Ridge
Wildlife and...

Ole South Auto Salvage

VENUS

US 27

LINK 11
(18.0 M)

CR 17

LINK 11
(18.0 M)

CR 731
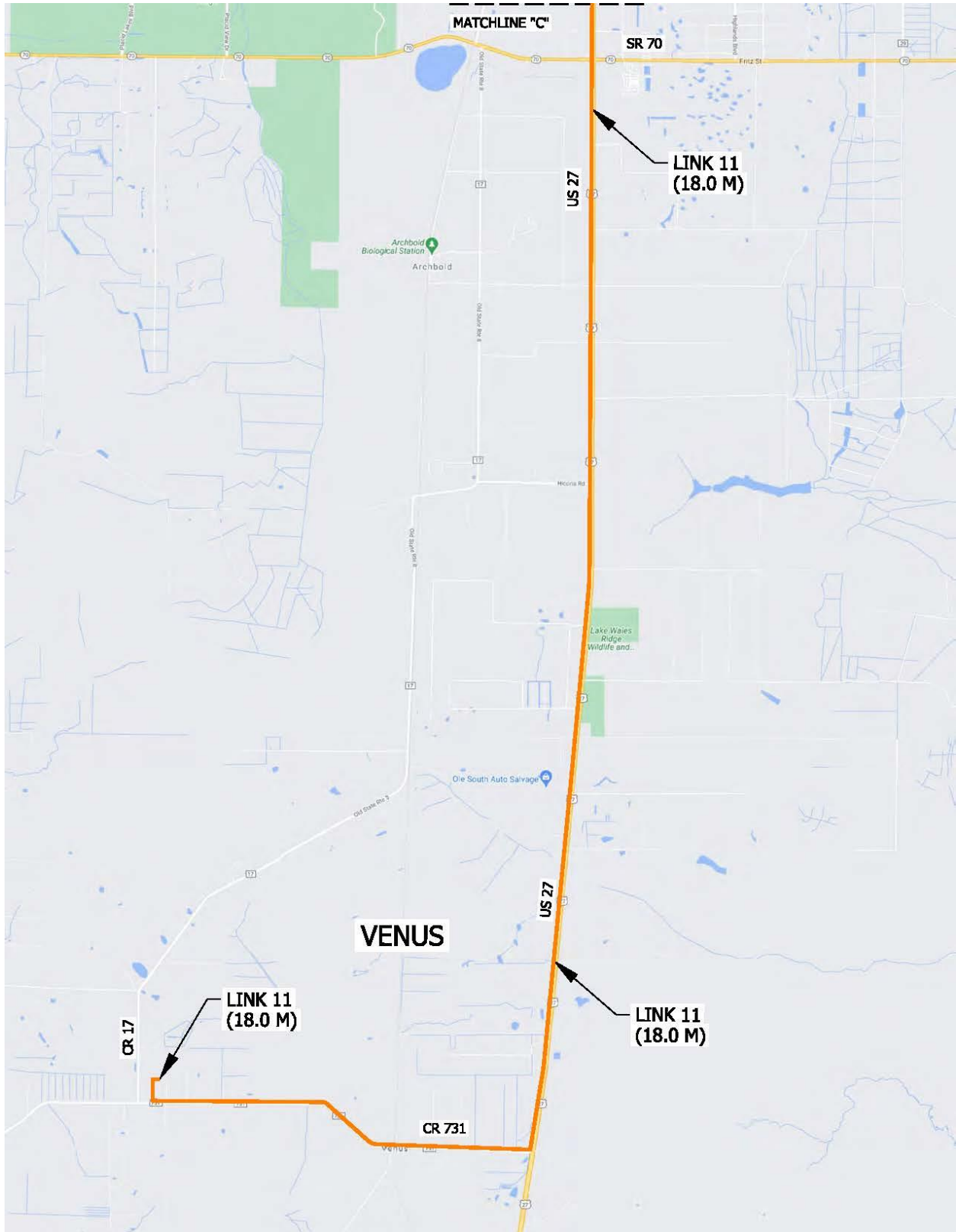
| Facilities to be connected | | | | |
|---|---|---|---|---|
| **County:** | **Schools (Public):** | **Avon Park:** | **Sebring:** | **Lake Placid:** |
| Fire Station-01 | Virtual & HCSD HQ | WWTP (Ryker) | Country Club | Police Dept |
| Fire Station-02 | Park Elementary School | WWTP (Glenada) | Water Plant | Library |
| Fire Station-04 | Avon Park Elementary School | Public Works | Public Works | Lake June Park |
| Fire Station-07 | Avon Park Middle School | MLK Field | Charlie Brown | WWTP Smoak Rd |
| Fire Station-09 | Avon Park High School | McWhite Park | Water Dept | WWTP CR29 |
| Fire Station-17 | Memorial Elementary School | Lake Tulane | Wastewater Collection | WWTP Tomoka N |
| Fire Station-18 | Sun-N-Lake Elementary School | Durrah Martin | WWTP | WWTP Rosewood |
| Fire Station-24 | Gustat Middle School | Walnut Park/WWTP | Police Storage | Govmt Center |
| Fire Station-29 | Woodlawn Elementary School | Donaldson Park | City SWA | Clubhouse Park |
| Fire Station-30 | Sebring Middle School | City Hall | Circle Park | |
| Fire Station-33 | Sebring High School | Chambers - Code Enf | Police Station | |
| Fire Station-36 | Wild Elementary School | Fire Station-05 (City) | Fire Station-14 (City) | |
| Fire Station-38 | Kindergarten Learning Center | Head Field | Fire Station-15 (City) | |
| Fire Station-39 | Cracker Trail Elementary School | Derkman Park | Golf Barn | |
| Fire Station-41 | Lake Placid Elementary School | Community Center | Utilities | |
| Fire Station-VENUS | Lake Placid Middle School | CRA | CRA on Circle | |
| Fire Station-W SEBRING | Lake Placid High School | | City Hall | |
| Sheriff - Main office | Lake Elementary School | | Civic Center | |
| Sheriff - North District | | | Gabe White | |
| Sheriff - Jail | **Schools (Private):** | | Max Long | |
| Sheriff - Tower | Walker Memorial | | | |
| Tax Collector (Avon Park) | Cornerstone Christian | | **State:** | |
| Tax Collector (Lake Placid) | Parkview Academy | | S. FL State College (Main) | |
| Kenilworth Center | Heartland Christian | | S. FL State College (Lake Placid) | |
| Childrens Center | Independent Baptist | | FDOT Operations | |
| Annex | St Catherine Catholic | | National Guard | |
| Public Defender | Lake Placid Christian | | | |
| Court House | Lakeview Christian | | | |
| Library | | | | |
| Solid Waste | **Hospital / Medical:** | | | |
| Road/Bridge Unit 1 | Advent Sebring | | | |
| Road/Bridge Unit 3 | Advent Cancer Institute | | | |
| Airport (Sebring) | Advent Lake Placid | | | |
| Airport (Avon Park) | Highlands Regional | | | |
| Sports Complex | Highlands Wound | | | |
| Fair Grounds | Sebring Heart | | | |
| | Florida Hospital Heartland | | | |

# 6.   Conclusions

Highlands County has a need for a Community Broadband Fiber Optic network to meet their current and expanding connectivity needs of Governmental, Commercial and Residential users. Fiber optics offers substantially higher capacity, consistency, reliability and diversity than any other data transmission medium today without an equivalent alternate on the horizon. Diversity and redundancy are necessary attributes for mission critical county services and are a requirement for economic development and attraction of new or expanding businesses

Optical networks are not inexpensive, but continuing to lease these services instead of investing in a network that can be expanded over time only keeps Highlands County behind those Counties that have been implementing this approach for 30 years now.

Highlands County's major objectives include connectivity to underserved areas of the county, encouraging digital inclusion, reducing rates for critical connectivity and expanding economic development. This review report provides Highlands County data on an all optical CBN for intelligent utilization of County resources.

# 7.    Recommendations and Next Steps

Highlands County, like virtually every rural US County, is struggling with a lack of consistent sufficient broadband connectivity. The report points out in detail this lack of connectivity effects on Governmental services delivered and the quality of life for the residents and efficiency of businesses in most areas of the County.  It is clear, we are in the Digital Revolution where affordable, reliable broadband is as critical as our roadways, water and electrical utilities.

Florida law, unless grandfathered, prohibits public entities from providing direct retail services without crossing some legal hurdles. They can however easily provide their internal needs and use services, connecting county assets, schools, community centers, public safety and other anchor institutions. The county can also provide wholesale services like dark and lit fiber, conduit, electronics and data storage space as leased or rented assets.

The reality is for-profit broadband providers are only willing to deploy in areas where the ROI meets their internal metrics, thus leaving large gaps in service for much of rural America. However, this critical utility cannot wait until providers decide if an investment is worth making, the pandemic has brought in to sharp focus just how vital and critical effective broadband is to rural communities.

Highlands County's lack of internet broadband is very apparent in several areas but mostly in the more rural parts of the county. The underlying cause of this lack of broadband is rooted in unsustainable business case to entice private for-profit providers to invest. Given the need the only feasible way to meet way to provide broadband to these areas is for local governments to invest in themselves. These investments would be substantial, phased and implemented in to meet current critical needs with replacement routes considered as leases expire.

The most cost-effective near-term way to achieve the Countywide connectivity would be to deploy a Fiber/Wireless network as a short-term transition for a county wide ultra-highspeed CBN expanding through the entire county over time.

The bottom line for Highlands County given the current environment it is highly unlikely that a retail provider will invest in the County especially in the more rural underserved areas and it is up to the County to invest in itself and to take positive steps to meet short and long terms community and economic development needs.

***These steps are recommended to accomplish those goals***:

1. Commit to meet short and long-term community and economic development needs by building, owning and operating an ultra-high-speed broadband network.
2. Engage a Grant Writer to seek funding for Rural Broadband achieving several requirements of these programs.
3. Expand this review with a Business and Financial Plan to support network infrastructure bond offerings based on the approach and phases described in this document.
4. Commit funds to detailed design and engineering route plans to seek shared utility opportunities and initiate often lengthy permitting processes.
5. Seek construction funding for network infrastructure development from public and private providers or governmental partnerships.
6. Review regulatory approvals required to consider business model for any public/private network governance maintaining open-source opportunities.
7. Implement broadband-friendly policies and make network infrastructure an integral component of economic development, land use planning public works, and real estate development.

# 8.  Community Fiber Optic Broadband success stories:

•**Indian River County, FL** adopted a Community Broadband Network with interlocal agreements with the City of Vero Beach, The City of Vero Beach T&D Utility, The School District of Indian River County, and Indian River County.  Starting with an initial 5-mile link in 1990 supporting the 19th Judicial Circuit Video Arraignment secured network requirement that has grown to >100 miles of fiber optic routes, 32 public and private educational institutions, 1 Research Institution, 16 County Constitutional facilities, 9 City of Vero sites, 12 Water Utility facilities and over 60 traffic signal sites.

•**Martin County, FL** adopted a Community Broadband Network with interlocal agreements with the Cities of Stuart, Jensen Beach and Jupiter Island, Martin County Water Utility, The Martin County School Board, and private ILEC/CLEC carrier ITS Telecom (recently acquired by Blue Stream Communications). This unique CBN touts private services over shared public/private infrastructure that currently encompasses >130 miles of fiber optic routes, 31 public and private educational, 12 County Constitutional facilities, 6 County Park facilities, 7 City sites, 16 SCADA

Water-Well-Wastewater Utility sites and over 50 traffic signal sites while the private FTTX offering has >2,500 residential and commercial Gbps connections. This CBN was initiated after a decade of expansion of an all-optical lease agreement with the local CATV provider, who, upon renewal set the rates for the 5-year multi-site renewal at a cost above that to build the entire CBN.

•**Palm Beach County, FL** implemented a Governmental Broadband Network which supports the County IT Department who is the optical bandwidth aggregator and primary bandwidth provider for all County Constitutional offices and >12 Municipalities for Governmental internet connectivity.  The PBCo GBN, also supports the 10th largest School District in the US with high-speed broadband from the FL LambdaRail network with an all-optical WAN to over 66 schools with diverse connections into the research network. This CBN is unique in its meeting the COVID-19 challenges with 2021 expansion into public educational network Wi-Fi deployments to overcome the digital divide conditions and provide distance learning capability in under supported communities.

•**The City of Lakeland and Polk County School District.** Over the past 20 years, the City of Lakeland, FL (Lakeland Electric) has connected over 70 Polk County Public School locations with fiber. Schools receive dark fiber connectivity, giving them access to near limitless speeds and control over their connectivity needs, while keeping recurring telecommunications costs low for the district. The City's investments in this fiber have kept budgets down and investments local to the area.


 •**Chattanooga, Tennessee.** The city-owned gigabit broadband network in Chattanooga, Tennessee, is often cited as a prime example of how municipal networks can thrive under the right circumstances. Since its 2010 launch, the city has rebranded itself as "the gig city" and has begun the processes of trying to use its network to grow a high-tech sector from scratch, and streamline a number of core municipal functions. Federal policy makers have taken note and have cited Chattanooga as a model that other cities might follow in meeting a "gigabit city challenge," which calls for "at least one gigabit community in all 50 states by 2015." Yet a number of aspects of the Chattanooga GON render it unique and may make it difficult for other municipalities to replicate. The system in Chattanooga also has a very high price tag, which caused the city to assume a heavy debt burden and raises the possibility that, over time, the costs of this network might very well outweigh any consumer benefits.

•**Palo Alto, CA.** The city-owned gigabit broadband network in Palo Alto, CA, has seen its challenges over the years but now operates as The City of Palo Alto Utilities (CPAU) supporting only businesses that rely on the Internet, offering fiber optic-based bandwidth connectivity between client's sites with a data center in Palo Alto or to the world through Equinix's Palo Alto

Internet Exchange (PAI X).  CPAU connects businesses to PAIX or another building, via a dark fiber optic network. Independent of CPAU, Businesses select an Internet Service Provider [ISP] from over 60 ISPs at PAIX. The Business is in control of the provider, the sped of that connection and the CPAU operates as a provider agnostic bandwidth provider.

# 9.    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.

5G – Fifth Generation      The fifth generation of mobile broadband technology, used by smart phones, tablets, and other mobile devices to access the web. It is believed that this technology will significantly increase bandwidth to users, up to 1 Gig.

ADSL                       Asymmetric Digital Subscriber Line (ADSL) service with a larger portion of the capacity devoted to downstream communications, less to upstream. Typically thought of as a residential service.

ADSS                       All-Dielectric Self-Supporting A type of optical fiber cable that contains no conductive metal elements predominantly deployed in aerial infrastructure conditions.

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.

ArcGIS                     A geographic information system (GIS) for working with maps and geographic information maintained by the Environmental Systems Research Institute (Esri).

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.

Backbone Cabling           Cable placed between telecommunication rooms, entrance facilities, equipment rooms or buildings.

| | |
|---|---|
| Bandwidth | The amount of data transmitted in a given amount of time; usually measured in bits per second, Kilobits per second (Kbps), Megabits per second (Mbps), Gigabits per second (Gbps). |
| BICSI | Building Industry Consulting Services International fulfilled the development and design for information transport systems (ITS) such as the EIA/TIA-568 (now ANSI/TIA-568) structured cabling system standard since the breakup of AT&T in 1984. |
| Bit | A single unit of data, either a one or a zero. Broadband transmission speed is referred to as the "bits" of transmitted data. A kilobit (Kb) is approximately 1,000 bits. A Megabit (Mb) is approximately 1,000,000 bits. |
| 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). |
| Byte | A unit of data information made up of 8 bits used to encode a single character of text in a computer. 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). |
| CAD | Computer Aided Design -The use of computer systems to assist in the electronic creation, modification, analysis, or optimization of a graphical design. |

| | |
|---|---|
| CAI | Community Anchor Institution - 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. Coaxial cable has an inner conductor surrounded by an insulating layer, surrounded by a conductive shielding where electrical signal flows through the center conductor. 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 - technology similar to DWDM only utilizing less wavelengths in a more customer-facing application whereby less bandwidth is required per fiber. |
| Demarcation Point | 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 LineThe 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. |

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| EON | Ethernet Optical Network- The use of Ethernet LAN packets running over a fiber network. |
| ESRI | Environmental Systems Research Institute) is an international supplier of geographic information system (GIS) software, web GIS and geodatabase management applications typically utilized by Governmental GIS agencies for uniformity in map data. |
| 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. |
| FTTD | Fiber to Desk- An optical fiber to a desk in the horizontal cabling infrastructure delivering secure high-speed data to a work area. |
| FTTN | Fiber to the Neighborhood- A hybrid network architecture involving optical fiber from the carrier network, terminating in a neighborhood cabinet which 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. |
| FTTx | Fiber to the X - All fiber optic topologies from a provider to its customers, based on the location of the fiber's termination point. |
| Gbps | Gigabits (billion) per second- 1,000,000,000 bits per second. A measure of how fast data can be transmitted. |
| GIS | Geographic Information Systems- A system designed to capture, store, manipulate, analyze, manage, and present all types of geographical data. |

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| 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 similar to FTTN architecture. |
| Horizontal Cabling | Cable placed between equipment and/or telecommunication rooms to work area outlets or network device connection. |
| 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. |

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| 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 (Thousand) per second- 1,000 bits per second. A measure of how fast data can be transmitted. |
| LAN | Local Area Network- A localized network consisting of both hardware and software. The network can link servers and workstations within a building with a single broadband internet connection. |
| Last Mile Network | Last mile refers to the short geographical distance that must be spanned to provide services to end-user customers. The last mile is the relatively expensive and complex delivery of cables or wiring from the provider's trunk to one's home, business, or personal device.  For instance, in a rural area, the last mile includes all cabling to individual facilities, homes, towers or other communication devices. |
| 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. |

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| 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 (Million) per second- 1,000,000 bits per second. A measure of how fast data can be transmitted. |
| Middle Mile Network | Middle mile is a term most often referring to the network connection between the last mile and greater Internet. For instance, in a rural area, the middle mile would likely connect the town's network to a larger metropolitan area where it interconnects with major carriers. |
| mmWave | Millimeter wave (MM wave), also known as *millimeter band*, is the band of spectrum with wavelengths between 10 millimeters (30 GHz) and 1 millimeter (300 GHz). It is also known as the extremely high frequency (EHF) band by the International Telecommunication Union (ITU). |
| 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. |
| OSP | Outside Plant - refers to all of the physical cabling and supporting infrastructure (such as conduit, cabinets, tower or poles), and any associated hardware (such as repeaters, routers) located between a demarcation point in a "service providers' switching facility" and a User/Customer premises demarcation point such as an equipment room (ER) or main distribution frame (MDF). |

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| OTN | Optical Transport Network - a new optical transport network layer over WDM network enabling more efficient convergence of mix of services such as 10/40/100Gb Ethernet, 8/16/32G FC and traditional SONET/SDH. |
| 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 among 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 - 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 P3. |
| 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 (SLAs). Elements of network performance within the scope of QoS often |

include availability (uptime), bandwidth (throughput), latency (delay), and error rate. QoS involves network traffic prioritization.

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 antennas.

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.

SD-LAN

Software-Defined Local Access offer central management, access management, dynamic bandwidth sharing, flexibility, adaptability, and scalability. SD-LAN is an architecture decoupling network control and forwarding, creating a directly programmable network control. SD-LAN network can be set up as a point-to-point network or a point to multipoint network.

SDN

Software-defined networking (SDN) application is a software program which is designed to perform a task in a software-defined networking environment. It is that approach to computer networking that not only allows network administrators to change programmatically, control, initialize, and manage network behavior

dynamically through open interfaces but also provides the concept of lower-level functionality.

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| 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. |
| Streaming | Streamed data is any information/data 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 | how many customers have subscribed for a particular telecommunications service. |
| Submarine Network | is the process by which data is carried on subsea cables to connect continents. Submarine networks carry 95 percent of the world's intercontinental electronic communications traffic. |
| 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). |

PCS

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| 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. |

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| 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. |
| Wavelength | The optical term for frequency. Fiber-optics generally uses the 850 nm, 1300/1310 nm, 1550 nm and 1625 nm wavelengths for transmission purpose due to the marriage of performance with light sources, optical fibers, and optical detector technologies. |
| Wi-Fi | 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 | 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, coaxial cable and/or fiber optic cables placed underground or aerial on utility poles. |