

Parke County, Indiana

Broadband Feasibility Study – Final Report

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Executive Summary

Vantage Point Solutions (VPS) was awarded a competitively bid contract to conduct a Broadband Assessment and Feasibility Study for Parke County, Indiana. The main purpose of this Study was to determine and identify what the broadband problems and challenges are in Parke County and the surrounding communities, and how they impact residents, businesses, local government and others.

To conduct the feasibility assessment, VPS gathered data and information by:

- Engaging with city officials and volunteer committee members
- Holding stakeholder outreach meetings with citizens and groups
- Talking with providers to discuss partnership opportunities
- Conducting a residential survey
- Analyzing information provided by the County
- Researching information obtained through publicly available sources

This comprehensive report details the information that was collected and analyzed and discusses the following aspects of the Study:

1. Competitive Landscape
2. Survey and Stakeholder Outreach
3. Network Types and Operating Models
4. Funding and Financing Options
5. Potential Network Designs
6. Analysis and Recommendations

When discussing broadband, it is important to understand the definition. The Federal Communications Commission (FCC) currently defines broadband as speeds that reach a minimum of 25 Mbps downstream and 3 Mbps upstream (25/3). However, most of the federal grant programs (to date) define unserved areas as those where service levels fall below a lower threshold of 10 Mbps downstream and 1 Mbps upstream (10/1). Although even the current FCC definition of broadband is far behind what most customers perceive to be adequate for residential use. For purposes of this report – high-speed broadband is internet speeds that meet or exceed the federal definition of broadband.

Key Findings

The biggest question a municipal feasibility study needs to answer is “what is the problem we need to solve?” As such, the most critical task of a feasibility study is to conduct outreach in the community in order to talk to as many stakeholders as possible. Stakeholders represent key groups of potential end-users of a municipal network such as citizens, businesses and government agencies. The purpose is to obtain feedback regarding current levels of service, future needs and concerns. The information gathered from these tasks directly assisted in the development of the models and the final recommendations.

Below is a brief summary overview of the comments provided through the Stakeholder Outreach. More detail can be found in Section 3.1.

Group	Comments
Health Care	Local healthcare providers are finding that poor broadband negatively impacts their patient’s ability to utilize services such as online charting, record keeping and viewing, and ordering and receiving of new prescriptions.
Business Community	Outside of the incorporated areas, businesses felt poor broadband coverage did not allow them to service customers to their best ability. They mentioned the strain on commerce during local festivals and events.
Farmers / Agriculture	Poor access to broadband can hamper farmers ability to run much needed state of the art technology on tractors and equipment.
Public Safety	Limited broadband and cellular coverage create complete communication “dead zones” during certain times of the year at recreational areas and local festivals. This prohibits communication with first respondents.
Schools and Libraries	Students often struggle without proper connections at home. As more and more homework goes online, and textbooks become digital, poor broadband creates issues with completing schoolwork for many students and families.
Citizens – Town Hall Meeting	Citizens echoed concerns noted in the survey which highlighted problems with speed, connectivity and reliability throughout the County. Citizens confirmed concerns of not being able to effectively work from home, as well as discrepancies with where companies were currently showing service availability on FCC maps.

In addition to the Stakeholder Outreach, there are multiple key findings to highlight. These include:

- Current providers are not meeting the needs and/or expectations of many residents, especially those residing outside of the developed portions of Parke County. Some residents claim that service is so unreliable, but necessary, that they are paying a premium for services that do not work a majority of the time.
- Internet plans for residents and businesses are expensive and copper lines, mobile internet, fixed wireless and satellite technologies present speed, reliability and latency issues for end-users. The topography of Parke County can present specific issues for fixed wireless and satellite technologies as hills, valleys, and trees create specific line-of-sight issues and create disruption of signals.
- Current provider offerings in many areas of Parke County appear overstated. Many residents dispute the 477 Data reported to the FCC by providers claiming their residence as covered by adequate broadband.
- Remote areas need better internet connections and better cellular coverage. Not having access is negatively impacting local business, employee attraction and economic growth. Poor coverage is exasperated during busy times at recreational areas, and during local festivals such as the Covered Bridge Festival. Poor broadband and cellular coverage mean vendors are limited on processing payments, and first responders struggle to communicate during emergency situations.
- Approximately 30% of respondents are either very satisfied or satisfied with the overall service and value they receive from their current provider. This is a low percentage of satisfaction. Some attendants of the Town-Hall meeting stated they were unable to voice their dissatisfaction due to poor connectivity interrupting their ability to reply to the online survey. This indicates that the true number may be lower than 30% of satisfied consumers.
- The Study area has a fair amount of middle-mile infrastructure. Providers such as NewWave, Joink, and Endeavor all have current, recently completed, or planned projects to upgrade or increase infrastructure within Parke County. However, these projects are not comprehensive solutions, rather targeted and regional projects. There is

not an effective and comprehensive residential fiber deployment in Parke County. Population density and terrain have kept local providers from providing a more comprehensive solution for Parke County.

Summary Recommendations

Based on all the information and data obtained through the data collection efforts, the network models developed and analyzed, VPS makes several main recommendations.

While a middle-mile network costs significantly less to deploy, **the primary problem facing the region is the lack of robust and reliable internet service to all residents and businesses that meets or exceeds the federal definition of broadband.** However, the County is not prepared to commit to further financial involvement or ownership of network assets and is looking to private providers to expand services. Also, the size and population density of Parke County make a traditional FTTP model difficult to prove financially feasible.

Therefore, it is the recommendation of VPS that Parke County further explore the viability of reaching the unserved and underserved with a goal of achieving 100% connectivity in the County, through a variety of methods including deploying a middle-mile network in conjunction with a last-mile network. Action items include:

1. Continuing to engage in direct dialogue with potential network partners in order to:
 - Determine if a provider would be willing to establish a public-private partnership in the County to reach either all homes/businesses through a phased-in approach.
 - Encourage the providers to expand their system to fill in the gaps and reach the percentage of residents within a zip code that do not currently have access to their service.
 - Determine if a provider would build into an area if a middle-mile network was deployed.
2. Continuing to explore incentives for providers including sources of direct support for providers, such as tax abatement, outside of grant funding in order to further offset costs for providers.
3. Prepare for future rounds of Indiana or federal grant funding opportunities by:
 - Identifying an area or areas within the County that would be the most-eligible for grant funding.
 - Finding a provider-partner who could be a lead applicant and provide required grant matching funds.
 - Preparing checklist of general application materials that would be needed in order to be ready for the grant process.
4. Consider establishing a Pilot Project to work with existing providers that would fill in the coverage gaps by connecting residents/businesses that are currently unserved or underserved. In this approach, the County could set aside funds to be “granted” to providers to assist with financing the cost of connecting customers. For example, if a connection costs \$1000 to build, the County could provide a grant of \$500 to the provider to help subsidize the cost. Finding ways to connect unserved and underserved residents and businesses in areas that are partially served by existing providers is a difficult problem to solve. A grant program is significantly cheaper than building a new network and could help to connect the residents and businesses that have the greatest need.

Additional details on these recommendations are provided in Section 8 and generally throughout the Report.

1. Glossary

Below are key terms found in this Report. An expanded discussion the various technology types is found in **Appendix A**.

Broadband: The Federal Communications Commission (FCC) currently defines broadband as speeds that reach a minimum of 25 Mbps downstream and 3 Mbps upstream (25/3).

Backbone: A high-fiber count fiber optic mainline that provides connectivity to the internet. Connections to buildings from the backbone are called lateral connections.

Backhaul: In a telecommunications network, the backhaul portion of the network comprises the intermediate links between the core network, or backbone network, and the small subnetworks at the edge of the network.

Conduit: A means by which something is transmitted. The conduit houses the fiber.

Dark Fiber: Refers to fiber optic cable that has been installed and is available to use but is not connected to any electronic devices and not transmitting any data. *Also referred to as excess capacity.*

Demand Aggregation: Strategy employed by network owners to determine the neighborhoods in the community that are most likely to purchase service in order to build there first.

Fiber-to-the-Premise (FTTP) or Fiber-to-the-Home (FTTH): A last-mile network that connects all buildings (residential, business and government) in a community.

GPON Architecture: Defined as Gigabit Passive Optical Network. This is technology used to provide fiber connections to the end consumer.

Indefeasible Right of Use (IRU): Commonly used in the industry to provide long-term access to assets. Conduit and fiber deployed is leased through an agreement called an IRU.

Last-Mile Network: Network that provides services directly to homes and businesses in the community.

Latency: Term used to indicate the delay that happens in data communication over a network.

Middle-Mile Network: Typically defined as a network that serves community anchor institutions (i.e. schools, libraries, government buildings, public safety agencies, hospitals, etc.) but does not directly serve homes and businesses.

Open-Access Network: A network where the infrastructure assets (conduit and fiber) are made available through leases to multiple non-network owners that meet the terms and conditions set.

Outside Plant (OSP): Commonly used to refer to the engineering and construction of fiber infrastructure assets.

Over the Top (OTT): Television provided over a data stream but utilizing the existing wiring to the household

Public-Private Partnerships (PPPs): A legal partnership created by two or more public and private partners that balances and apportions risk, benefit and control of a last-mile network.

2. Competitive Landscape

One of the first tasks in conducting a broadband feasibility study is to undertake an evaluation of the current competitive landscape in the municipality. This includes looking at what existing infrastructure is present as well as researching what current providers are offering residents and businesses in terms of services and pricing.

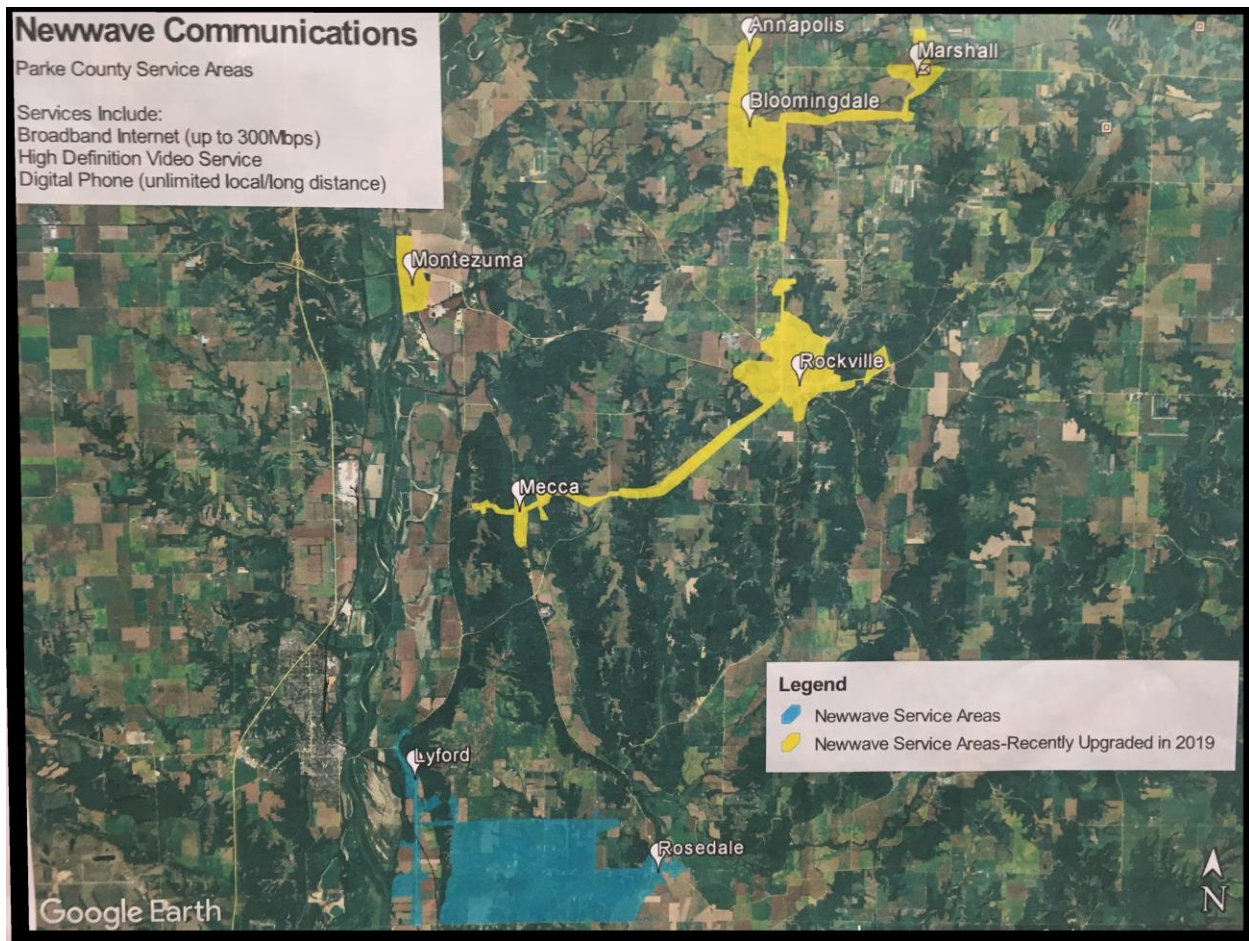
2.1 Existing Providers Network Infrastructure

This section explores what existing infrastructure assets can be found in Parke County and the surrounding communities as well as details discussions with the Providers that were part of the Stakeholder Outreach.

2.1.1 NewWave Communications

NewWave Communications has active fiber and copper assets within Parke County. During the meeting, NewWave Communications offered the map included below. NewWave did not indicate which areas contained fiber-based infrastructure, and which were copper based cable. NewWave did indicate that they had purchased much of their infrastructure within Parke County some time ago, and that at the time of purchase, the infrastructure was in disrepair. As shown below, they have recently completed a network upgrade in all areas of yellow on the map below to better serve customers. NewWave did not share any future plans for expansion. However, they did indicate that they were interested in learning more about County initiatives for broadband expansion in Parke County.

NewWave stated that they were open to hearing ideas proposed by the County on covering more areas but did not share any immediate plans to expand their existing footprint. NewWave was recently acquired by the large cable company CableOne. This has helped finance recent improvements to their existing infrastructure in Parke County. However, this may create more red tape in order for NewWave to work with the County.



2.1.2 Bloomingdale Home Telephone Company

Bloomingdale Home Telephone (Bloomindale) has existing and active fiber assets within Parke County. Bloomingdale indicated that they had planned their network design to extend in the future but had not yet finalized any plans to move forward with expansion. Bloomingdale also indicated that they have had discussions with Endeavor communications and were open to working with the County and other providers in the area to create a comprehensive plan to serve Parke County. Bloomingdale is extremely invested in Parke County and is vocal about serving the County to the best of their ability.

It must be noted that Bloomingdale Home Telephone Company is extremely well rated, and well liked within Parke County. In both the survey and stakeholder meetings, both businesses and residential customers touted their reliability, speeds, and customer service as excellent.

2.1.3 Endeavor Communications

Endeavor Communications is building fiber infrastructure in southeast Parke County. Endeavor shared that they have plans to build north and capture the Raccoon Lake. Endeavor is utilizing an online platform to gather interest in locations in order to direct their fiber build outs and ensure proper take rates and financial feasibility. The below map was taken from their online platform. The Green indicates areas which have active fiber service, and the orange areas indicate those which

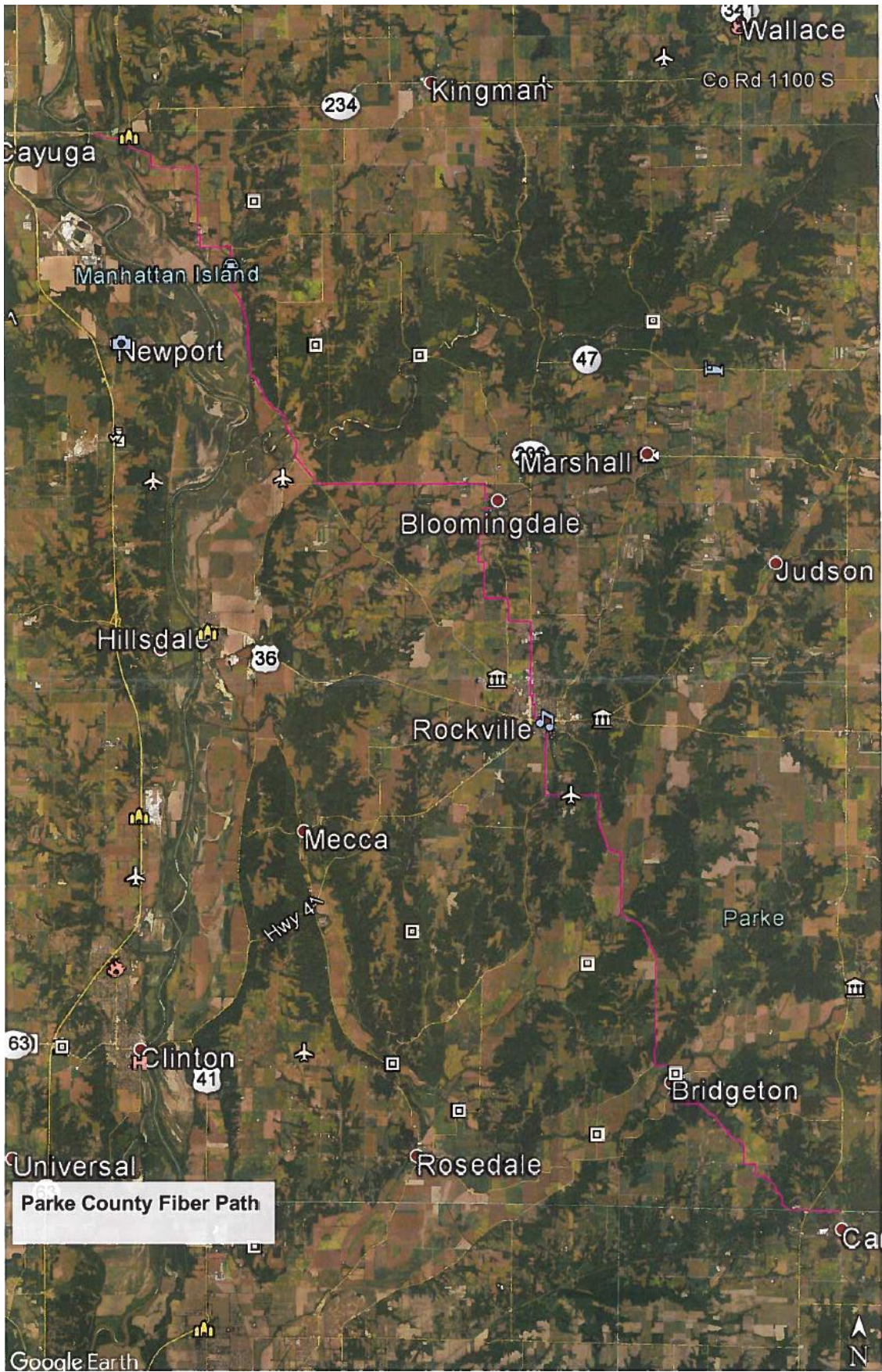
they are actively gathering interest to determine areas for upcoming builds. VPS spoke with Endeavor and they expressed interest in partnering with the County to bring broadband to areas which may not be currently financially feasible for them to serve.



2.1.4 Joink

Joink has existing and active fiber assets within Parke County. During the meeting, Joink shared their current fiber route project which traverses directly through Parke County. Joink shared that they did not have a set plan for connecting residential customers to the new fiber route, but they do have a long-term plan to roll out service to residential areas.

Joink was open to discussions about partnering with Parke County to create comprehensive broadband to all residents but was hesitant to commit any direct support. Joink stated that their primary focus is on completing the path, and then connecting businesses. The fiber path under construction currently is noted in pink on the map below.



2.1.5 AT&T

AT&T has fiber within Parke County. However, VPS was unable to determine exact locations, or amounts. VPS has found it difficult for municipalities to coordinate with AT&T on projects in the past. While leveraging existing AT&T fiber assets may be an option, VPS has not seen much success in this pursuit in the past.

2.2 Current Provider Offerings

This section details the packages and service offerings that are available in the region broken down by zip code and **according to the providers**. The main purpose for this exercise is to understand what the providers are saying in terms of their own services and availability.

For this portion of the Study, VPS collected data directly from each provider's website, as well as from a number of publicly available sources including BroadbandNow.com. **All of the data detailed in this section is information that is self-reported by the providers to third-party sites including the FCC.** For example, each provider is required to file a 477 Form with the FCC that details their coverage. Most third-party sites utilize the 477 data in addition to other publicly available data to generate coverage maps. **None of the data and information provided is the opinion of, nor validated by VPS.**

As such it is important to understand that the following:

- Providers report data based on entire census blocks and not by individual address level, so data does not accurately show where there might be gaps. Many third-party sites aggregate this data by zip code, which may further skew data.
- The speed data only shows the highest speeds of **what may be offered** by providers in an area. The speed data does not reflect what residents or businesses are actually receiving.
- It is unclear whether the FCC validates portions of the 477 data that is filed by the providers.

It is also important to note that unfortunately, most federal grant programs utilize the 477 data as a tool to determine whether an area is unserved or underserved. In other words, if the 477 data shows a provider is offering 10/1 speeds in an area – that area could be disqualified from pursuing federal funding opportunities. In addition, it would be the responsibility of the applicant to prove the negative - that an area is not actually being served if the 477 data says otherwise.

The data for the charts included for each zip code and area in this report includes:

- Provider
- Type of provider (wireline or wireless)
- Coverage % (within the zip code)
- Fastest advertised available speed (not actual speed)
- Customer rating (as reported by BroadbandNow.com)
- Pricing of stand-alone internet service offerings
- Pricing of available bundled package offerings

VPS looked at the variety of service offerings, as well as packages that are currently available through existing providers. The data will be presented through tables showing:

- Competitive data
- Residential and business price lists by carrier

- Residential and business bundled services price lists by carrier

The following caveats apply to this data:

- Only competitors who have greater than 2% coverage of an examined zip code have been included in this analysis.
- Providers often offer promotional pricing and alter pricing structures based on contract length and duration. The data included in this report attempts when possible, to be representative of having at least a 12-month contract with the provider. When possible, pricing included in this report excludes any promotional pricing offers in order to accurately represent total cost to potential customers.
- Pricing for bundled services has been included. There are many different options for bundled services. In an effort to provide clear and concise data, only standard bundled pricing options have been included.
- Enterprise or “build-to-fit” custom business offerings have not been included. All business pricing included is standardized offerings available to small to medium size businesses.
- Business coverage may not be representative of current service, rather willingness of providers to serve businesses in a given area.

2.2.1 Competitive Data Summary

The following tables serve as a summary overview of the number of providers in Parke County, type of technology, coverage area, and customer rating.

Rockville (47872)				
Provider	Type	Coverage %	Fastest Available Speed	Customer Rating¹
Residential				
AT&T Internet	DSL	59%+	Up to 25 Mbps	41%
Joink	Fixed Wireless	56%+	Up to 8 Mbps	70%
NewWave Communications	Cable and Fiber	49%+	Up to 300 Mbps	61%
Bloomington Home Telephone Co.	Fiber	24%+	Up to 100 Mbps	-
AgPro Wireless	Fixed Wireless	22%+	Up to 30 Mbps	-
Hoosier Broadband	Fixed Wireless	17%+	Up to .768 Mbps	-
airHOP	Fixed Wireless	5%+	Up to 3 Mbps	-
Business				
AT&T Business	DSL	100%	Up to 25 Mbps	41%
Hoosier Broadband	Fixed Wireless	82%+	Up to .768 Mbps	-
NewWave Business	Cable and Fiber	47%+	Up to 300 Mbps	61%
Joink	Fixed Wireless	41%+	Up to 8 Mbps	70%
Bloomington Home Telephone Co.	Fiber	2%+	Up to 100 Mbps	-

¹ The Customer Rating comes from www.broadbandnow.com and is based on whether or not current and verified customers would recommend the service to others. Example: 25% of customers asked would recommend the service to others. Those companies without ratings are marked with a dash.

Montezuma (47862)				
Provider	Type	Coverage %	Fastest Available Speed	Customer Rating
Residential				
AT&T Internet	DSL	81%+	Up to 25 Mbps	41%
NewWave Communications	Cable and Fiber	70%+	Up to 100 Mbps	61%
AgPro Wireless	Fixed Wireless	21%+	Up to 30 Mbps	-
Bloomington Home Telephone Co.	DSL and Fiber	5%+	Up to 50 Mbps	-
Wi-Power	Fixed Wireless	2%+	Up to 3 Mbps	39%
Business				
AT&T Business	DSL	100%	Up to 25 Mbps	41%
NewWave Business	Cable and Fiber	57%+	Up to 100 Mbps	61%

Bloomington (47832)				
Provider	Type	Coverage %	Fastest Available Speed	Customer Rating
Residential				
Hoosier Broadband	Fixed Wireless	95%+	Up to .768 Mbps	-
Bloomington Home Telephone Co.	DSL and Fiber	80%+	Up to 100 Mbps	-
NewWave Communications	Cable and Fiber	60%+	Up to 100 Mbps	61%
AgPro Wireless	Fixed Wireless	38%+	Up to 30 Mbps	-
Joink	Fixed Wireless	6%+	Up to 8 Mbps	70%
AT&T Internet	DSL	6%+	Up to 18 Mbps	41%
Business				
Hoosier Broadband	Fixed Wireless	100%	Up to .768 Mbps	-
NewWave Business	Cable and Fiber	100%	Up to 100 Mbps	61%
AT&T Business	DSL	32%+	Up to 18 Mbps	41%
Joink	Fixed Wireless	27%+	Up to 8 Mbps	70%
Bloomington Home Telephone Co.	DSL and Fiber	10%+	Up to 100 Mbps	-

Marshall (47859)				
Provider	Type	Coverage %	Fastest Available Speed	Customer Rating
Residential				
Hoosier Broadband	Fixed Wireless	100%	Up to .768 Mbps	-
AT&T Internet	DSL	83%+	Up to 18 Mbps	41%
NewWave Communications	Cable and Fiber	51%+	Up to 100 Mbps	61%
AgPro Wireless	Fixed Wireless	46%+	Up to 30 Mbps	-
Wi-Power	Fixed Wireless	27%+	Up to 3 Mbps	39%
Joink	Fixed Wireless	15%+	Up to 8 Mbps	70%
Wi-Power	Fixed Wireless	14%+	Up to 3 Mbps	39%
Bloomington Home Telephone Co.	DSL	9%+	Up to 10 Mbps	-

Business				
AT&T Business	DSL	100%	Up to 18 Mbps	41%
Hoosier Broadband	Fixed Wireless	100%	Up to .768 Mbps	-
NewWave Business	Cable and Fiber	54%+	Up to 100 Mbps	61%
Joink	Fixed Wireless and Fiber	27%+	Up to 8 Mbps	70%

Rosedale (47874)				
Provider	Type	Coverage %	Fastest Available Speed	Customer Rating
Residential				
NewWave Communications	Cable and Fiber	75%+	Up to 100 Mbps	61%
AT&T Internet	DSL	57%+	Up to 25 Mbps	41%
Joink	Fixed Wireless	28%+	Up to 8 Mbps	70%
Frontier Communications	DSL	27%+	Up to 24 Mbps	34%
AgPro Wireless	Fixed Wireless	8%+	Up to 30 Mbps	-
Business				
NewWave Business	Cable and Fiber	100%	Up to 100 Mbps	61%
AT&T Business	DSL	88%+	Up to 25 Mbps	41%
Frontier Business	DSL and Copper	55%+	Up to 24 Mbps	34%
Joink	Fixed Wireless and Fiber	55%+	Up to 8 Mbps	70%
Spectrum Business	Cable	3%+	Up to 100 Mbps	50%

Mecca (47860)				
Provider	Type	Coverage %	Fastest Available Speed	Customer Rating
Residential				
NewWave Communications	Cable and Fiber	100%	Up to 100 Mbps	61%
Business				
NewWave Business	Cable and Fiber	100%	Up to 100 Mbps	61%

Bridgeton (47836)				
Provider	Type	Coverage %	Fastest Available Speed	Customer Rating
Residential				
Satellite Only				

Satellite - Across All Zip Codes				
Provider	Type	Coverage %	Fastest Available Speed	Customer Rating
Residential & Business				
HughesNet	Satellite	100%	Up to 25 Mbps	25%
Viasat/Exede	Satellite	100%	Up to 100 Mbps	35%

2.2.2. Residential and Business Price Lists by Carrier

The next two tables detail the residential and business pricing for the services offered by each carrier.

2.2.2.1 Residential Pricing

Provider	Speed (Mbps)	Price
AT&T Internet	Up to 5 Mbps	\$40.00
	Up to 25 Mbps	\$50.00
AgPro Wireless	Up to 30 Mbps	Not Publicly Available
airHOP	Up to 3 Mbps	Not Publicly Available
Bloomingdale Home Telephone Co.	Up to 10 Mbps	\$39.95
	Up to 25 Mbps	\$55.95
	Up to 50 Mbps	\$79.95
Charter Spectrum	Up to 30 Mbps	\$44.99
Hoosier Broadband	Up to .768 Mbps	\$44.95
	Up to 1 Mbps	\$69.95
	Up to 1.5 Mbps	\$99.95
Joink	Up to 7 Mbps	\$54.95
	Up to 15 Mbps	\$74.95
	Up to 25 Mbps	\$104.95
NewWave Communications	Up to 15 Mbps-100GB Data	\$30.00
	Up to 100 Mbps-300GB Data	\$55.00
	Up to 200 Mbps-600GB Data	\$65.00
	Up to 300 Mbps-900GB Data	\$80.00
Wi-Power	Up to 5 Mbps	\$49.95
	Up to 10 Mbps	\$79.95
	Up to 15 Mbps	\$99.95
	Legacy - Up to 4 Mbps	\$49.95
	Legacy - Up to 6 Mbps	\$79.95
	Legacy - Up to 10 Mbps	\$99.95
Endeavor Communications	Up to 25 Mbps	Not Publicly Available
	Up to 50 Mbps	Not Publicly Available

	Up to 100 Mbps	Not Publicly Available
	Up to 1 Gig	Not Publicly Available

2.2.2.2 Business Pricing

Provider	Speed (Mbps)	Price
AT&T Business	Up to 18 Mbps	\$60.00
Bloomingdale Home Telephone Co.	Up to 10 Mbps	\$49.95
	Up to 25 Mbps	\$89.95
	Up to 50 Mbps	\$125.00
	Up to 100 Mbps	\$500.00
Hoosier Broadband - Home Business	Up to 1 Mbps	\$54.95
	Up to 2 Mbps	\$64.95
Hoosier Broadband - Business	Up to 1 Mbps	\$99.95
	Up to 1.5 Mbps	\$149.95
	Up to 2 Mbps	\$199.95
Joink - Business	Up to 8 Mbps	\$99.95
	Up to 50 Mbps	\$199.99
	Up to 100 Mbps	\$249.99
	Up to 250 Mbps	\$299.99
NewWave Communications	Up to 25 Mbps	Not Publicly Available
	Up to 50 Mbps	Not Publicly Available
	Up to 100 Mbps	Not Publicly Available
Spectrum Business	Up to 100 Mbps	Not Publicly Available
Endeavor Communications	Up to 25 Mbps	Not Publicly Available
	Up to 50 Mbps	Not Publicly Available
	Up to 100 Mbps	Not Publicly Available
	Up to 1 Gig	Not Publicly Available

2.2.2.3 Satellite Providers

Provider	Speed (Mbps)	Price
Residential		
HughesNet	Up to 25 Mbps - 10 GB Data	\$59.99

	Up to 25 Mbps - 20 GB Data	\$69.99
	Up to 25 Mbps - 30 GB Data	\$99.99
	Up to 25 Mbps - 50 GB Data	\$149.99
Viasat/Exede	Up to 25 Mbps - Data Prioritized	\$50.00
	Up to 25 Mbps - Data Prioritized	\$70.00
	Up to 50 Mbps - Data Prioritized	\$100.00
	Up to 100 Mbps - Data Prioritized	\$150.00
Business		
HughesNet	Up to 25 Mbps - 35 GB Data	\$69.99
	Up to 25 Mbps - 50 GB Data	\$99.99
	Up to 25 Mbps - 75 GB Data	\$149.99
	Up to 25 Mbps - 100 GB Data	\$199.99
Viasat/Exede	Up to 35 Mbps - 1 GB Data	\$50.00
	Up to 35 Mbps - 10 GB Data	\$80.00
	Up to 35 Mbps - 20 GB Data	\$100.00
	Up to 35 Mbps - 50 GB Data	\$150.00
	Up to 35 Mbps - 200 GB Data	\$400.00
	Up to 35 Mbps - Unlimited Data	\$175.00

2.2.3 Bundled Services Pricing Lists by Carrier

2.2.3.1 AT&T Bundled Services

Phone + Internet			
Broadband Speed	Channel Offering	Price	Add-Ons
Dependent on Location	-	\$72.00	Wi-Fi Gateway Router Included
Phone + Internet + DirectTV			
Broadband Speed	Channel Offering	Price	Add-Ons
Dependent on Location	155+	\$94.99	Wi-Fi Gateway Router Included
Phone + Internet + DirectTV			
Broadband Speed	Channel Offering	Price	Add-Ons
Dependent on Location	180+	\$94.99	Wi-Fi Gateway Router Included

2.2.3.2 Bloomingdale Home Telephone Company Bundled Services

Phone, Internet, & 250 Long Distance Min.			
Broadband Speed	Channel Offering	Price	Add-Ons
Up to 10 Mbps	-	\$64.95 + Tax	Calling features at additional costs
Phone, Internet, & 250 Long Distance Min.			
Broadband Speed	Channel Offering	Price	Add-Ons
Up to 25 Mbps	-	\$74.95 + Tax	Calling features at additional costs
Phone, Internet, & 250 Long Distance Min.			

Broadband Speed	Channel Offering	Price	Add-Ons
Up to 50 Mbps	-	\$99.95 + Tax	Calling features at additional costs

2.2.3.3 Charter Spectrum Bundled Services

Internet - Phone			
Broadband Speed	Channel Offering	Monthly Price	Add-Ons
Up to 100 Mbps	-	\$54.98	Free Internet Modem
Internet - TV			
Broadband Speed	Channel Offering	Monthly Price	Add-Ons
Up to 100 Mbps	125+	\$89.98	Free HD, On Demand, Optional DVRs
Up to 100 Mbps	175+	\$109.98	Free HD, Unlimited Local & Long Distance
Internet - TV – Phone			
Broadband Speed	Channel Offering	Monthly Price	Add-Ons
Up to 100 Mbps	125+	\$99.97	Free HD, Unlimited Local & Long Distance
Up to 100 Mbps	175+	\$119.97	Free HD, Unlimited Local & Long Distance
Up to 100 Mbps	200+	\$139.97	Free HD, Unlimited Local & Long Distance

2.2.3.4 NewWave Communications Bundled Services

Elite Package with Starter 100 Mbps Plus			
Broadband Speed	Channel Offering	Price	Add-Ons
Up to 100 Mbps	Standard Cable	\$154.00	Unlimited Local & Long Distance
Elite 3 Pack Bundle with 200 Mbps Plus			
Broadband Speed	Channel Offering	Price	Add-Ons
Up to 200 Mbps	Standard Cable	\$164.00	Unlimited Local & Long Distance
Elite 3 Pack Bundle with 300 Mbps Plus			
Broadband Speed	Channel Offering	Price	Add-Ons
Up to 300 Mbps	Standard Cable	\$179.00	Unlimited Local & Long Distance

2.2.3.5 Endeavor Communications

Endeavor offers phone and internet package pricing. All package pricing requires a 2-year agreement. Pricing available upon signing up for services.

2.2.3.6 HughesNet and Viasat

HughesNet offers lowered pricing for both residential and business customers who bundle internet and phone together. Currently, HughesNet offers \$10 off per month for bundling for the first twelve months.

Similar to HughesNet, Viasat offers lowered pricing for residential and business customers who bundle internet and phone together. Viasat also offers discounted pricing for bundling their services with DirectTV. Currently, customers can save \$10 a month for the first six months when bundling phone and internet, and an additional \$10 a month for the first twelve months when bundling internet and DirectTV.

2.3 Key Findings

Based on the information gathered from discussions with existing providers, VPS provides the following key findings:

- The County has a fair amount of middle-mile infrastructure. Providers such as NewWave, Joink, and Endeavor all have current, recently completed, or planned projects to upgrade or increase infrastructure within Parke County. However, these projects are not comprehensive solutions, rather targeted and regional projects.
- Overall, there are a number of providers. However, many residents still do not have access to reliable high-speed broadband. Areas who are served by local providers such as Bloomingdale and Endeavor have solid and reliable service. Areas who are served by only AT&T and/or satellite options struggle. Current local providers have not expanded to many of these areas due to population density, and potential shortfalls with return-on-investment of construction and maintenance costs.
- There is not an effective and comprehensive residential fiber deployment in Parke County. Population density and terrain have kept local providers from providing a more comprehensive solution for Parke County.
- Many homes are limited to only Fixed Wireless, Mobile, or Satellite providers. Depending on a variety of issues these providers may present latency issues which limit the speed and capability of the end user's connection.
- Other than Endeavor Communications, no current service providers in Parke County have shared any plans to expand their service areas in the immediate future to serve residents who are currently underserved or completely unserved.

3. Survey and Stakeholder Outreach Results

The biggest question a municipal feasibility study needs to answer is “what is the problem we need to solve?” As such, the most critical task of a feasibility study is to conduct outreach in the community in order to talk to as many stakeholders as possible. Stakeholders represent key groups of potential end-users of a municipal network such as citizens, businesses and government agencies. The purpose is to obtain feedback regarding current levels of service, future needs and concerns.

In order for the stakeholder outreach to be as comprehensive as possible, VPS utilized a variety of methods to collect the data and information including holding one-on-one meetings with key groups, leading a town-hall discussion, and conducting a residential survey.

3.1 Stakeholder Meetings

VPS conducted stakeholder meetings with a variety of groups. A chart detailing those comments is provided below.

Group	Comments
Health Care	Local healthcare providers are finding that poor broadband negatively impacts their patient’s ability to utilize services such as online charting, record keeping and viewing, and ordering and receiving of new prescriptions. They also found it difficult to advertise new health initiatives to residents. Providers also found that poor broadband to residents was hampering the growth of telemedicine and home health programs in the area. With an aging population, the ability to eliminate some routine travel to doctors could be extremely helpful to elderly patients.
Business Community	Within the incorporated areas of Rockville, business owners felt they were provided with good options for broadband. However, outside of the incorporated areas, businesses felt the poor coverage did not allow them to serve customers to their best ability. They also mentioned the strain on commerce during local festivals and events. Vendors are often unable to run credit card processing equipment remotely which limits sales and customers dramatically. Limited cellular coverage and limited Wi-Fi hotspots, or public Wi-Fi also means that directing new customers to local business locations via the internet is almost impossible. Mapping applications are unable to effectively be utilized in many areas of the County.
Farmers / Agriculture	Farming, like the rest of the world is increasingly utilizing smart technology. Poor access to broadband can hamper farmers ability to run much needed state of the art technology on tractors and equipment. Poor broadband and cellular connectivity can also limit technician’s ability to service equipment in the field, access GPS and other needed software.
Public Safety	Limited broadband and cellular coverage create complete communication “dead zones” during certain times of the year at recreational areas and local festivals. This creates situations where individuals are unable to contact first responders and first responders are unable to communicate with individuals in distress. Local public safety officials also noted that improved broadband speeds at public safety buildings would allow for increased training opportunities.
Schools and Libraries	Schools and Libraries are reportedly well served in Parke County. However, students often struggle without proper connections at home. As more and more homework is accessed online, and textbooks become digital, this fact creates an issue with students and families who are underserved or unserved by broadband providers. Local schools noted the need to print out text book pages for students without access to the internet. Many students were unable to complete work without coming in early to school to upload or download documents. It was also noted that communication to parents is costly as the schools must duplicate any communication made digitally with a physical mailer or phone call. Poor broadband for many households limits the effectiveness of digital-only or email communications.

Citizens – Town Hall Meeting	Citizens who attended the Town Hall voiced a number of concerns and opinions. Citizens echoed concerns heard in the survey which highlighted problems with speed, connectivity and reliability throughout the County. Citizens voiced concerns about the cost effectiveness of fiber, but also the speed and reliability of a wireless option given the varied terrain. Citizens were concerned about local and state support for the program as well as what cost would be transferred to them and how long the project would take. Citizens confirmed concerns of not being able to effectively work from home, as well as discrepancies with where companies were currently showing service availability on FCC maps.
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In summary, there are five key points that stand out from the Stakeholder Outreach. They are:

- Many areas need better internet connection options and cellular coverage. Not having access is negatively impacting local business, employee attraction and economic growth.
- Lack of coverage is creating significant issues for public safety and first responders, especially during the summer and around recreational areas and local festivals.
- Internet plans for residents and businesses in rural areas are expensive and mobile broadband, fixed wireless and satellite technologies present speed and latency issues for many customers. Some residents report paying a premium for broadband service that often doesn't work at all.
- Healthcare providers are limited in using online charting, online access to patient records, telehealth and home health due to poor broadband options for patients.
- There is a clear need for more infrastructure – towers and fiber throughout the area. Notably, several reports by providers note that cellular towers need upgraded infrastructure to provide improved service.

3.2 Residential Survey Results

VPS conducted an informal residential market demand survey to obtain key data points regarding current level of service, satisfaction with current providers, resident's willingness to switch providers, and what price do residents consider to be reasonable for high-speed broadband.

The survey itself contained a total of 27 questions (4 of which were demographic related) and was hosted on the online platform of Survey Monkey. Overall, VPS received 909 survey responses.

Please note: Due to budgetary restraints, this was considered an informal survey primarily because it lacked a randomized targeted mail program. In order to obtain responses, the link to the online survey was shared through social media, emails, press releases and other methods. Respondents chose to participate (self-selection bias). There was little control over the geographic distribution of the respondent sample. However, with 909 responses, this survey resulted in valuable directional research.

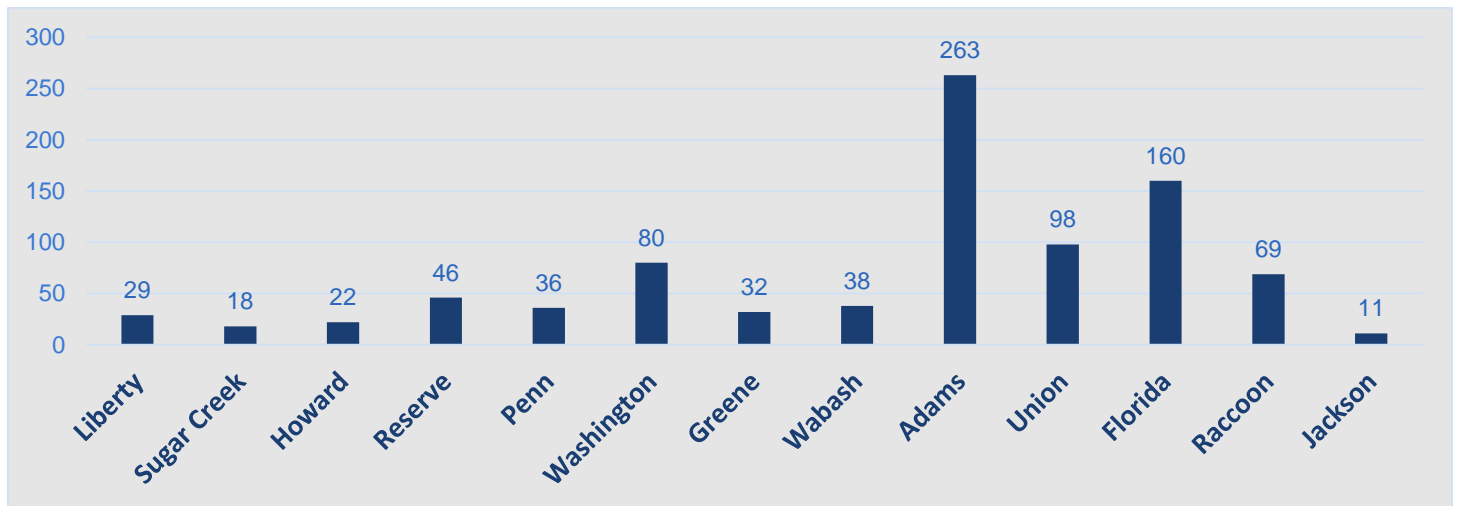
The official survey data and analysis is presented below broken down by topic. Actual results are rounded to the closest whole percent for presentation purposes.

3.2.1 Demographics

Respondents identified themselves as being from the 13 townships in Parke County. The townships are as follows:

1. Liberty
2. Sugar Creek
3. Howard
4. Reserve
5. Penn
6. Washington
7. Greene
8. Wabash
9. Adams
10. Union
11. Florida
12. Raccoon
13. Jackson

Number of responses from the above townships:



3.2.2 Household Services Purchased and Ranking by Importance

Respondents purchase a variety of communications services for their household, but they are not purchased equally. For example:

- 86% purchase internet
- 86% purchase cellular/mobile service
- 65% purchase cable or satellite television
- 30% purchase land-line telephone service
- 1% purchase phone service such as VOIP directly from a cable provider

When asked to rank the services from most to least important, internet and cellular/mobile telephone service were overwhelmingly the most important. On a ranking scale with 4 being most important, the following scores illustrate what community members find most important:

- 3.36 for High-speed internet connection
- 3.14 for Cellular/mobile telephone
- 2.22 for Television
- 1.38 for Fixed (land-line) telephone

3.2.3 Current Internet Service

Approximately 86% of respondents purchase internet services in some form in Parke County and the surrounding areas. Approximately 46% of those who do not purchase internet services indicated that internet was not available at their location. Other reasons for not purchasing internet included that internet was simply too slow to purchase (25%), or that an internet connection was too expensive (18%). The remaining respondents stated a number of other reasons for not purchasing internet services.

For those that do purchase internet services, the survey asked about cost. Around 5% of respondents answered that they purchase internet through a bundled package with phone and/or television so it's difficult to determine how much they are paying just for internet. However, of the remainder that do purchase internet as a stand-alone service:

- 30% are paying \$41-\$60 a month
- 24% are paying \$61-\$80 a month
- 19% are paying \$40 or less a month
- 13% are paying \$81-\$100 a month
- 10% are paying over \$100 a month

It is important to note that 41% of respondents receive their service from AT&T. Approximately 15% purchase service from Bloomingdale Home Telephone Co. Another 15% purchase service from NewWave Communications. 10% purchase service through HughesNet, and 9% purchase services through Viasat/Exede. The remaining number of respondents are served by various providers. Despite the number of providers present in Parke County, many respondents commented that they felt they did not feel they had enough provider or service options in their respective areas. They felt this lack of providers hampered Parke County in a number of ways.

3.2.4 Satisfaction of Current Providers

The next set of questions explore how satisfied internet subscribers are with their current broadband providers and service.

Approximately 31% of respondents are either very satisfied or satisfied with the overall service and value they receive from their current provider. Approximately 45% of respondents answered that they were dissatisfied or very dissatisfied with their current overall service and value they receive from their internet provider. This leaves 24% who are neither satisfied or dissatisfied.

This level of satisfaction is well below average. Looking deeper into what aspects of service respondents were most concerned with, the following statistics stated:

- 27% were either very satisfied or satisfied with price of service, while 53% were unsatisfied or very unsatisfied with the price of service. The remaining amount were neutral.
- Approximately 42% were very satisfied or satisfied with the speed of their connection. 40% of respondents were unsatisfied or very unsatisfied with the speed of their connection. The remaining amount were neutral.
- Respondents were overall more likely to believe that their connections were not reliable as 39% felt very satisfied or satisfied with their current connection. 41% who were unsatisfied, or very unsatisfied with their connection’s reliability. The remaining amount were neutral.

Delving a bit deeper into the various aspects of their internet service, respondents indicated how important certain aspects of home internet service were to them. The following percentage of respondents felt the following aspects were “very important” or “important” to them:

- Reliability (99%)
- Speed (98%)
- Price (96%)
- Overall customer service (94%)
- Technical support (93%)

3.2.5 Willingness to Switch from Current Providers

Keeping in mind what respondents are currently paying for internet service, the survey asked respondents what is the most they would pay if a new provider offered gigabit service. The respondents answered the following:

Answer Choices	Responses
\$21 to \$40	22%
\$41 to \$60	34%
\$61 to \$80	22%
\$81 to \$100	13%
\$100 to \$125	4%
Over \$125	1%

75% of respondents indicated that they would switch providers at the price selected above. This data suggests that individuals may be willing to pay slightly more money to receive a higher quality service. However, according to a previous question in which only 27% of respondents were satisfied with price, raising prices past current market may be more than current residents are able to bear. The data and survey indicate most importantly that residents would switch to a provider who offered them value. Many households indicate they are already paying a premium for services, yet not receiving adequate speeds or reliability. These households are not likely to pay more, yet they would be willing to switch to a provider who offered them more for what they are already paying.

3.2.6 Willingness to Pay One-time Hookup Fees

The Survey asked respondents what is the most you would pay for a one-time hookup/connection fee if it were required by a new provider that offered a reliable, robust, high-speed internet connection (up to 1 Gig) The purpose of this question is to explore partial funding mechanisms for deploying a network. Any hook-up fees can help offset some or a significant portion of the deployment fees depending on the amount. Parke County residents do not mind paying hook-up fees if

they are reasonably priced, but they would need to be under \$100. Unfortunately, at this price point, the fee would do little to offset any costs. Hookup fees, especially in rural areas, can be much higher. Below is the data on how much respondents would be willing to pay:

- 43% would pay \$50 dollars or less
- 30% would be willing to pay up to \$100 dollars for a hook-up fee
- 7% would be willing to pay up to \$250 dollars
- 3% of respondents would pay or consider a fee over \$250 dollars
- 17% were averse to the idea of a hookup fee and indicated that they would not pay an upfront hook-up fee regardless of cost.

3.2.7 Television

Television is an important staple in many households across America. As technology changes, there have become more options for watching popular shows, movies, and live events. Many individuals have begun to move away from traditional sources of television (Cable or Satellite) and started purchasing programming options over the internet. In Lyndon and the surrounding areas, the data for television programming is as follows.

Respondents reported that:

- 64% purchase satellite television such as Direct TV
- 24% stream content over the internet (including Netflix, Hulu, Vudu, etc...)
- 15% obtain television content free - over the air with an antenna
- 7% purchase cable television
- 6% don't purchase any television service
- 4% only stream shows using the internet and do not subscribe to any other television service

The data tells us that 71% of respondents purchase satellite and cable services and 24% are currently purchasing Internet programming (such as Netflix, Hulu, Vudu). Respondents were able to select more than one option, so someone could indicate they purchase cable service and buy programming through the internet. Interestingly, only 4% of respondents who are using Internet streaming services are not paying for some other type of programming via satellite or cable. This indicates that, for those purchasing programming in the Parke County area, most have not made the switch to solely streaming their video and television programming and becoming "cord cutters."

Cord cutting is the term given to households that stop purchasing traditional television services and instead solely utilize their internet connection to stream television content. While cord cutting is a national trend, rural areas have seen a much slower adoption rate due to speed and connectivity issues. Broadband providers have also found that television service is a necessary offering in order to help drive subscription rates – in part due to discount rates for bundled service packages (TV, internet and phone).

3.2.8 Cellular Telephone

Since the feasibility study also looked at cellular broadband, the survey asked a few questions about resident's cell phone experiences. Overall 93% purchase cellular telephone service. Approximately 80% of respondents purchase cellular service through AT&T. Percentages of identified carriers are as follows:

- 80% AT&T
- 9% Verizon
- 1% T-Mobile
- 1% Sprint
- 1% US Cellular
- 8% Other

Approximately 20% of those that purchase cellular telephone service indicated that “The cell signal is weak at my house and it's very difficult to use my cell phone at home.” Another 19% indicated that they need to move around the house in order to make or receive a call. Just over 5% of respondents had no cellular telephone service at their residence. 56% of respondents answered that their cell signal was strong most of the time or better.

Overall, based on the data, the cellular coverage in Parke County is relatively good and reliable in certain areas, and struggles immensely in other areas. Due to the lack of available broadband providers, some residents have chosen to use cellular hotspots which provide internet for devices through cellular data. These are often far more costly than traditional services, and are data capped. This means there may be limited use.

3.2.9 County Action

The survey asked one question regarding respondents’ opinion of the role of the County in improving broadband. The responses were very mixed. However, approximately 32% agree with the statement that local government has a role in improving broadband services, but they aren’t sure what government should do. 20% believe that local government should use public funds to finance and build a County-owned network. In stark contrast, around 14% of respondents believe that current providers are meeting the needs and local government shouldn’t do anything. Another 34% of respondents felt the local government needed to at least consider using public funds to finance a network of some kind if current providers were not able to improve broadband services in Parke County.

Out of 274 respondents who added additional general comments, only 23 respondents added that they were wary or had adverse opinions to local government becoming involved in broadband improvement. This is notably below the average rate of responses directed at local government’s involvement in broadband improvement.

3.2.10 Respondent Comments

Below is a summary of the open-ended comments submitted by survey respondents that express a wide-range of opinions regarding their current concerns and need for better broadband.

Note: The opinions stated below are directly from respondents of this survey and do not represent the views, opinions or positions of VPS in any way.

- **Parke County residents have very strong opinions about the current state of broadband in the communities they reside in.**
 - *“I am going to move if internet coverage does not improve. How can our townships bring in new families if we do not keep up with technology? Our towns are going to continue to decline if conditions do not improve.”*
 - *“Internet service in Parke County really, really needs some help.”*
 - *“Parke County is a dead zone, countywide. There needs to be adequate internet and cell coverage EVERYWHERE. Over at Riverton Parke cell coverage is non-existent, which is a huge safety factor for our children. Around (the) Bridgeton area, cell and internet coverage is non-existent. This problem needs rectified NOW.”*

- **Many Parke County residents believe that their broadband options and deployments are behind the times.**
 - *“It is very frustrating to be so far behind the times when it comes to internet connectivity.”*
 - *“We are setting our community back by not having internet. It is 2018, there has to be a way.”*
 - *“The internet service in Parke County is very outdated, unreliable, and in need of major improvements. It is astonishing how “behind the times” we are in terms of availability of internet service. It needs attention. It is important for the residents of Parke County to have access to high speed reliable internet.”*

- **Many residents in Parke County feel that they do not have as many options for broadband as they would like and that certain areas of Parke County are monopolized by current providers.**
 - *“Just happy it is being looked into. We don’t have any options and the companies know this, they take advantage of us.”*
 - *“Satellite internet is the only option right now and it is EXPENSIVE. It would be great to have another option.”*
 - *“The options and prices are horrible. I would love to not have satellite internet and phone.”*

- **Many residents expressed concerns about the personal and public ramifications that not improving broadband access may have. Respondents were notably concerned about educational and economic issues.**
 - *“Reliable high-speed internet is invaluable to creating opportunities of employment and education for current and future residents.”*
 - *“I realize that we are rural, and we all choose to live here but it does not mean we are behind the times. Reliable, high speed internet is necessary for many of us including children who now have much of their curriculum tied to technology. Students shouldn’t have to use their cell phones to complete homework assignments or type essays because they don’t have access to internet. Ost farmers have gone to using technology. Their technology requires internet services to download their days work in planting and harvest, as well as many other ways that require them to use technology to stay at the top of their field.”*
 - *“Having broadband speed internet in Parke County would greatly benefit their citizens and help launch the county into the future. So much is relying on the internet these days, from entertainment to education. The school corporations would be able to participate in E-learning days and reduce the time away from school. It would also help individuals who are considering higher education with classes only offered online.”*

- **Many Parke County residents praised Bloomingdale Telephone Company and want to see their service area expanded.**
 - *“I would like to see Bloomingdale expand their coverage area. They have excellent service.”*
 - *“Bloomingdale phone company should expand their services they are affordable and have good connectivity.”*
 - *“BHTC is the best internet provider with great customer service and technical support.”*

- **Broadband experiences currently vary majorly from resident to resident. Two locations and residences may have completely different experiences with speed and reliability.**
 - *“I have heard many great things about Bloomingdale Telephone and internet service!! Not only is it extremely reliable but it is also affordable at a reasonable cost for services. Unfortunately, living even just 2 miles off the highway on a county road that doesn’t have many houses, hinders those of us that would love to have TV and internet service by a local provider, and to speak to a local person if problems arise.”*
 - *“If you are in BHTC’s range, you are good to go. If you are outside town and/or not able to get BHTC, you’re screwed.”*
 - *“Depending where at in Parke Co. you live you may have good internet some don’t.”*

- **Many areas of Parke County lack speeds which meet the FCC’s high-speed broadband standards and lack basic cellular coverage.**
 - *“Many areas in Parke County do not carry any service I fear for my family to contact emergency help.”*
 - *“Not just internet, but also cell service. It is imperative to be able to reach out in case of emergency and many places in the county have no coverage for anything but AT&T and even then, AT&T coverage is lacking in some places.”*
 - *“Due to lack of cell service in our area and little to no internet it makes it very hard for our kids to keep up with school work at home. If we had one or the other, we could get by, but we have neither. It seems the individuals that have cellular service also have great internet and since we live further out, we have neither. I understand cost vs only a few individuals, but we are falling behind.”*

- **Residents of Parke County are extremely interested about value. They want to see the speed and reliability of service they feel matches the amount they pay to current providers.**
 - *“Please get us a reliable internet connection. We have tried all available to us and they are just not worth the money spent.”*
 - *“Absolutely terrible and ridiculous in pricing. How are people supposed to do a job that requires internet or kids do schoolwork at home when things are online now?”*
 - *“We pay the same price for terrible speeds as the people in larger cities pay for very high speeds. I’m so glad our county is doing something to improve this situation!”*

4. Municipal Network Model Overview

There are two main types of municipal networks that serve end-users (other than networks built exclusively for internal government use) and they are most commonly referred to as last-mile and middle-mile. For purposes of this discussion, the term network is inclusive of all technologies including fiber and/or wireless.

4.1 Last-Mile Network Models

A last-mile network (also known as Fiber-to-the-Premise or FTTP) is one that is designed to provide service directly to homes and businesses in the community. Last-mile networks can also serve government buildings and other community anchor institutions.

Last-mile networks are the most expensive to deploy but can provide the biggest benefit to the community. However, municipal FTTP networks are also more-rare due to the cost it takes to deploy the infrastructure and the need to have an operator/provider who can run and manage the network. For this reason, most of the municipal last-mile networks in existence are in communities that also have a municipal electric utility. This is because the local government (through its municipal utility) already owns utility pole infrastructure that can be leveraged to offset deployment costs. Municipal electric utilities also have operating and billing systems already in place to serve customers. Therefore, they have experience in serving customers and can more easily shift gears to offer a broadband service as a new offering rather than having to create an operational system greenfield.

The other key factor is that last-mile networks usually require a take-rate that is between 40-60%. This means that the network operator needs to obtain 40-60% of the residential subscriptions available in the community in order to recoup the capital investment, make a profit and be sustainable. Examples of FTTP networks – both those that have a municipal electric utility and those that do not - are provided below. The municipal electric network examples are all very similar and so only one example is provided.

Muni Electric FTTP Network Examples	
Longmont, CO	<p>Longmont’s “NextLight” is a gigabit fiber network owned and operated by the city and its power utility, Longmont Power & Communications (LPC). In 2013 Longmont supported the network build at a 70% level, approving a \$40.3 million bond issuance to cover the startup costs of the Internet service. Even the \$40 million price tag would have been significantly higher if not for the existing asset of an 18-mile fiber loop within the City’s limits.</p> <p>Longmont has 38,000 premises and 92,000 residents within its approximately 30 square miles. NextLight offers symmetrical gigabit service at \$50/month for those who signed up early. This \$50 rate is for both the lifetime of the home as well as the owner should he/she move within city limits.</p> <p>Late in 2016 the City voted to increase LPC’s budget by \$7 million, sourced from the Electric and Broadband Utility Fund balance to hire staff needed to support take rates significantly higher as initially predicted. Current take rates average 53%.</p>

Non-Muni Electric FTTP Network Examples	
Rio Blanco County, CO	Rio Blanco County utilized county funds and State of Colorado grant funds to construct an FTTP network serving its rural community. The technologies deployed are a mix of fiber and wireless. Rio Blanco is building a fiber to the premises network in its main two population centers (Meeker and Rangely) and a shared fixed wireless solution designed to reach all other addresses. Additionally, Rio Blanco is building middle-mile fiber available for carriers to lease in the county.
Ammon, ID	<p>The City of Ammon Idaho has a very unique model. Ammon has built an open access network that lets multiple private ISPs offer service to customers over city-owned fiber. The City self-funded a portion of the network. However, Ammon is using a model similar to Google Fiber's "Fiberhoods," in which construction happens first in neighborhoods where a majority of residents commit to buying service. Those who opt-in have the option to pay either an upfront fee of \$3000 or pay the amount gradually over a 20-year period, excluding an additional utility fee of \$16.50 a month. Should a home-owner sell their house prior to the \$3000 fee being paid off – it would be the responsibility of the new home-owner to continue those payments. Conversely, should a homeowner move after paying the upfront fee – the new homeowner would have the benefit of the network connection without needing to pay the connection fee.</p> <p>This model has been touted as the “model of the future” but it is far from being complete. Success is yet to be determined the fee structure may not be appropriate for many communities.</p>
Sandy, Oregon	<p>In 2001, the City of Sandy formed its own municipal internet utility in order to get the connectivity it needed to perform basic government functions. At that time, Sandy couldn't even get a DSL line from a local provider to serve City Hall. The service expanded and in 2013, Sandy decided to move from DSL and wireless to building a FTTP network to serve government, residents and businesses. What makes Sandy unique is that at that time, there were very few municipal broadband networks that were deployed without leveraging a municipal electric utility. Working with partners to implement the network, Sandy issued a bond for 7.5 million dollars to cover the costs of construction. Construction was completed in 2015 and the network is very successful with a take rate of approximately 60%. Sandy charges \$59.95 for symmetrical gigabit service.</p> <p>Sandy is also located in Clackamas County which built its own middle-mile network as detailed below. One way they have partnered is that Clackamas County needed some conduit and space in Sandy's data center. In exchange, the County gave the city dark fiber into Portland's Northwest Access Exchange, where the city now interconnects for access to the wider Internet.</p>
Fairlawn, OH	The City of Fairlawn established FairlawnGig as a forward-thinking, economic development strategy founded on the belief that business growth, innovation, and community transformation will follow with every connection. The build cost approximately \$10 million dollars (paid for by bond) and the City will connect every home and business. The City is not looking to the network to become a profit-making revenue stream. The City felt that FairlawnGig was a necessity for the community at large. The network has a take rate of just over 50% and is looking at expanding to neighboring towns.

4.2 Middle-Mile Networks

A municipal middle-mile network is typically defined as a network that serves community anchor institutions (i.e. schools, libraries, government buildings, public safety agencies, hospitals, etc.) but does not directly serve homes and businesses. A middle-mile network could either be operated directly by the municipality or outsourced to a network operator.

The purpose of middle-mile networks is generally to build a high fiber count (fiber cables with strand counts of 144 and above) backbone¹ that provides direct lateral connections to key institutions and enables infrastructure assets to be

¹ A backbone is literally the spine of the network. Backbone's are usually built along main corridors and provide transport to and from the hub site where the electronics are located to the connected entity.

leveraged and leased by others including businesses and private providers. Although, there are middle-mile networks that are built to support internal government needs only (closed network).

Middle-mile networks are much more commonly constructed by municipalities than last-mile networks due to the significantly lower cost of deployment and operations and reduced risk. Middle-mile networks can be a tremendous asset to a community in that it can generate revenue, and provide critical infrastructure needed to support government operations.

Examples of rural middle-mile networks are provided below.

Rural Middle-Mile Municipal Network Examples	
Kent County, MD	Kent County, Maryland is a rural county on the Eastern shore of the state. Kent County determined a few years ago that they wanted to invest in middle-mile infrastructure that they could own as an asset. The County decided not to finance the network build through a bond, but rather paid for it entirely out of general funds. The County now has a 110-mile network completed and have made the assets available to be leased and leveraged by others.
Clackamas County, Oregon	<p>In 2010 Clackamas County received a \$7.8 million-dollar federal grant through the American Reinvestment and Recovery Act (ARRA) to build a middle-mile network. Clackamas Broadband Express (CBX). Today, the network extends approximately 200 miles and is expanding. CBX provides cost effective, high speed communications and data transfer services. The network is managed by the County and the fiber broadband provides public agencies and local businesses the foundation for enhancing services, improving product delivery, and gaining a competitive edge in a global marketplace.</p> <p>CBX initially benefitted a number of community anchor institutions, such as schools, police and fire stations, libraries, healthcare centers, governments, transportation facilities and utility companies. In addition, CBX is benefitting current broadband service providers and businesses throughout the county by providing nondiscriminatory, cost effective, high speed infrastructure.</p> <p>CBX is also now serving both urban and rural communities, including the cities of Milwaukie, Oregon City, Gladstone, Damascus, Boring, Sandy, Estacada, Colton, Molalla, and Canby. Extensions of this initial "fiber ring" have also brought broadband to Government Camp and Wilsonville.</p>
Northwest Colorado Broadband (NWCB); Steamboat Springs, CO	The City of Steamboat Springs teamed with Routt County, Yampa Valley Electric Association, Yampa Valley Hospital, Chamber of Commerce and the Steamboat Springs School System to legally form a nonprofit. The partners supplied some of the capital along with DOLA grant funds to build a middle-mile network through Steamboat Springs. NWCB selected Mammoth Networks as its network operator who will manage, operate the network and lease fiber to interested and qualified applicants. NWCB is also talking with the City of Craig and Moffat County about being the Network Operator for a regional network.

4.3 Open Access Middle-Mile Networks

An open access network is one where the infrastructure assets (conduit and/or fiber) are made available under certain policies and procedures to multiple non-network owners. Most middle-mile networks are usually open networks and most last-mile networks are typically closed particularly those built by providers.² Publicly funded grant programs offered by the federal and state government sometimes require networks to be open access.

² Open access is a hotly debated topic particularly as it relates to last-mile networks because the greater the number of providers in an area, the harder it is for a new-entrant provider to meet its take-rate goals and make a profit. This will be of particular concern for providers that are also making a financial investment. Will a provider be able to meet take rates of 40-60% while other providers are invited to compete for the same customers? Ultimately, the open access question will be determined by all the investors and stakeholders.

Middle-mile networks that lease dark fiber and conduit are designed to be open access. With middle-mile networks – the more users, the bigger the benefit to the network and the more revenue it generates. A private provider that is considering building in a community may have an interest in leasing middle-mile assets because it helps with reducing their costs of deployment. A provider, then, would only need to invest in the lateral connections to homes and businesses and would not have to build the backbone. Larger businesses and those with multiple office locations may also be interested in leasing fiber assets to help connect an internal network or obtain better broadband.

In most cases, excess³ conduit and fiber deployed can be leased through an agreement called an Indefeasible Right of Use (IRU). IRUs are commonly used in the industry to provide long-term access to assets. The term of an IRU typically runs between 10-20 years.

4.4 Conduit Leasing

Conduit is something that is generally (except in extreme circumstances) part of every underground network fiber build. The most expensive part of a deploying a broadband network is the construction. The cost of the actual assets (fiber and conduit) are a tiny portion of the overall budget. Therefore, if engaging in a network build, it is cost-effective to install larger or extra conduit banks and install high-count fiber during the initial construction phase to cover all current and future needs. It is not cost-effective to have to dig more than once.

There are a variety of conduit sizes that can accommodate one or more fiber cables. Often, the network owner will install a larger size conduit than what is needed in order to lease excess space to other providers that want to install fiber. Sometimes a network owner will install multiple conduits side-by-side instead of having one larger conduit bank because some providers prefer to have exclusive rights to a single conduit for security reasons.

Conduit pricing is usually based on a per-foot basis. Pricing varies based on demand in the region and amount of conduit available. Below is a chart that provides examples of three different pricing structures for conduit:

Location	Price	IRU Term	Total Cost
Boulder, Co	\$5.50 per foot	20 years	\$722,271 in a one-time payment
Lincoln, NE	\$65,000 per year	20 years	\$1.3 million paid monthly over 20 years with an escalation clause not exceed CPI.
Baltimore, MD	\$3.00 per foot (appx)	Negotiable	Depends on how much leased. City requires any new conduit built by provider to be owned by City

Investing in conduit without building a fiber network is actually a strategy that several localities have successfully implemented.

In 2012, the City of Lincoln invested \$700,000 into building an extensive conduit system. Restrictions on municipal broadband prevented them from building a fiber network, so they limited the infrastructure to conduit. The conduit was leased for several years to multiple providers including Level 3 and NebraskaLink. In 2014 the city launched a free Wi-Fi initiative with backhaul provided by NebraskaLink. In 2015, the city announced that the conduit project had attracted Allo Communications, who planned to lease the conduit and undertake a massive FTTP buildout with the goal to serve every home and business in Lincoln. Allo plans to have the project completed no later than early 2019. Allo charges competitive pricing with 1 gigabit service costing approximately \$90 per month, and 300 Mbps costing approximately \$65 per month.

³ Conduit and fiber strands that will not be used by the municipality.

Atlanta BeltLine is a nonprofit organization that was established to help ignite economic development in an urban area of central Atlanta. The BeltLine owns an old railroad Right-of-Way (ROW) that is a natural loop around the City. The Beltline has been building a conduit system to run under the land around the entire ROW. The BeltLine is moving forward with plans to lease the conduit to interested broadband providers and they have recently hired a company to assist them with the marketing and management of the system.

4.5 Dark Fiber Leasing

Dark fiber refers to fiber optic cable that has been installed and is available to use but is not connected to any electronic devices and not transmitting any data. Dark fiber is also referred to as excess capacity. Fiber optic cable comes in strand counts ranging from 12 strands to 1400+ strands. Any strands not in use by the owner (or other entity) are considered dark fiber strands that can be leased.

Similar to conduit, dark fiber pricing is subjective and includes but is not limited to the following criteria:

- Availability of dark fiber in the area
- Market rate of other dark fiber in the area (sometimes very difficult to ascertain)
- Number of strands to be leased (minimum of two)
- Amount of footage to be leased (per mile)
- Term of years requested
- Payment up-front versus over time
- Number of strands remaining that may not be marketable (i.e. if an entity only leases a portion of a route, the corresponding strands on the remainder of the route may not be usable. Often providers require the entire route to be leased for this reason.)

Unlike conduit, dark fiber is not based on price per foot but rather based on a per-strand, per mile, per month basis. Prices can range from \$5-\$750 per pair of strands with a typical IRU term of 10-20 years. Similar to conduit, payments can be made on monthly, annually or on a one-time payment. One-time payments require less administrative work and book keeping. It also provides a large infusion of cash. However, smaller entities may not be able to provide one-time payment and it is difficult to estimate market value over the course of twenty years. Ultimately, all of these considerations are discussed in the negotiating process.

Maintenance can be included in the cost of the IRU or added as an additional fee. Maintenance fees range from about \$200-700 per mile, per year. The below chart shows what a rate schedule would look like for a price per pair of strands ranging from \$10 - \$100 exclusive of any up-front or maintenance fees.

Rate Schedule Based on Flat Fee Per Pair of Strands										
Per Pair	Per Mile	Per month	Per Year	10 Yrs.	20 Yrs.	Per Mile	Per month	Per Year	10 Yrs.	20 Yrs.
\$10	1	\$10	\$120	\$1,200	\$2,400	10	\$100	\$1,200	\$12,000	\$24,000
\$20	1	\$20	\$240	\$2,400	\$4,800	10	\$200	\$2,400	\$24,000	\$48,000
\$30	1	\$30	\$360	\$3,600	\$7,200	10	\$300	\$3,600	\$36,000	\$72,000
\$40	1	\$40	\$480	\$4,800	\$9,600	10	\$400	\$4,800	\$48,000	\$96,000
\$50	1	\$50	\$600	\$6,000	\$12,000	10	\$500	\$6,000	\$60,000	\$120,000
\$60	1	\$60	\$720	\$7,200	\$14,400	10	\$600	\$7,200	\$72,000	\$144,000
\$70	1	\$70	\$840	\$8,400	\$16,800	10	\$700	\$8,400	\$84,000	\$168,000
\$80	1	\$80	\$960	\$9,600	\$19,200	10	\$800	\$9,600	\$96,000	\$192,000
\$90	1	\$90	\$1,080	\$10,800	\$21,600	10	\$900	\$10,800	\$108,000	\$216,000
\$100	1	\$100	\$1,200	\$12,000	\$24,000	10	\$1,000	\$12,000	\$120,000	\$240,000

4.6 Other Conduit and Dark Fiber Leasing Considerations

When leasing conduit and dark fiber, the owner of the infrastructure must take into account the following considerations:

- A map (GIS ideally) and inventory of all assets leased and available to be leased must be kept current and active. There are several companies that offer cloud-based cutting-edge fiber management software solutions.
- Maintenance of the conduit and the fiber generally falls to the network owner and so the owner must have policies and procedures in place to meet any service level agreements (SLAs) that the lessee's have in place. In other words – the network owner must be able to repair fiber cut within an emergency window to prevent downtime outages to the network customers.
- The network owner must have a plan in place for third-party network access.
- The network owner must have a process in place for interested third-party applications as well as templates for legal agreements and other documents.

5. Network Ownership Models

There are multiple kinds of ownership and operating models for municipal networks. Below is an overview of the general types of models.

5.1 Publicly-Owned and Operated Network

This is a municipal network that is almost 100% self-provisioned. In other words, the municipality solely owns, and internally manages and operates the network and may only need to hire a few contractors for things like locates, and installations. Networks that are self-provisioned are most likely to be municipal electric utility broadband networks such as Longmont NextLight because they already have the back-office systems, trucks, and experience to add on a broadband service. However, FairlawnGig previously discussed in Section 6 is a rare example of a greenfield municipal network that is 100% self-provisioned without having an electric utility.

5.2 Publicly-Owned and Privately-Operated Network

In this model, the municipality owns the assets, and provides oversight, but outsources the management and operations to a third-party entity who also provides the services. This is a more common model for municipal networks and is appealing for localities that do not wish to directly become a service provider. An example of this type of operating structure is Hudson Oaks, Texas. Hudson Oaks owns the infrastructure and is leasing access to a local ISP who is serving as the service provider.

5.3 Hybrid

Another option is to create a hybrid model that combines one or more of the above options. This includes:

- Public-Private Partnership (PPP)
- Creation of a non-profit or regional entity

5.4 Public Private Partnerships (PPPs)

Public-private partnerships (PPPs) are a relatively young phenomenon in broadband. A PPP is a legal partnership wherein the partners balance and apportion risk, benefit and control. Recently, more and more municipalities are exploring establishing a PPP for deploying and operating last-mile networks. There are many different types of PPPs.

They include but are not limited to the following:

- An investment entity that steps forward to provide funding for the network in exchange for a long-term payback on their investment. This is a traditional PPP. The investment entity usually requires an ownership stake in the assets and sets other conditions such as requiring the municipality to provide a credit backstop to guarantee investments. The municipality generally may or may not need to provide cash contributions. An investment entity is only likely to be drawn to projects that cost a bare minimum of \$15 million dollars. An investment entity also generally works with another partner that is the service provider.
- A partnership wherein both the municipality and provider contribute funding and resources to the project. Both may share in ownership of the assets. For example, the municipality owns the middle-mile infrastructure, but the provider owns the drops from the middle-mile network to the customer premise.

The type of PPP depends on a number of factors, including:

- Whether the provider can make a profit with take rates that justify an investment;
- The sum total amount of financial resources the municipality can provide;
- Whether the municipality is willing to be flexible on asset ownership;
- Whether there is a private-entity that is interested and viable;
- Whether the municipality and private partner can come to agreement on terms and requirements.

Some ISPs would prefer to own their own infrastructure - including the middle-mile backbone in order to control the infrastructure. On the other hand, other ISPs need the municipality to build the middle-mile to offset deployment costs.

Despite the fact that PPPs are widely pursued as options for last-mile municipal broadband networks, a PPP is difficult to establish. This is particularly true in rural areas where the cost of the build is high, and the number of potential customers makes it difficult to justify the investment. This is also true in suburban areas where there are existing incumbent providers with a broad footprint that have a market share of subscribers.

5.5 Joint Authority or Non-Profit Entity

For networks that may involve more than one municipality or financial contributions that are coming from more than one entity, a good option to consider is to create some kind of joint-authority entity or nonprofit. For example, Northwest Colorado Broadband created a nonprofit entity with six founding members that included the City, County, school system, electric association, Chamber of Commerce, and hospital. Several of the partners contributed funding and/or own assets that were part of the project to build a middle-mile network through Steamboat Springs. The founding members serve on the Board of the nonprofit and the nonprofit is responsible for overseeing the network build, and operations. Since the nonprofit does not have any staff, the nonprofit hired a network operator to manage the network and manage the dark fiber leasing and marketing.

The entity may also pursue grants and expand services in the region. By establishing a nonprofit, it increases the ability to share resources, share costs and create economies of scale for smaller networks that may better entice network partners. A regional entity could also more easily deploy and manage options for programs including Wi-Fi deployment, smart city applications and dark fiber leasing.

6. Funding and Financing

A key component in developing the business plan for the selected model is to identify all potential funding sources. This last section briefly discusses possible funding options for municipalities separate from any private-sector partner contributions that could be possible. Depending on the amount of funding needed to support the selected model, one more of the below options could be utilized.

One thing to keep in mind is that a local government usually has a different need for building a network than a private sector provider. For example, a private provider is largely profit driven and must generate revenue for the network to be sustainable. Municipal networks – particularly those that are middle-mile usually serve a different purpose. The municipality is building the network for internal connectivity to anchor institutions, to generate cost savings, or to use for economic development purposes. Therefore, in many cases, municipal networks should be careful relying on network-generated revenue as a mechanism to support a bond payment or loan.

6.1 Public Self-Funding

Depending on the amount of funding needed, the municipality may be able to entirely fund a network build by either shifting funds or budgeting for them through a general fund set-aside. Kent County, Maryland funded their entire 100-mile network build by paying for it directly out of their general funds. A municipality may also set-aside general funds to pay back a revenue bond if partially or fully funding a network out of general funds is not feasible.

6.2 Revenue Bonds

Aside from allocating capital project funds as part of the budget process, bond funding is something municipalities can utilize to assist with funding network construction, and to support startup and maintenance costs. This is traditionally what many municipalities have used to finance their broadband network. Bonds can be repaid either by revenue generated from the network or through other funds. Bonding agencies have supported this movement because a fiber network is a valuable asset to a community.

If revenue from the network is expected to be relied upon as funds to pay back the bond, the business plan must support that expectation. In addition, the municipality should have a contingency in place in the event the identified funds for paying back the bond do not materialize. For example, the State of Kentucky ended up with an \$11 million-dollar shortfall for bond repayment because a source of funding to pay back the bond fell-through.

6.3 Taxation

Taxation is another source of funding that local governments can consider. Some municipalities have either obtained approval to utilize other taxation revenues already in place or have opted to place a referendum on the ballot for residential approval to establish a special taxation district. These strategies are typically utilized in high-dollar builds when millions of dollars of funding is needed.

6.4 Inter-governmental Loans

The City of Fairlawn, Ohio financed their greenfield FTTP network through the Development Finance Authority of Summit County, OH which offers fixed rate/bond fund, conduit/non-bond fund, PACE program and tax credit financing arrangements for businesses located in Summit County, OH. This type of funding is like an intergovernmental loan.

6.5 Connection Fees/Liens

Another mechanism for partially funding a last-mile network is to charge a large connection fee to every home that wishes to connect to the network. The City of Ammon, Idaho has funded a significant part of their network by charging a \$3000

connection fee payable either in lump sum or over a twenty-year period to every home that wishes to purchase service. The connection fee operates like a lien. If a resident moves, the payment stays with the house and applies to the next home-owner. If money is still-owed, the new resident will be expected to pay the remaining funds due. Based on the survey results, this does not appear to be an option for Harney County.

6.6 Federal Grant and Loan Funding Opportunities

Below are some identified programs that may be options to pursue with the right partners. Additional information on each of these programs is provided in **Appendix B**.

- **USDA: Community Connect Grant:** This program helps fund broadband deployment into rural communities where it is not yet economically viable for private sector providers to deliver service. The application window for this program will be open from February 12th, 2019 through April 15th, 2019.
- **Distance Learning & Telemedicine Grants:** These programs help rural communities use the unique capabilities of telecommunications to connect to each other and to the world. The grant helps awardees to acquire the technology and training necessary to connect educational and medical professionals with the teachers and medical providers who serve rural residents at the local level. Two funding opportunities have been published for 2019. Applications to the Traditional DLT Program must be submitted by May 15th, 2019. Applications for the Opioid DLT program must be submitted by April 15th, 2019.
- **The Rural Broadband Access Loan & Loan Guarantee Program:** This program furnishes loans and loan guarantees to provide funds for the costs of construction improvements or acquisition of facilities and equipment needed to provide service at the broadband lending speed in eligible rural areas. RUS is currently accepting applications on a rolling basis throughout 2019. Applications will be processed on a first come, first served basis.
- **Healthcare Connect Fund (HCF):** The purpose of the Healthcare Connect Fund is to expand HCP access to broadband services, particularly in rural areas, and to encourage the formation of state and regional broadband networks linking health care providers. Applications for this program are being accepted from February 1st, 2019 through May 31st, 2019.
- **ReConnect Loan and Grant Program:** With the passage of the 2018 Farm Bill, the Rural Utilities Service established a pilot broadband program named the Reconnect Loan and Grant Program on March 23, 2018. The program looks to bring reliable broadband to Americans who are not currently receiving 10/1 Mbps speeds. Application windows for the various programs can be found in Appendix B.
- **IRS Opportunity Zone.** The 2017 Tax Cuts and Jobs Act created a program designed to spur investment in distressed communities throughout the country through tax benefits. Under a nomination process completed in June of last year, 8,761 communities in all 50 states, the District of Columbia and five U.S. territories were designated as qualified Opportunity Zones. Opportunity Zones retain their designation for 10 years. Investors may defer tax on almost any capital gain up to Dec. 31, 2026 by making an appropriate investment in a zone, making an election after December 21, 2017, and meeting other requirements. While this is not a broadband-specific program, broadband may qualify as an eligible project.

6.7 Third-Party Funding – Public Private Partnerships

Municipalities looking to build a FTTP network often seek to create a PPP in order to off-set the costs and share the financial risk with a private sector partner. As previously discussed in Section 5.4 while this development is a recent trend, PPPs are actually difficult to establish.

A recent trend by communities interested in exploring PPPs, is for the municipality to issue a Request for Information (RFI) to invite potential interested partners to submit proposals. To date, this has not yet proven to be an effective strategy in the establishment of a PPP.

This is due to a few key reasons. First, there are instances where the RFI itself has created confusion and significant delay in network planning – particularly where the RFI is issued prematurely, is open ended, vague, or includes too many difficult to meet requirements. In some cases, this has resulted in situations where a community has had to re-issue the RFI with new requirements and/or hold multiple rounds of interviews. Vendors are wary of the RFIs that lead to nowhere. A much more effective strategy is to hold meetings with providers (which the County is presently doing) and explore this option before issuing out any RFIs or RFPs.

7. Parke County Proposed Models

This section explores the cost estimates for Parke County, Indiana to build a broadband network. For this project, VPS developed two primary models – a middle-mile network option and a last-mile network model with three options for deployment. VPS also provided outside plant (OSP) and electronics costs for consideration and comparison. The models are detailed below.

It should be noted that the estimates provide a high-level capital cost only for the design, construction, and implementation of a fiber-optic network. In addition, these cost estimates do not include costs associated with the operational structure and costs that would be needed to support each network model.

7.1 Network Model Assumptions

VPS designed the high-level network using only satellite imagery. A site visit and further in-depth engineering would be needed to confirm the feasibility of the network and costs estimated. The basic assumptions for the network models are listed below:

- Middle-Mile network assumes serving anchor institution locations from one hut and one remote electronics cabinet.
- Middle-mile estimates include costs for only fiber and electronics to service anchor institutions and provide adequate dark fiber that can be utilized as a transport network to feed FTTP electronics capable of serving the full county. Last-mile FTTP distribution fiber and electronics costs are not included.
- Middle-mile locations consist of 40 community anchor institutions provided by Parke County.
- Last-mile estimates do not include costs to serve Middle-Mile.
- Last-mile estimate assumes serving all locations from 5 existing CO buildings. Therefore, no building or land costs are included.
- Last mile residential and business Location data was obtained from a public database.
- Estimates only include serving locations and routes within the County boundary.
- The estimated buried cost does not include variable costs for rocky soil conditions.
 - If rocky soil is present along the middle-mile route, an additional cost of \$75 per foot of rocky soil should be added to the cost estimate.
- The estimated aerial cost does not include any make ready engineering or make ready construction costs.
 - In the event a pole replacement is needed, the cost per pole ranges from \$5,000 to \$7,500. Cost can vary greatly for size and class of pole, distribution vs transmission pole, etc.
 - In the event a riser needs extended, or neutral needs adjusted for clearance on the poles, the additional cost can be estimated at \$500 per pole.
- Aerial cost estimates assume the same route as the buried path because pole line data was not provided.
 - The mileage and costs could increase if utility pole lines are not close to routes assumed.
- Electronics and fiber management costs assume GPON architecture.
- Estimates do not include costs for any right-of-way acquisition or pole attachment agreements.
- Internet provider meet point was not determined, if meet point is not along proposed fiber path, assume additional costs.
- Estimates include both engineering and overhead costs.
- Estimates do not include RF or IP video expenses or switching costs, data network equipment, or transport to service area.

Please keep these assumptions in mind while budgeting for the project. Furthermore, VPS makes every attempt to have our estimates be within +/- 10% of the actual project cost, which is normally the case. However, it is still an estimate, there are many factors outside of our control that could result in the actual cost differing by more than 10%, such as material or labor charges, design changes since estimate, inflation, construction delays, etc.

7.2 Middle-Mile Network Model

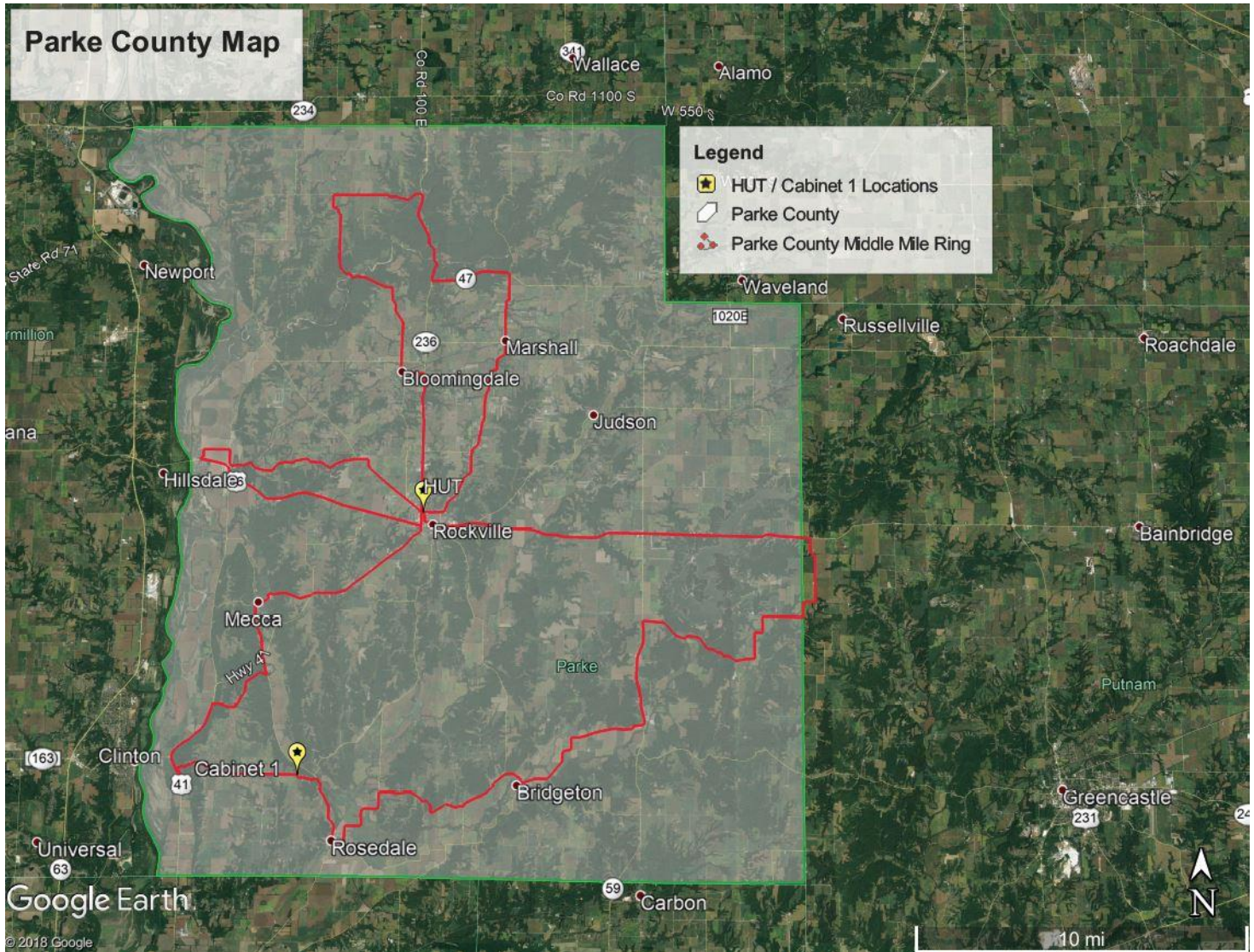
The middle-mile network is designed to be a ring to allow the network to self-heal via a redundant path in the event of fiber or electronic failures and includes the following:

- Connections to 40 anchor institutions that are listed in Appendix C
- A network design that can be utilized as a transport network for a future FTTP deployment.
- A buried cost estimate for the middle-mile network, including OSP and electronics.
- A 100% aerial and 100% buried OSP middle-mile network cost comparison.

This middle-mile network would not require further investment to be leveraged as a transport network for a FTTP deployment in Parke County. However, it would require significant investment to develop and deploy the FTTP mainline distribution fiber, drop fiber, and FTTP electronics to serve all residential and business locations within Parke County.

The middle-mile network model is one option for completing a ring in the County. This model was designed to reach the community anchor institutions but could be revised for other purposes.

The map below provides a look at the entirety of the proposed middle-mile ring, including the proposed locations of the electronics to serve the anchor institutions. The red line indicates the proposed fiber and the yellow placemarks identify the locations of the electronics.



7.1.1 Middle-Mile Cost Estimate

VPS utilized the network model above to estimate the costs to deploy a state-of-the-art broadband network to provide high speed service to the anchor institutions on the ring. VPS utilized construction costs from projects of similar size, scope, and geography, as well as, electronics costs to encompass the total capital expense in the estimate provided. As discussed previously, the same proposed middle-mile network can also be utilized as a transport network for a FTTP network deployment in the future.

Various assumptions were made in the design and estimate phase and have been documented in the following assumptions section. The middle-mile network design and cost estimates only account for fiber needed to serve the anchor institutions and provide adequate dark fiber that can be utilized as transport fiber to feed FTTP electronics capable of serving the full county.

Below is the outside plant and electronics cost estimate for a middle-mile network that is built 100% underground.

Parke County 100% Buried Middle Mile Estimate			
OSP		Miles	Cost
	Buried Rural Mainline	105.2	\$ 5,444,000
	Buried Town Mainline	16.7	\$ 1,722,000
	Buried Drops	1.8	\$ 35,000
	Fiber Management (40 drops)		\$ 3,000
	Total		\$ 7,204,000
Electronics		Units	Cost
	Hut	1	\$ 230,000
	Data Router	1	\$ 173,000
	Cabinets	1	\$ 35,000
	FTTP Electronics		\$ 61,000
	Electronics Install		\$ 44,000
	ONTs and Install	40	\$ 20,000
	Total		\$ 563,000
Total Cost			Cost
	OSP Construction		\$ 7,204,000
	Electronics		\$ 563,000
	Grand Total		\$ 7,767,000

In summary, to serve the 40 anchor institutions and build a robust middle-mile network that can be utilized for a FTTP deployment, the proposed design includes 121.9 miles of mainline fiber and 1.8 miles of drop fiber. The total OSP costs is \$7,204,000 and the electronics costs is \$563,000 for a total of \$7,767,000.

In addition, VPS did not analyze whether any aerial construction would be feasible by obtaining a pole attachment agreement. However, should the County or another provider select one of these models, aerial construction could be an option to explore in the engineering phase that could reduce costs in areas where pole attachments are possible. VPS did however, run the same study to estimate the OSP costs of building the network aerially by utilizing utility poles. This model reflects the cost to build the fiber optic cable 100% aerial as opposed to 100% buried fiber optic cable. For both models, the electronics costs would remain the same. See table below:

Parke County 100% Buried vs 100% Aerial Comparison		
OSP		Total
	Buried OSP Total	\$ 7,204,000
	Aerial OSP Total	\$ 4,576,000

7.3 Last-Mile Network Models

VPS developed the following three last-mile models for Parke County:

- A last-mile FTTP network deployed to 100% the premises
- A last-mile FTTP network deployed to 60% of the premises
- A last-mile FTTP network deployed to 30% of the premises

Similar to the middle-mile network model, these estimates provide a high-level capital cost estimates only for the design, construction and implementation of a fiber-optic network. In addition, these models do not include costs associated with the operational structure that would be needed to support each network option.

These last-mile network models detail the costs for a FTTP network with 3 different penetration rates. Penetration rates refer to the percentage of households that are connected or passed by the network. Penetration does not equal subscriber take rate percentages – only the percentage of households that could potentially subscribe to the network if a drop were connected from the home to the network.

The following chart summarizes the total estimated costs of the three FTTP options. These values are based on the corresponding penetration percentage of both mainline miles and locations. Each estimate assumes serving 100% of the number of locations expressed by the penetration rates.

	100% Penetration	60% Penetration	30% Penetration
OSP Estimate	\$82,199,000	\$49,339,000	\$24,694,000
Electronics Estimate	\$10,100,000	\$6,080,000	\$3,051,000
Total Estimate	\$92,299,000	\$55,419,000	\$27,745,000
Total Locations	13,011	7,807	3,904
Mainline Miles	1,072.5	643.5	321.8
Drop Miles	606.7	364.0	182.0

The difference between the three models is in the percentage of mainline miles, drop miles, and number of locations reached. Each model accounts for a 100% take rate within the portion constructed. It is important to note the mainline miles decrease with each model. This model does not anticipate building the entire mainline first, prior to building out the drops within an area. The purpose of the three models is to show what it would cost to build to a reduced area.

Although take rates vary greatly from project to project, it is common to achieve between 30% to 60% in areas where existing broadband speeds are lacking. Therefore, even if the network passes 100% of the households – only about 30% to 60% of the homes are estimated to subscribe to the network. So, the question becomes – can a provider have a viable

and sustainable network if the penetration rates are reduced to 30% to reduce costs and account for a 30% take rate within that footprint?

The biggest issue in deploying a network that is less than 100% penetration, is determining which 30% or 60% may be the most interested in subscribing to the network. If a provider builds to the wrong 30%, take rates will be even lower than what is projected. The decision to build to 100% versus 60% or 30% depends on the financial analysis and take rate estimates.

For this reason, many networks utilize a technique called Demand Aggregation. Demand Aggregation refers to a deployment strategy wherein residents are encouraged to commit to sign up for service and may even be required to pay a small fee (\$10-\$20). When the percentage of residential sign-ups in an area reaches 60% or greater, construction commences in that neighborhood. This enables a provider to find the most interested subscribers and bring in revenue in high-subscription areas before building out the entire system. Google utilized this technique very effectively in their buildout strategy by establishing Google “Fiber-hoods”. In essence, this technique enables a phased-in construction plan with the goal of exceeding take rate estimates and eventually achieving 100% penetration in steps.

The details for each of these three network options are provided on the following pages. Below is a key provided to assist with understanding the terminology and reading the models.

Key for Understanding Network Models

Terminology		Description
Electronics		
	CO Electronics	“CO” means Central Office which is the buildings where the main electronics will be housed.
	Installation (10%)	This includes the electronics, spares, and miscellaneous materials needed for network operations. Installation (10%) means that it costs roughly 10% of the cost of equipment.
	ONTs	
	ONT Installation	
OSP		OSP stands for Outside Plant.
	Cable	This includes the cost of the fiber, conduit, miscellaneous materials needed for the construction of the network. Drops refers to the cost of fiber drops to each premise. These cost estimates also include the cost of construction (labor) and engineering.
	Drops	
	Fiber Management	
Number of Locations		Number of residential and business premises included in the network design.
Mainline miles		This refers to miles of backbone built but does not include Middle-Mile miles.
Drop miles		This refers to miles of drops direct from the backbone to the customer premise.

Parke County
PROPOSED FTTP HIGH LEVEL ESTIMATE - 100% PENETRATION

Electronics	<u>Buried</u>
CO Electronics	\$1,761,000
Installation (10%)	\$177,000
ONTs	\$5,247,000
ONT Installation	\$2,915,000
Outside Plant	
Cable	\$68,562,000
Drops	\$12,162,000
Fiber Management	\$1,475,000
Total	\$92,299,000
Mainline Miles	1,072.5
Drops Miles	606.7
Total Miles	1,679.2
Total Locations	13,011

Assumptions:

- Location data used from public database.
- Last-Mile estimates do not include costs to serve Middle-Mile.
- Estimates only include serving locations and routes within the County boundary.
- Does not include RF or IP video expenses, switching costs, data network equipment, or transport to service area.
- Electronics & fiber management estimates assume GPON.
- Installation estimated at 10% of equipment.
- Assumes serving all locations from 5 existing CO buildings. Therefore, no building or land costs are included.
- Assumes 100% penetration (by mainline mileage and locations).
- Estimates include engineering and overhead costs.
- Does not include any costs for right-of-way acquisitions.
- OSP estimates do not include any costs for rocky soil conditions.
- OSP estimates assume all buried construction.
- Drop estimates assume 180' buried drop for town locations and 300' buried drop for rural locations.

Notes:

We make every attempt to have our estimates be within +/- 10% of the actual project cost, which is normally the case. However, it is still an estimate, there are many factors outside of our control that could result in the actual cost differing by more than 10%, such as material or labor charges, design changes since estimate, inflation, construction delays, etc. Please keep this in mind when budgeting for this project.

Parke County
PROPOSED FTTP HIGH LEVEL ESTIMATE - 60% PENETRATION

Electronics	<u>Buried</u>
CO Electronics	\$1,075,000
Installation (10%)	\$108,000
ONTs	\$3,148,000
ONT Installation	\$1,749,000
Outside Plant	
Cable	\$41,138,000
Drops	\$7,297,000
Fiber Management	\$904,000
Total	\$55,419,000
Mainline Miles	643.5
Drops Miles	364.0
Total Miles	1,007.5
Total Locations	7,807

Assumptions:

- Location data used from public database.
- Last-Mile estimates do not include costs to serve Middle-Mile.
- Estimates only include serving locations and routes within the County boundary.
- Does not include RF or IP video expenses, switching costs, data network equipment, or transport to service area.
- Electronics & fiber management estimates assume GPON.
- Installation estimated at 10% of equipment.
- Assumes serving all locations from 5 existing CO buildings. Therefore, no building or land costs are included.
- Assumes 60% penetration (by mainline mileage and locations).
- Estimates include engineering and overhead costs.
- Does not include any costs for right-of-way acquisitions.
- OSP estimates do not include any costs for rocky soil conditions.
- OSP estimates assume all buried construction.
- Drop estimates assume 180' buried drop for town locations and 300' buried drop for rural locations.

Notes:

We make every attempt to have our estimates be within +/- 10% of the actual project cost, which is normally the case. However, it is still an estimate, there are many factors outside of our control that could result in the actual cost differing by more than 10%, such as material or labor charges, design changes since estimate, inflation, construction delays, etc. Please keep this in mind when budgeting for this project.

Parke County
PROPOSED FTTP HIGH LEVEL ESTIMATE - 30% PENETRATION

Electronics	<u>Buried</u>
CO Electronics	\$546,000
Installation (10%)	\$55,000
ONTs	\$1,575,000
ONT Installation	\$875,000
Outside Plant	
Cable	\$20,569,000
Drops	\$3,649,000
Fiber Management	\$476,000
Total	\$27,745,000
Mainline Miles	321.8
Drops Miles	182.0
Total Miles	503.8
Total Locations	3,904

Assumptions:

- Location data used from public database.
- Last-Mile estimates do not include costs to serve Middle-Mile.
- Estimates only include serving locations and routes within the County boundary.
- Does not include RF or IP video expenses, switching costs, data network equipment, or transport to service area.
- Electronics & fiber management estimates assume GPON.
- Installation estimated at 10% of equipment.
- Assumes serving all locations from 5 existing CO buildings. Therefore, no building or land costs are included.
- Assumes 30% penetration (by mainline mileage and locations).
- Estimates include engineering and overhead costs.
- Does not include any costs for right-of-way acquisitions.
- OSP estimates do not include any costs for rocky soil conditions.
- OSP estimates assume all buried construction.
- Drop estimates assume 180' buried drop for town locations and 300' buried drop for rural locations.

Notes:

We make every attempt to have our estimates be within +/- 10% of the actual project cost, which is normally the case. However, it is still an estimate, there are many factors outside of our control that could result in the actual cost differing by more than 10%, such as material or labor charges, design changes since estimate, inflation, construction delays, etc. Please keep this in mind when budgeting for this project.

8. Analysis and Recommendations

As a reminder, the biggest question a municipal feasibility study needs to answer is “what is the problem we need to solve?” In summary, **the biggest issue facing Parke County and the surrounding communities is inconsistent and poor residential and business internet service that falls well short of the federal definition of broadband.**

There are significant gaps in accessibility to affordable robust residential and business internet service in Parke County. As previously detailed in this study, a summary of a few key findings included the following:

- Current providers are not meeting the needs and/or expectations of many residents (with the exception of those residents that subscribe to Bloomindale Home Telephone). This is especially true of those residing outside of the developed portions of Parke County. Some residents claim that service is so unreliable, but necessary, that they are paying a premium for services that do not work a majority of the time.
- Internet plans for residents and businesses are expensive and copper lines, mobile internet, fixed wireless and satellite technologies present speed, reliability and latency issues for end-users. The topography of Parke County can present specific issues for fixed wireless and satellite technologies as hills, valleys, and trees create specific line-of-sight issues and create disruption of signals.
- Current provider offerings in many areas of Parke County appear overstated. Many residents dispute the 477 Data reported to the FCC by providers claiming their residence as covered by adequate broadband.
- Remote areas need better internet connections and better cellular coverage. Not having access is negatively impacting local business, employee attraction and economic growth. Poor coverage is exasperated during busy times at recreational areas, and during local festivals such as the Covered Bridge Festival. Poor broadband and cellular coverage mean vendors are limited on processing payments, and first responders struggle to communicate during emergency situations.
- Approximately 30% of respondents are either very satisfied or satisfied with the overall service and value they receive from their current provider. This is a low percentage of satisfaction. Some attendants of the Town-Hall meeting stated they were unable to voice their dissatisfaction due to poor connectivity interrupting their ability to reply to the online survey. This indicates that the true number may be lower than 30% of satisfied consumers.

8.1 Middle-Mile Model Assessment

Middle-mile networks cost less to deploy because they are only designed to create a ring through the community and connect to a selected number of anchor institutions. The benefits of a middle-mile network are substantial and would enable Parke County and the surrounding communities to:

- Deploy critical infrastructure that will serve regional needs for the next 30+ years.
- Own a network with an investment cost that is much smaller with a risk much less significant than a last-mile network.
- Potentially phase-in a last-mile solution.
- Potentially build fiber to towers to better encourage wireless technology deployment.
- Reduce costs for last-mile providers in reaching the underserved areas.
- Lease excess fiber and conduit to generate revenue and encourage private provider investments.

Another benefit of a middle-mile network is the County could coordinate with neighboring communities which would increase the benefits and allow for economies of scale. For example:

- A larger inter-governmental regional middle-mile network provides more fiber that could be leased to third-parties with longer routes.
- A Non-profit or joint entity could be formed to oversee and manage the regional networks together which would save operating costs and maximize resources.
- A Non-profit or joint entity could more easily deploy smart city applications, launch pilot projects, and generate economic development on a regional level.

While a middle-mile model does not directly serve homes and businesses, last-mile connections could be phased-in over time or leveraged by last-mile providers.

8.2 Last-Mile Network Assessment

For a local government – and over time, the cost of funding a broadband solution can be significantly less than the cost of not having robust broadband. Similar to the benefits of a middle-mile network, the benefits of a FTTP network are substantial and would enable Parke County to:

- Deploy critical infrastructure that will serve regional needs for the next 30+ years.
- Significantly increase economic development opportunities including job attraction and retention.
- Increase real estate value (particularly for those areas that are currently unserved by fiber. The City of Fairlawn Ohio saw an 8% increase in property values after their FTTP network was deployed).
- Enable Parke County to compete with other Indiana communities that are moving forward with improving broadband connectivity.

Of course, there are additional considerations with deploying a FTTP network that include:

- This option carries the most financial risk and is the most expensive.
- The operational costs are high.
- It may not be possible to find a provider-partner who is willing to invest its own funds into the network.

8.3 Challenges and Recommendations

This section outlines some of the biggest challenges to network deployment and provides recommendations for how the Parke County and surrounding communities can solve the problems identified in this Report.

With each of the above network models, there are a significant number of challenges including finding the right partners and implementing strategies to maximize subscription rates. However, the biggest challenge is determining how to fund the network build and operations. The most common method for funding municipal networks is through revenue bond funding or through some sort of taxation system. However, funding may also come from the private providers and/or grant funding.

When seeking third party investment, challenges include the following:

- Many providers interested in working with a community need the community to contribute financially to the build in order for them to make a return on their investment.
- Providers may or may not want to own middle-mile infrastructure. (i.e. providers may want/need the municipality to own the middle-mile infrastructure).
- There may not be a provider who is willing and able to serve the entire community but is able to serve a smaller portion.

With any grant funding opportunities, it is important to keep in mind the following:

- There is no guarantee that the grant will be awarded, and it is an intense in-depth process to develop the application with a lot of data and information that must be supplied by the municipality.
- A municipality should have a Plan B for funding in the event the grant is either not fully or only partially awarded.
- There will most likely be a substantial cash match requirement. Most grants do not accept in-kind (i.e. waving of pole attachment fees to qualify as a part of the match).
- If another entity has received prior federal funding for broadband within the territory, the municipality may be disqualified from applying for federal funding.
- A consortium or partnership usually does not qualify as an applicant. The lead applicant needs to be the ISP provider.
- Areas that have internet speeds of 10/1 Mbps or greater will most likely not qualify for grant funding.

Based on all the information and data obtained through the data collection efforts, the network models developed and analyzed, VPS makes several main recommendations.

While a middle-mile network costs significantly less to deploy, **the primary problem facing the region is the lack of robust and reliable internet service to all residents and businesses that meets or exceeds the federal definition of broadband.**

There is a significant gap problem in the County. For example, some areas have adequate coverage while others do not. To further expand on this last bullet point, below is a chart that summarizes the provider-reported data detailed in Section 2. As you can see, based on what the providers are reporting, every zip code except for one has greater than 51% coverage for advertised speeds greater than 25/3. As previously discussed in Section 2, the providers do not report coverage on an address level basis, so this information does not detail where the percentage of coverage is located, within any given zip code.

Towns/zip code	Wireline and Wireless Providers with Advertised Speeds of 25/3 ⁴	Greatest Percentage of Coverage by a Provider
Rockville	AT&T, NewWave, Bloomingdale	59%
Montezuma (47862)	AT&T, NewWave, Bloomingdale, AgPro Wireless	81%
Bloomingdale (47832)	NewWave, Bloomingdale, AgPro Wireless	80%
Marshall (47859)	NewWave, AgPro Wireless	51%
Rosedale (47874)	AT&T, NewWave, AgPro Wireless	75%
Mecca (47860)	NewWave	100%
Bridgeton (47836)		0%

As you can see, there are significant gaps of coverage within each zip code. In addition, based on information provided through the Stakeholder Outreach, some residents reported being unable to access internet service while their neighbors on either side of them are able to access high speed internet service. Solving the gap issue is very difficult without a comprehensive solution.

⁴ Satellite providers also report they offer service throughout the County with advertised speeds greater than 25/3. However, this information was not included in the above chart since connectivity and speed availability is completely location dependent. For example, if a particular house is surrounded by trees, the residents will most likely not be able to connect. Satellite viability must be determined on a location by location basis.

However, since the County is not prepared to commit to further financial involvement or ownership of network assets – the County is dependent on the willingness of private providers to expand services. Also, the size and population density of Parke County make a traditional FTTP model difficult to prove financially feasible.

Therefore, it is the recommendation of VPS that Parke County further explore the viability of reaching the unserved and underserved with a goal of achieving 100% connectivity in the County through a variety of methods including deploying a middle-mile network in conjunction with a last-mile network. Action items include:

1. Continuing to engage in direct dialogue with potential network partners in order to:
 - Determine if a provider would be willing to establish a public-private partnership in the County to reach either all homes/businesses through a phased-in approach.
 - Encourage the providers to expand their system to fill in the gaps and reach the percentage of residents within a zip code that do not currently have access to their service.
 - Determine if a provider would build into an area if a middle-mile network was deployed.
2. Continuing to explore incentives for providers including sources of direct support for providers, such as tax abatement, outside of grant funding in order to further offset costs for providers.
3. Prepare for future rounds of Indiana or federal grant funding opportunities by:
 - Identifying an area or areas within the County that would be the most-eligible for grant funding.
 - Finding a provider-partner who could be a lead applicant and provide required grant matching funds.
 - Preparing checklist of general application materials that would be needed in order to be ready for the grant process.
4. Consider establishing a Pilot Project to work with existing providers that would fill in the coverage gaps by connecting residents/businesses that are currently unserved or underserved. In this approach, the County could set aside funds to be “granted” to providers to assist with financing the cost of connecting customers. For example, if a connection costs \$1000 to build, the County could provide a grant of \$500 to the provider to help subsidize the cost. Finding ways to connect unserved and underserved residents and businesses in areas that are partially served by existing providers is a difficult problem to solve. A grant program is significantly cheaper than building a new network and could help to connect the residents and businesses that have the greatest need. To further explore this option the County could:
 - Discuss the amount of money the County could provide as funding for the Pilot Project.
 - Discuss the idea with providers to ensure provider-participation.
 - Develop a framework for requirements and criteria that would need to be met for funds to be distributed.
 - Consider establishing a non-profit to run the grant program if the Pilot is successful.

Appendix A – Technology Background

For background and as a Broadband 101 primer, it's important to understand the definition of broadband as well as the different types of technologies referenced in this Report. Broadband technologies can be broken down into two main categories – wireline and wireless. This Appendix provides an overview of each and helps define some the terms that will be utilized in this report.

Wireline Technologies

Wireline technologies rely on a physical cable for transmission of the communication signal. These cables usually transport an electrical signal on a copper cable or an optical signal on a fiber optic cable. There are three common wireline technologies used by wireline companies today. These are:

- Digital Subscriber Line (DSL) – This wireline technology overlays a broadband signal on existing twisted pair copper cables. Broadband speeds on DSL networks are dependent on the customer's distance from electronics in remote terminals or central offices. Modern DSL technologies can typically provide 1 Mbps to 2 Mbps download speeds, depending upon the quality and size of the copper cable. However, for customers served by copper cable that exceeds 18,000 feet in length, the distortion caused by the capacitance of the cable renders the cable unsuitable for quality voice. Telephone companies have historically provided voice service over twisted pairs of copper cable. Consequently, millions of miles of twisted pair copper cables have been deployed throughout the country. However, most service providers have concluded that DSL is near the end of its useful life and will not be a long-term solution for broadband delivery. Therefore, they have been looking to fiber technology to meet the increasing customer demand.
- Coaxial Cable (DOCSIS) – Coaxial cable can also be used to provide wireline broadband services with typical speeds of 160 Mbps downstream and 120 Mbps upstream that can be shared by a large number of subscribers. Most Cable Television (CATV) providers like Comcast rely on COAX cables. The CATV industry has implemented standards called Data Over Cable Service Interface Specifications (DOCSIS), which defines how the COAX network can be used to deliver broadband services to their customers. It is important to note that the CATV coax networks are shared – meaning a single cable leaving the CATV headend is split many times to serve many customers. Often, a single cable will provide broadband and/or video to hundreds of customers. This architecture worked well for broadcast video services, since it was a “one-to-many” service, but has limitations when delivering services such as broadband, where each customer requires their own unique connection.
- Fiber to the Premises (FTTP) – This wireline technology serves all customers by a fiber optic cable. Most FTTP equipment allows between 70 Mbps and 1 Gbps of broadband to each customer and is capable of serving customers that are more than twelve miles from the central office or electronic field terminal locations.

Wireless Technologies

Wireless technologies transmit the communication signal “over the air” on a radio frequency (RF) carrier. There are four common wireless technologies used by providers today. These are:

- Fifth Generation (5G) – The Third Generation Partnership Program (3GPP) organization is in process of defining the 5G standards, expected circa 2019. Per the GSM Association, 5G will be targeting user throughputs of 10 Gbps peak, a hundred times that of 4G networks. Although inherently a mobile technology, the first wave of 5G will be utilized for the fixed delivery of wireless broadband services. 5G is anticipated to incorporate higher-order spatial diversity (MIMO schemes, beam forming, cell splitting, etc.), self-organizing networks to minimize self-interference and new user interfaces to support the Internet of Things (IoT).
- Fourth Generation (4G) – Utilizes Long Term Evolution (LTE) licensed spectra to provide wireless broadband services, as defined by the 3GPP organization, with duplexing methodology of both time (TD-LTE) and frequency

Divisions. Although inherently a mobile technology, today, nearly all terrestrial wireless providers have standardized on Long Term Evolution (LTE) with fixed Customer Premises Equipment (CPE), as the Wireless Metropolitan Area Network (WMAN) broadband technology of choice. All major cellular providers in the U.S. have deployed LTE and continue to expand their LTE footprints.

- Unlicensed Operations – Unlicensed operations on unlicensed spectra can also be used to provide wireless broadband services. Systems operating on unlicensed spectra typically utilize vendor proprietary air interfaces, Institute of Electrical and Electronics Engineers (IEEE) 802.11, or another variant of the IEEE standards. Operations in the unlicensed spectra inherently are utilized for the fixed delivery of wireless broadband services, as the utilization of fixed devices allow for additional deployment efforts to overcome interference inherent within the unlicensed bands.
- Satellite - Satellite-based broadband is not considered a viable broadband alternative due to the high latency which makes it unsuitable for many applications and unable to provide reliable, high-quality voice connectivity.

Some believe that wireless can be a substitute for terrestrial wireline connections that may be too costly to construct. While wireless can be part of the solution and should be considered for deployment in very rural areas – there are considerations that should be taken into consideration.

- Wireless technologies must be replaced every 5-7 years and they can be very costly to maintain.
- Wireless is not suited for growth. For example – since bandwidth is shared among subscribers, available bandwidth per subscriber decreases as density of subscribers or devices increases.
- Available bandwidth decreases as distance of subscriber from access point increases.
- Broadband speeds are more limited. 4G technologies might allow customers to burst up to 10 or 20 Mbps for short periods of time.
- Not well suited for large bandwidth needs and often discouraged by carriers by only allowing a limited amount of data per month.
- Geography and atmospheric conditions can and will impact service delivery for technologies that need to be in sight of each other in order to transmit a signal. Mountains, hills, valleys, buildings, and trees interfere with the propagation of the wireless signal. Some technologies such as LTE can provide non-line-of-site service (NLOS) to some extent, but at significantly reduced throughput compared to direct LOS. These terrain issues and obstacles can mean that some customers cannot receive the broadband signal or that additional towers (and investment) are required.

Wireline vs. Wireless Technology

Both wireless and wireline broadband service providers have benefited from technology advances, but *wireline* technologies have historically been capable of speeds many times faster than the best *wireless* technologies. Fiber optic cable has been used by service providers for more than forty years to build high-speed broadband networks, primarily for long haul transport routes. Over the last ten to fifteen years, fiber has also been used to increase broadband speeds to the customer because no other technology can deliver as much broadband speed. With FTTP, the broadband speed provided is not dependent upon cable length, but electronics, and each new generation of FTTP electronics allows service providers the ability to offer significantly higher broadband speeds over greater distances without having to make significant changes to their outside plant architecture. There is no foreseeable end to the amount of bandwidth that can be provided over fiber cables.

There are many reasons why fiber is the best technology to construct modern network or upgrade existing networks. Fiber is immune to electromagnetic interference, provides the most reliable services, and minimizes operational expenses. Therefore, it delivers the best voice and broadband services available for today and the foreseeable future. Over the last several years, increases in copper prices, advances in technology, and growth in broadband demand have all worked together to make FTTP a more economical wireline technology for providing broadband. Not only is a fiber network less

expensive to deploy, maintain, and upgrade than other wireline technologies, but it has superior broadband capabilities, such as being able to offer telecommuting, telemedicine services, and telepresence. All of these factors make it clear that copper is a dying technology in the telecommunications industry. It would be unwise for companies to utilize copper in their network deployments going forward, except in certain very limited situations.

Once fiber infrastructure is in place, service providers are able to increase the broadband by simply upgrading the electronics on the fiber cable, which represents a relatively small portion of the overall fiber network investment. Fiber technology will allow higher speeds to be delivered to customers over time with minimal incremental investment, making it the best technology for meeting future broadband service needs.

The amount of bandwidth per customer is significantly greater for a FTTP network when compared to a wireless network. Using the technologies available today, the bandwidth delivered to a customer can be more than 100 times greater than what is possible over a wireless network under similar conditions. The bandwidth advantage for FTTP will increase significantly in the coming years due to technology advances with the electronics.

Fiber optic cable is the most-costly to construct. However, it is also an enabling technology that allows for growth. A lion's share of the FTTP investment is the placement of the cable facilities, which typically has a 30-year life, compared to the wireless infrastructure, which has a greater portion of the investment associated with faster-depreciating infrastructure. When placement costs are included over a 30-year life, the cost savings for a wireless network are significantly reduced or eliminated.

Appendix B- Grant Programs

USDA: Community Connect Grant

1) Deadline:

- a. The application window will be from February 12th, 2019 through April 15th, 2019.

2) Purpose:

- a. This program helps fund broadband deployment into rural communities where it is not yet economically viable for private sector providers to deliver service.

3) Eligible Applicants:

- a. Most State and local governments
- b. Federally-recognized Tribes
- c. Non-profits
- d. For-profit corporations

4) Approved Use of Funds:

- a. Construction, acquisition or leasing of facilities, spectrum, land or buildings used to deploy broadband service.
- b. The cost of providing broadband service free of charge to critical community facilities for 2 years.
- c. **Please Note:** Less than 10% of the grant amount, or up to \$150,000 may be used for the improvement, expansion, construction or acquisition of a community center that provides online access to the public.

5) Requirements & Rules:

- a. The impacted area must be classified as Rural and lack any existing broadband speed of at least 10 Mbps down and 1 Mbps up.
- b. Applicant must provide matching funds of at least 15% from non-federal sources. These funds can be used for operating costs.
- c. Buildings constructed with grant funds must be located on property owned by the awardee.
- d. Leasing expenses will only be covered through the advance of funds period included in the award documents.
- e. Grantees must have legal authority to provide, construct, operate and maintain the proposed facilities or services.
- f. Partnerships with other federal, state, local, private and non-profit entities are encouraged.
- g. For additional detail see Code of Federal Regulations 7 CFR, Part 1739.

6) Type of Funding Available:

- a. Grant Funding

USDA: Distance Learning & Telemedicine Grants

1) Deadline

- a. Applications under the Traditional DLT program must be submitted by May 15th, 2019. Applications under the Opioid DLT program must be submitted by April 15th, 2019.

2) Purpose

- a. Traditional DLT: Helps rural communities use the unique capabilities of telecommunications to connect to each other and to the world. Helps to acquire the technology and training necessary to connect educational and medical professionals with the teachers and medical providers who serve rural residents at the local level.
- b. Opioid DLT: The programs aims to help address the opioid epidemic in rural America by providing assistance to areas such as prevention, treatment, and recovery.

3) Eligible Applicants:

- a. Most State and local governments
- b. Federally-recognized Tribes
- c. Non-profits
- d. For-profit Corporations

4) Approved Use of Funds:

- a. Acquisition of eligible capital assets, such as:
 - i. Broadband transmission facilities
 - ii. Audio, video and interactive video equipment
 - iii. Terminal and data terminal equipment
 - iv. Computer hardware, network components and software
 - v. Inside wiring and similar infrastructure that further DLT services
- b. Acquisition of instructional programming that is a capital asset.
- c. Acquisition of technical assistance and instruction for using eligible equipment.

5) Requirements & Rules:

- a. A minimum 15% match is required for grant-only awards (cannot be from another federal source).
- b. DLT 100% grant applications are accepted through a competitive process. The application window is announced annually (typically after the first of the year) through a Notice of Funds Availability (NOFA) or a Notice of Solicitation of Applications (NOSA) in the Federal Register. Applicants are required to provide a minimum 15 percent match. Awards can range from \$50,000 to \$500,000.

6) Type of Funding Available:

- a. Grant Funding

USDA: The Rural Broadband Access Loan & Loan Guarantee Program

1) **Deadline:**

- a. Applications are now accepted for 2019

2) **Purpose**

- a. Furnishes loans and loan guarantees to provide funds for the costs of construction improvements or acquisition of facilities and equipment needed to provide service at the broadband lending speed in eligible rural areas.

3) **Eligible Applicants:**

- a. Corporation
- b. LLC
- c. Cooperative or mutual organization
- d. Tribes or Tribal organization
- e. State or local government

4) **Approved Use of Funds:**

- a. The construction, improvement, and acquisition of facilities required to provide service at the broadband lending speed including facilities required for providing other services through the same facilities.
- b. The cost of leasing facilities required to provide service at the broadband Lending speed if such lease qualifies as a capital lease under Generally Accepted Accounting Principles (GAAP).
- c. An acquisition, under certain circumstances and with restrictions.
- d. For additional detail see 7 CFR 1738

5) **Requirements & Rules:**

- a. Proposed funded service areas must be completely contained within a rural area or composed of multiple rural areas, as defined in 7 CFR 1738.
- b. At least 15 percent of the households in the proposed funded service area are unserved,
- c. No part of the proposed funded service area has three or more “incumbent service providers.”
- d. No part of the proposed funded service area overlaps with the service area of current RUS borrowers or the service areas of grantees that were funded by RUS.
- e. Communities where USDA Rural Utilities Service has previously provided funding for construction of broadband infrastructure may not be eligible.
- f. **Please Note:** In order to be counted as a provider for eligibility purposes, a provider must file a response to a Public Notice Filing for an area they operate in. Please see the Broadband Mapping Tool for more information and to sign up for a subscription to be notified when Public Notice Filings are published.

6) **Type of Funding Available:**

- a. Direct Cost of Money Loan Funding

USAC - Healthcare Connect Fund (HCF)

1) **Deadline:**

- a. The initial filing window is February 1 – May 31, 2019.

2) **Purpose:**

- a. The purpose of the Healthcare Connect Fund is to expand HCP access to broadband services, particularly in rural areas, and to encourage the formation of state and regional broadband networks linking health care providers.

3) **Eligible Applicants:**

- a. A post-secondary educational institution offering health care instruction, such as teaching hospitals or medical schools,
- b. A community health center or health center providing health care to migrants,
- c. A local health department or agency,
- d. A community mental health center,
- e. A not-for-profit hospital,
- f. A rural health clinic, including mobile clinics,
- g. A dedicated emergency room of a rural for-profit hospital, or
- h. Skilled Nursing Facilities (SNFs)

4) **Approved Use of Funds:**

- a. Under the program, eligible rural HCPs, and those non-rural HCPs that are members of a consortium that has a majority rural HCP sites, can receive a 65 percent discount from the fund on all eligible expenses.

5) **Requirements & Rules:**

- a. HCPs are required to contribute the remaining 35 percent to participate in the program.
- b. HCPs can use the Healthcare Connect Fund to purchase services and equipment, as well as construct their own broadband infrastructure where it is shown to be the most cost-effective option.
- c. Non-rural HCPs may participate and receive support as part of consortia that include a majority rural HCP site.

6) **Type of Funding Available:**

- a. Support Funding

7) **Further Information:**

- a. On June 25, 2018, the Federal Communications Commission (FCC) issued an Order that adopts rules to: (1) increase the annual RHC Program funding cap to \$571 million and apply it to FY2017; (2) annually adjust the RHC Program funding cap for inflation, beginning with FY2018; and (3) establish a process to carry-forward unused funds from past funding years for use in future funding years. As noted in the FCC's RHC 2018 Funding Cap Order, the RHC Program funding cap for FY2018 will be \$581 million, adjusted for inflation

ReConnect Loan and Grant Program

1) Deadline:

- a. 100% Grant Funding Application – Applications Due: April 29, 2019 – Awards subject to competitive scoring
- b. 50% Grant / 50% Loan Funding Application – Applications Due: May 29, 2019 – Awards subject to competitive scoring
- c. 100% Loan Funding Application – Applications Due: June 28, 2019 – Awarded on first come / first serve basis
Applicants are only allowed to apply in one of the funding categories

2) Purpose:

- a. Provide up to \$600 million in loan and grant funding to assist with building broadband infrastructure in rural areas. Provide broadband to unserved or severely underserved areas which lack 10/1 Mbps broadband speeds.

3) Eligible Applicants:

- a. Non-Profit Entities
- b. For-Profit Corporations
- c. Limited liability Companies
- d. Cooperative or Mutual Organizations
- e. State and Local Government Entities
- f. Territory or Possession of the U.S.
- g. Indian Tribe Budget Control Mechanism Calculation and Per-Line Limit on Universal Service
**CAF II Auction recipients limited to 100% loan category.*

4) Eligible Areas:

- a. 100% Grant Funding Application – Service area is only eligible if 100% of the area lacks 10/1 Mbps
- b. 50% Grant / 50% Loan Funding Application – Service area is only eligible if 90% of the area lacks 10/1 Mbps
- c. 100% Loan Funding Application – Service area is only eligible if 90% of the area lacks 10/1 Mbps

5) Requirements & Rules:

- a. Recipients must provide 25/3 Mbps to every location within the proposed funded service area.
- b. Applicants must prepare a 5-year financial forecast to support financial feasibility and sustainability of the project. Key elements of these financials include:
 - i) Positive ending cash each year of forecast
 - ii) Positive cash flow from operations
 - iii) Must meet two of the following criteria:
 - (1) Current Ratio of 1.20
 - (2) Tier Ratio of 1.20 minimum (100% loan or 50% loan / 50% grant)
 - (3) DSCR Ratio of 1.20 minimum (100% loan or 50% loan / 50% grant)
 - (4) If no existing debt, not proposing new debt and only applying for grant only, the Current Ratio of 1.20 is required

6) Type of Funding Available:

- a. Total of \$200 million for projects seeking 100% grant funding - Max request limit is \$25 million
- b. Total of \$200 million for projects seeking 50% grant and 50% loan funding - Max request limit is \$25 million for loan, and \$25 million for grant funding
- c. \$200 million for projects seeking 100% loan funds - Max request is \$50 million

Appendix C – List of Anchor Institutions

Parke County Clerks Office	116 W High St	Rockville	IN	47872
Parke County EMS - Ambulance Service	395 Parkway Dr	Rockville	IN	47872
Parke County Emergency Management Services	110 E High St	Rockville	IN	47872
Parke County Library - Rockville	106 N Market St	Rockville	IN	47872
Parke County Sherriff - Office / Jail	458 W Strawberry Rd	Rockville	IN	47872
Parke County Courthouse	116 W High St	Rockville	IN	47872
Parke County Highway Department	306 N Lincoln Rd	Rockville	IN	47872
Parke Heritage High School	506 N Beadle Street	Rockville	IN	47872
Rockville Correctional Facility	811 W 50 N	Rockville	IN	47872
Rockville Elementary	406 Elm St	Rockville	IN	47872
Rockville Town Board	103 W High St	Rockville	IN	47872
Rockville Fire Department	403 S Jefferson St	Rockville	IN	47872
Rockville Post Office	102 N Market St	Rockville	IN	47872
Raccoon State Park	1588 S Raccoon Pkwy	Rockville	IN	47872
Rockville Police Department	416 S Jefferson St	Rockville	IN	47872
Potential Equipment Location	1238 N Lincoln Rd	Rockville	IN	47872
Montezuma Volunteer Fire Department	551 E Crawford St	Montezuma	IN	47862
Montezuma Elementary	459 Strawberry Rd	Montezuma	IN	47862
Montezuma Public Library	270 E Crawford St	Montezuma	IN	47862
Montezuma Town Marshall	270 Crawford St	Montezuma	IN	47862
Riverton Parke Jr/Sr High School	4907 Coxville Rd	Montezuma	IN	47862
Montezuma Post Office	982 N Washington St	Montezuma	IN	47862
Montezuma Police Department	272 E Crawford St	Montezuma	IN	47862
Rosedale Town Hall	52 Middle St	Rosedale	IN	47874
Rosedale Fire Department	84 N Main St	Rosedale	IN	47874
Rosedale Elementary	613 Central St	Rosedale	IN	47874
Lyford Fire Department	7112 W 6th St	Rosedale	IN	47874
Rosedale Post Office	55 N Main St	Rosedale	IN	47874
Rosedale Police Department	130 N Main St	Rosedale	IN	47874
Marshall Fire Department	101 W Guion St	Marshall	IN	47859
Turkey Run State Park	8121 Park Rd	Marshall	IN	47859
Marshall Post Office	61 E Guion St	Marshall	IN	47859
Parke Heritage Middle School	1551 E SR 47	Marshall	IN	47859
Turkey Run Elementary	1551 IN-47	Marshall	IN	47859
Bloomingtondale Post Office	90 Main St	Bloomingtondale	IN	47832
Bloomingtondale Fire Department	64 S Main St	Bloomingtondale	IN	47832
Bridgeton Post Office	8128 S Bridgeton Rd	Bridgeton	IN	47836
Bridgeton Fire Department	3359 E Hawkins Rd	Bridgeton	IN	47836
Bellmore Fire Department	7020 W US Highway 36	Bellmore	IN	47830
Mecca Fire Department	4882 W Wabash St	Mecca	IN	47860