BROADBAND

DEVELOPMENT AND IMPLEMENTATION STUDY

For West Virginia Regional Planning & Development Councils Regions 1 & 4 and Regional Optical Communications (ROC)

THOMPSON & LITTON

BRASG
Blue Ridge Advisory Services Group

Prepared for:
Webster County Commission, #G1, 2 Court Square, Webster Springs, WV 26288
and
Wyoming County Commission, PO Box 376, Pineville WV 24874

February 28, 2020

This Broadband Development and Implementation Study for the West Virginia Regional Planning & Development Councils Regions 1 & 4 was funded through a HUD Community Development Block Grant (CDBG) program which is administered statewide through the West Virginia Development Office (WVDO), and a United States Department of Commerce Economic Development Authority (EDA) grant.

The CDBG program is a program of the U.S. Department of Housing and Urban Development (HUD). The primary objective of Title 1 of the Housing and Community Development Act of 1974, as amended, is to develop viable communities by providing decent housing, a suitable living environment, and expanded economic opportunities, principally for persons of low-to moderate-income.

CDBG funds are available to municipal or county governments for projects to enhance communities by providing decent housing and suitable living environments and expanding economic opportunities. These grants primarily serve persons of low-and moderate-incomes.

While funding is primarily utilized for the development of water and sewer infrastructure, the WVDO recognizes that telecommunications, specifically broadband infrastructure, is a critical factor in West Virginia's ability to compete for economic development and job creation opportunities. As communities and economies become more connected, broadband infrastructure is an increasing concern, particularly among rural areas of West Virginia and areas in which low-to moderate-income residents do not have adequate access to this technology.

In FY 2017, the WVDO expanded the CDBG award categories to include broadband development. On February 1, 2018, Governor Jim Justice awarded the Webster County Commission a CDBG grant in the amount of $125,000 and the Wyoming County Commission a CDBG grant in the amount of $125,000 for the development of a comprehensive broadband plan. The primary objective of the CDBG award was to develop effective strategies that will directly lead the County Commission and other entities in Regions 1 & 4 to the strategic deployment of broadband-related implementation projects, with an emphasis on identifying project areas that would qualify under the HUD CDBG program guidelines.

The Webster County Commission and Wyoming County Commission hired Thompson & Litton, Inc. of Wise, Virginia, Radford, Virginia and Princeton, West VIrginia. in June 2018 as its professional consultant for the execution of this planning grant. This plan is the culmination of analysis in conjunction with the Regions 1 & 4 project team.

This plan provides the strategies for Regions 1 & 4 to implement broadband infrastructure builds in areas that are eligible for HUD CDBG funding in addition to other broadband-specific funding sources. Other important details of this plan include:

- A preliminary design of broadband networks outlining the types of installation and their locations including projects that could be implemented in identified CDBG-eligible areas.
- The preliminary cost estimates for construction of the proposed installations with guidance in applying for funding sources, including the HUD CDBG program.
- Estimates of the number of businesses and households that will be provided with improved and/or new broadband service, including projects that would be implemented CDBG-eligible areas.

The EDA grant to complement the Broadband Initiative for Southern WV was applied for and awarded to Region 4 PDC. This grant covers all eleven counties of Regions 1 &4 and was in the amount of $250,000 bringing the total project awarded amount to $500,000.

The following is an overall comprehensive broadband development and implementation study for the communities throughout the counties contained within the boundaries of Regions 1 & 4. The study includes an overall needs analysis and compilation, a full listing of existing broadband providers and their respective service areas including capabilities, establishment of best applications of existing, current and future technologies, maps of existing broadband facilities, and finally detailed project recommendations and cost estimates for providing the most cost effective and efficient broadband system which will allow access to fully functional and affordable Internet for the citizens of Southern West Virginia.

Also, included in the study are economic impacts of reliable high-speed broadband to the region, recommendations on broadband utility organizational measures and allowances for future technology sustainability for public access to societal broadband demands. The study provides the information needed to provide well-coordinated, affordable and sustainable implementation projects. Southern West Virginia must be strategic in their approach to building out broadband in order to capitalize the maximum direct and indirect benefits for job creation and private investment, and this study serves as a road map for this important endeavor.

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EXECUTIVE SUMMARY

This report documents a needs assessment of the broadband services in the West Virginia Regional Planning & Development Council Regions 1 & 4 and Regional Optical Communications (ROC) Service Area. (For more information on ROC, please see pages 50-51)

ROC is a non-profit corporation comprised of Region I Planning and Development Council and Region 4 Planning and Development Council (PDC), and Clay, Calhoun, and Roane Counties, with the mission to promote the social welfare and economic development within their communities through advocating and championing the development of enhanced technology, communications, telecommunications, and broadband availability throughout Southern West Virginia.

ROC is spearheading the installation of middle mile fiber in West Virginia, and facilitates communication and collaboration between all of its members on current and potential broadband projects. This alliance allows for sharing of resources and more effective planning on projects that will ultimately benefit all of West Virginia. ROC works to ensure that all of the localities within their regions are developing and executing strategies that benefit the overall health and well-being of the entire state, and acts as an information clearinghouse for current and future broadband projects and potential funding sources.

The rural parts of West Virginia are largely under-served, with some areas completely unserved, by broadband providers. The low population density in the region and the challenging geography make it unlikely that the region's leaders will be able to rely on the private sector to solve this problem. If there were a market-based business case, the investor-owned service providers would already be serving.

With few exceptions, the Incumbent Local Exchange Carriers' traditional copper and cable networks are insufficient to meet the current and future bandwidth needs of the region. Due to the financial impracticality of deploying current-technology networks, most incumbent local exchange carriers have neglected to extend, upgrade, or expand their networks in the region.

This lack of ubiquitous, affordable, reliable broadband has had an ongoing impact on the region. In many areas covered in this study, populations are declining. Communities are having difficulties retaining youth. Economies are stagnant and lacking the means to grow.

EXECUTIVE SUMMARY (CONTINUED)

Residents are frustrated about the lack of broadband and wireless connectivity. Students are falling behind. Small businesses cannot compete. Larger businesses are moving out of the region. Not all these maladies are caused by lack of sufficient broadband services, but it is certainly a contributing factor.

The need and demand for broadband communications services is great. The demand is enough to justify a long-term public investment. The total projected cost for a fiber-based solution is estimated between $21.9 million - $51.9 million. This represents a high-level estimate of the total cost to extend fiber to an existing wholesale internet provider and to build middle-mile fiber through the eleven counties that comprise the two regions. The plan calls for approximately 550 miles of new backbone fiber.

The following table displays the breakdown of the communities to be served, the miles of fiber, and total estimated cost to remediate the targeted areas.

		UNDERGROUND		AERIAL	
COUNTY	MILES	COST PER MILE	ESTIMATED COST	COST PER MILE	ESTIMATED COST
FAYETTE	46.2	$95,000	$4,389,000	$40,000	$1,848,000
GREENBRIER	69.3	$95,000	$6,583,500	$40,000	$2,772,000
MCDOWELL	27.1	$95,000	$2,574,500	$40,000	$1,084,000
MERCER	63.4	$95,000	$6,023,000	$40,000	$2,536,000
MONROE	35.0	$95,000	$3,325,000	$40,000	$1,400,000
NICHOLAS	54.6	$95,000	$5,187,000	$40,000	$2,184,000
POCAHONTAS	93.6	$95,000	$8,892,000	$40,000	$3,744,000
RALEIGH	39.2	$95,000	$3,724,000	$40,000	$1,568,000
SUMMERS	21.6	$95,000	$2,052,000	$40,000	$864,000
WEBSTER	69.0	$95,000	$6,555,000	$40,000	$2,760,000
WYOMING	27.8	$95,000	$2,641,000	$40,000	$1,112,000
	546.8		**$51,945,000**		**$21,872,000**

This investment will not solve all the regional connectivity problems. It will however, address access to high-speed Internet service for the communities in the greatest need.

There is a correlation between investments in broadband and economic development. The relationships are well studied and there are several articles that quantify the impacts of investment in rural broadband and economic growth, specifically:

- Gross Domestic Product Per Capita Increase,
- Median Household Income Increase, and
- Productivity Increase

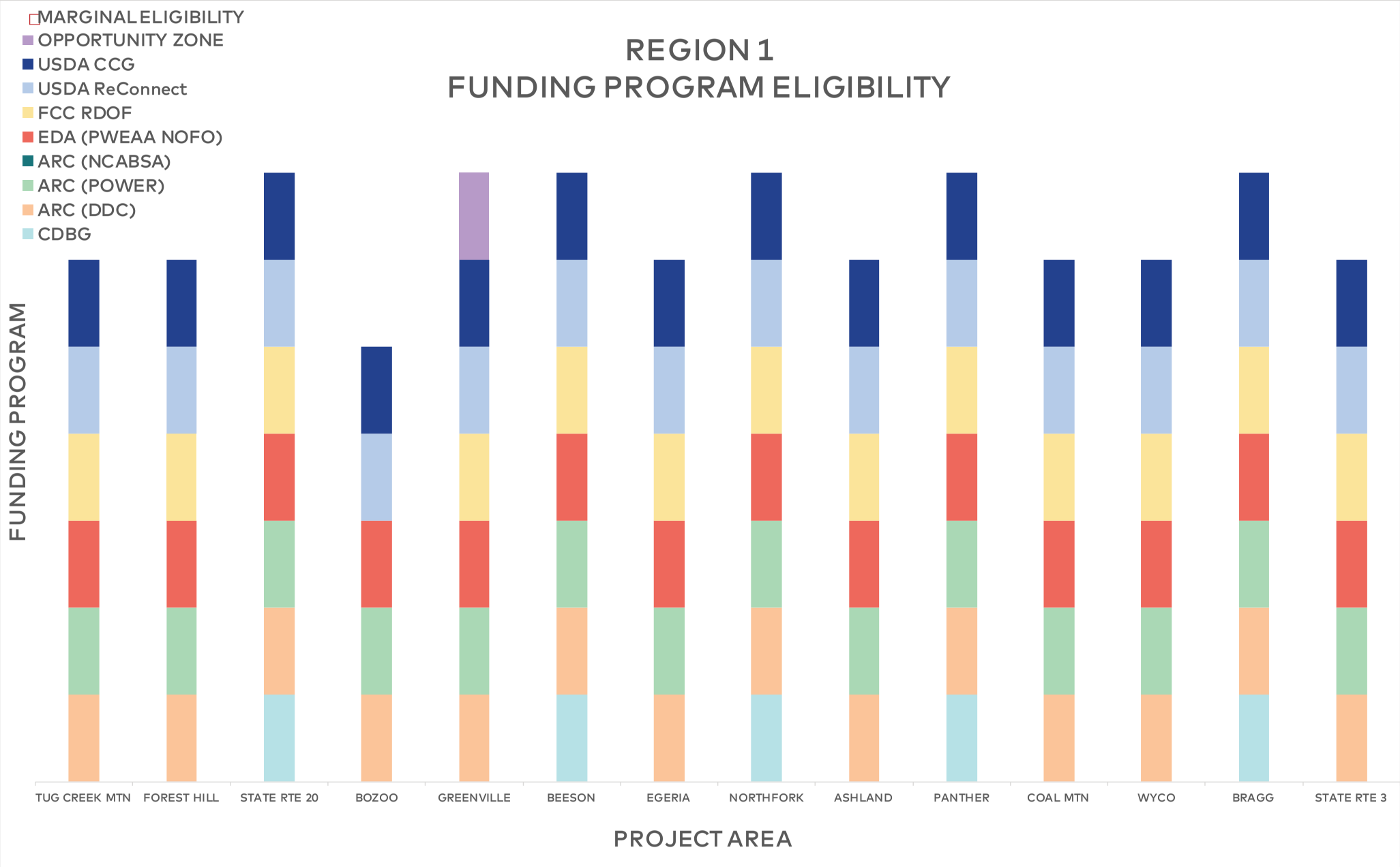
One of the more recent studies commissioned by the World Bank, studied the economic impact in developing economies:

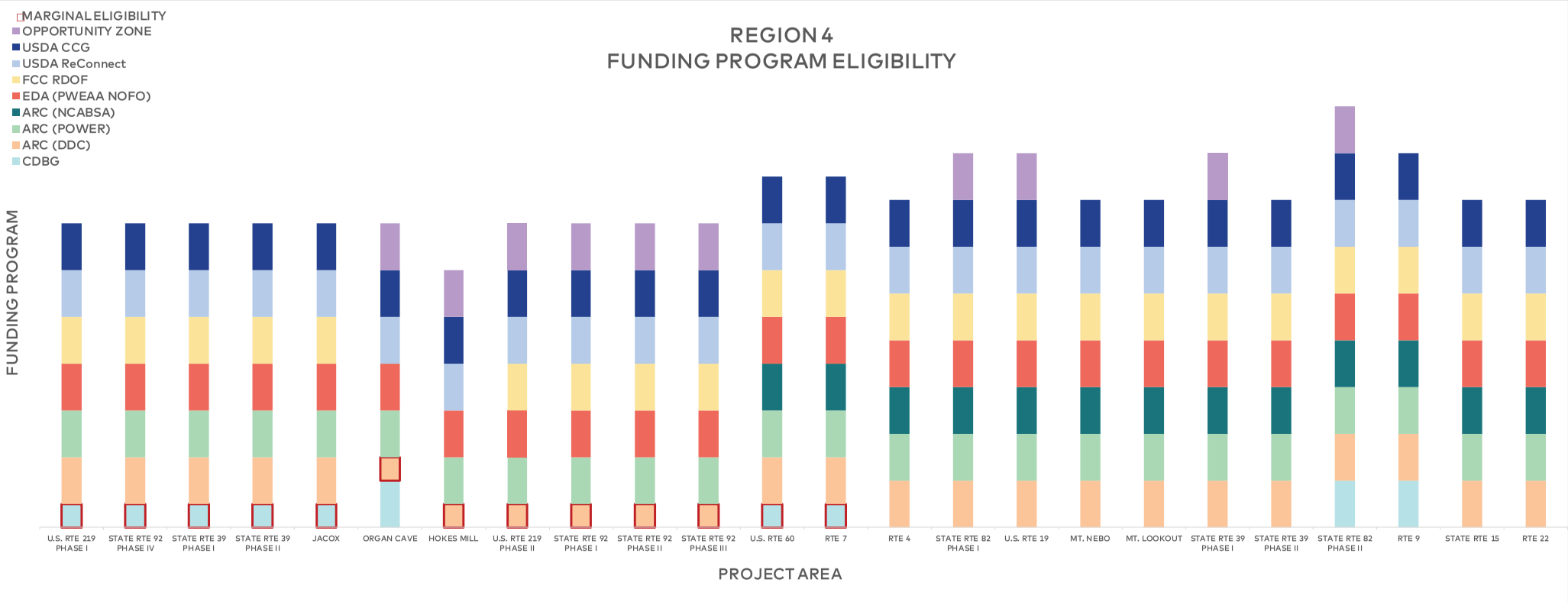
Digital Dividends. Exploring the Relationship Between Broadband and Economic Growth, by Michael Minges, 2016.

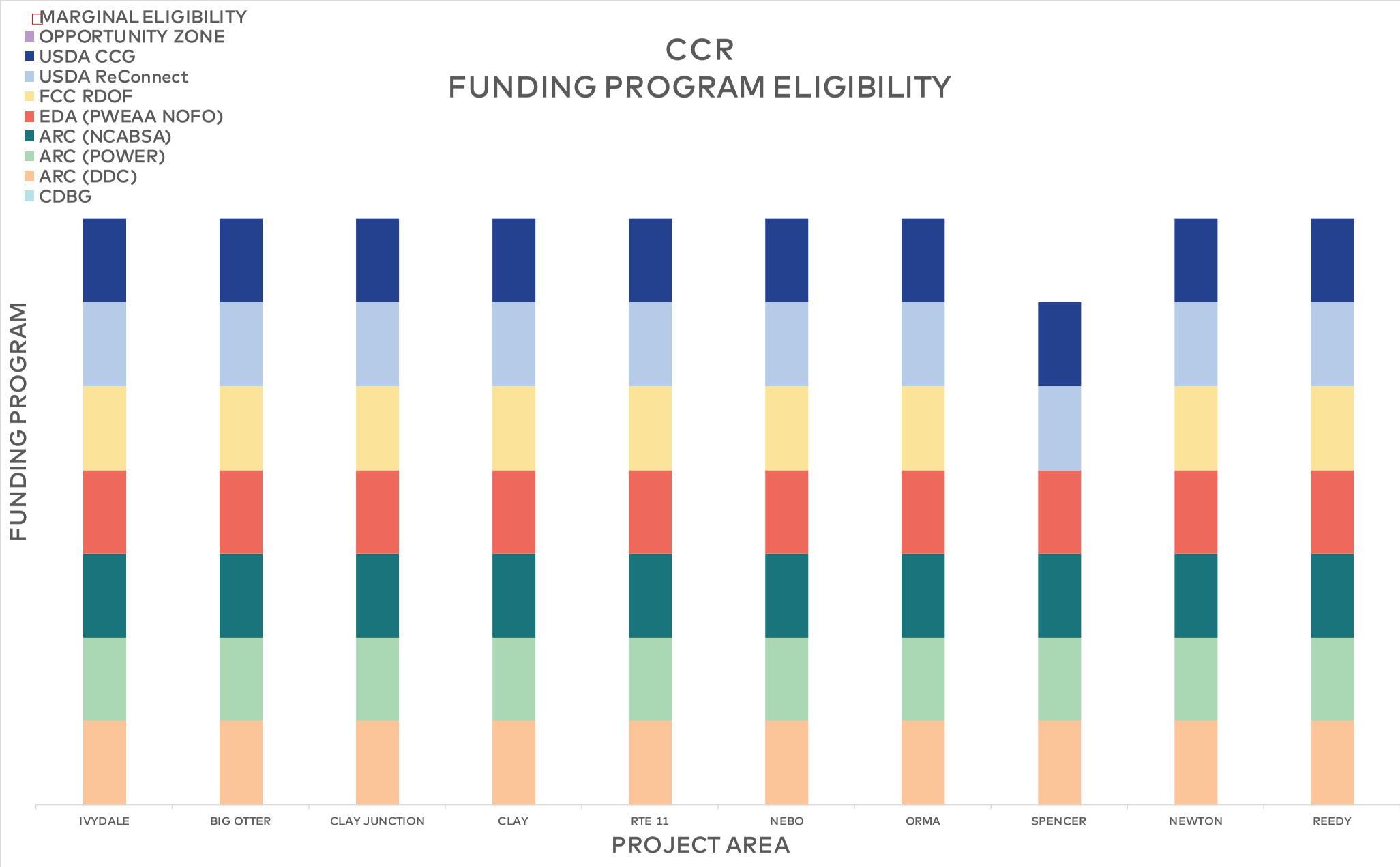
The study concludes that a 10-percentage point increase in fixed broadband penetration would increase GDP growth by 1.21% in developed economies and 1.38% in developing ones.

While the underlying broadband need in Regions 1 & 4 is for expanding middle-mile fiber, the ultimate goal is to get homes and businesses connected. Last-mile projects were developed in anticipation of several broadband funding programs. A minimum of two projects were developed in each county of Regions 1 & 4. The counties of Clay, Calhoun and Roan were included since these counties joined ROC. The following table summarizes the cost of each project area and identifies the eligibility of several funding programs.

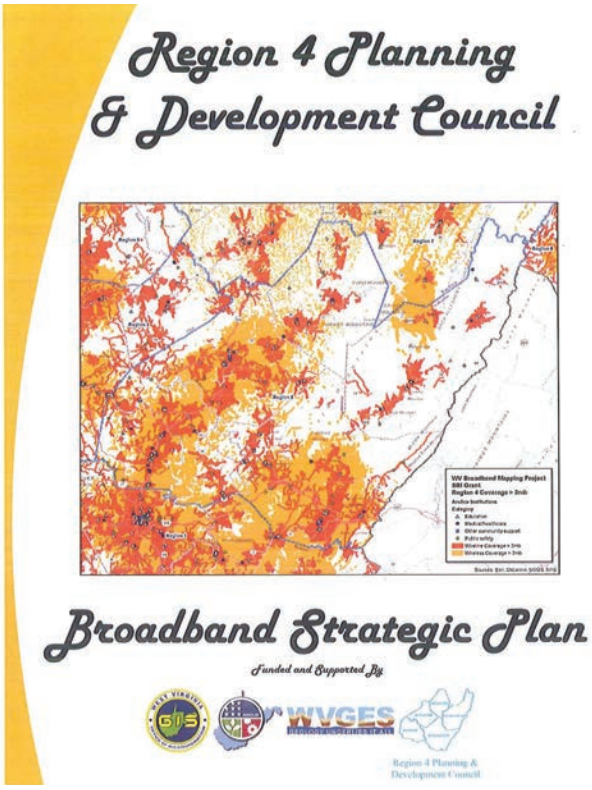
LAST-MILE PROJECT COSTS & FUNDING ELIGIBILITY




REGION 4
FUNDING PROGRAM ELIGIBILITY
MARGINAL ELIGIBILITY
OPPORTUNITY ZONE
USDA CCG
USDA ReConnect
FCC RDOF
EDA (PWEAA NOFO)
ARC (NCABSA)
ARC (POWER)
ARC (DDC)
CDBG
FUNDING PROGRAM
U.S. RTE 219 PHASE I
STATE RTE 92 PHASE IV
STATE RTE 39 PHASE I
STATE RTE 39 PHASE II
JACOX
ORGAN CAVE
HOKES MILL
U.S. RTE 219 PHASE II
STATE RTE 92 PHASE I
STATE RTE 92 PHASE II
STATE RTE 92 PHASE III
U.S. RTE 60
RTE 7
RTE 4
STATE RTE 82 PHASE I
U.S. RTE 19
MT. NEBO
MT. LOOKOUT
STATE RTE 39 PHASE I
STATE RTE 39 PHASE II
STATE RTE 82 PHASE II
RTE 9
STATE RTE 15
RTE 22
PROJECT AREA


MARGINAL ELIGIBILITY
OPPORTUNITY ZONE
USDA CCG
USDA ReConnect
FCC RDOF
EDA (PWEAA NOFO)
ARC (NCABSA)
ARC (POWER)
ARC (DDC)
CDBG
CCR
FUNDING PROGRAM ELIGIBILITY
FUNDING PROGRAM
IVYDALE
BIG OTTER
CLAY JUNCTION
CLAY
RTE 11
NEBO
ORMA
SPENCER
NEWTON
REEDY
PROJECT AREA

INTRODUCTION



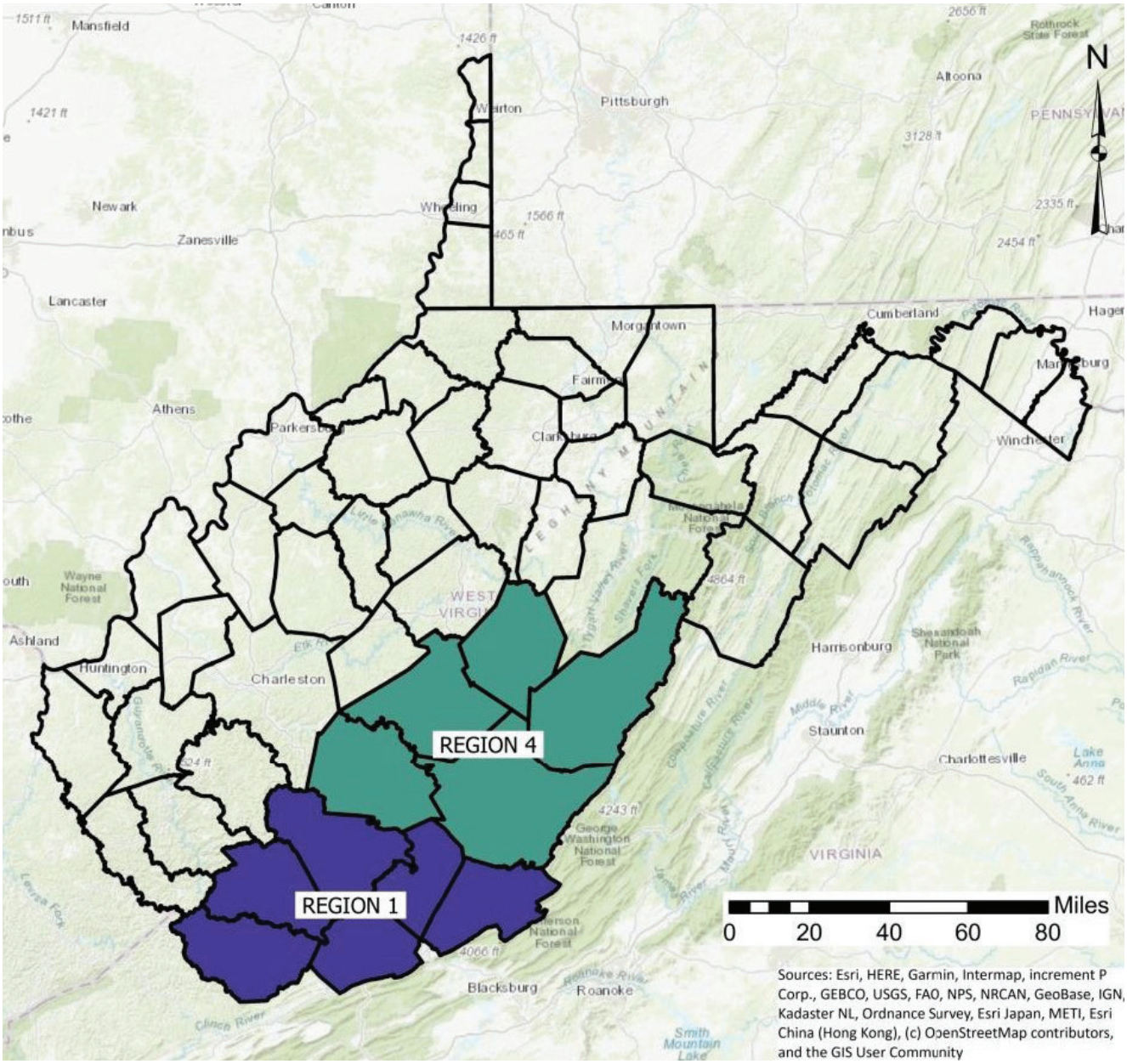
In 2013, the Regions 1 & 4 PDCs prepared their Regional Broadband Strategic Plans.

These documents are now six years old, however, they are very relevant and should be used in conjunction with this study as Regions 1 & 4 and the individual counties, towns and communities within these regions seek to expand broadband. These documents contain fundamental information that should be understood prior to reading this document (refer to Appendix 1 for definitions).

This report is funded by a CDBG awarded to Wyoming County in Region 1 and Webster County in Region 4. The work was coordinated with staff from both Regions 1 & 4 PDC offices.

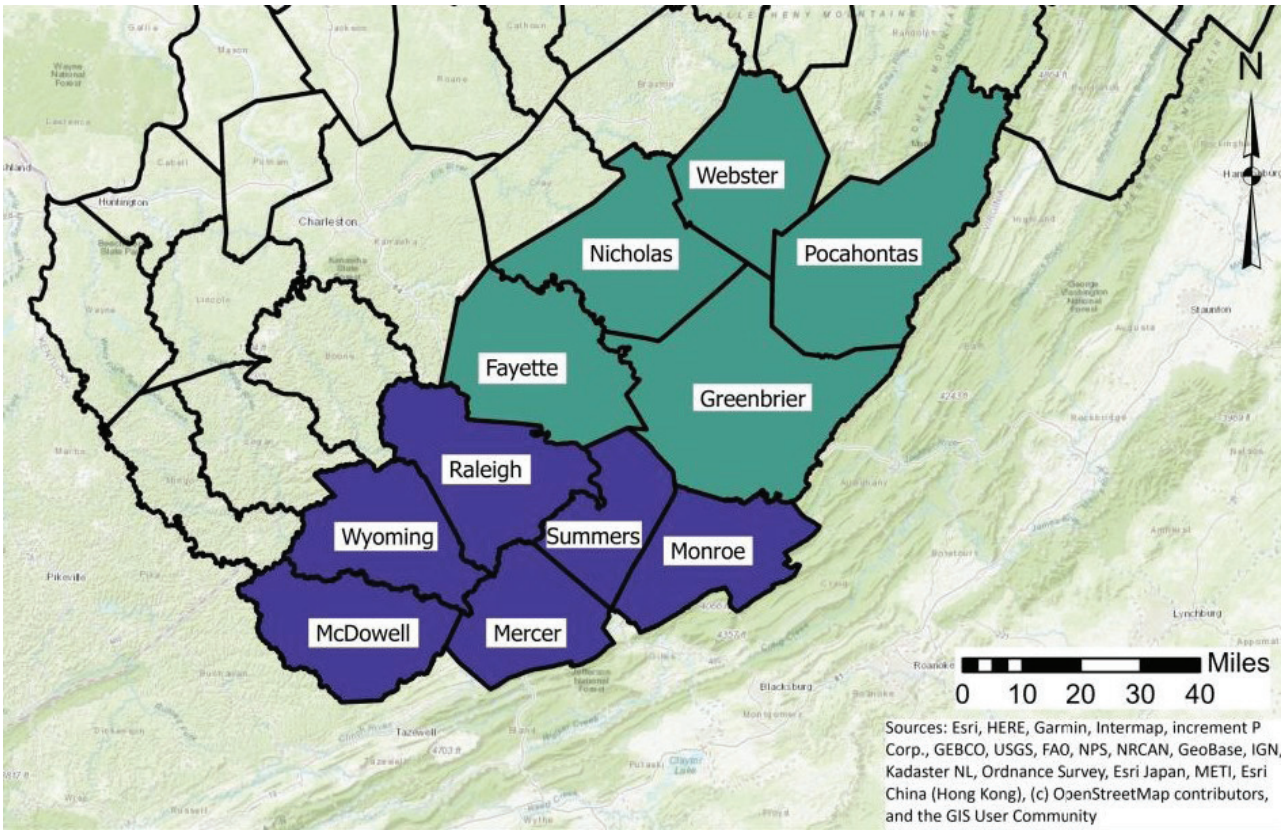
The goal of this report is to build upon the 2013 plans and identify projects from both a regional level and county/town/community levels.

PROJECT AREA



The project area comprises Eleven of the fifty-five counties in West Virginia. The total land area covered by these two regions is approximately 6,750 square miles or around 4.3 million acres. The project area is generally very rural with a few larger cities/towns. The City of Beckley is the largest city. Bluefield, Princeton, Summersville, Welch, Lewisburg, White Sulphur Springs, and Fayetteville are some of the other larger communities.

PROJECT AREA



The total population for the combined project area is approximately 321,500 with a density of roughly 48 residents per square mile.

US Census Bureau People Quick Facts	McDowell County	Mercer County	Wyoming County	Raleigh County	Summers County	Monroe County	Fayette County	Greenbrier County	Nicholas County	Webster County	Pocahontas County	114-County Region
Population estimates (V2017)	18,456	59,753	21,210	75,022	12,993	13,402	43,521	35,287	25,043	8,372	8,456	351,333
Land area in square miles, 2010	533.5	419.0	499.5	605.4	360.5	472.8	661.6	1,019.6	646.8	553.5	940.3	67,816.9
Population Density	34.6	142.6	42.5	123.9	36.0	28.3	65.8	34.6	38.7	15.1	9.0	44.9

Despite several centers of innovation and growth, the region lacks ubiquitously available broadband services, and where broadband is available there are serious issues regarding network reliability and service speeds.

Through the diagnostic interview process several communities were mentioned for their complete lack of high-speed internet, the exceptionally poor reliability of the internet, and specific mention of high-speed internet as an impediment to economic development or commercial retention.

***The source of all mapping is online ESRI Maps**

PROJECT TEAM

Regional Planning & Development Councils 1 & 4

The Regional Councils focus on expansion and improvement of: water and sewer facilities, infrastructure, transportation, employment, industry, small business development, housing, health care, education, and recreation. By coordinating closely with their affiliates in the region, they promote stability, growth, and progress in West Virginia, especially assisting local jurisdictions too small to maintain staff for grant writing and planning.

Thompson & Litton, Inc.

Thompson & Litton, Inc. (T&L), a local professional services firm, was selected to develop the study. T&L partnered with Blue Ridge Advisory Services Group, Inc. (Blue Ridge) to complete a comprehensive needs assessment and identify potential remedial solutions in Regions 1 & 4.

T&L has over 100 employees in eight offices, offering an array of engineering, architectural, surveying, planning and construction services throughout Virginia, Tennessee, and West Virginia. T&L has designed 15 broadband projects and numerous wireless deployment projects since 2006.

T&L's related project experiences include:

- Roanoke Valley Broadband Authority
- Citizens Telephone Cooperative
- Bristol VA Utilities/Cumberland Plateau
- Virginia Coalfield Coalition
- Verizon Wireless
- AT&T Mobility
- Nextel Communications
- SBA Communications
- Roanoke Valley Broadband Authority
- Virginia State Police
- Citynet

Blue Ridge Advisory Group

Blue Ridge Advisory Services Group (Blue Ridge) is a professional services firm that has been serving the telecommunications sector for 20 years. The firm provides strategies, business plans, feasibility studies, financial modeling, and other value-added related services to bring about actionable plans to improve communities.

Blue Ridge's related project experience includes:

- Dominion Energy Telecommunications
- DukeNet
- CaroNet
- TVA Telecom
- Bonneville Power Telecom
- Mid-Atlantic Broadband (and LIT Networks)
- Virginia Coalfield Coalition
- LENOWISCO LLC
- Roanoke Valley Broadband Authority
- Consolidated Cooperative FTTH Initiative

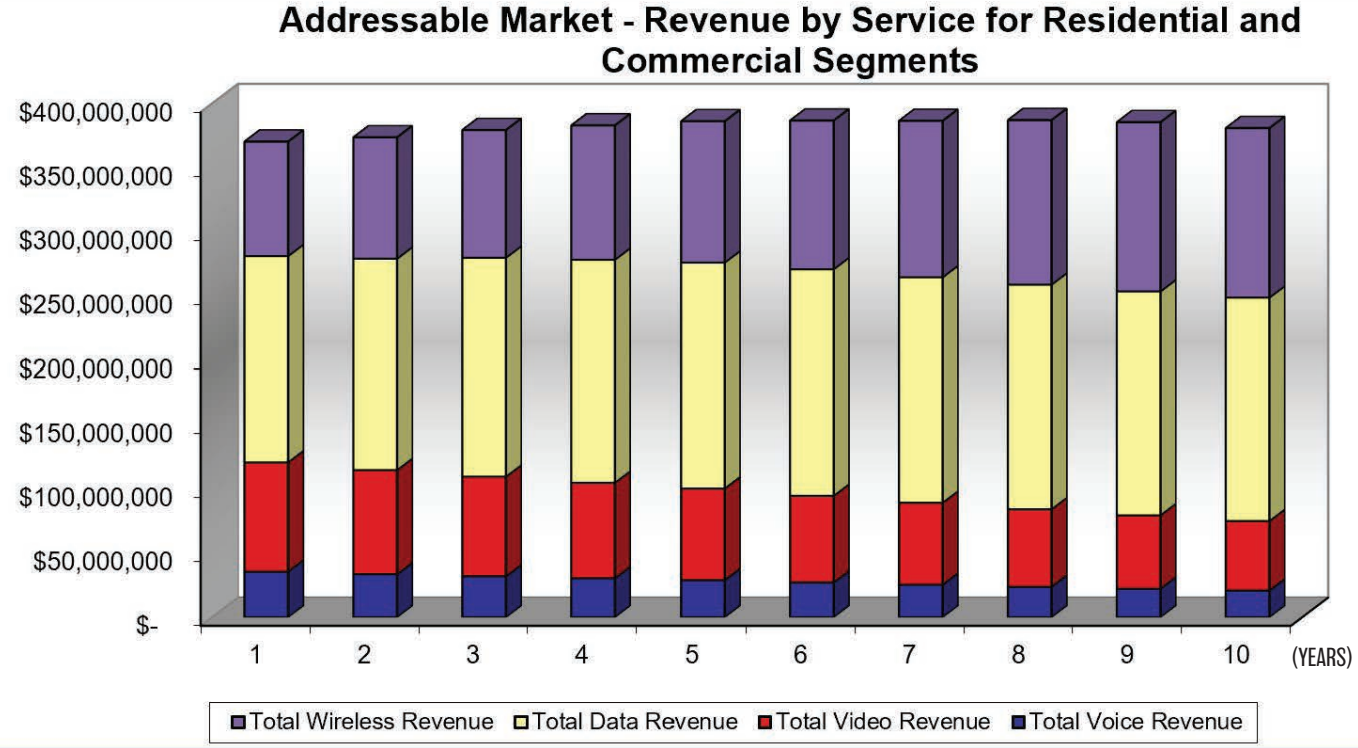
MARKET ANALYSIS

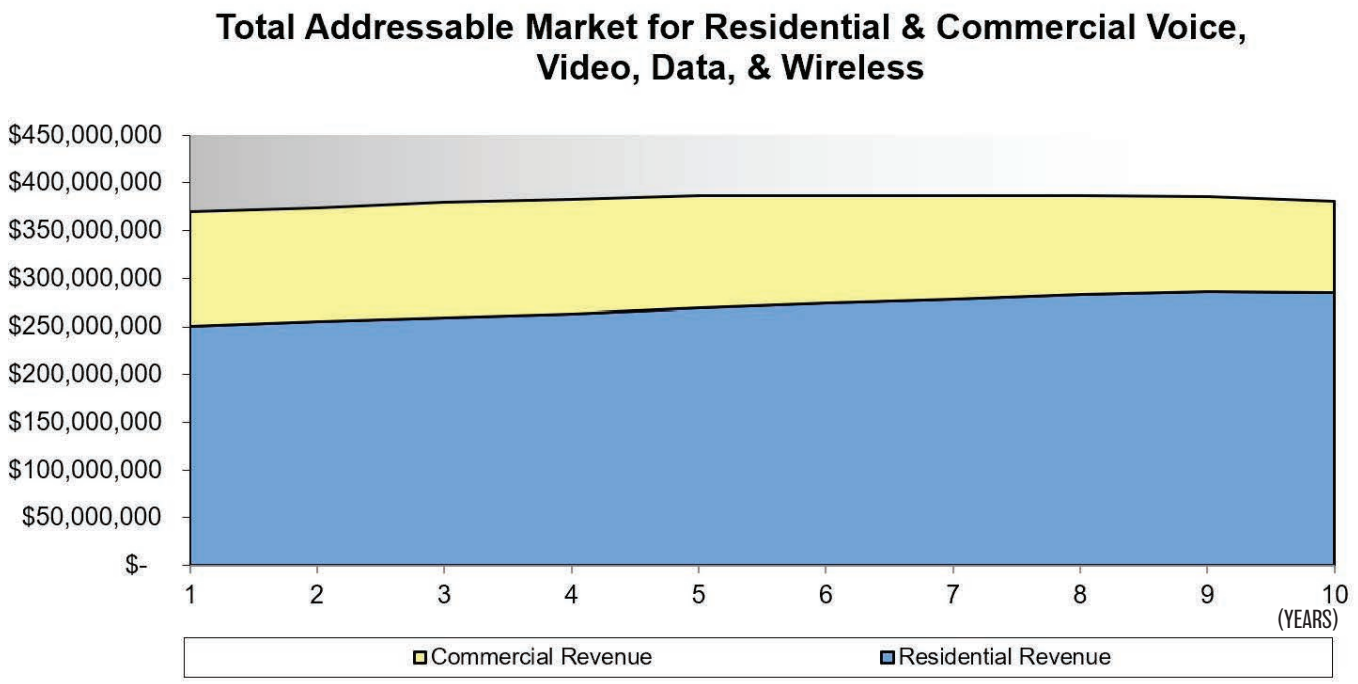
The total addressable market for retail telecom services in Regions 1 & 4 was calculated to be approximately $380 million annually. This includes all telecom services (Voice, Video, Data and Mobile Wireless).

HOW LARGE IS THE OPPORTUNITY?				
TOTAL ADDRESSABLE MARKET FOR RETAIL TELCOM SERVICES IN THE 11-COUNTY WEST VIRGINIA REGION				
TELCOM SERVICE	ANNUAL REVENUE AT YEAR 1	ANNUAL REVENUE AT YEAR 5	ANNUAL REVENUE AT YEAR 10	CUMULATIVE 10 YEAR REVENUE
VOICE	$35,659,649	$28,969,154	$22,335,969	$280,288,251
VIDEO	$85,145,786	$71,565,137	$57,286,178	$694,133,561
DATA	$160,187,072	$175,492,491	$173,905,902	$1,716,177,647
WIRELESS	$89,296,136	$110,258,776	$131,999,444	$1,129,335,645
TOTAL	**$370,388,625**	**$386,285,558**	**$385,527,493**	**$3,819,935,104**

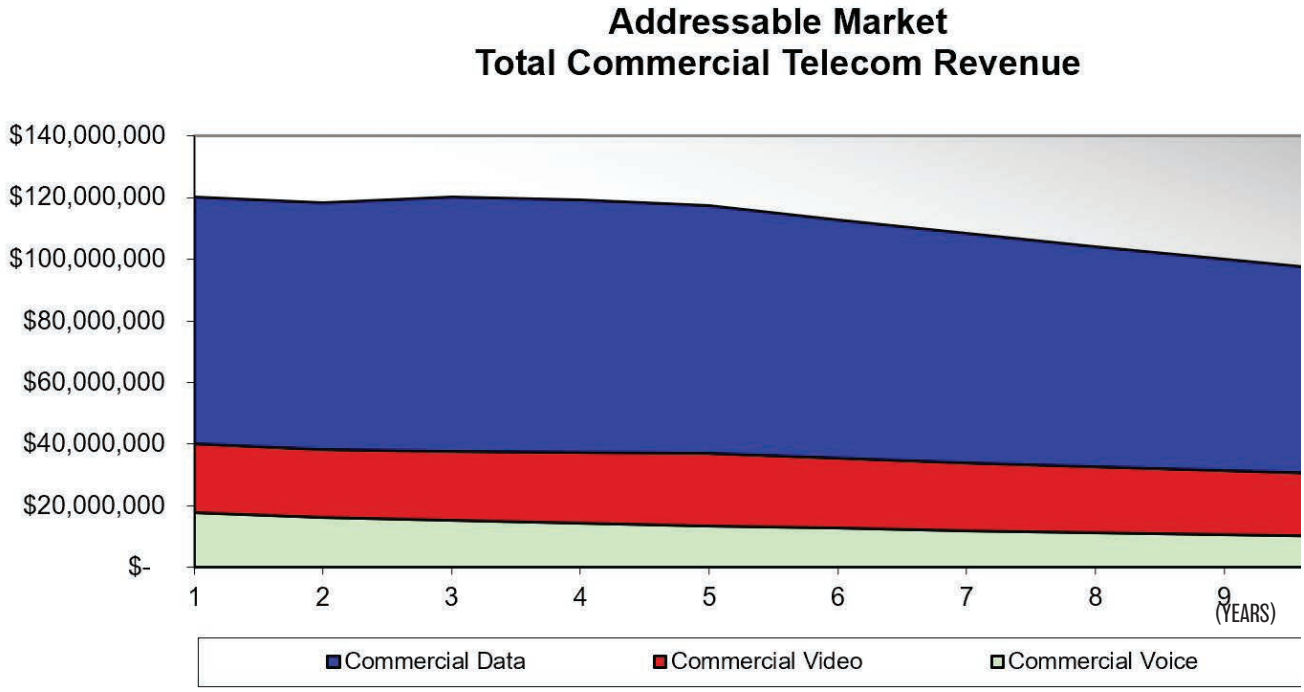
The market for the two Regions is approximately 71% residential and 29% commercial. The following graphs summarize the findings of the market analysis.

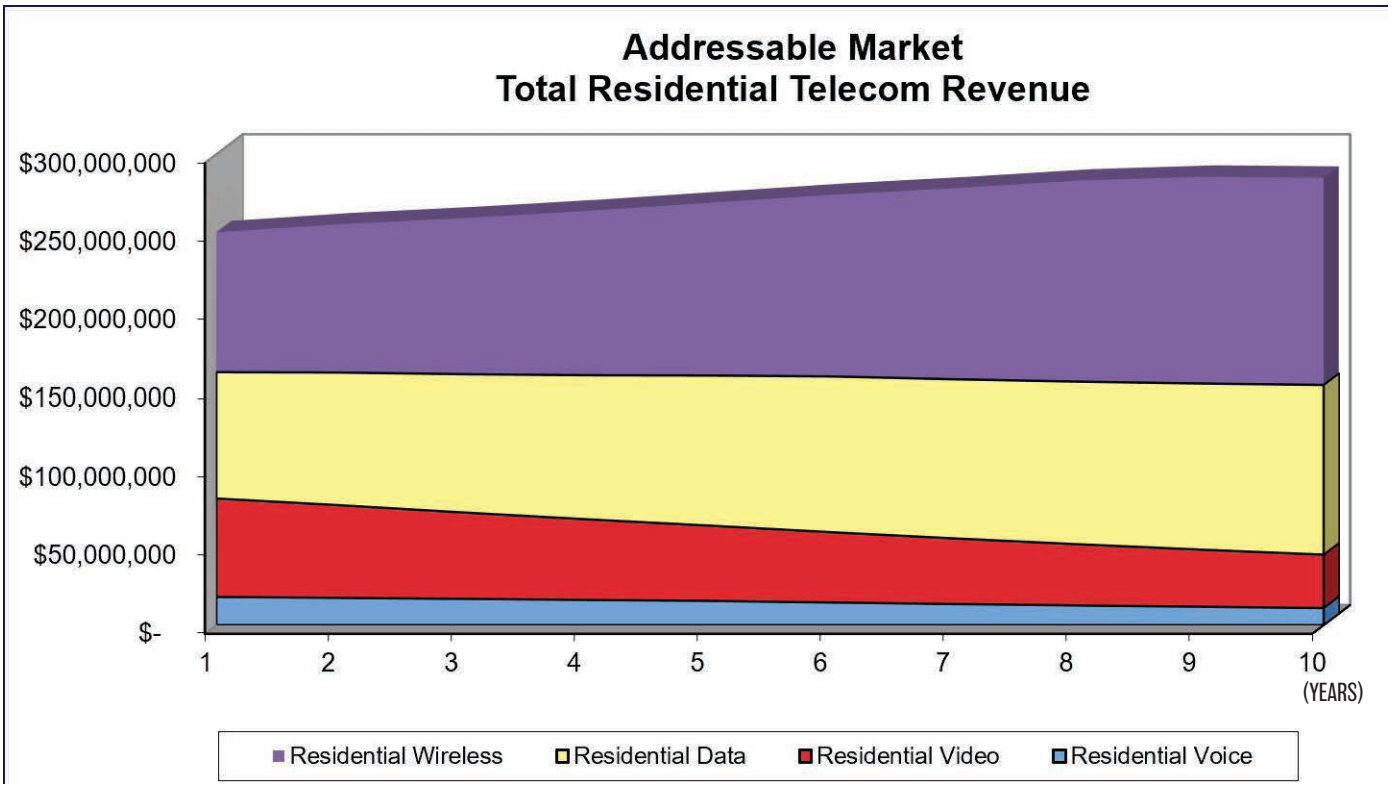
MARKET ANALYSIS





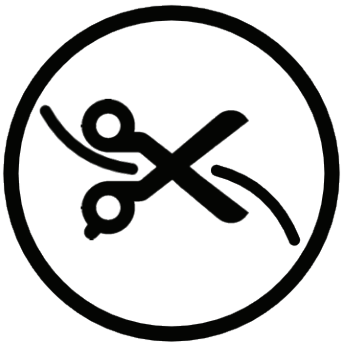
MARKET ANALYSIS





MARKET ANALYSIS

The important market dynamics that will influence this addressable market are threefold:



1. Cable TV Cord Cutting.

As wireless service becomes more reliable and ubiquitous, and as broadband becomes more available, there will be a continued defection not only from landline voice to wireless but also from cable TV to digital, a-la-carte streaming services. Cisco predicts that nearly four-fifths (79 percent) of the world's mobile data traffic will be video by 2022.

2. Mobile Data Demand.

The explosion in mobile data demand only continues. It grew 23% in 2017 in North America. The increasing number of wireless devices and connections will continue to drive the surge in demand for wireless data.

3. 5G Technology.

The evolution of 5th Generation, or 5G, networks, holds the promise to deliver faster speeds. However, it is likely that rural areas, most areas within this study, may be last in line to see the carriers upgrade, as they will target the larger markets initially. A strong fiber backbone will still be needed to service the 5G network. 4G will carry most of the traffic for the next 10 years or so.

These trends will drive demand for expanded fiber and wireless-dependent services in the region, presenting an opportunity for service providers. However, the issue remains. The associated costs of upgrading networks to meet that demand is still extremely high due to the low population densities and challenging geography of the region. Regional leaders must find ways to partner with providers to bridge the gap so that their communities are not left behind.

STATUS OF EXISTING BROADBAND

An analysis of the existing broadband infrastructure revealed that the more populated areas in both Regions 1 & 4 have some form of broadband service.

Frontier is the telephone company serving most of West Virginia. Frontier is shown to serve many areas with broadband DSL service. Based on observations and interviews, the Frontier service is very poor. There were reports of service being out for over week. Frontier does have fiber service to most of the critical community facilities such as schools, government facilities, libraries and first responder services. Through the federal Broadband Technology Opportunities Program (BTOP) grant in 2009, fiber service was extended to these facilities.

The 2013 Broadband Strategic Plan for both Regions 1 & 4 stated the following:

> **"Fiber backbone is growing and is providing opportunities to create new commerce via broadband hubs and hot spots."**

It is our observation, however, that the two regions suffer from a lack of adequate backhaul fiber. The following statement is from the Region VII Broadband Strategic Plan and holds true for Regions 1 & 4:

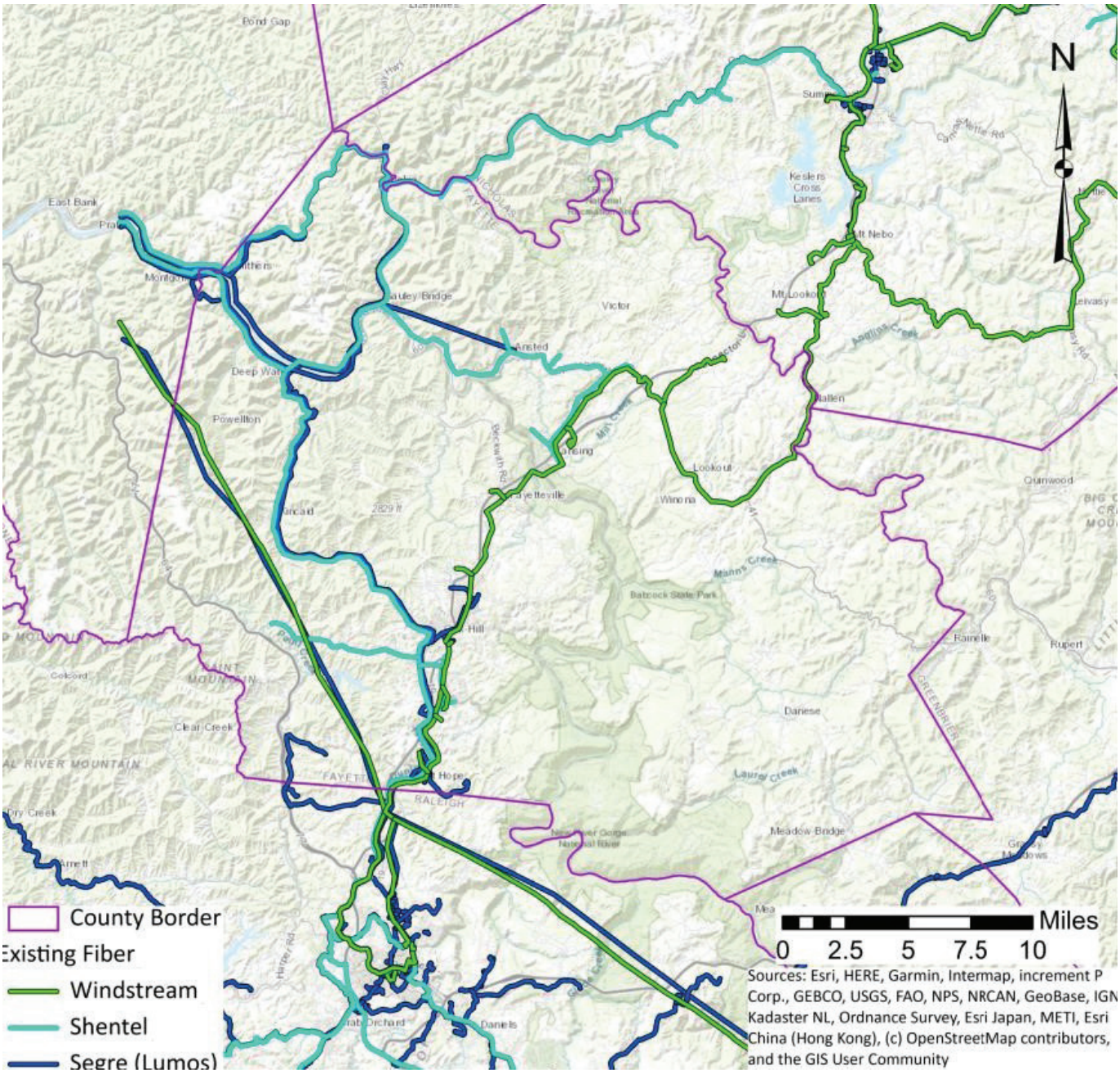
> **"Having no major Point of Presence (POP) and only one wholesale "backhaul" fiber line reduces redundancy to the prime Internet core and negates the web effect of the Internet system. Data packages will travel the path of least resistance and when there is only one main line all data is funneled through that element of the system causing a bottleneck. Broadband capacity per second remains the same; however, if more use is taking place at any second the speed for the individual user drops. When there are more backhauls the demand for data transport is spread out and a more uniform speed of data transfer is accomplished. The Region VII broadband fiber system looks and functions more like a tentacle than a web, one way in and one way out."**

The lack of middle-mile fiber is a major hindrance to broadband expansion in Regions 1 & 4 as well as the entire state of West Virginia.

EXISTING FIBER INFRASTRUCTURE

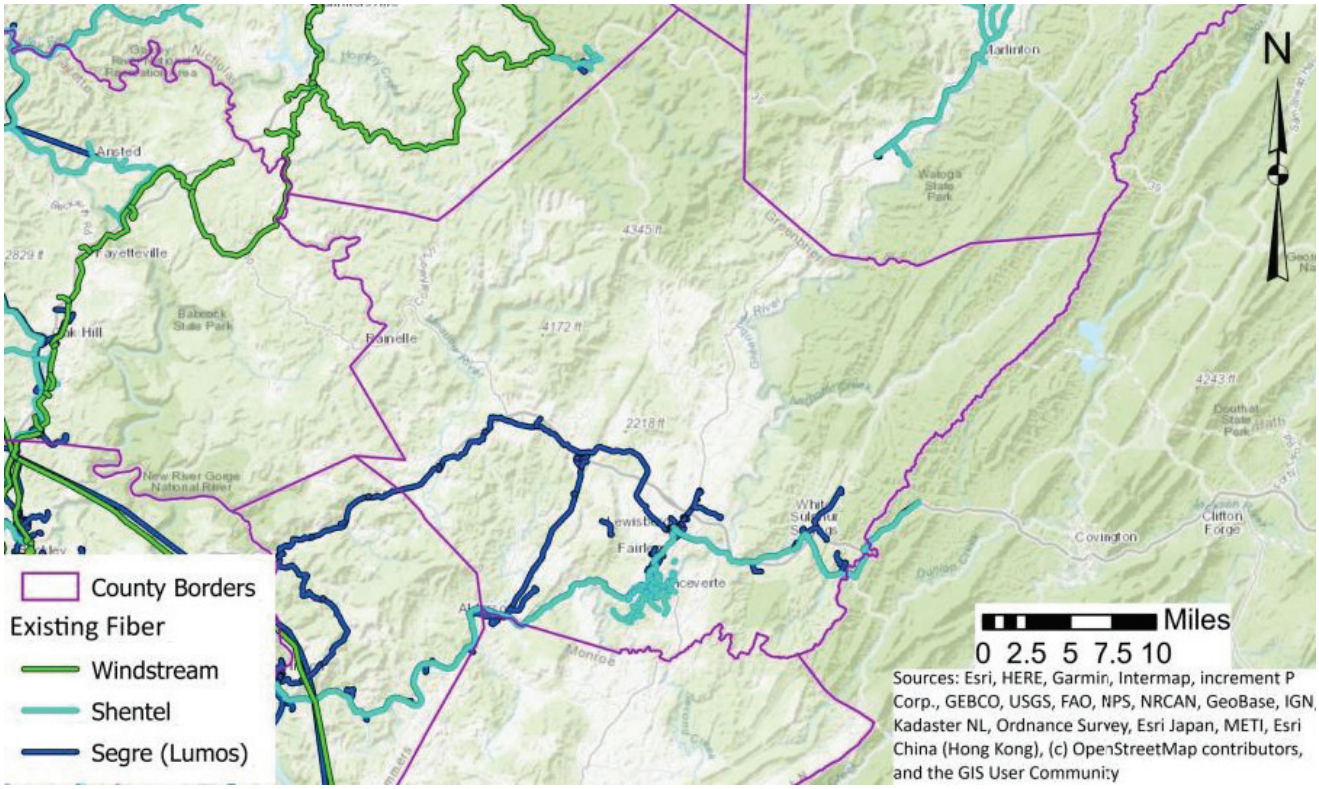
The exhibits below show the existing fiber in each county of the Regions 1 & 4 project area.

FAYETTE COUNTY

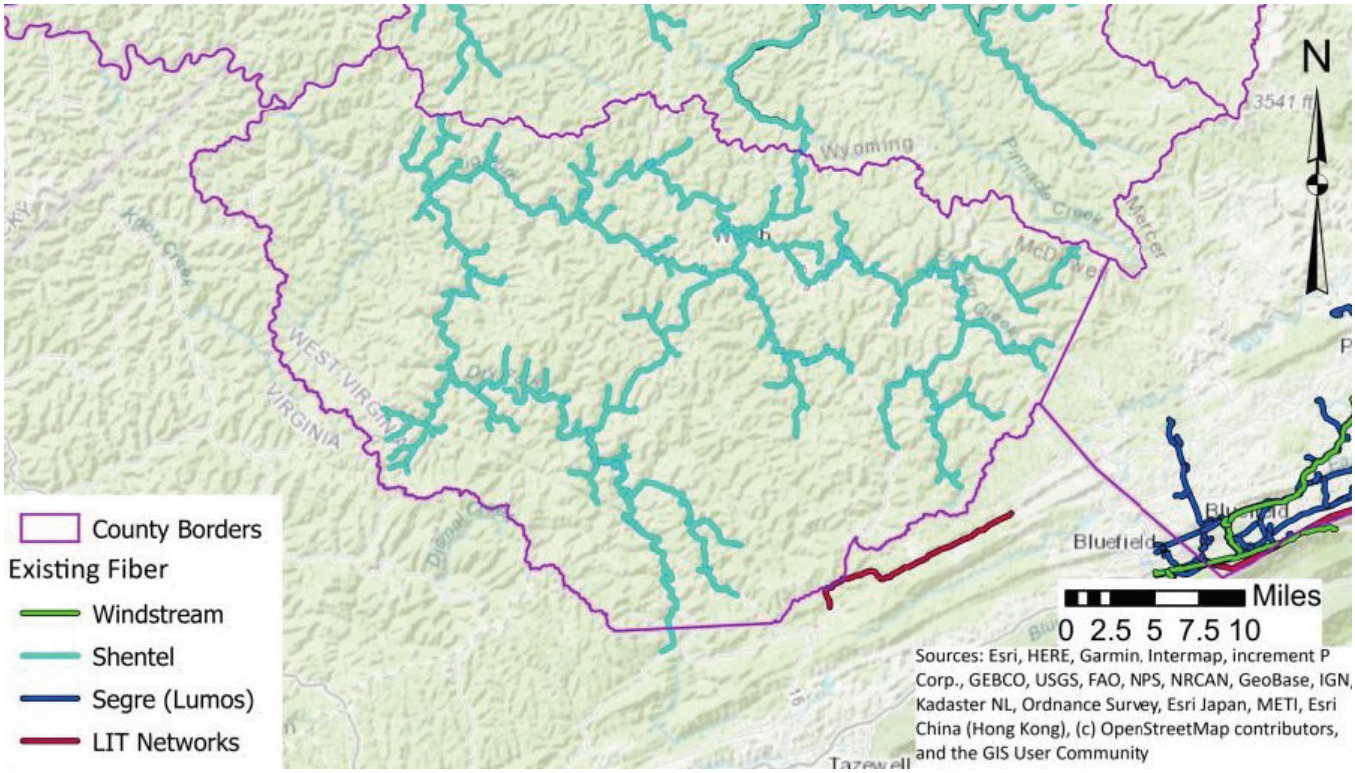


Note...Some of the fiber shown below is not available for service, but is used primarily for long-haul connections and for cellular tower connections. Also, many providers such as Frontier, Comcast and Suddenlink, do not make there fiber networks available for public viewing.

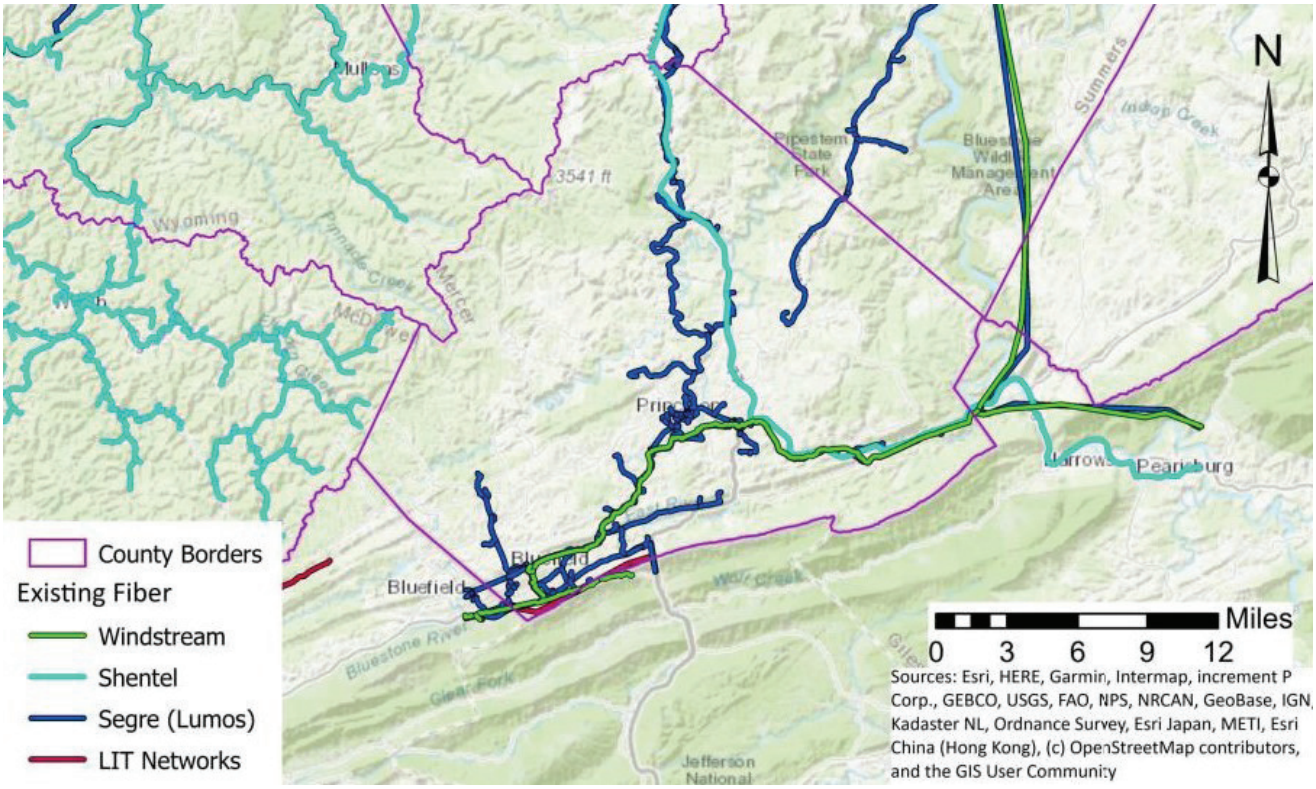
GREENBRIER COUNTY



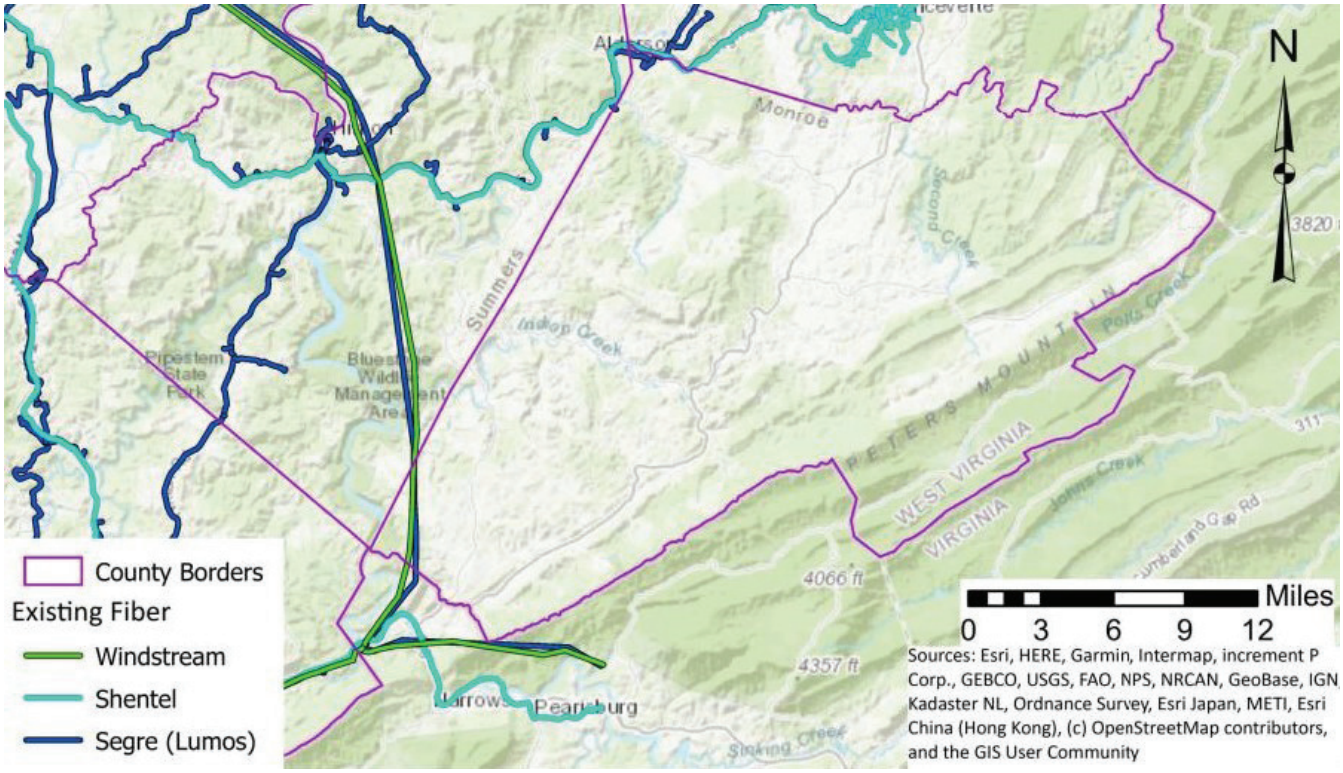
MCDOWELL COUNTY



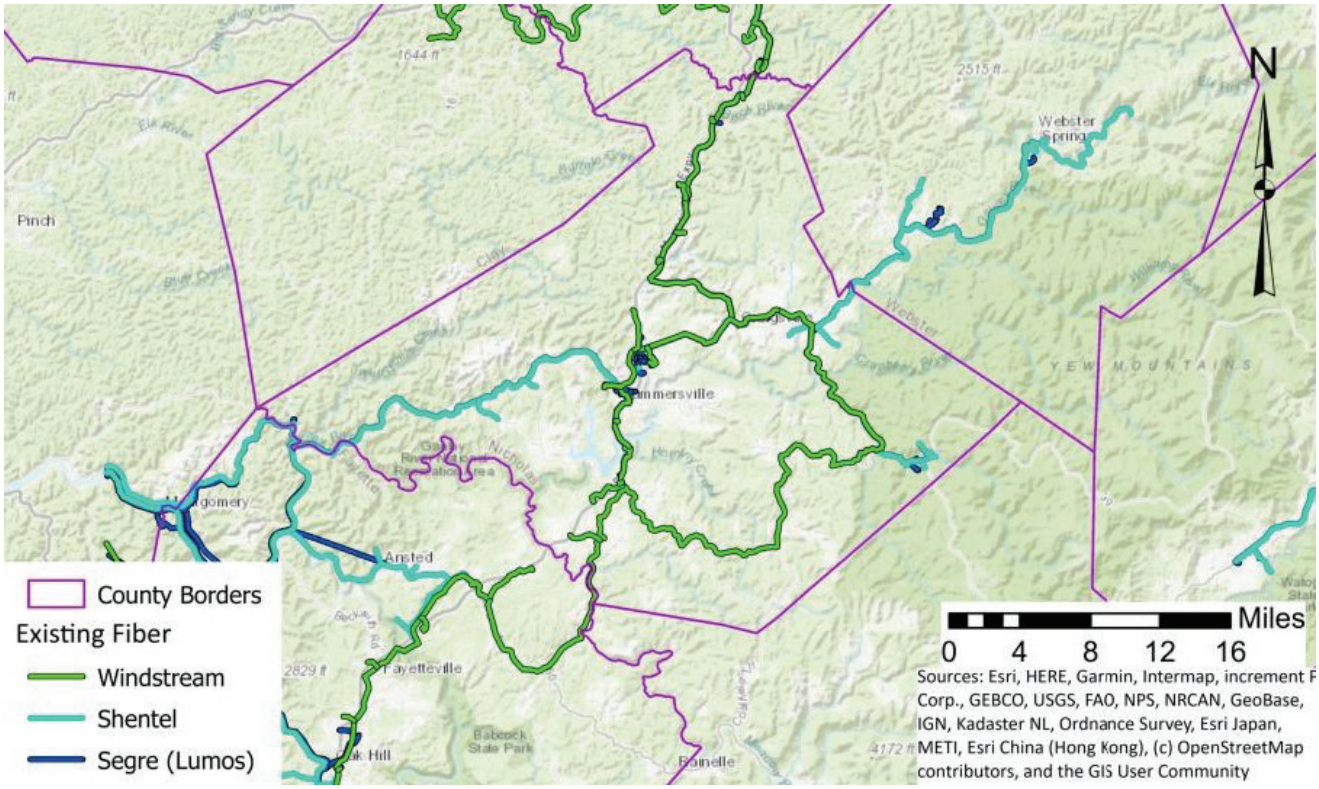
MERCER COUNTY



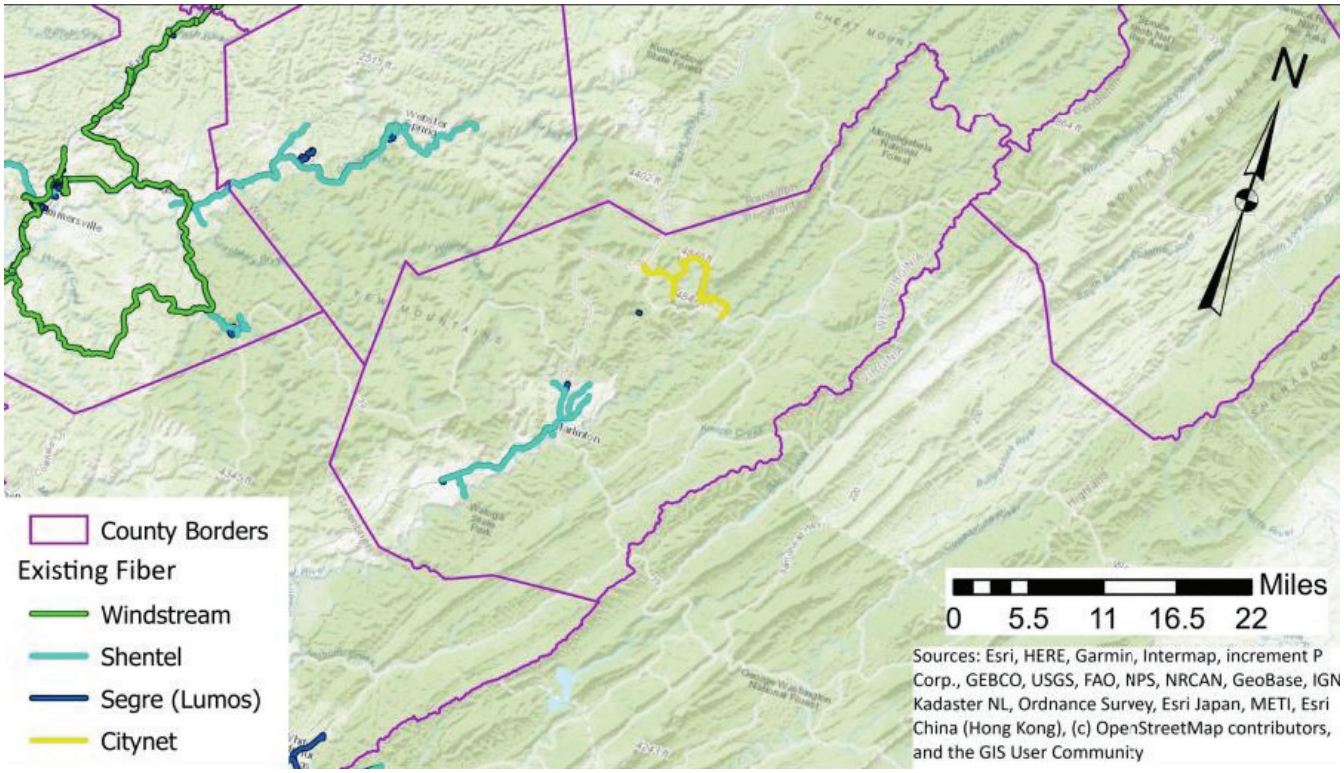
MONROE COUNTY



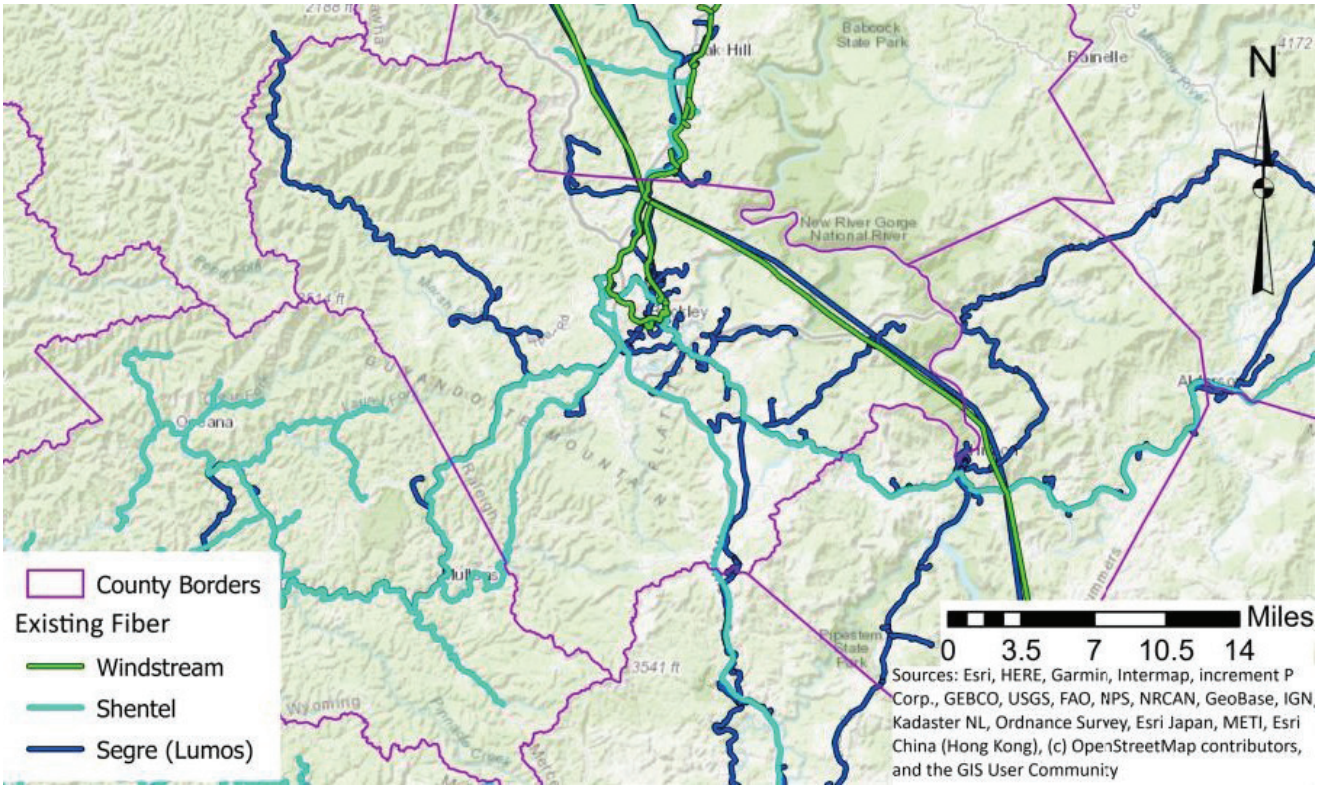
NICHOLAS COUNTY



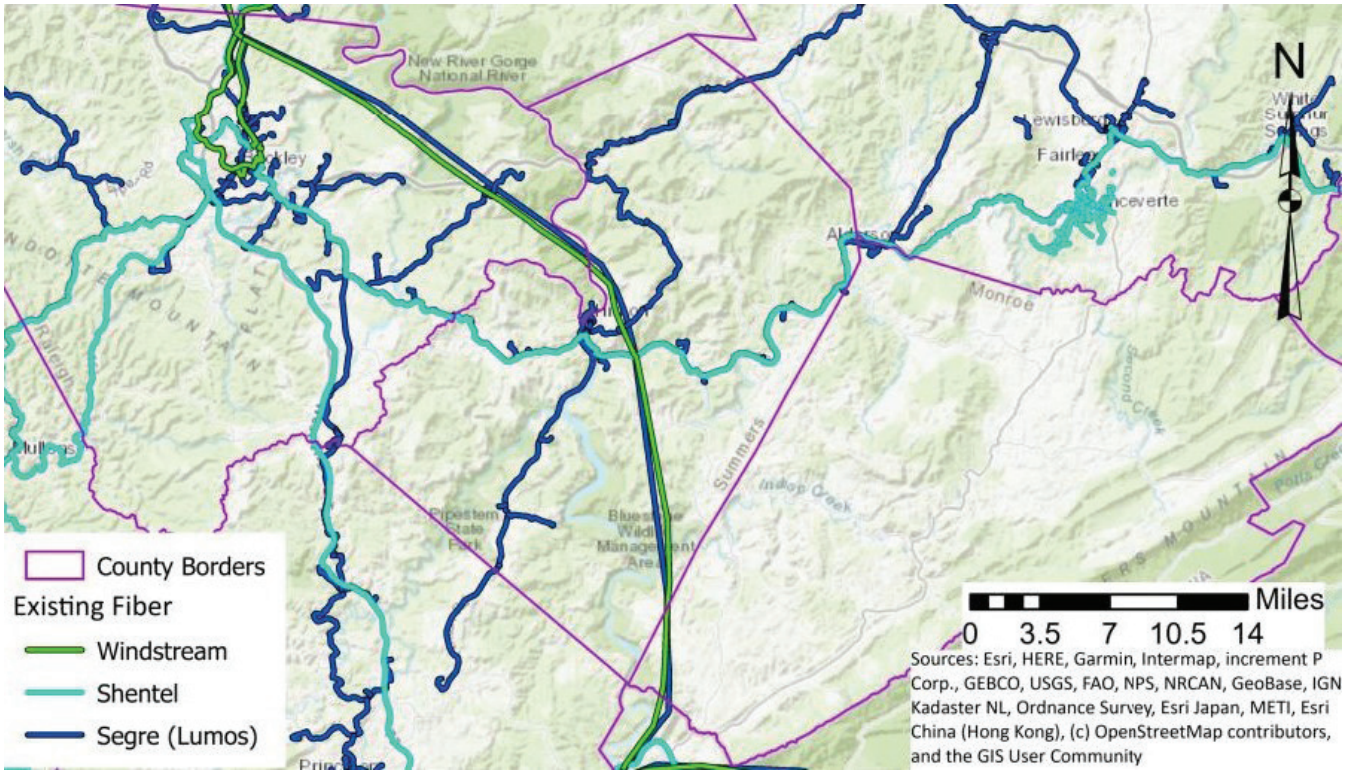
POCAHONTAS COUNTY



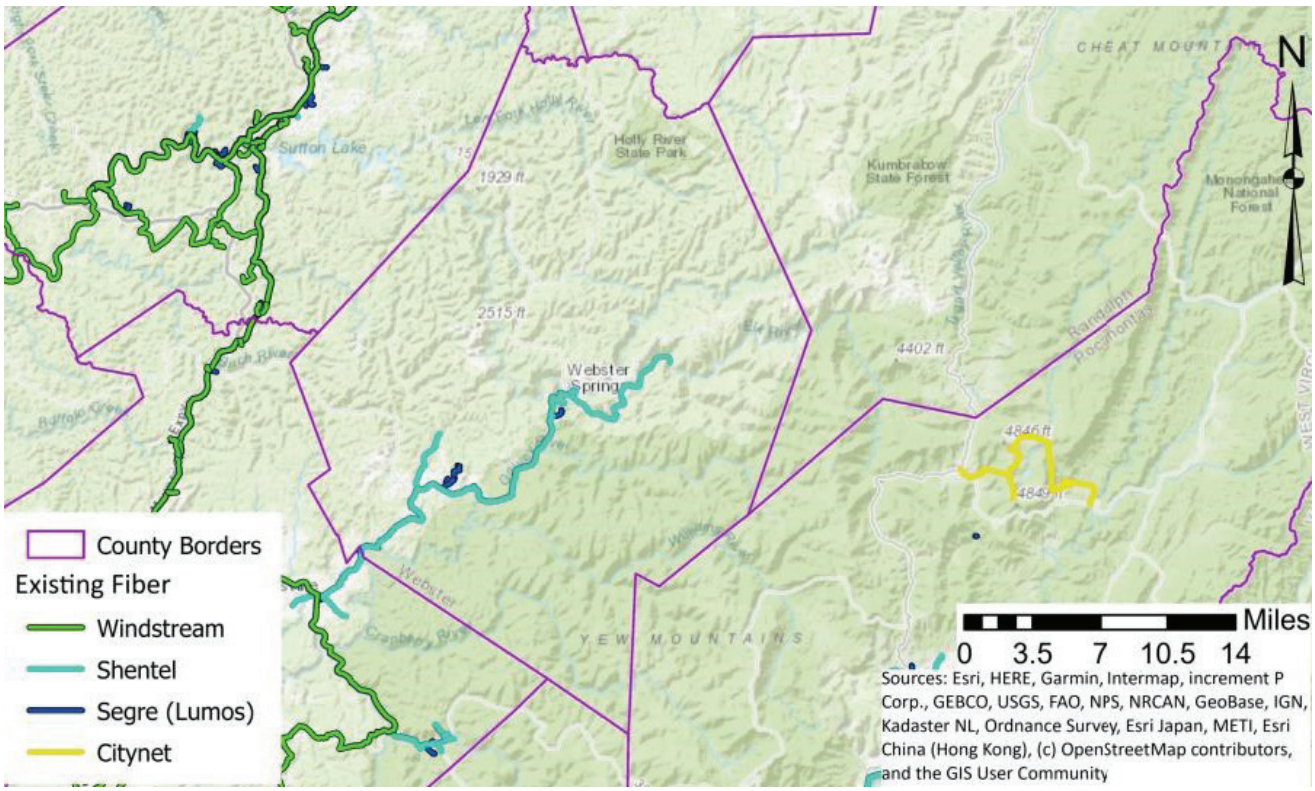
RALEIGH COUNTY



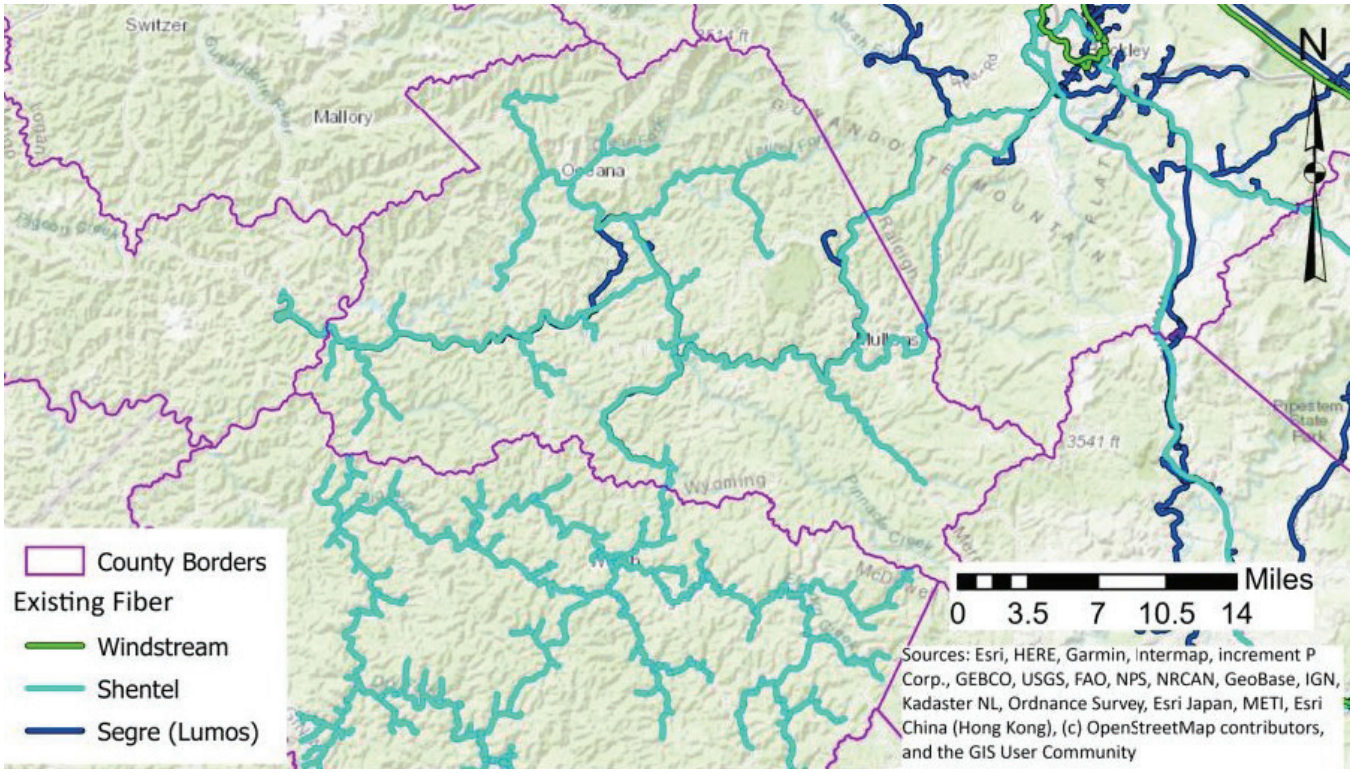
SUMMERS COUNTY



WEBSTER COUNTY

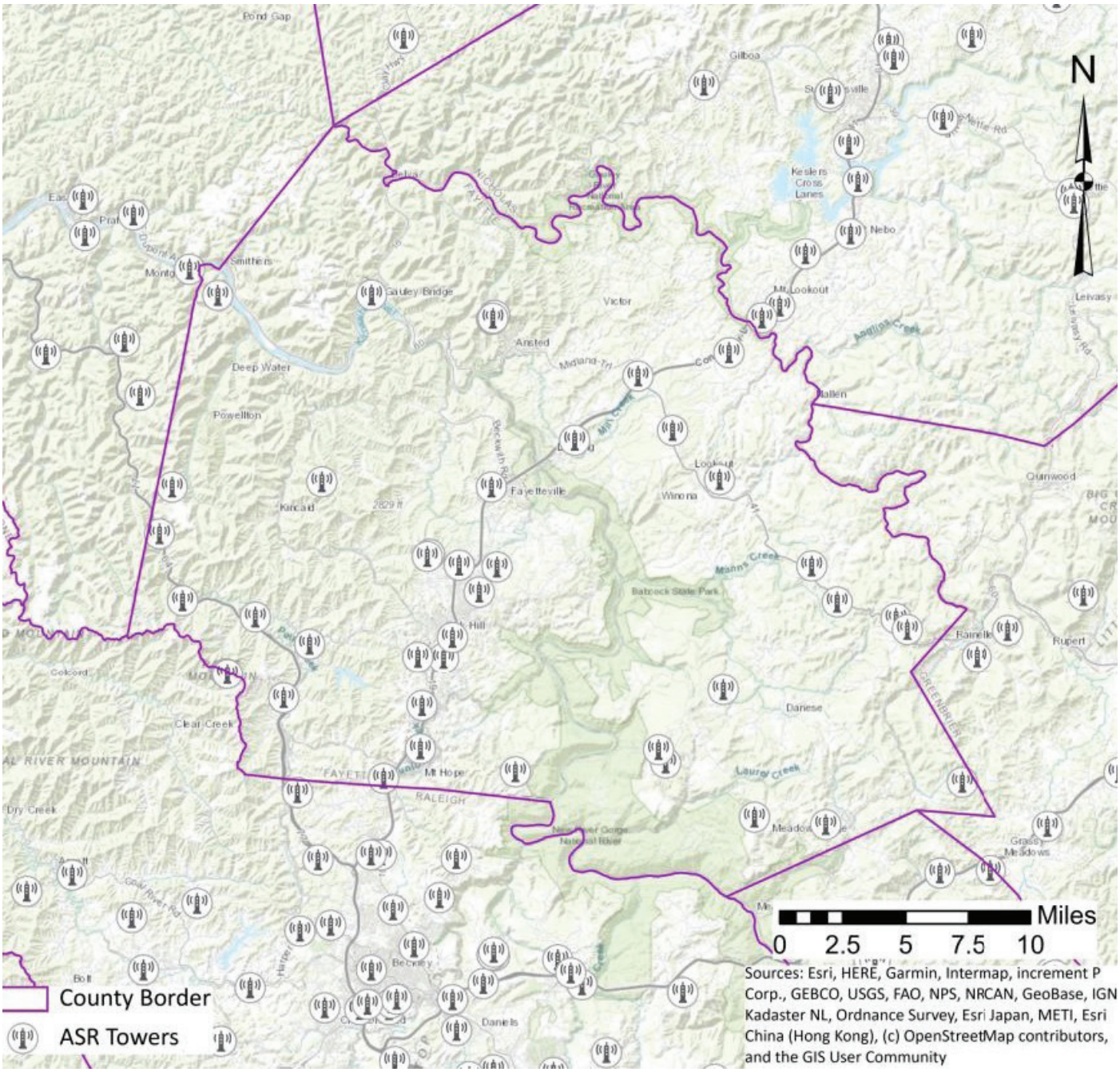


WYOMING COUNTY



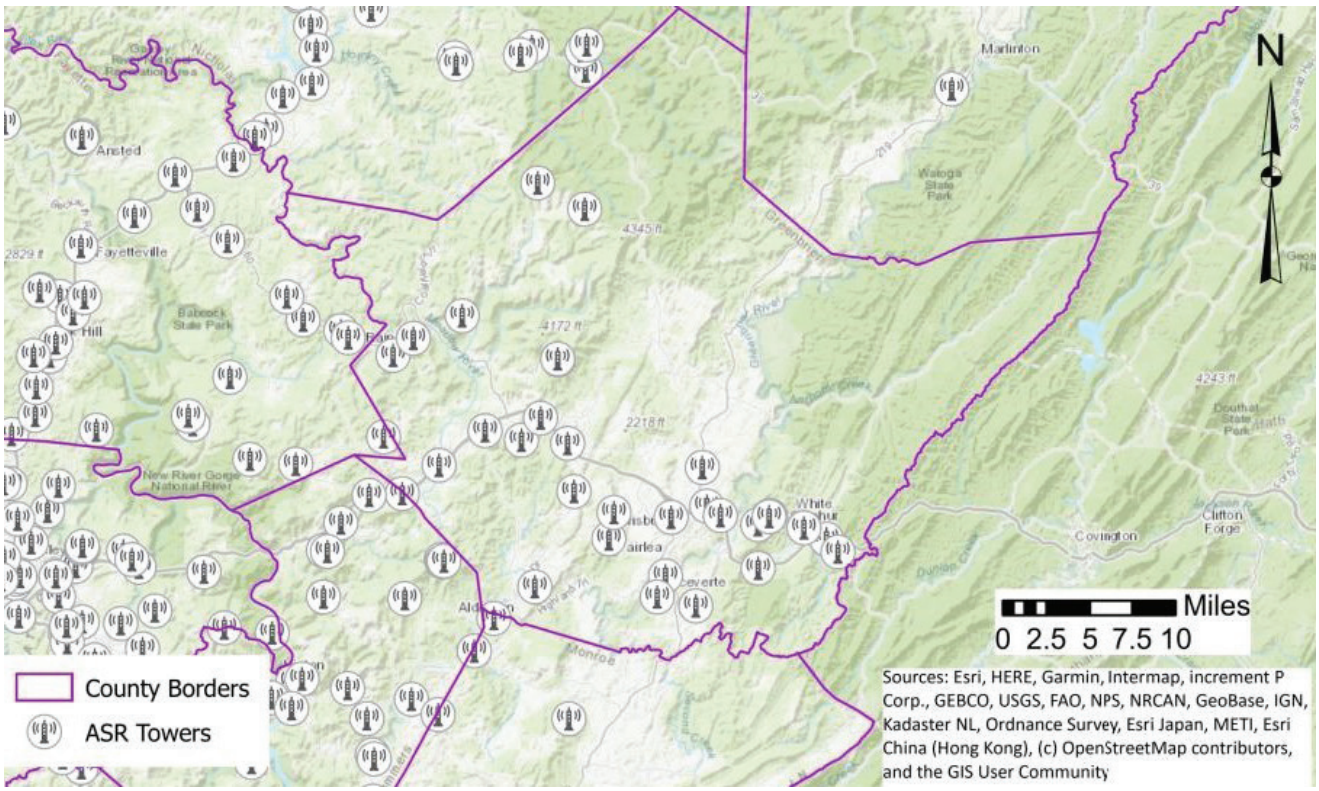
EXISTING COMMUNICATION TOWERS

FAYETTE COUNTY

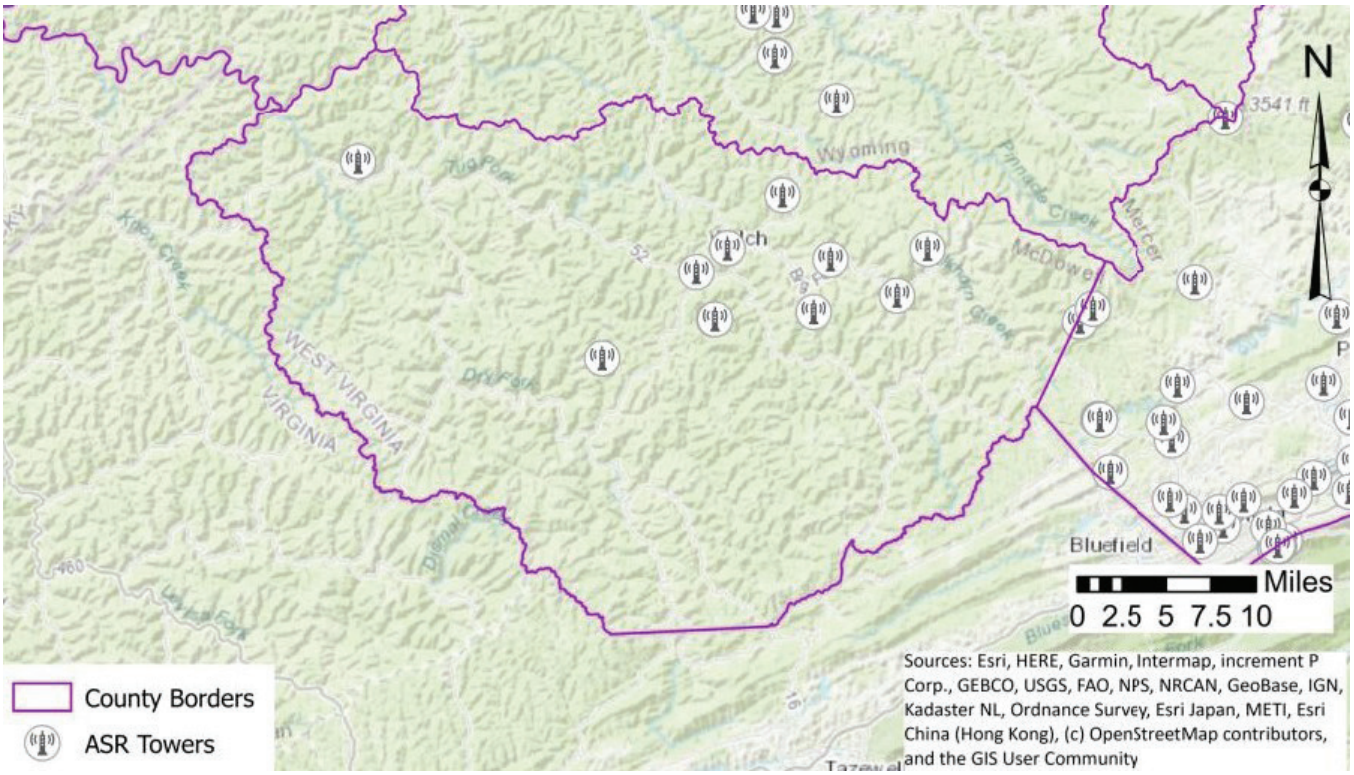


Most of the towers shown are for mobile (cellular) wireless communication. Some tower are also used for fixed wireless broadband. While fixed wireless is a good solution for many areas, it should be relied as a final solution. Where fixed wireless is considered, it should be as a hybrid (fiber/wireless) product.

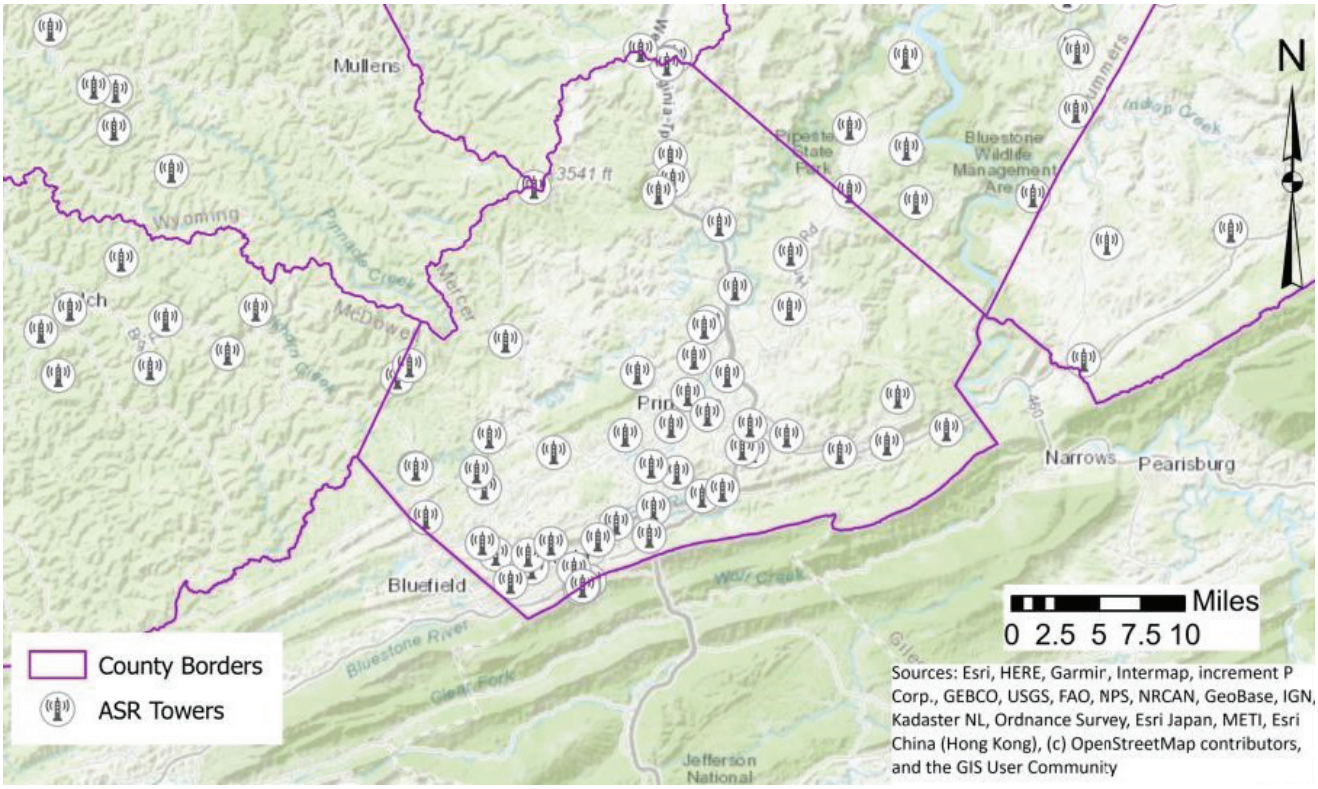
GREENBRIER COUNTY



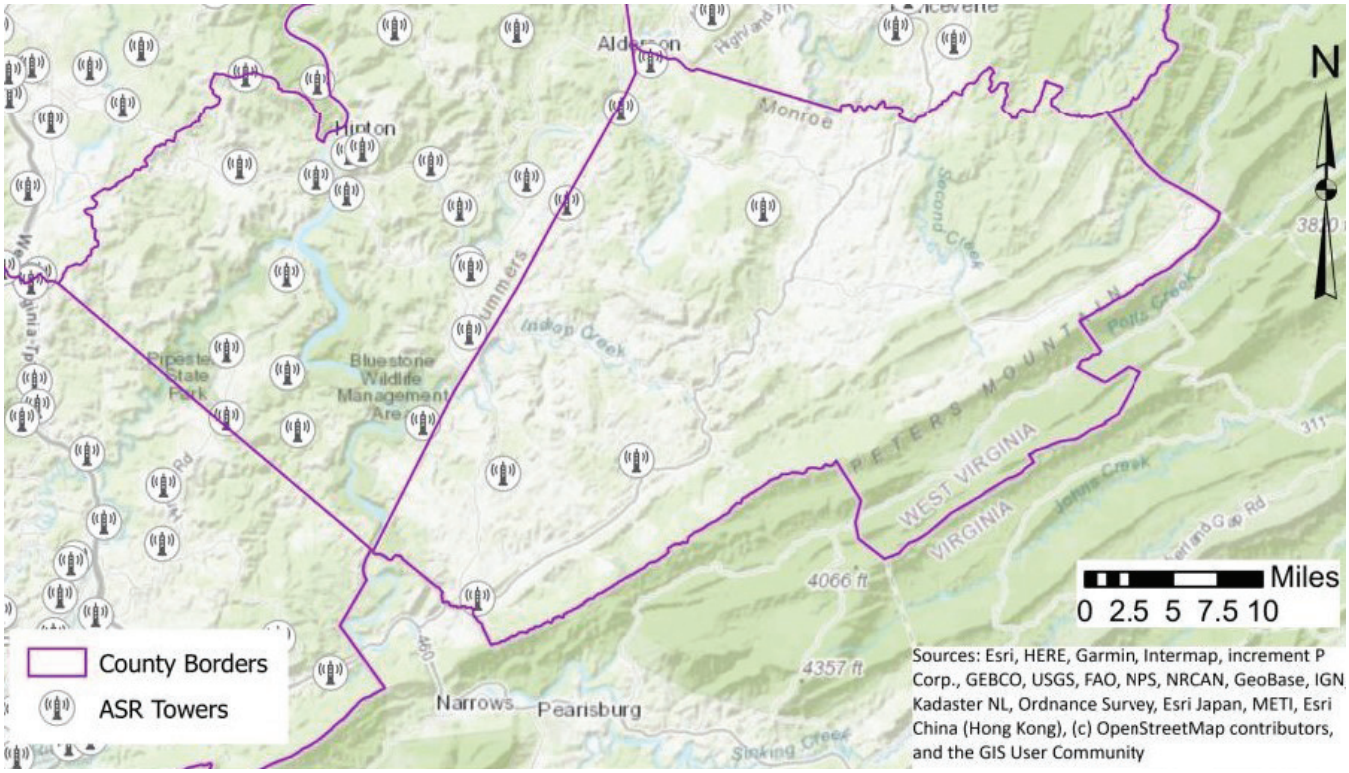
MCDOWELL COUNTY



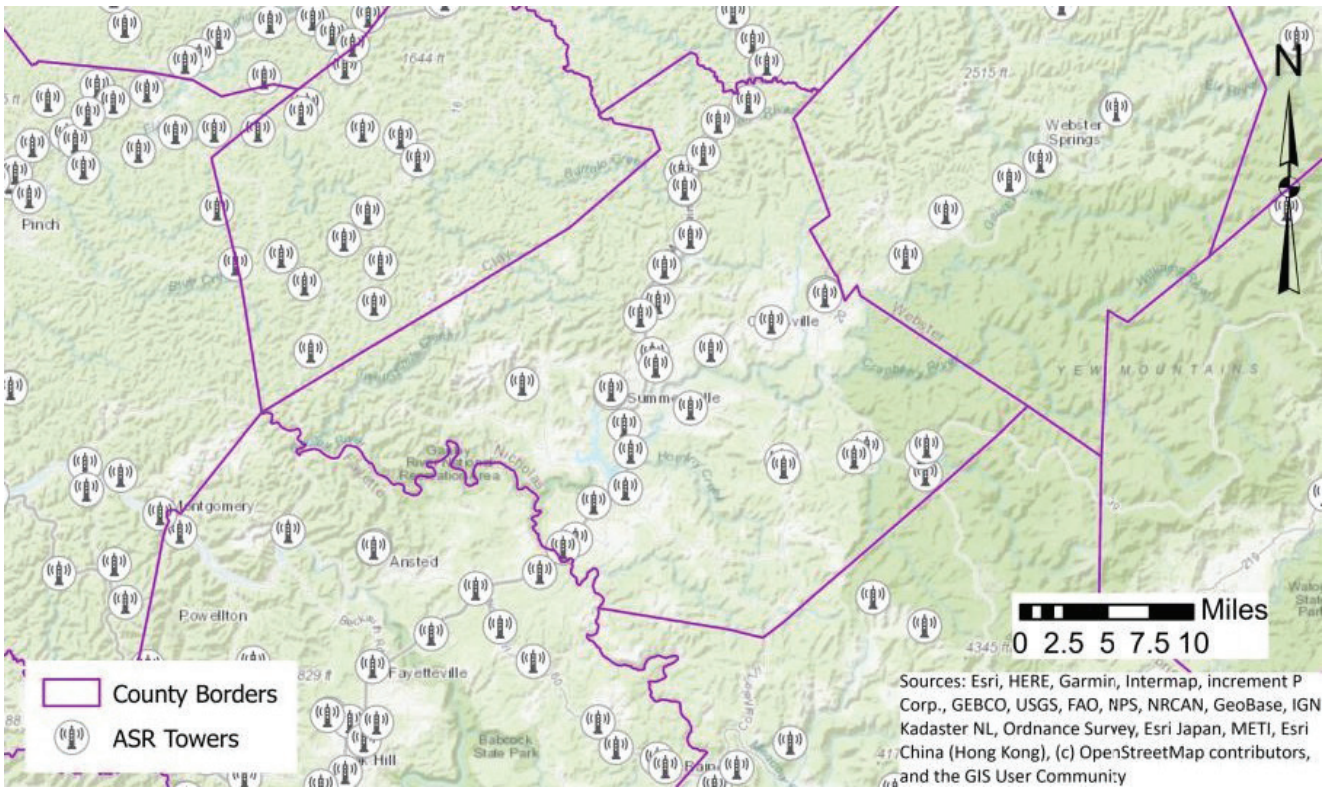
MERCER COUNTY



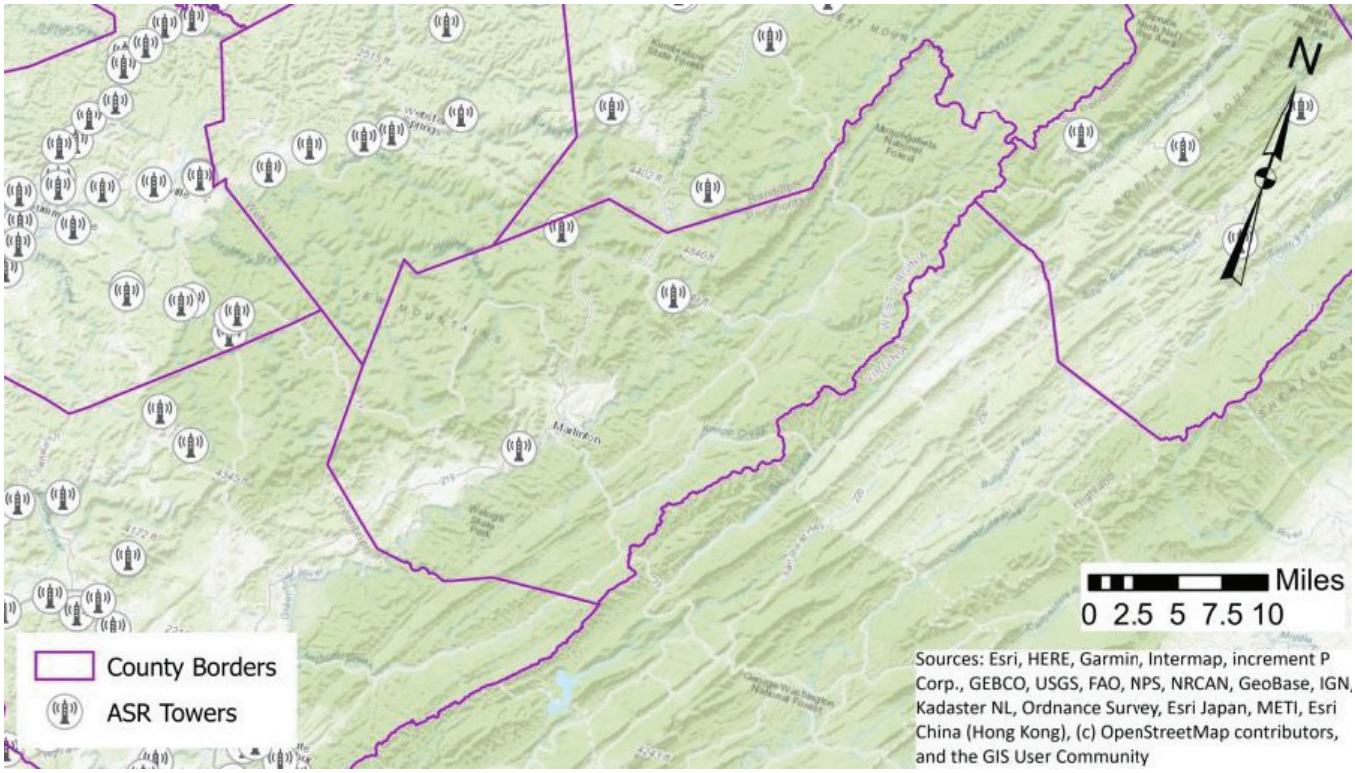
MONROE COUNTY



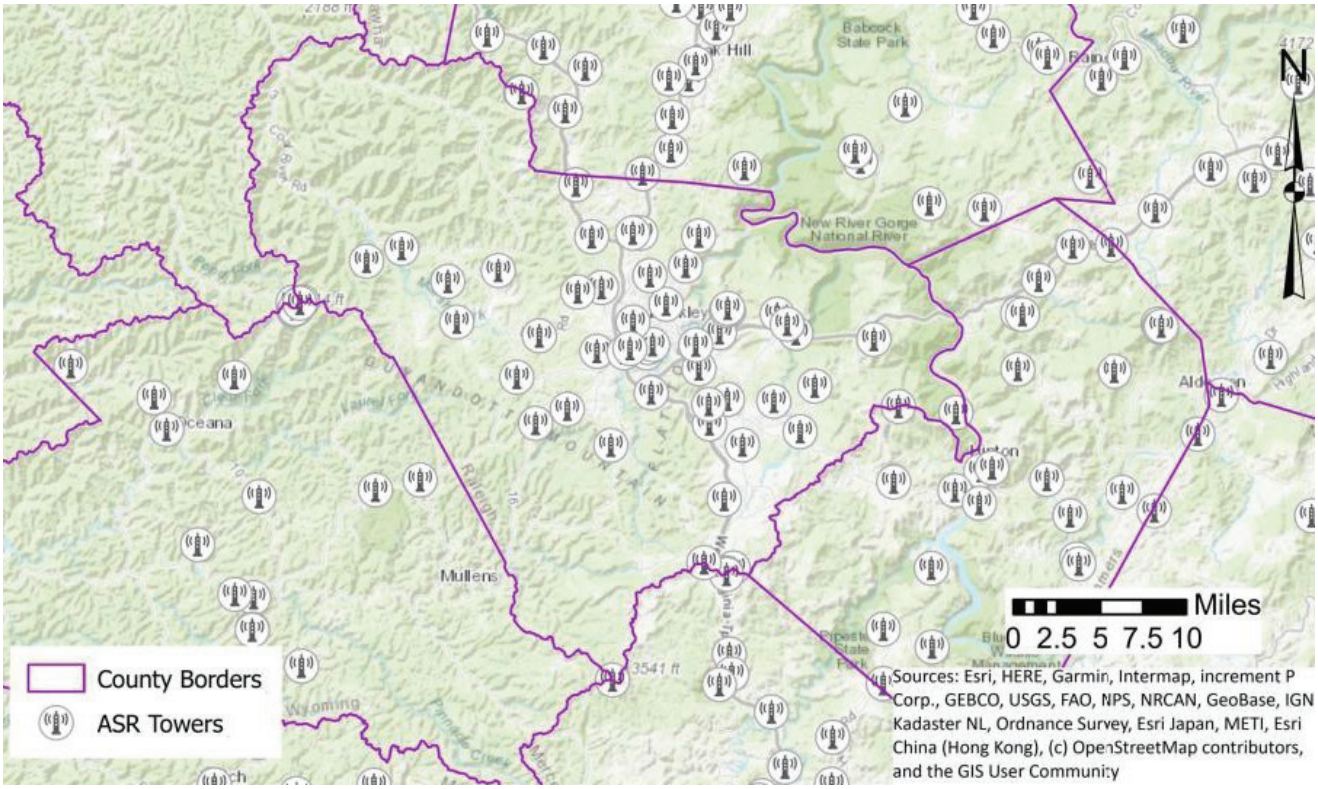
NICHOLAS COUNTY



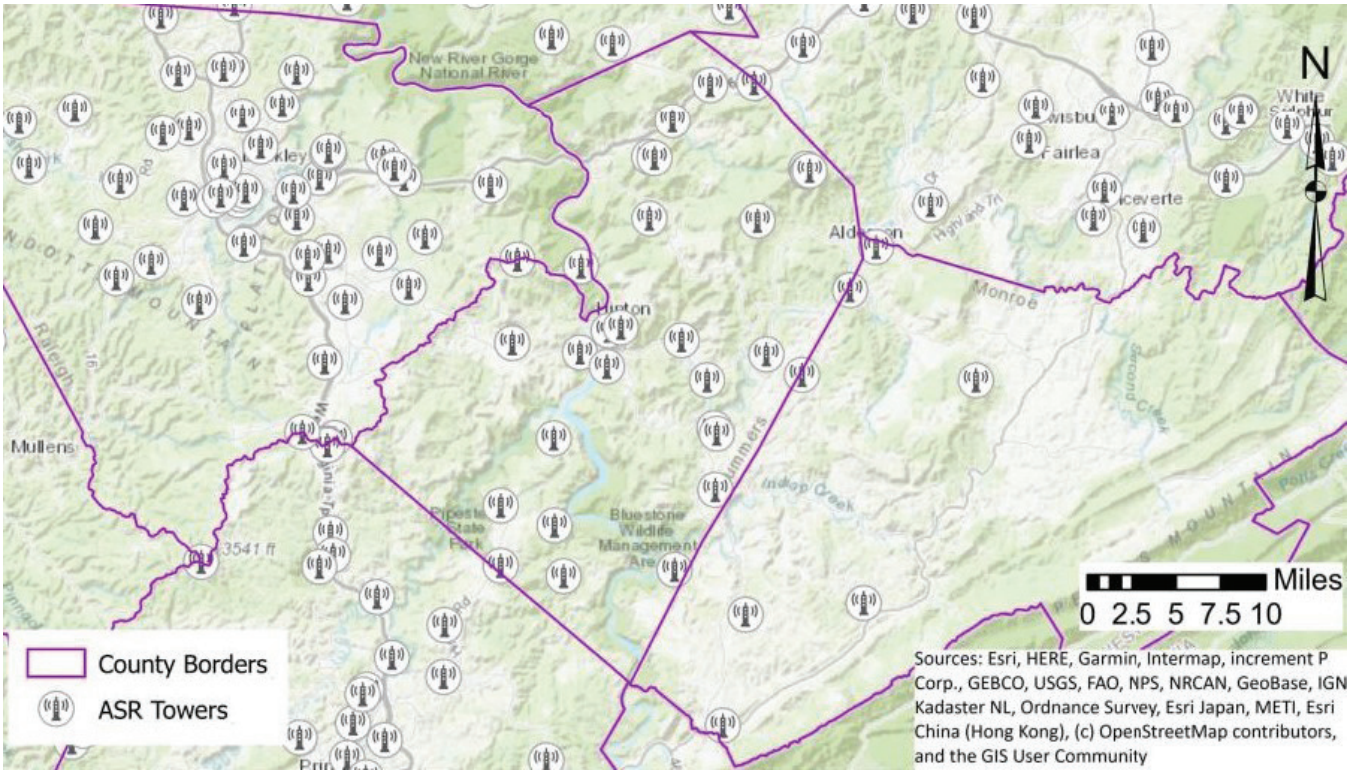
POCAHONTAS COUNTY



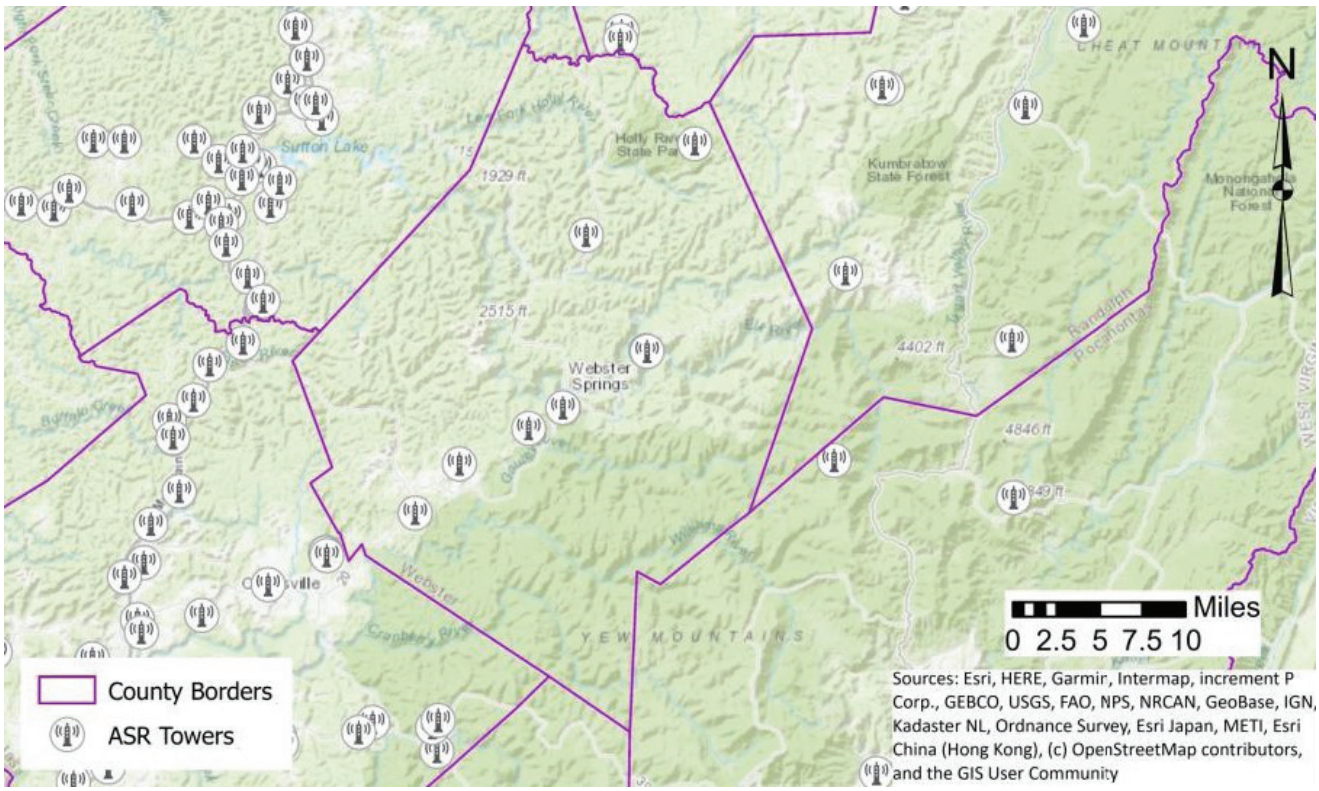
RALEIGH COUNTY



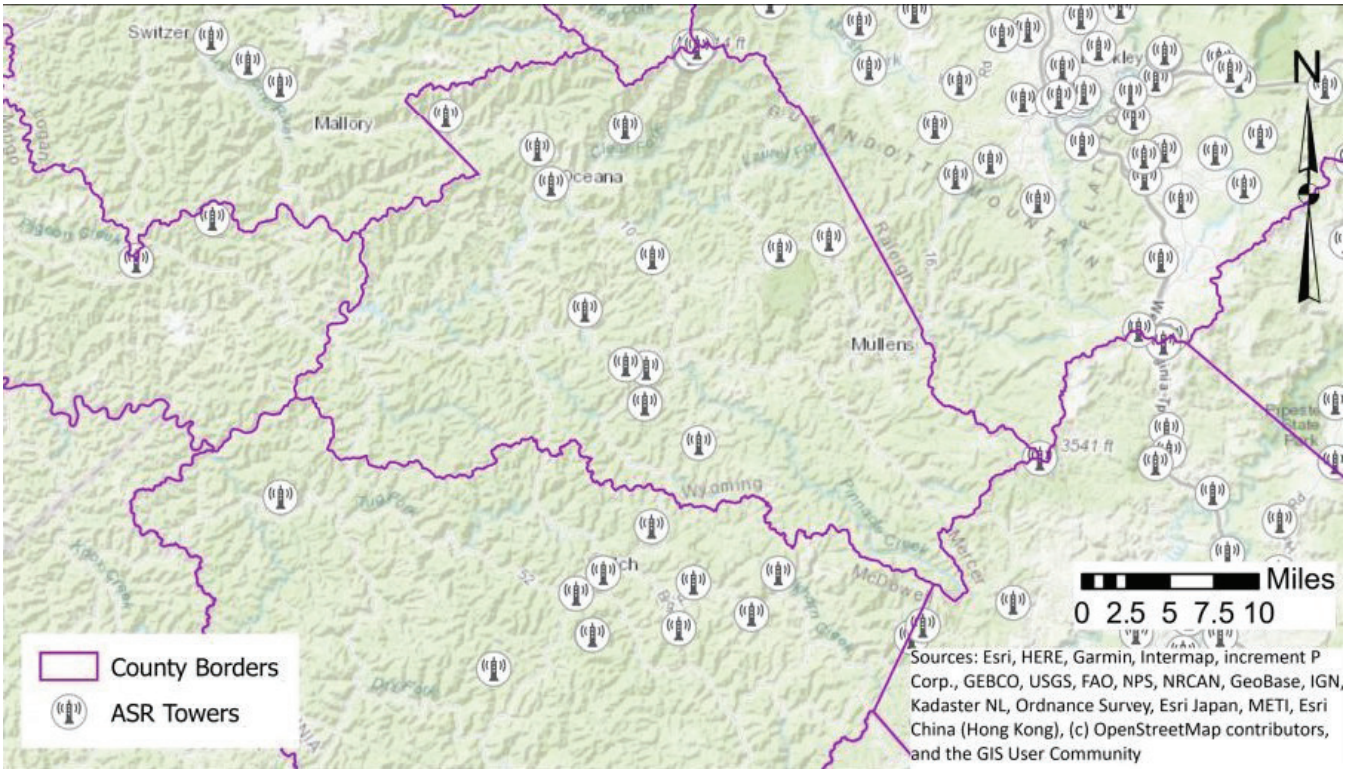
SUMMERS COUNTY



WEBSTER COUNTY



WYOMING COUNTY



INTERNET SPEEDS

The Federal Communications Commission (FCC) currently defines broadband as speeds of 25 Mbps download and 3 Mbps upload (25/3). This 25/3 benchmark is a requirement for service levels for most state and federal lending programs. Some lending programs will not fund projects in areas where service exists at the 10/1 level. For the purpose of this report, un-served is considered 10/1 or less. Under-served is considered 10/1 to 25/3.

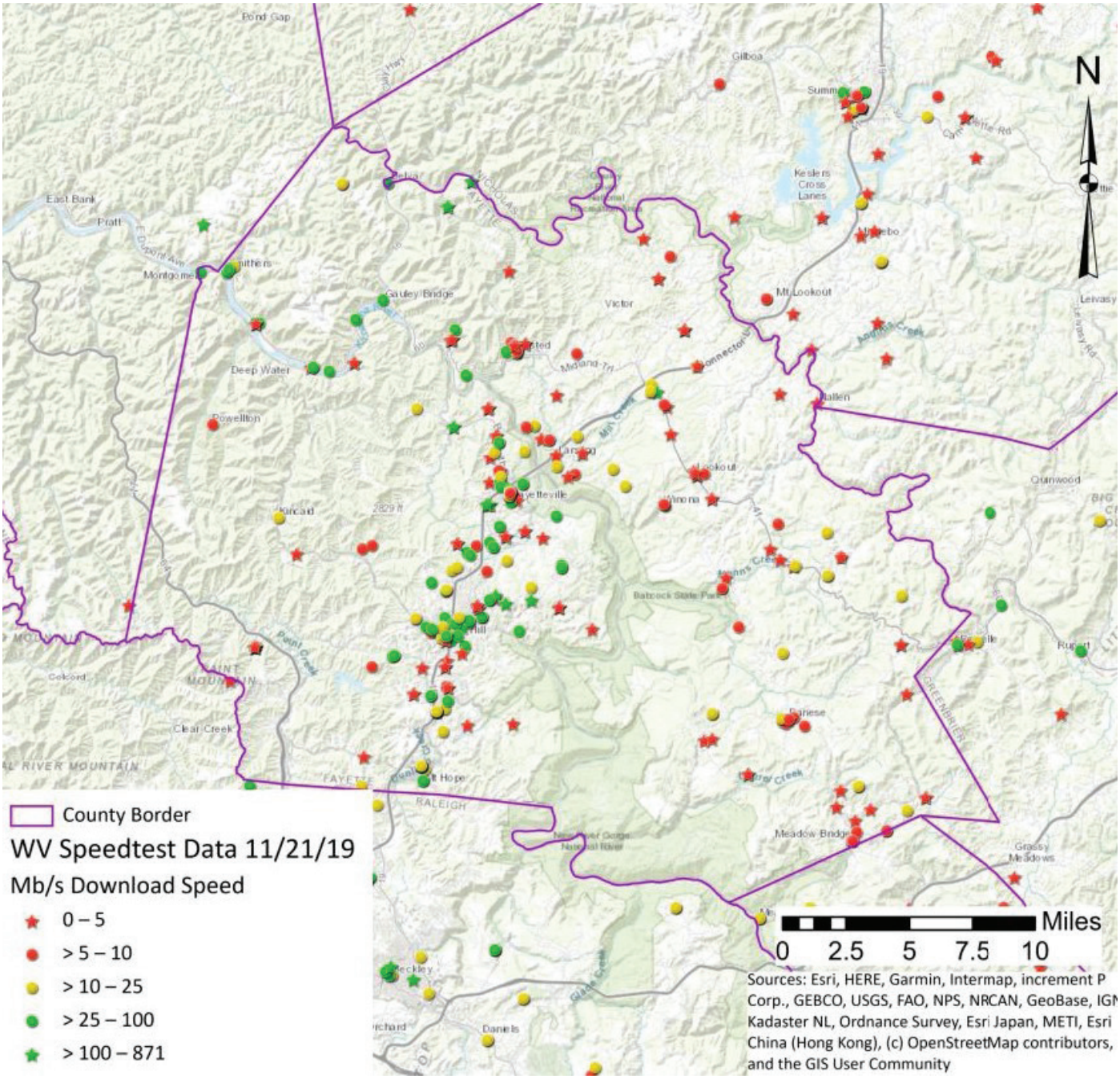
The definition of Broadband has changed significantly over the past two decades as indicated in the table below. It is worth mentioning that in 2013, the Region VII Broadband Strategic Plan used the definition of 4/1.

FCC BROADBAND DEFINITION OVER TIME			
DATE ADOPTED	**MINIMUM DOWNLOAD**	**MINIMUM UPLOAD**	**FCC COMMISSIONER**
2015	25 MBPS	3 MBPS	TOM WHEELER, D
2010	4 MBPS	1 MBPS	JULIUS GENACHOWSKI, D
1996	200 KBPS	200 KBPS	WILLIAM KENNARD, D

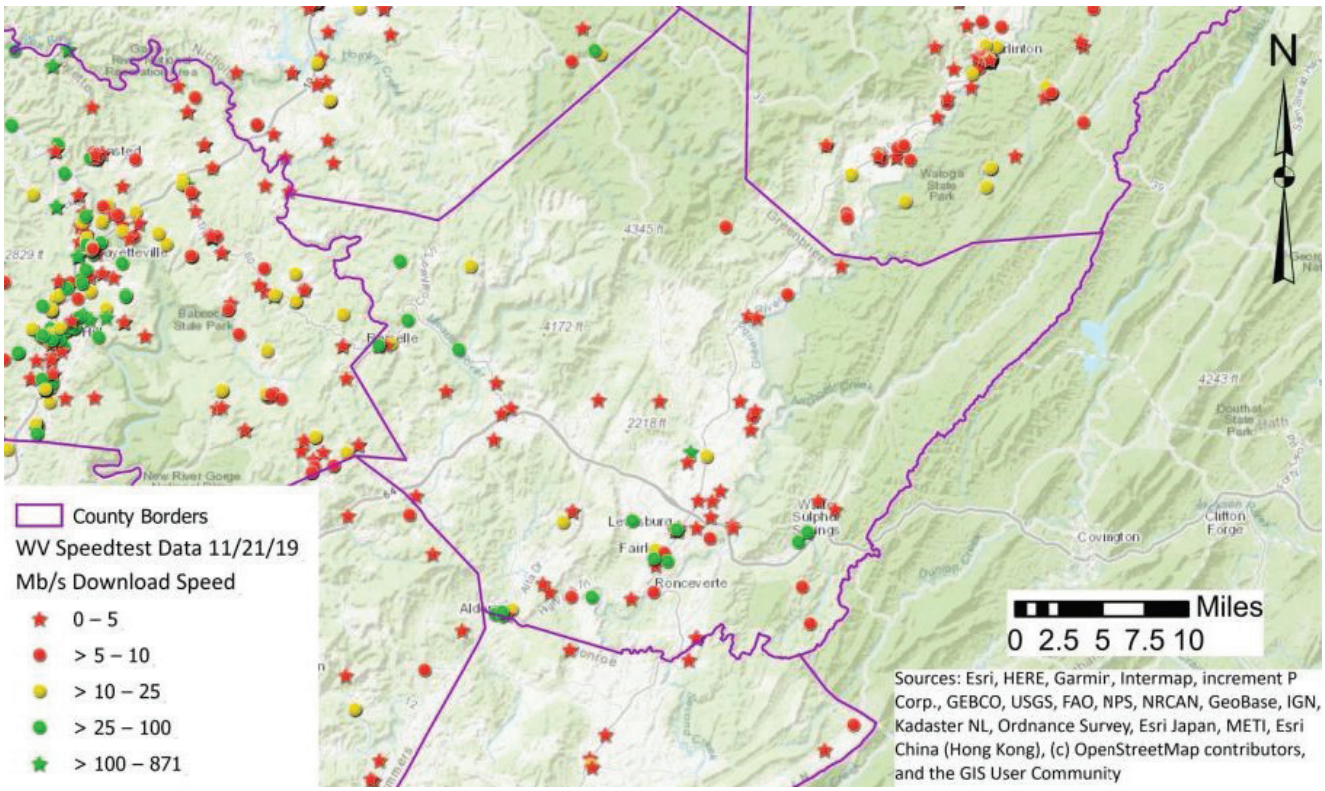
Beginning in March of 2018, the West Virginia Broadband Enhancement Council (WVBEC) has been hosting a speed test engine and survey to collect data from users across the state. Through November of 2019, data from over 3,000 tests (statewide) have been collected. Through an initial glitch in the survey form, 643 records are recorded at the default location of a remote area in Gilmer County. This erroneous data has been excluded from the analysis.

The following exhibits detail the results of the data for each county in Regions 1 & 4:

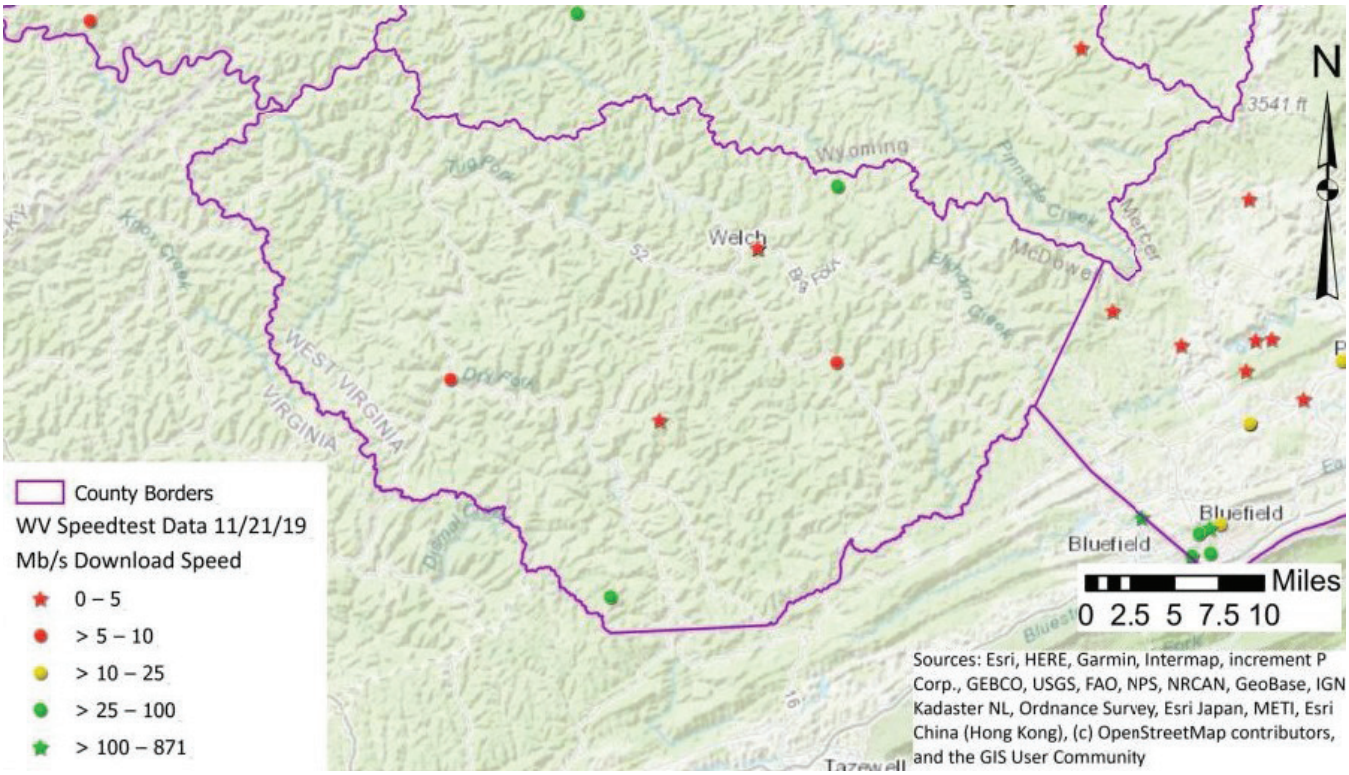
FAYETTE COUNTY



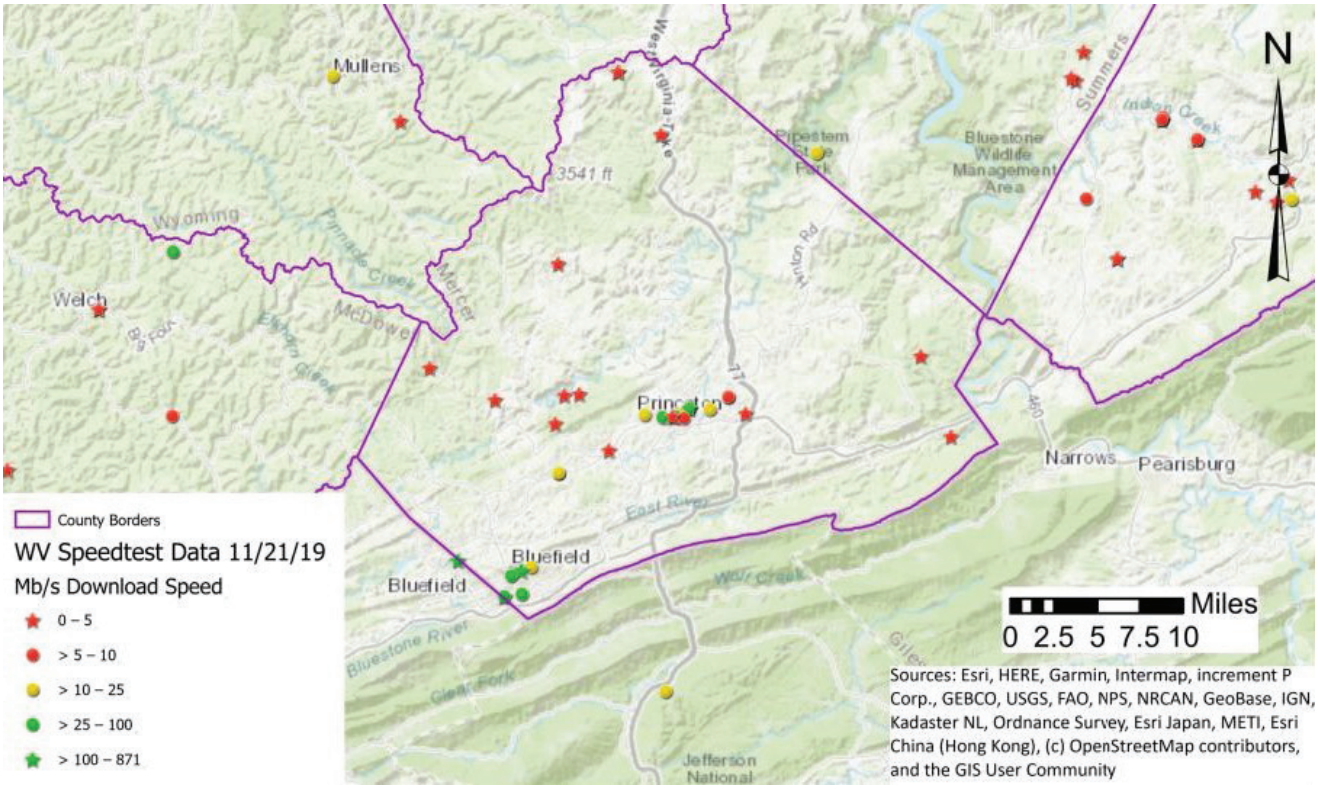
GREENBRIER COUNTY



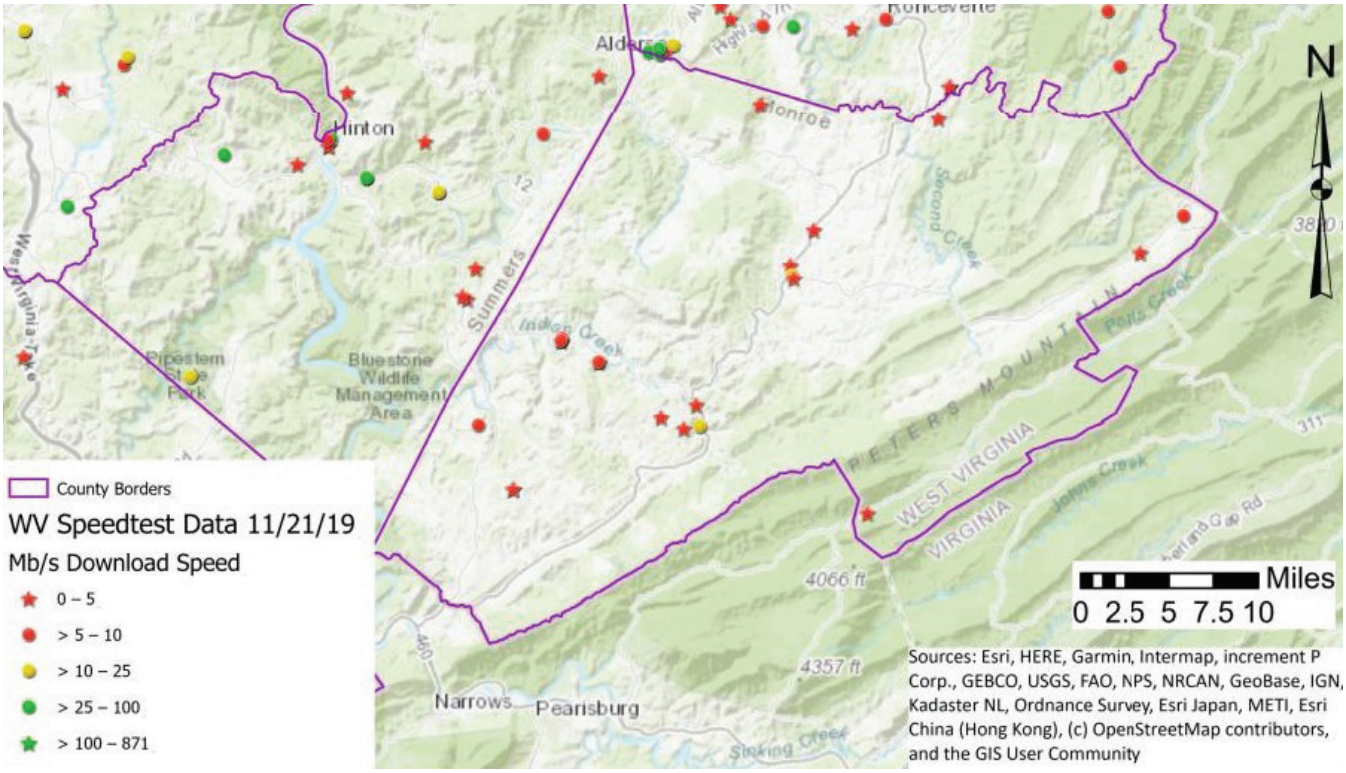
MCDOWELL COUNTY



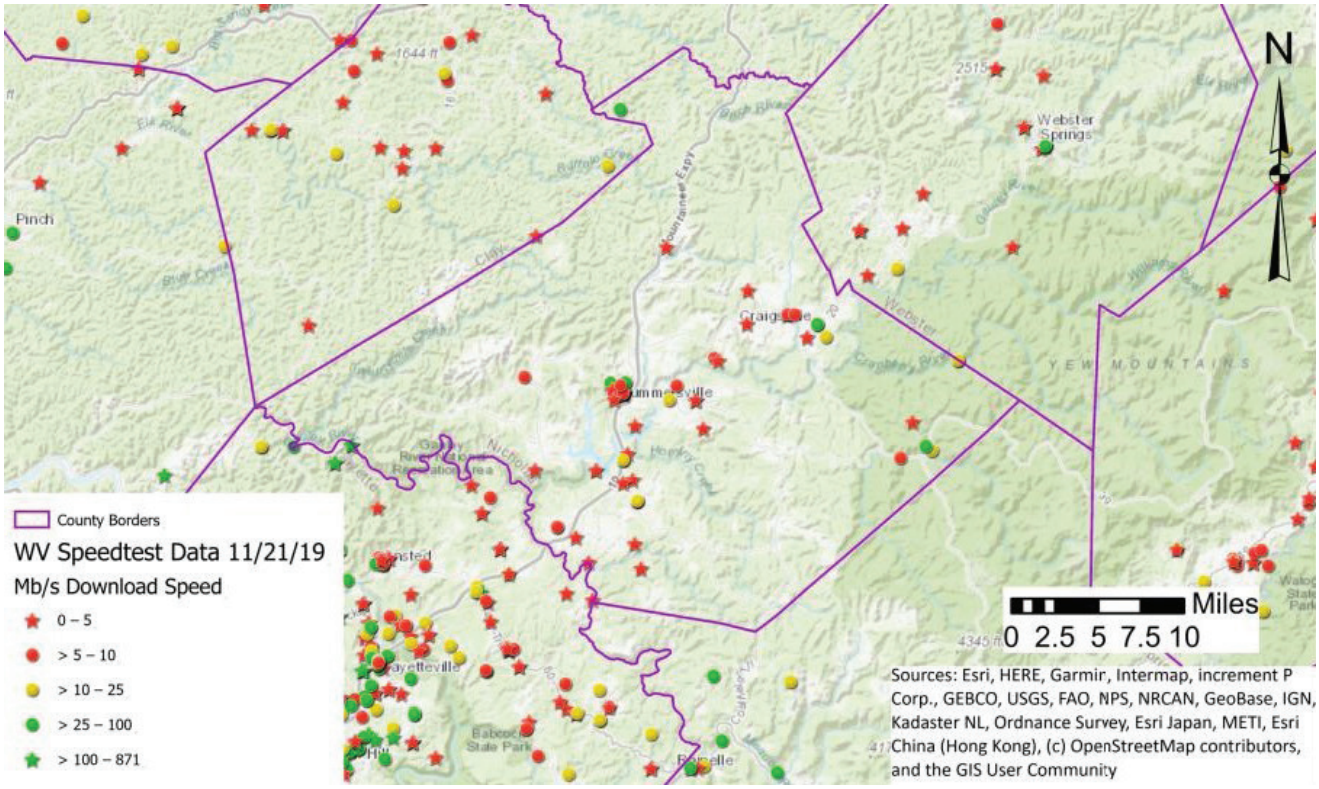
MERCER COUNTY



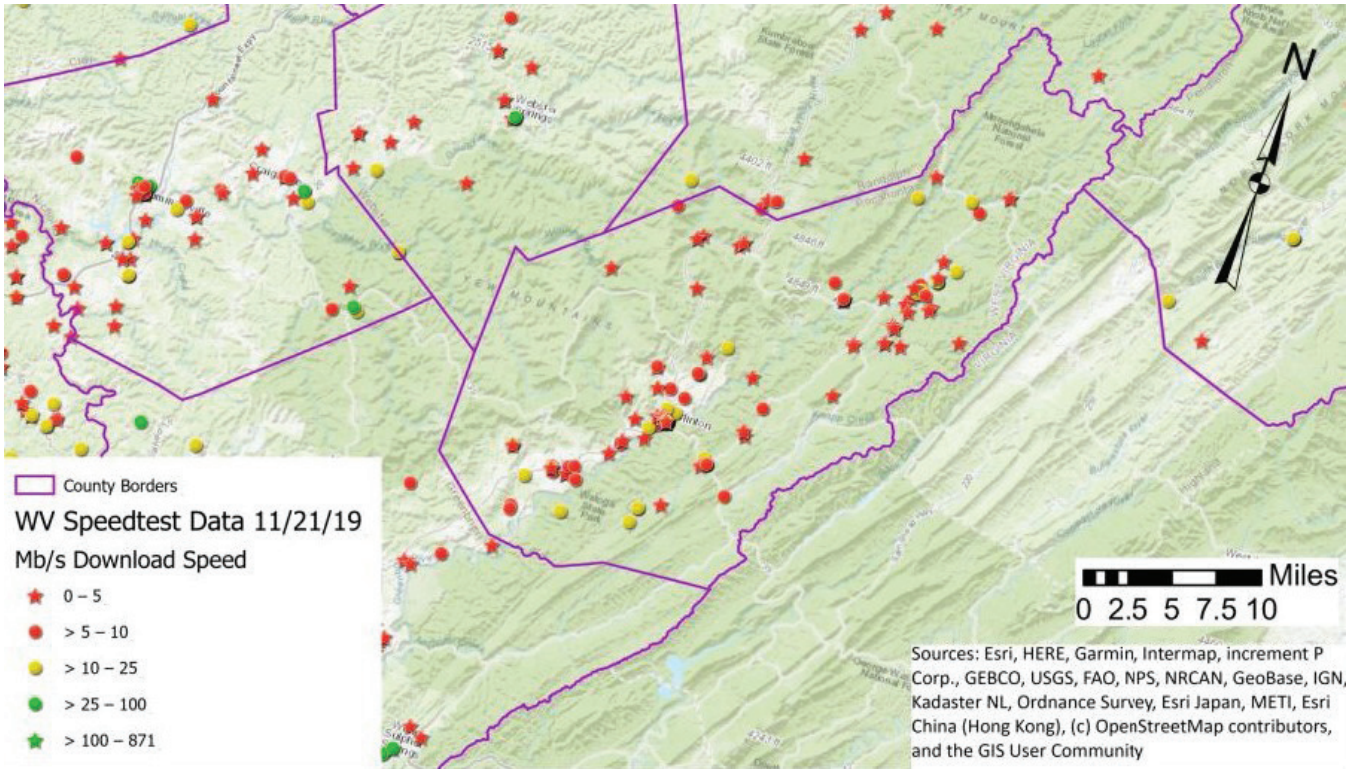
MONROE COUNTY



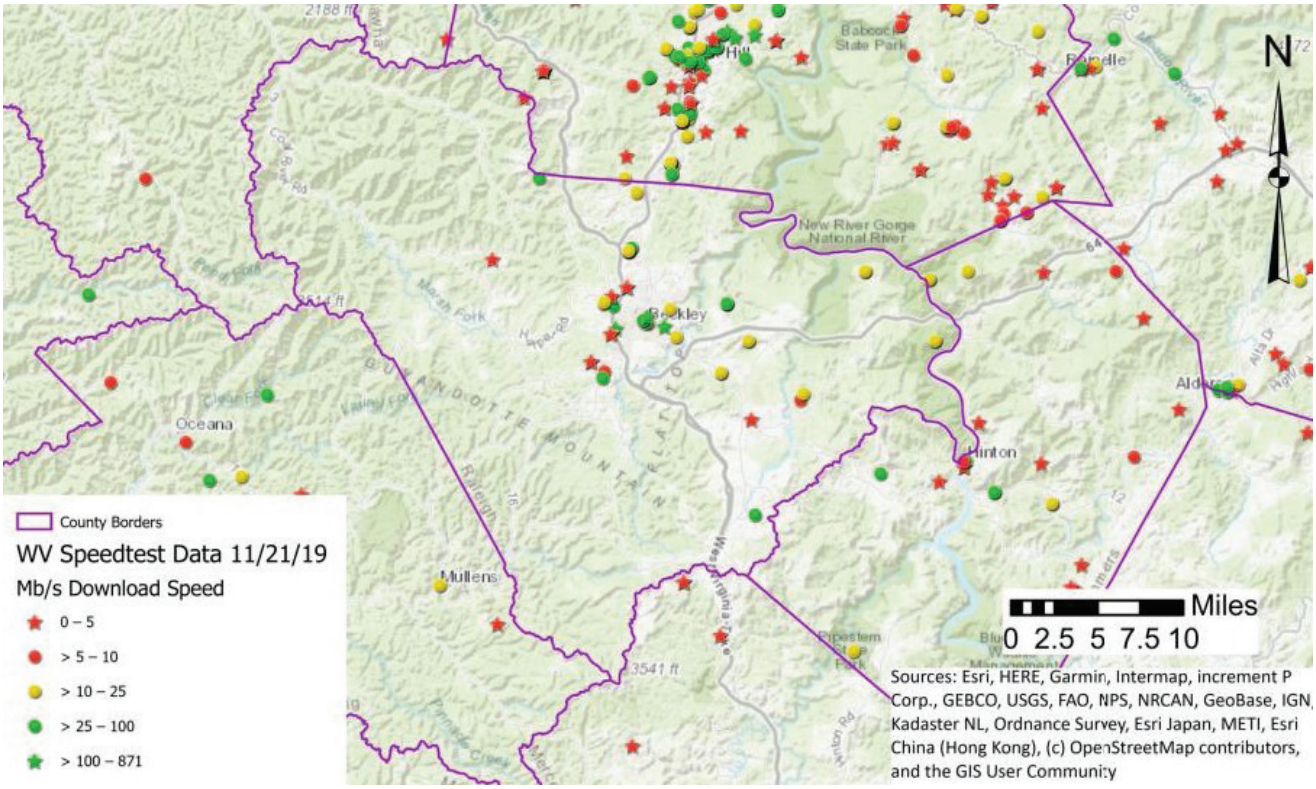
NICHOLAS COUNTY



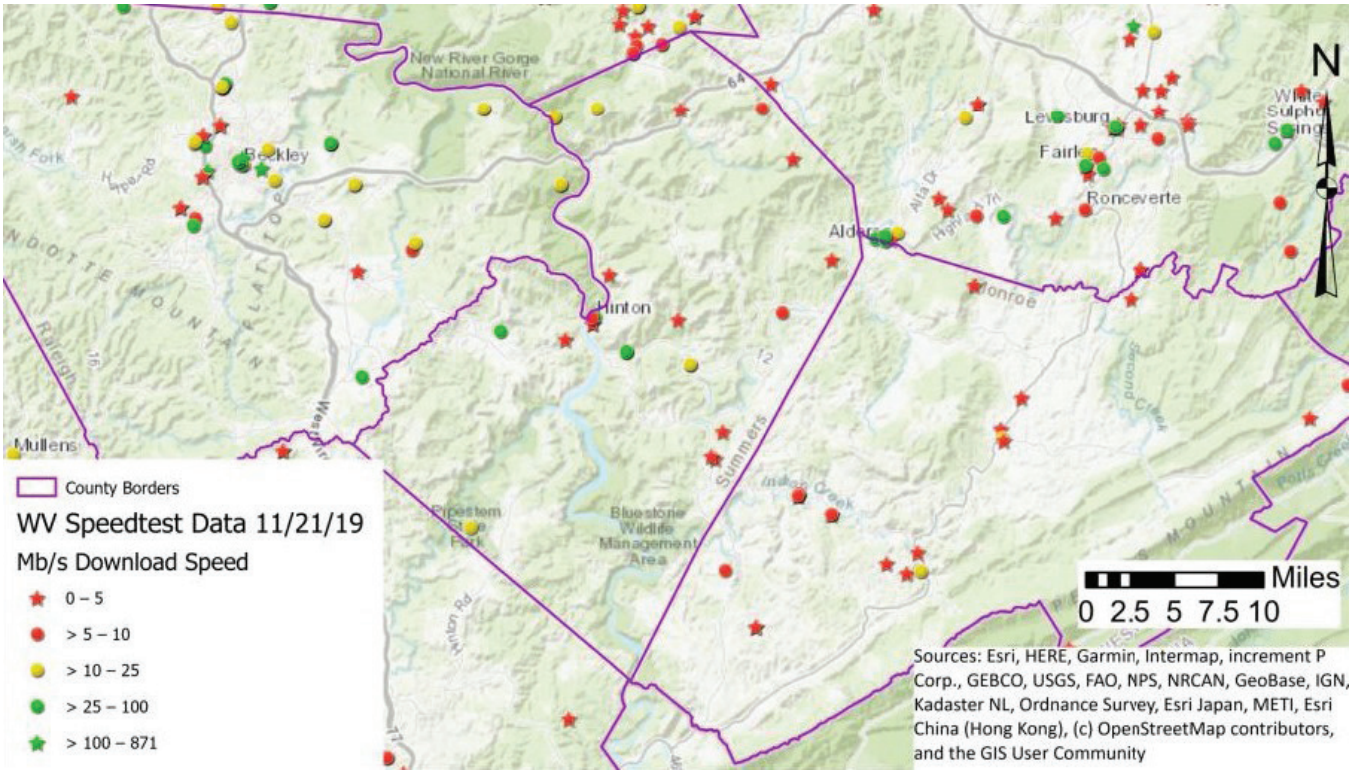
POCAHONTAS COUNTY



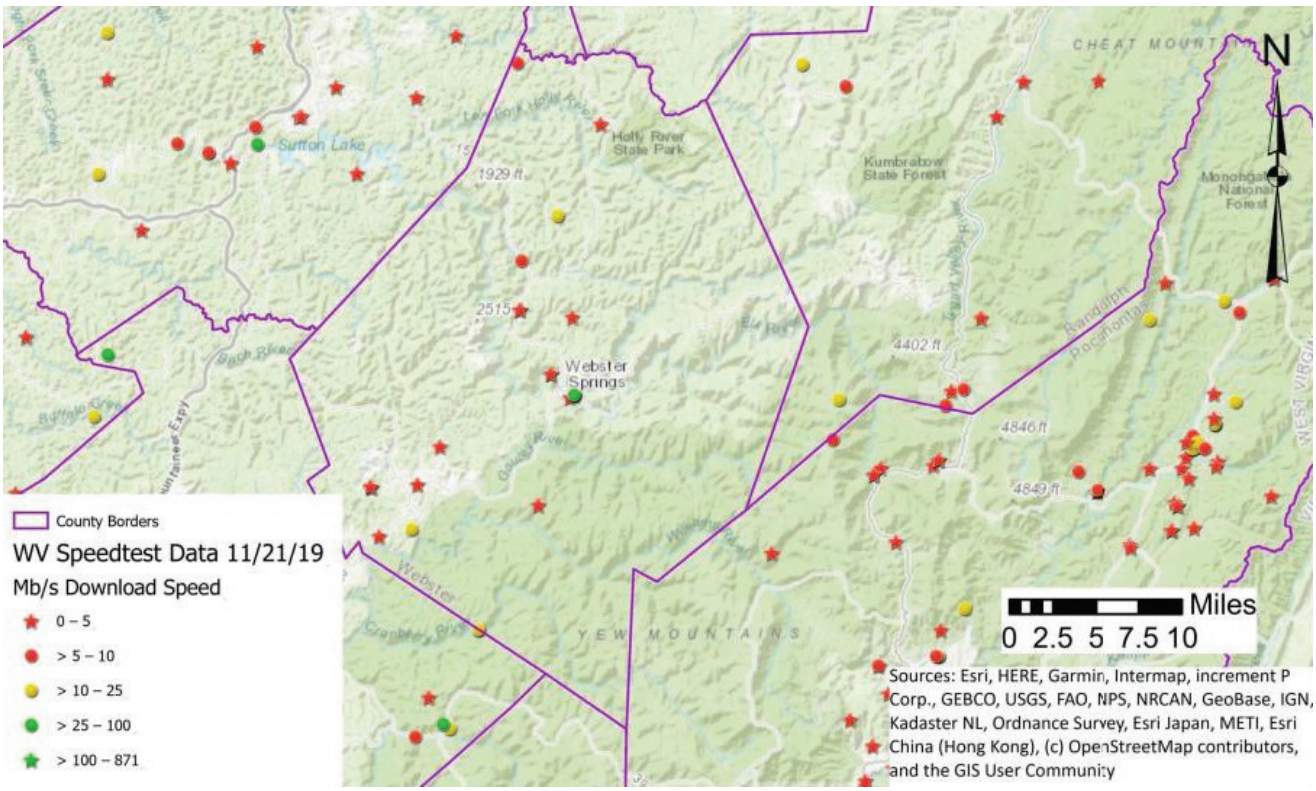
RALEIGH COUNTY



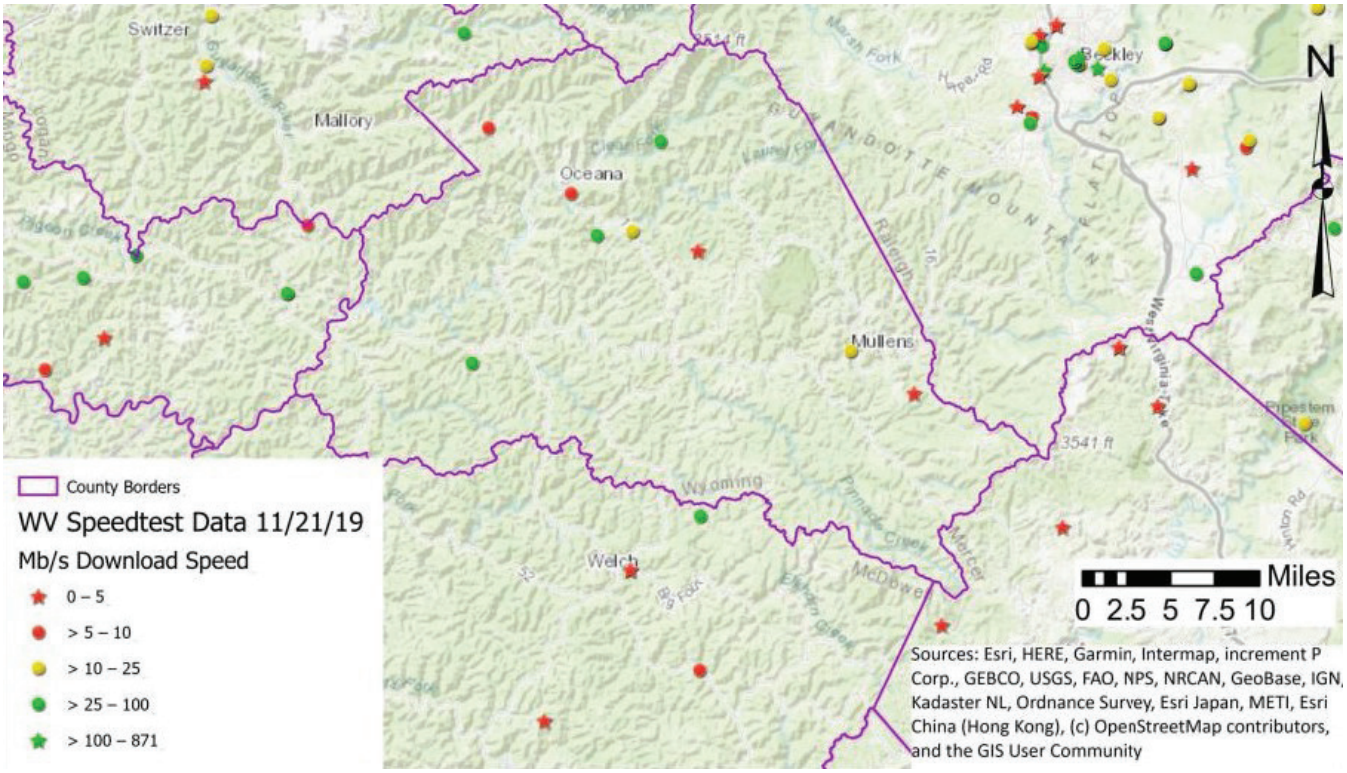
SUMMERS COUNTY



WEBSTER COUNTY



WYOMING COUNTY

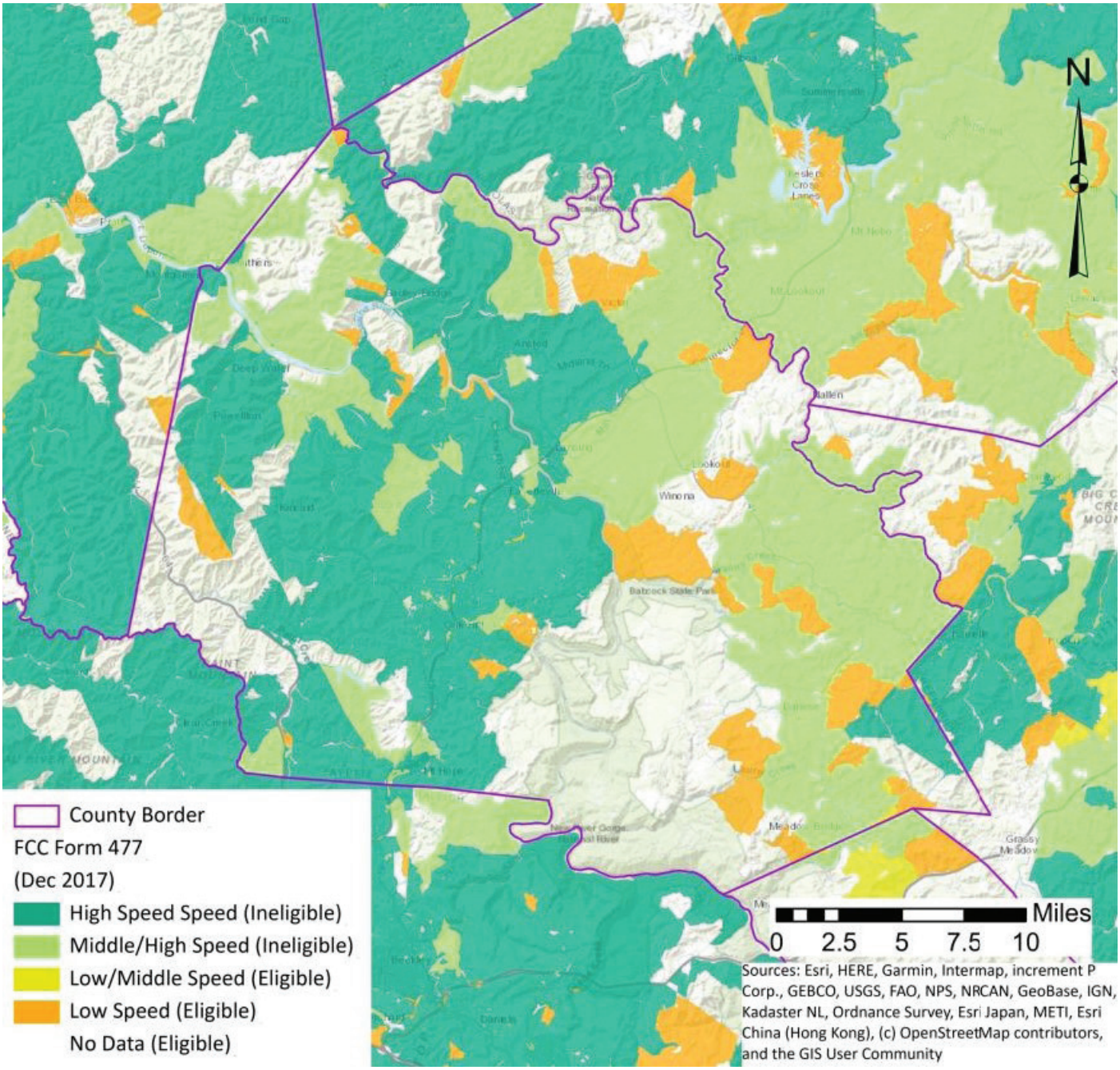


SERVED/UNDER SERVED/ UN-SERVED AREAS

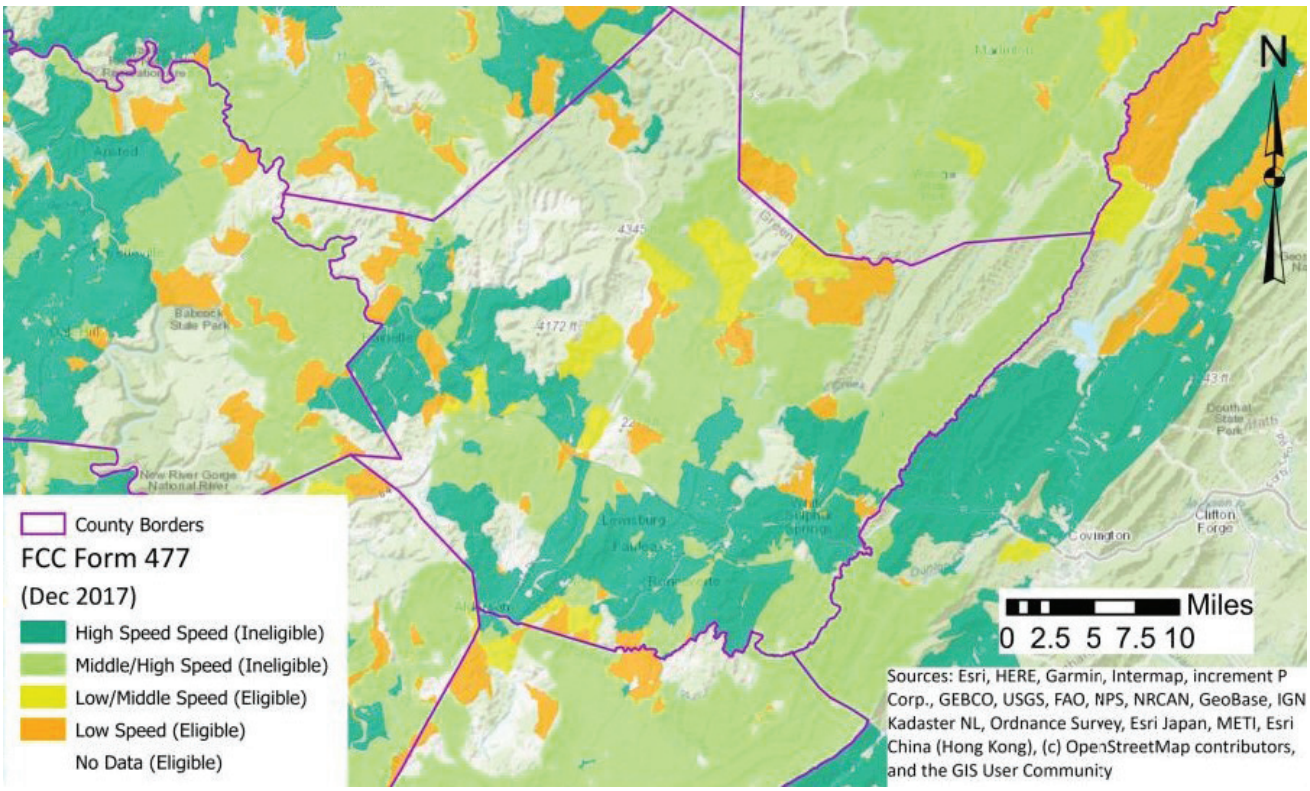
The FCC collects self-reported broadband deployment data from service providers twice a year. Data is collected through the FCC Form 477. This data is used to populate the Fixed Broadband Deployment map better known as "The Broadband Map".

The data used in this study is from the December 2017 reporting data. The data is visualized for eligibility for federal and state funding programs. Typical eligibility is for areas with existing speeds of 10/1 or less. The areas identified as "Middle/High Speed" on the maps below are most likely served by Frontier DSL service. In many instances, the WVBEC data and other verification processes have determined that these areas are most likely considered unserved. These areas should be field verified before considering them as eligible areas for funding applications.

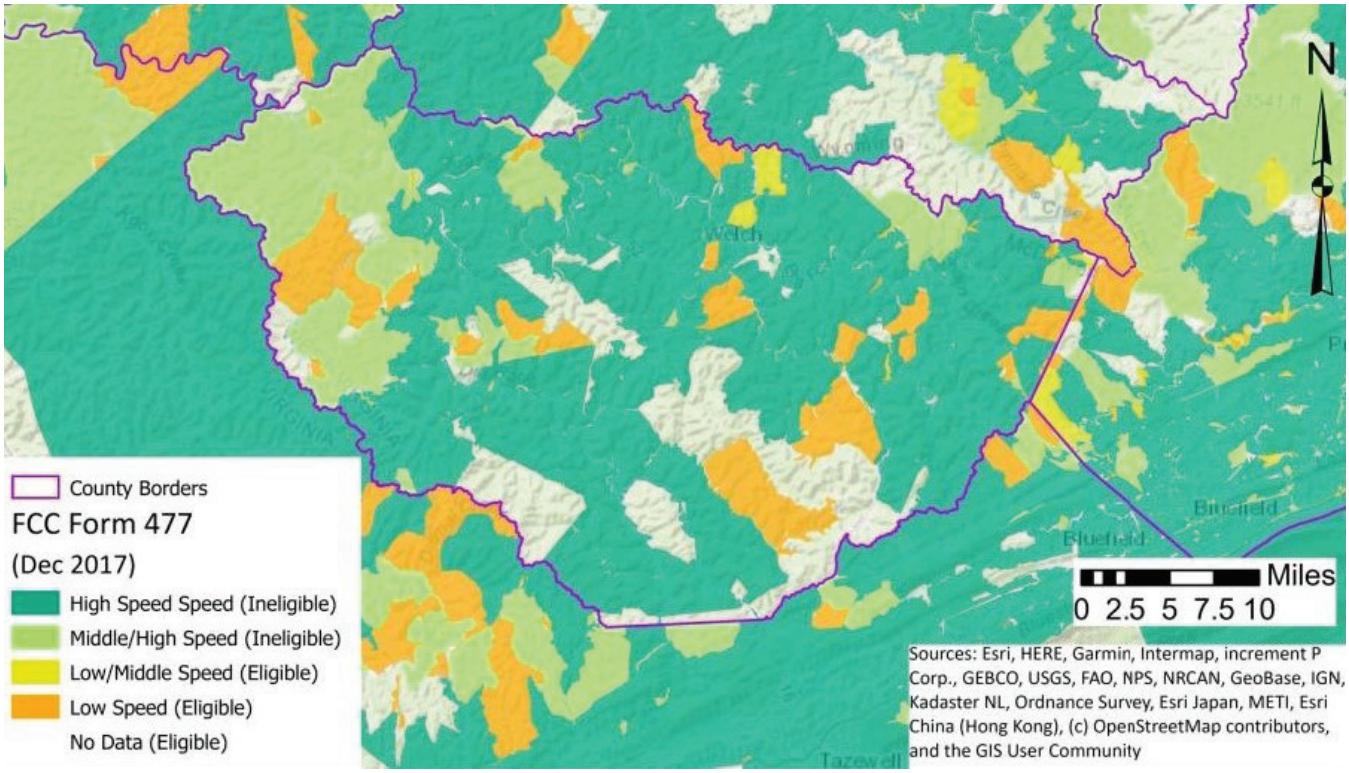
FAYETTE COUNTY



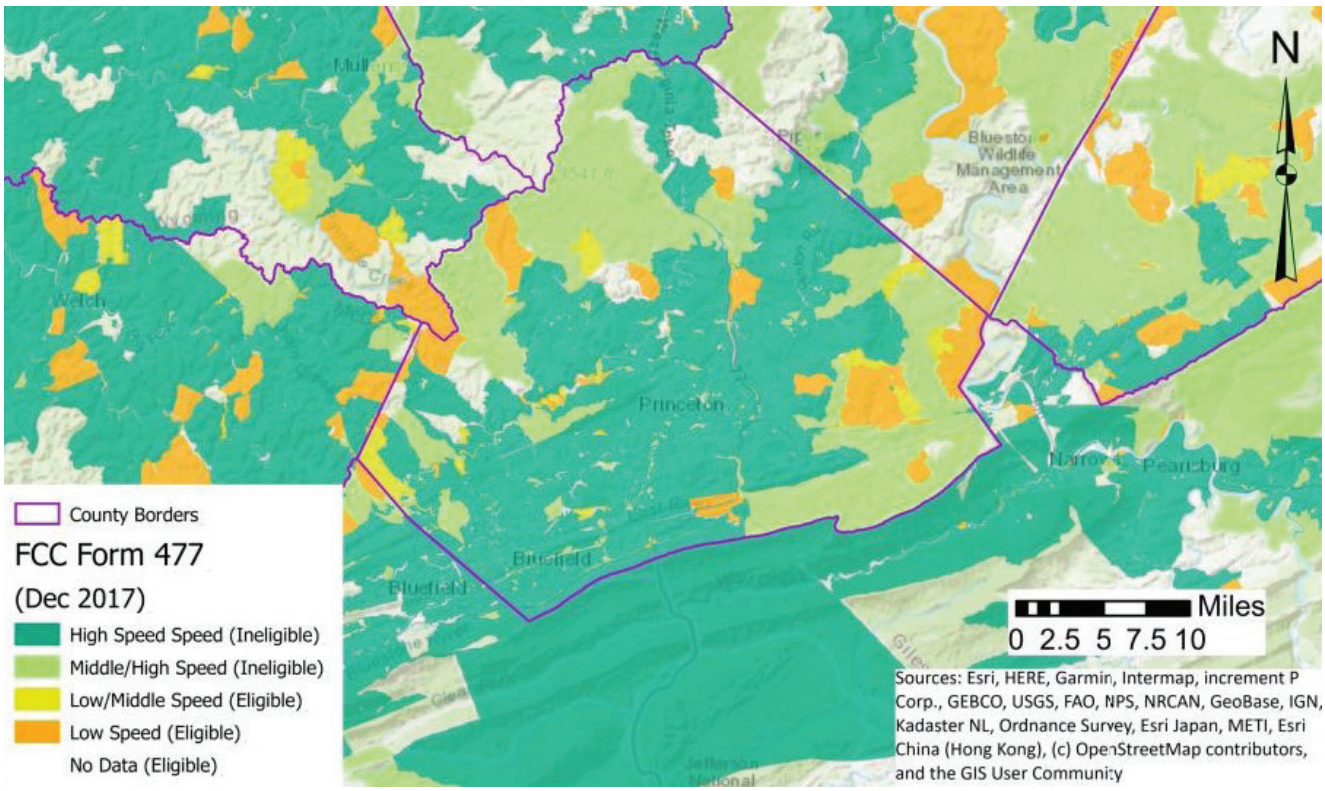
GREENBRIER COUNTY



MCDOWELL COUNTY

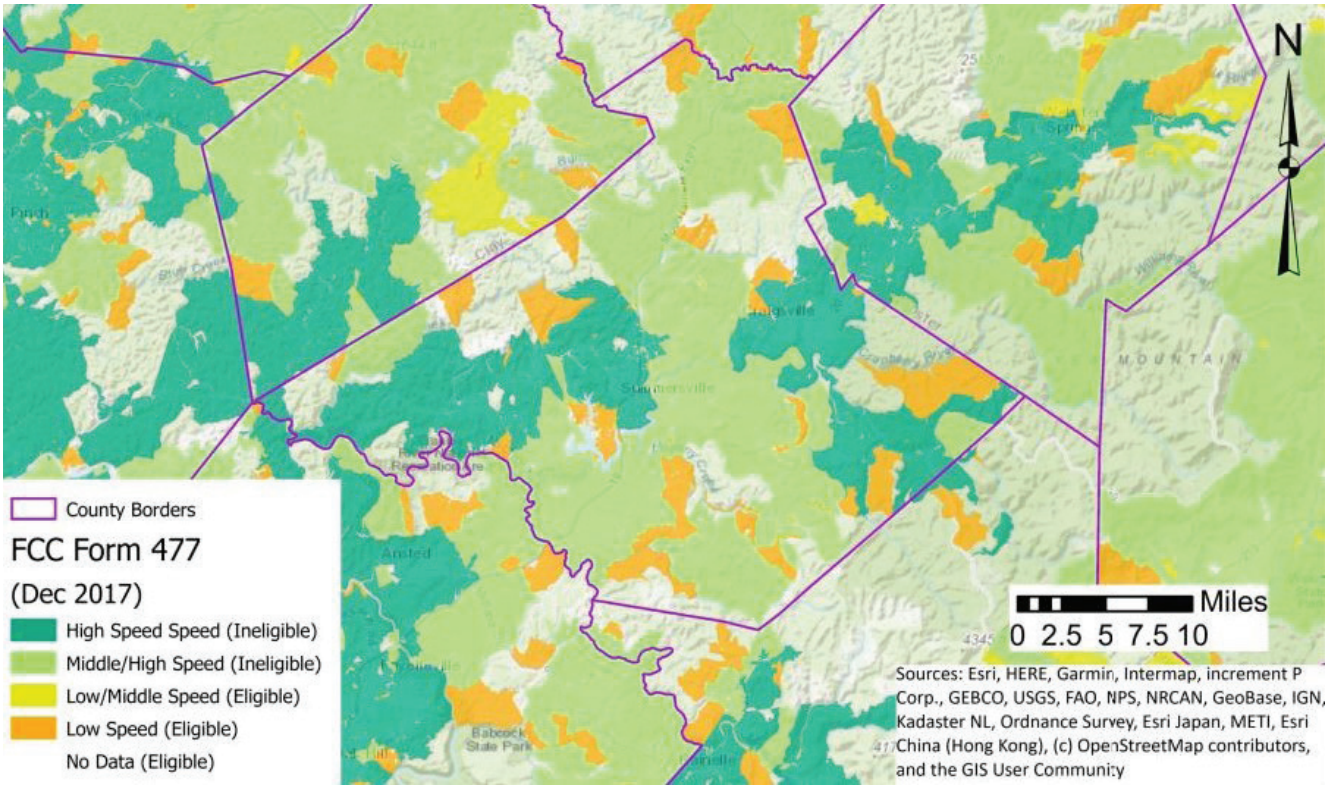


MERCER COUNTY

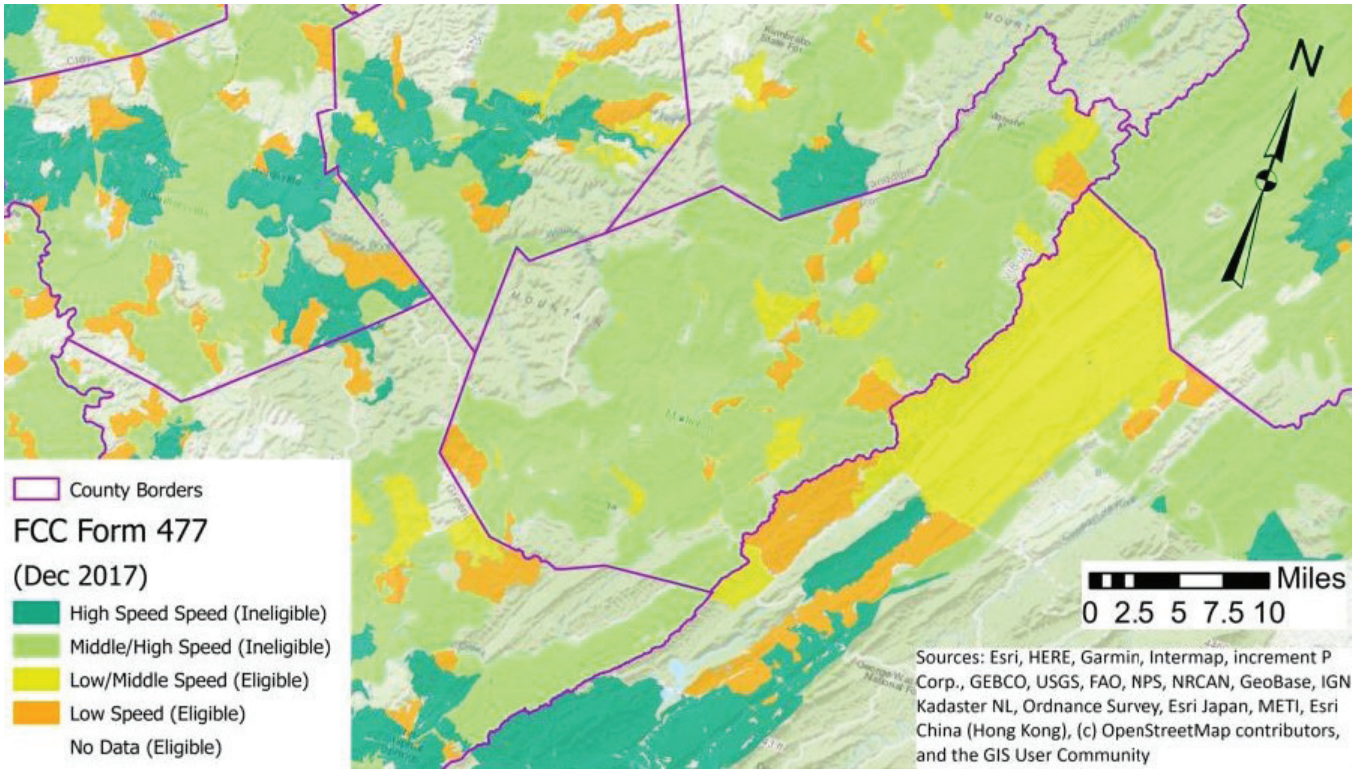


MONROE COUNTY

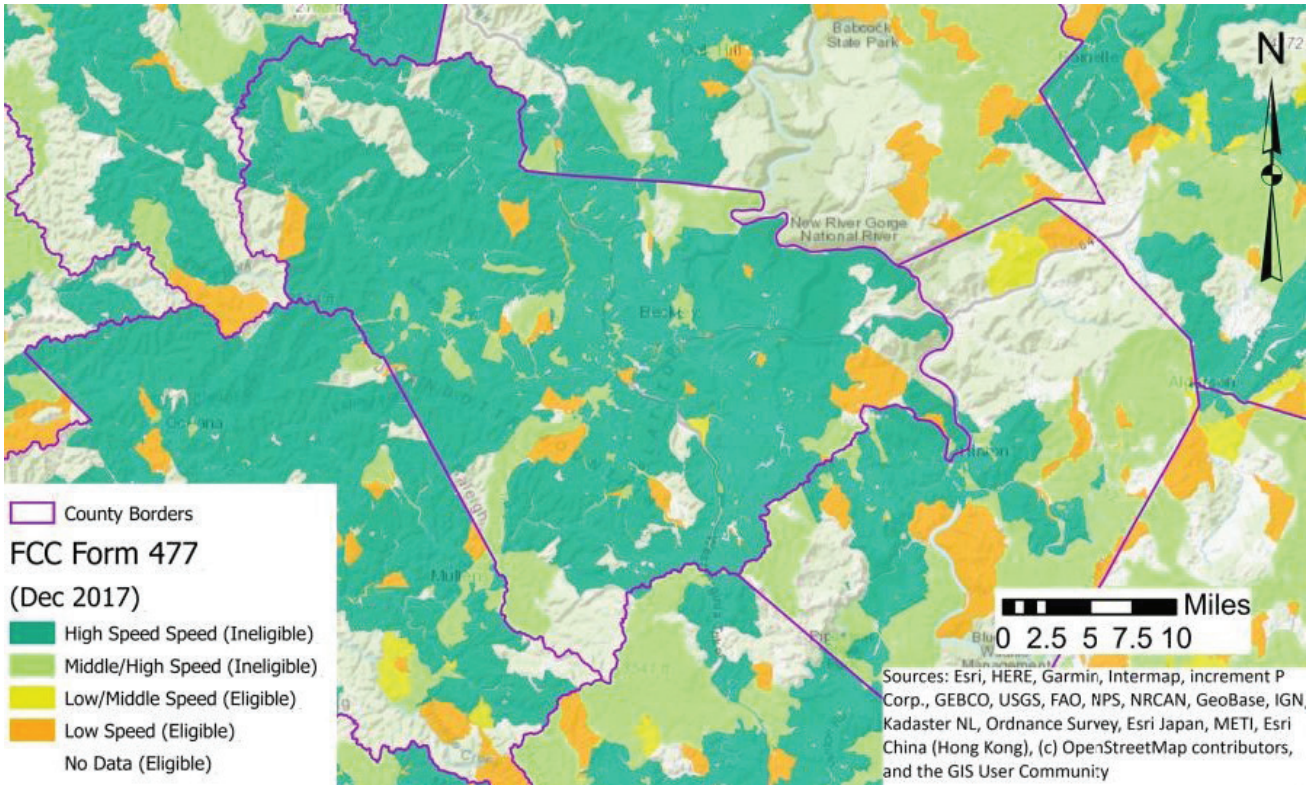
NICHOLAS COUNTY



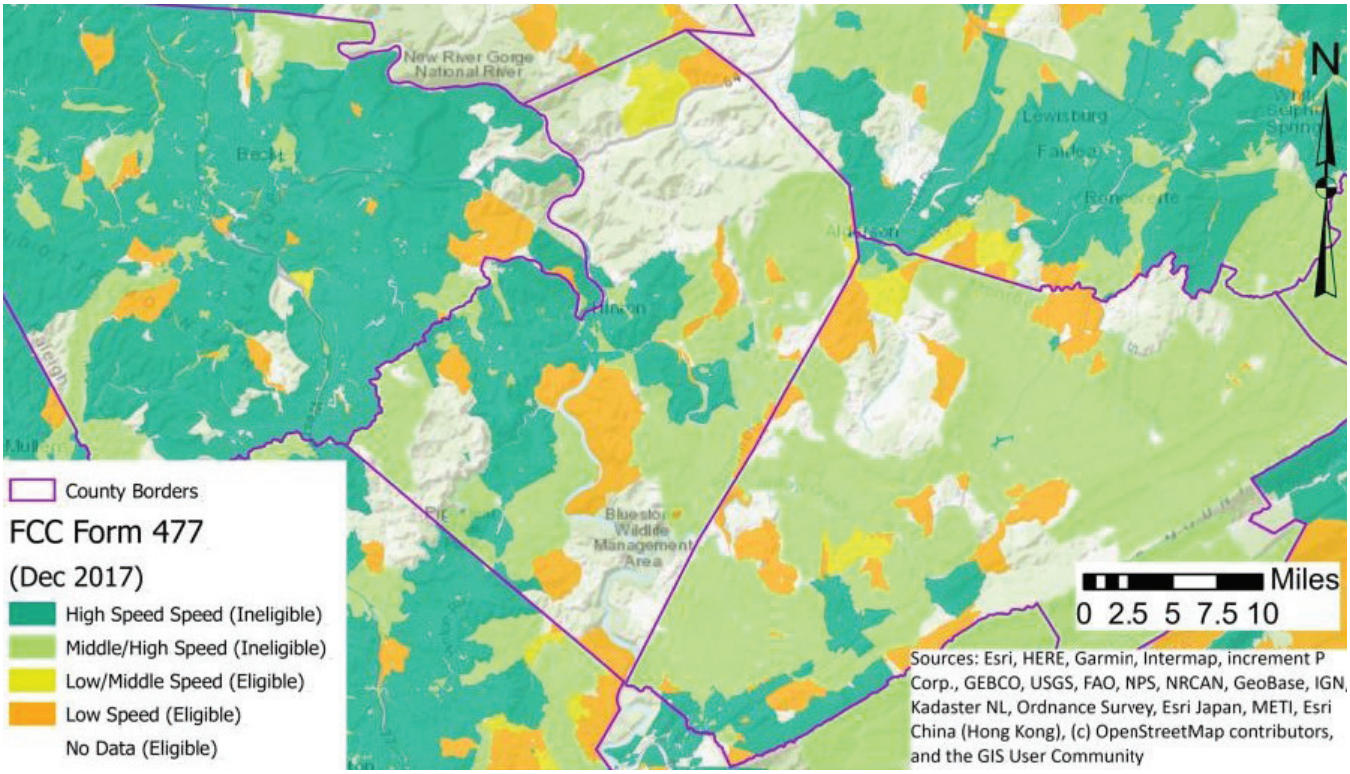
POCAHONTAS COUNTY



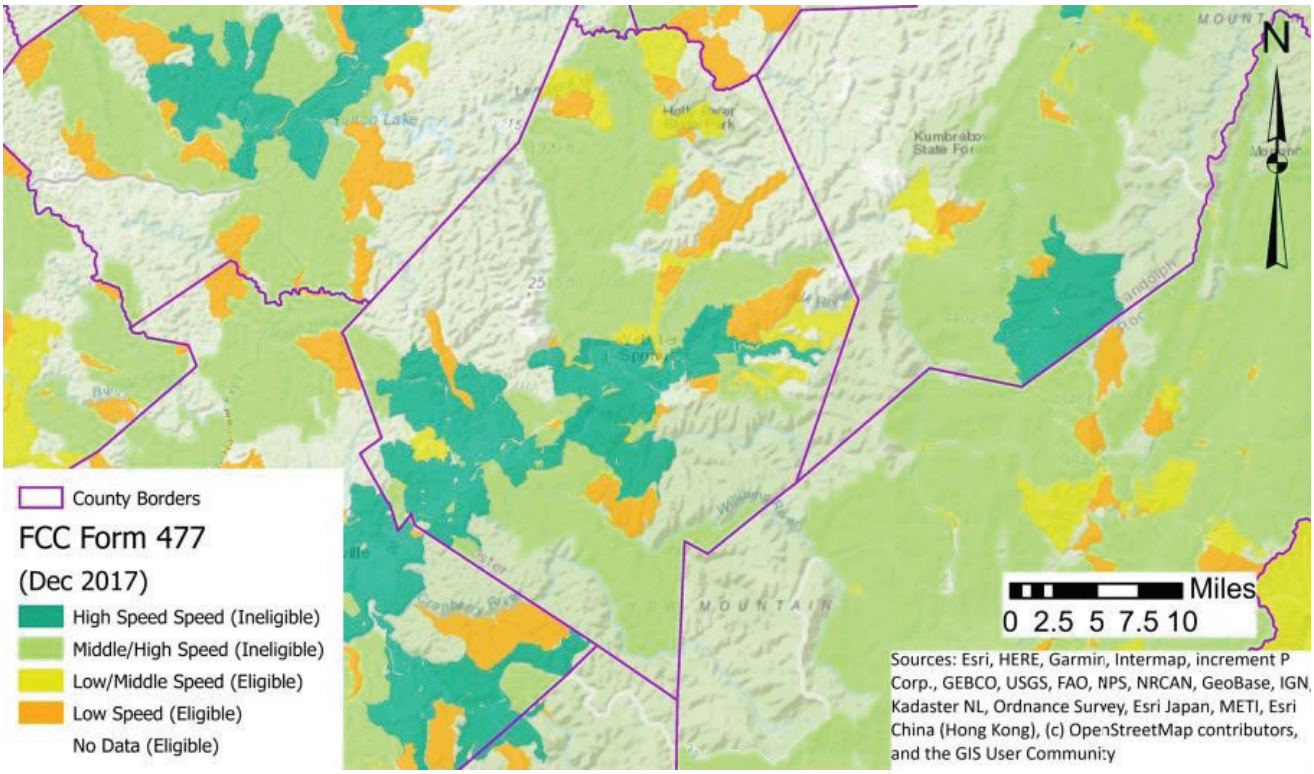
RALEIGH COUNTY



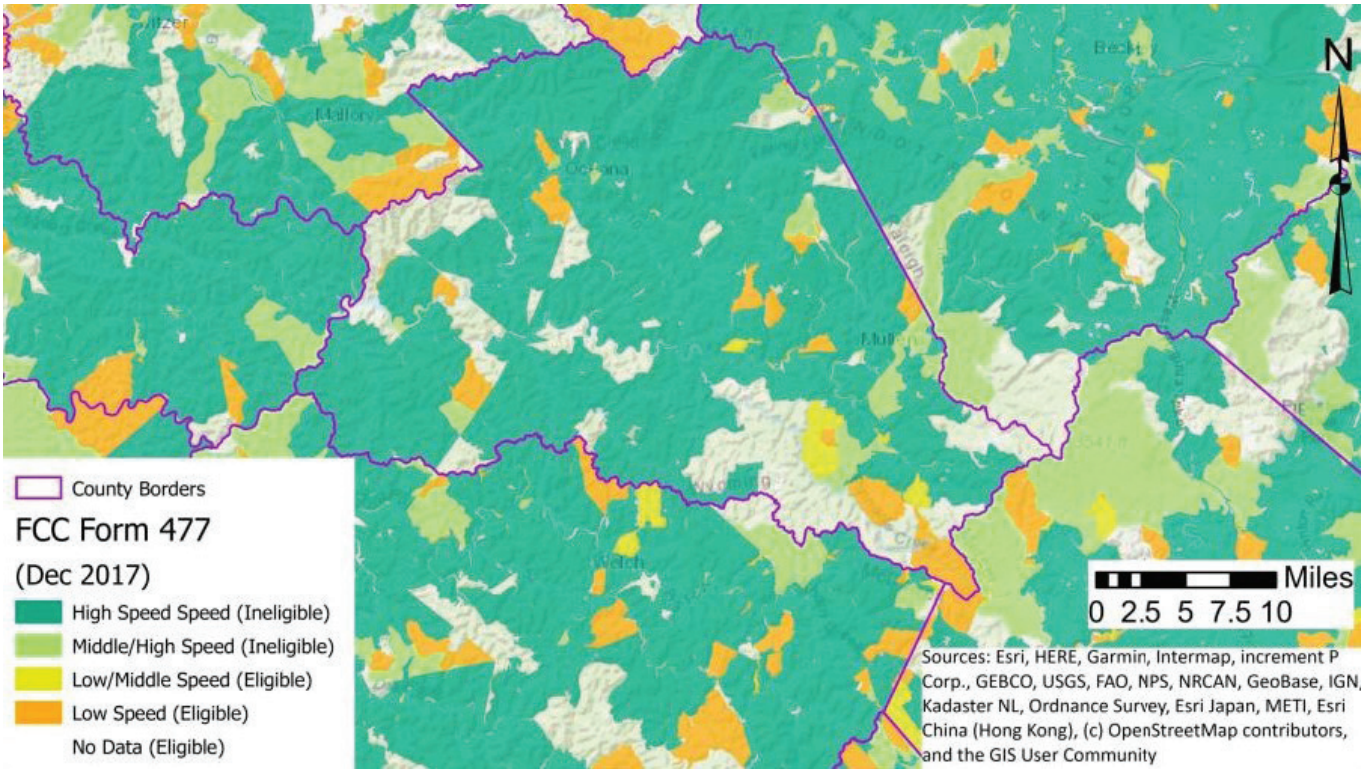
SUMMERS COUNTY



WEBSTER COUNTY



WYOMING COUNTY



BROADBAND DEVELOPMENT PLAN

The needs of Regions 1 & 4 to support technology-enabled, quality-of-life-improving applications were identified by interviewing key stakeholders throughout regions. Regional leaders view broadband as a necessity - a "4th utility."

While there is adequate connectivity to most of the critical community facilities in the region, the lack of broadband in many areas has a profound impact on economic development, citizens, and the educational system.

Impact on Economic Development

Attracting Investment - Prospective companies expect broadband to be available & won't wait for it to be built to suit. If a business expects to locate, high speed broadband with 4G is anticipated. Potential investors who cannot place a phone call from their cell phones are immediately turned off.

Tourism
Tourists don't come back without cell service.

Infrastructure
Broadband infrastructure is key to economic survival. Can't "get in the game" or even "sit on the bench" without it. Fiber/Broadband is one of the major utility requirements defined by the West Virginia Department of Commerce for a property to be considered "Site-Ready"

Workforce
It's a serious "workforce issue" for retaining employees or getting new hires to relocate. Non-traditional, virtual jobs, and work from home will become more and more the future.

Farming
Impacts farming as operations become more technology-driven.

Innovation
Broadband is necessary to foster innovation and to retain young people -- largest export is educated youth.

Real Estate
Impacts home sales, as there is a noted lower demand for homes without access to broadband

BROADBAND DEVELOPMENT PLAN

Impact on Citizens and Educational System

Medical Services

Using telehealth, including telemedicine, is a viable way to meet evolving health care challenges while revolutionizing patient care and reducing overall health care expenditures. Patients also gain more convenient access to care. For patients, getting remote access to health care providers offers major advantages over traditional methods of delivery. Telehealth provides enhanced value for rural communities. There is a shortage of some medical specialties in rural America, making telehealth even more critical in giving patients access to the care they need. Electronic Health Records (EHR) enable better outcomes and lower costs.

Options

Without fiber and broadband, communities are unable to develop and provide advanced services.

Emergency Services

A cutting-edge public safety communications system uses broadband technologies to allow first responders to send and receive critical voice, video and data to save lives, reduce injuries and prevent acts of crime and terror. Broadband can ensure all Americans can access emergency services quickly and send and receive vital information, regardless of how it is transmitted, and revolutionize the way Americans are notified about emergencies and disasters so they receive information vital to their safety. Broadband can also make 911 and emergency alert systems more capable, allowing for better protection of lives and property.

Schools

Schools are well connected, but there is a major disconnect between school and home accessibility, also known as the "homework gap.

Speeds

There is a gap between what's advertised and what residents are experiencing, plus asymmetry between upload and download speeds.

Price

Consumers experience substantial pricing differentials across the region, depending on the level of competition.

RECOMMENDATIONS

1. Address the broadband problem on a regional basis. The Regional Optical Communications, Inc. (ROC) is an organization comprised of the following counties: Calhoun, Clay, Fayette, Greenbrier, McDowell, Mercer, Monroe, Nicholas, Pocahontas, Raleigh, Roane, Summers, Webster and Wyoming. ROC should be the conduit to expand the middle-mile fiber network in Regions 1 & 4.

2. Build middle-mile routes that address the unserved portions of Regions 1 & 4
    a. Avoid overbuilding the existing fiber routes of LUMOS, Shentel, and Frontier if possible
    b. Interconnect to the "outside world" through Bluefield
    c. Interconnect with as many carriers as possible to provide maximum connectivity
    d. Provide Multi-Media System Access Points in all markets

3. Develop a framework for Wireless Internet Service Providers (WISPs) and possibly Fiber to the Home service.
    a. Utilize the existing Statewide Interoperable Radio Network (SIRN) towers as starting point
    b. Potential to expand to other existing towers or construct new towers
    c. A self-help model could be implemented
    d. Use the WV Hive Network to develop standardized business models for operational support
    e. Where possible, partner with existing WISPs to expand reach

POTENTIAL PARTNERS

The following is a non-inclusive list of potential partners for Regions 1 & 4.

- Micrologic
  - Fixed Wireless
  - Buckhannon, WV
  - http://www.micrologicwv.com/
- Shentel
  - Fiber and Cable TV
  - Edinburg, VA
  - https://www.shentel.com/
- CityNet
  - Fiber & Fixed Wireless
  - Bridgeport, WV
  - https://www.citynet.net/
- Suddenlink
  - Cable TV
  - Charleston, WV
  - https://www.suddenlink.com/
- Agile Networks
  - Fiber & Fixed Wireless
  - Canton, OH
  - http://agilenetworks.com/
- RT21.NET
  - Fixed Wireless
  - Ripley, WV
  - http://rt21.net/
- GigaBeam Networks
  - Fiber & Fixed Wireless
  - Bluefield, WV
  - http://www.wvva.net/internet-access-it/gigabeam-broadband/
- iGo
  - Fiber & Fixed Wireless
  - Grundy, VA
  - http://www.igotechnology.com/
- Point Broadband
  - Fiber & Fixed Wireless
  - Bristol, VA
  - https://point-broadband.com/southwest-virginia/
- LIT Networks
  - Fiber & Optical Transport
  - South Boston, VA
  - https://www.litnetworks.com/
- Citizens Telephone Cooperative
  - Fiber
  - Floyd, VA
  - https://citizens.coop/

FUNDING RESOURCES

The list below is a non-inclusive list of potential funding sources for broadband projects.

- US Department of Agriculture (USDA)
  - ReConnect Loan and Grant Program
    The Broadband ReConnect Program furnishes loans and grants to provide funds for the costs of construction, improvement, or acquisition of facilities and equipment needed to provide broadband service in eligible rural areas.
    https://www.usda.gov/reconnect
  - Community Connect Grants
    This program helps fund broadband deployment into rural communities where it is not yet economically viable for private sector providers to deliver service.
    https://www.rd.usda.gov/programs-services/community-connect-grants
  - Distance Learning & Telemedicine Grants
    The Distance Learning and Telemedicine program helps rural communities use the unique capabilities of telecommunications to connect to each other and to the world, overcoming the effects of remoteness and low population density.
    https://www.rd.usda.gov/programs-services/distance-learning-telemedicine-grants
  - Telecommunications Infrastructure Loans & Loan Guarantees
    This program provides financing for the construction, maintenance, improvement and expansion of telephone service and broadband in rural areas.
    https://www.rd.usda.gov/programs-services/telecommunications-infrastructure-loans-loan-guarantees

- Appalachian Regional Commission (ARC)
    - ARC Project Grants
      ARC funds several telecommunications activities, including strategic community plan ning, equipment acquisition, and hardware and software for network building. ARC funds can be used for strategic telecommunications planning activities, telecom munication service inventory and assessment activities, aggregation of demand proj ects, community awareness IT outreach training programs, sector-specific training programs in IT/e-commerce for small and medium-sized businesses, activities related to assisting in the development of IT business development, the acquisition of telecommunications equipment and related software, general operational and administrative expenses associated with project implementation, the installation of telecommunication infrastructure necessary to implement projects or support the development of IT incubators and limited telephone line charge expenses associated with the implementation of projects.
      https://www.arc.gov/funding/ARCProjectGrants.asp
    - POWER Initiative
      POWER (Partnerships for Opportunity and Workforce and Economic Revitalization) is a congressionally funded initiative that makes federal resources available to help communities and regions that have been affected by job losses in coal mining, coal power plant operations, and coal-related supply chain industries due to the changing economics of America's energy production.
      https://www.arc.gov/funding/POWER.asp
    - ARC North Central Appalachian Broadband Special Allocations
      ARC has allocated funds specifically for broadband projects in the North Central Appalachian region. The counties that are eligible are Braxton, Calhoun, Clay, Fayette, Gilmer, Nicholas Roane, Webster, and Wirt.
- US Economic Development Administration (EDA)
    - The EDA's mission is to lead the Federal economic development agenda by promoting innovation and competitiveness, preparing American regions for economic growth and success in the worldwide economy. EDA fulfills this mission through strategic investments and partnerships that create the regional economic ecosystems required to foster globally competitive regions throughout the United States.
    - https://www.eda.gov/funding-opportunities/
- US Department of Housing & Urban Development (HUD) Community Development Block Grant (CDBG)
    - Broadband development and infrastructure grants are available to eligible applicants through the HUD CDBG program. This designated Technology and Innovation grant program is administered by the State Department of Commerce.
    - https://wvcad.org/resources

CDBG
COMMUNITY DEVELOPMENT
BLOCK GRANT

USDA Rural Development
Committed to the future of rural communities.

- Federal Communications Commission (FCC)
    - Connect America Fund- The goal of the Connect America fund is expanding networks in under served areas so that all people in the U.S. have access to affordable voice and broadband. The 2018 Phase II auction followed an earlier allocation of Phase II support to price cap carriers based on a cost model. In 2015, ten price cap carriers accepted an offer of Phase II support calculated by this model in exchange for deploying and maintaining voice and broad band service in the high-cost areas in their respective states. The areas for which price cap carriers did not accept model-based support, as well as other areas, were made available in the Phase II auction.

      https://www.fcc.gov/auction/903#two

    - Rural Digital Opportunity Fund - The Rural Digital Opportunity Fund (RDOF) is the Commission's next step in bridging the digital divide. On August 1, 2019, the Commission adopted a Notice of Proposed Rulemaking (NPRM) proposing to establish the $20.4 billion RDOF to bring high speed fixed broadband service to rural homes and small businesses that lack it. On January 30, 2020, the Commission adopted the RDOF Report and Order, which es tablishes the framework for the RDOF, building on the success of the CAF Phase II auction by using reverse auctions in two phases. The Phase I auction, which is scheduled for October 22, 2020, will target over six million homes and businesses in census blocks that are entirely unserved by voice and broadband with download speeds of at least 25 Mbps. Phase II will cover locations in census blocks that are partially served, as well as locations not funded in Phase I. The RDOF will ensure that networks stand the test of time by prioritizing higher net work speeds and lower latency, so that those benefitting from these networks will be able to use tomorrow's Internet applications as well as today's.

      https://www.fcc.gov/rural-digital-opportunity-fund

Additional funding information can be found in Appendix 2.

OWNERSHIP & OPERATIONS

REGIONAL OPTICAL COMMUNICATIONS

Regional Optical Communications, Inc. (ROC)

The Regional Optical Communications, Inc. (ROC) should be the conduit to expand the middle-mile fiber network in Regions 1 & 4, and should also serve as the information hub for all broadband projects in the region.

Historically, West Virginia's eleven Regional Planning & Development Councils (RPDCs)have focused on the expansion and improvement of: water and sewer facilities, infrastructure, transportation, employment, industry, small business development, housing, health care, education, and recreation.

RPDCs offer local jurisdictions innovative solutions to growth-related problems by identifying and prioritizing goals; creating proactive strategies to realize these objectives; applying for funding packages; soliciting engineers, architects, attorneys, bond counsel, accountants, and other consultants, as needed, for each endeavor; and administering the projects to ensure funding is properly managed and all program guidelines are followed. When the need for high-speed broadband infrastructure in West Virginia became apparent, and funding opportunities became available, RPDCs high level of experience in infrastructure development made them the ideal source for administration of these projects.

With the vast number of all other infrastructure projects occurring throughout West Virginia, and the importance of propelling broadband initiatives forward throughout the state, Regions I & 4 formed Regional Optical Communications Inc. (ROC), to focus solely on broadband development in West Virginia.

ROC is a non-profit corporation comprised of Region I PDC and Region 4 PDC with the mission to promote the social welfare and economic development within their communities through advocating and championing the development of enhanced technology, communications, telecommunications, and broadband availability throughout Southern West Virginia.

ROC began with the localities located in Regions I and 4, but has expanded to include additional localities in Southern West Virginia. ROC is currently comprised of the Counties of Calhoun, Clay, Fayette, Greenbrier, McDowell, Mercer, Monroe, Nicolas, Pocahontas, Raleigh, Randolph, Roane, Summers, Wyoming and Webster,

ROC is spearheading the installation of middle mile fiber in West Virginia, and facilitates communication and collaboration between all of its members on current and potential broadband projects. This alliance allows for sharing of resources and more effective planning on projects that will ultimately benefit all of West Virginia. ROC works to ensure that all of the localities within their regions are developing and executing strategies that benefit the overall health and well-being of the entire state, and acts as an information clearinghouse for current and future broadband projects and potential funding sources.

REGIONAL OPTICAL COMMUNICATIONS

Officers:

Sam Felton	Chairman
Joe Blankenship	Vice Chairman
Robert Shafer	Vice Chairman
Jason Roberts	President
Tim Pike	Secretary
Lyle Neal	Assistant Secretary
John Tuggle	Treasurer/Assistant Secretary

Board of Directors:

Joe Blankenship, Chairman, Region I PDC
David Tolliver, Vice Chairman, Region I PDC
Tim Pike, Treasurer, Region I PDC
Bill Shiflet, Secretary, Region I PDC
Jason Roberts, Executive Director Region I PDC
Sam Felton, Chairman, Region 4 PDC
Robert Shafer, Vice Chair, Region 4 PDC
Anna Carpenter Treasurer, Region 4 PDC
Lyle Neal Secretary, Region 4 PDC
John Tuggle, Executive Director Region 4 PDC
John Norman, First Energy Corporation (Representing the Counties of Calhoun, Clay and Roane)

OWNERSHIP & OPERATIONS (CONTINUED)

Ownership/Operation Models - Pros/cons of authorities, co-ops, etc...

Selecting a business model means balancing costs, risks, business realities, and available partners. Determining the right business model is key to the success or failure of a municipal broadband project. The selection of an appropriate business model should be based on factors that include a municipality's stage of broadband development, the local environment, the municipality's funding capacity, its organizational capabilities and the desired benefits to the community. Exploring all available options will help municipalities understand which business model provides the balance of risk and reward that fits best within their current environments in terms of financial and community benefits. Variations in local government structures, private sector firms, community forces, state laws and local conditions bring a unique set of circumstances to each broadband deployment.

Basic Models

1. Private Owned/Operated
    a. Investment/Ownership & Governance - A commercial operator (private or non-profit) builds, owns, and operates the network. Funding is generally private, but may be augmented by grants.
    b. Network Operation: The network is operated by the commercial operator.
    c. Community Role: Community feasibility studies and planning by CAIs and economic development authorities may contribute to the business case. Commitment from, and aggregating demand among, community entities and CAIs can also support the project's financial success and future expansion.
        i. Benefits
            1. Capital from private investor(s) reduces the risks associated with public financing.
            2. Generally led by incumbent service providers or existing providers entering new markets
        ii. Challenges.
            1. Network planning does not center on community need.
            2. Communities have little control over implementation and operation.
            3. Financial success, not community goals, drives future expansion.
            4. Networks are unlikely to be open access without some form of community financing.

Ownership and Operations Sources

Broadband Communications Magazine Online: Seven Models for Community Broadband: http://www.bbpmag.com/MuniPortal/EditorsChoice/0516editorschoice.php

BroadbandUSA: The Business of Broadband - Getting Started: https://www2.ntia.doc.gov/files/business_of_broadband_webinar_slides_v2.pdf

ctc technology & energy: Overview of Local Community Broadband Business Models: https://kentuckywired.ky.gov/SiteCollectionDocuments/webinars/Webinar-2015-10-26.pdf

OWNERSHIP & OPERATIONS (CONTINUED)

2. Publicly Owned/Operated
    a. Investment, Ownership & Governance: A public entity (e.g., state, county or city government or municipal electric utility) owns the network. The public entity may either use an existing organization, such as a municipal electric system, or create an entirely new one. State and Federal grants may augment public funding sources.
    b. Network Operation: Operation may be public or private depending on community capabilities.
    c. Community Role: Community financing is the key driver, be it local, State, or Federal (or a combination). Communities may engage private partners in the construction, operation, and/ or maintenance of the network. Support from CAIs and economic development authorities, including demand aggregation, is critical to sustainability.
        i. Benefits
            1. Goals, objectives, and network design are generally architected around community needs
            2. Publicly-led does not mean public only! Implementation and operation may be publicly-led, contracted to private entities, or a hybrid.
        ii. Challenges
            1. Communities must raise the capital - and take the fiduciary risk - necessary for construction and build-out of the network.
            2. Public finances and network operating revenues drive future expansion.

3. Public Private Partnership
    a. Investment, Ownership & Governance: One or more commercial operators (private or non-profit) and one or more public enterprises jointly invest in the network and share capacity. Either party may own the assets (or share ownership). State and Federal grants may augment other funding sources.
    b. Network Operation: The network is generally operated by the commercial partners.

OWNERSHIP & OPERATIONS (CONTINUED)

c. Community Role: Community financing is a key driver, while community feasibility studies, planning, and regulatory support are also critical to success. Communities must have a long -term commitment to the partnership. Support from CAIs and economic development authorities.
   i. Benefits
      1. Risk is shared among public and private investors.
      2. Public objectives will contribute to the network design, subject to its overall financial success.
      3. Provides many options for the method and economics of implementation, operation, etc
   ii. Challenges.
      1. Network planning decisions must balance community and private-sector needs.
      2. Partnerships are subject to market conditions, the success of private partners, mergers & acquisitions.
      3. Public and private entities will likely share ownership of assets, complicating some transactions.
         - Who has rights to access the network, and is the P3 exclusive or nonexclusive?
         - What are the public and private partners' goals, and how are they incentivized?
         - What roles and responsibilities do the public and private partner have in the P3?
         - What assets are financed through the public and private partners respectively?
         - What revenue model do the public and private partners use to recoup their investments?
         - What requirements must the private partner meet in terms of service availability, speed, price, locations and time frames?
         - How will the partners determine future buildouts, and who pays for them?

4. Co-operative
   a. Investment, Ownership & Governance: Cooperatives may be public-centric utilities or consortia of private entities.
   b. Investment: Investors are generally public and may include State or Federal funding.
   c. Community Role: Community financing is the key driver, be it local, State, or Federal (or a combination). Communities may engage private partners in the construction, operation, and/ or maintenance of the network. Support from Community Anchor Institutions (CAIs) and economic development authorities, including aggregating demand among community entities, is critical to sustainability.
      i. Benefits.
         1. Capital from outside investor(s) reduces the risks associated with public financing.
         2. Generally led by experienced utilities that understand infrastructure projects.
      ii. Challenges.
         1. Network planning is designed around sustainability, not community need.
         2. Cooperatives are not known for explosive growth; expansion is likely based upon the reinvestment of earnings and may be slow.
         3. Networks are unlikely to be open access without some form of community financing.
   d. Not recommended for middle-mile.
   e. Works best when private ISP partners with existing electric co-op.

OWNERSHIP & OPERATIONS (CONTINUED)

Operations & Maintenance (O&M) Costs

Beyond the capitol expense costs (CAPEX), costs associated with Operations & Maintenance (O&M) should be accounted. O&M costs are typically determined as a percentage of revenue. In the early years of a broadband network, the provision for Operation and Maintenance (O&M) costs and Sales General & Admin (SG&A) is

- O&M = 20% revenue
- SG&A = 15% or revenue

This will taper down to 15% for O&M and 10% for SG&A as revenue grows.

Broadband Communities Magazine online provides a free Financial Analyzer that can assist with understanding the financial implications and viability of broadband projects. Whether you are considering a project or have a project underway, these tools aid in evaluating the financial implications of your project. Users input or modify a limited number of data elements, and the Analyzer calculates the rest. This tool can be found:
https://www.bbcmag.com/tools-and-resources/ftth-financial-analyzers

Backhaul Rates

Backhaul pricing is completely dependent upon the region. The wholesale prices in Metro areas tend to be double the price of wholesale prices in rural areas.

For planning purposes, the following table summarizes the anticipated backhaul rates for Southern West Virginia.

Capacity	Regional Carrier A $$/ Month	Regional Carrier B $$/ Month	Regional Carrier C $$/ Month	Regional Carrier D $$/ Month	Average of Regional Carriers	$$/Mbps/ Month
10Mbps	$200.00	$400.00	$550.00	$450.00	$400.00	$40.00
20Mbps	$300.00	$600.00	$672.00	$500.00	$518.00	$25.90
50Mbps	$500.00	$1,000.00	$837.00	$675.00	$753.00	$15.06
100Mbps	$800.00	$1,500.00	$1,367.00	$1,100.00	$1,191.75	$11.92
200Mbps	$1,250.00	$1,750.00	$1,787.00	$1,350.00	$1,534.25	$7.67
300Mbps	$1,500.00	$2,000.00	$2,427.00	$1,500.00	$1,856.75	$6.19
400Mbps	$1,750.00	$2,400.00	$2,557.00	$1,800.00	$2,126.75	$5.32
500Mbps	$2,250.00	$2,750.00	$3,097.00	$2,200.00	$2,574.25	$5.15
1GigE	$4,500.00	$7,000.00	$5,687.00	$4,300.00	$5,371.75	$5.37

ECONOMIC IMPACT

Economic Impact of Broadband on Southern West Virginia

(For complete Economic Impact Report see Appendix 3)

The notion of economic development is multifaceted. There are at least three dimensions that seem immediately relevant to the Regions 1 & 4 initiative to deploy fixed broadband in West Virginia:

Attracting new prospects to a region,

Retaining existing jobs and promoting organic growth through expansion of existing businesses.

Improving productivity, enabled by technology that will allow businesses to grow and expand.

Key Findings of Economic Impact on Southern West Virginia

The higher the penetration, or adoption, of broadband, the more important is its contribution to economic growth, especially in the areas of median household income and number of firms added.

A 10% increase in fixed broadband penetration could impact GDP per capita on average by up to 3.2% over a 10-year period. Using this assumption, if leaders in West Virginia Regions 1 & 4 invested $22.5 mm in a broadband network that leads to an increase in adoption by 10%, they might expect to see a $217 mm impact in GDP over a 10-year period.

If broadband availability in West Virginia were to increase to 100%, studies show this would result in an estimated 4,793 jobs created (20%) or saved (80%) from business expansion over a 3-year period. The largest portion of jobs created or saved would be in rural isolated environments such as in Regions 1 & 4, where you might expect to see an increase in approximately 844 jobs (160 created, 684 saved) over a 3-year period. Studies also show that increasing broadband availability would increase median income of each affected county by an estimated 3.43%. While this data focuses specifically on wireless broadband deployment and its economic impact, one can see the relevance to fixed broadband as well.

Impact on Growth Rates / Unemployment / Social Linkages in rural areas

In Broadband's Contribution to Economic Health in Rural Areas, a report published by Cornell University, the impact of broadband on growth rates, unemployment rates, and business growth in rural areas, as well as its impact on other quality of life facets (health care, education, social linkages) were documented. To assess the impact, they looked at the FCC's broadband adoption rates recorded as of the 2010 census and compared them to median household income, education levels, number of firms, poverty rates and unemployment rates.
The areas with high adoption (more than 80%) had higher corresponding income and education with less poverty and low unemployment. However, they were unable to prove causation - that broadband was the cause of these positive factors in these areas. So, they looked at the demographic factors before broadband was available. Areas that had high levels of broadband adoption (greater than 60%) in 2010 had higher growth in median household income - 23.4% versus just over 22% - between 2001 and 2010 when compared to counties that had similar characteristics in the1990s but were not as successful at adopting broadband. Unemployment rates also increased more slowly (the study period coincided with a recession period).

When they looked at broadband availability vs. adoption, there was minimal impact. The only positive result was the availability of higher speeds resulting in higher growth in the creative class (between 2001 and 2010). Researchers concluded that broadband adoption had a greater economic impact than broadband availability and simply providing infrastructure may not be enough to encourage true economic growth.

***IMPACT ON GROWTH RATES / UNEMPLOYMENT/ SOCIAL LINKAGES IN RURAL AREAS FINDINGS FROM: Broadband's Contribution to Economic Health in Rural Areas, Cornell University, Community & Regional Development Institute, Brian Whitacre, Oklahoma State University, Roberto Gallardo, Mississippi State University, Sharon Strover, University of Texas, February 2015.**

Impact of Broadband of the Economy

Broadband's impact as a powerful technology can be seen in the transformation of the Information Technology (IT) sector, especially in the areas of cloud computing and mobile applications. It has also influenced innovation across many other sectors including health, transportation and government. The impact of broadband on the economy is therefore a subject of growing interest.

Economists often model economic growth where output is a function of capital, labor and technology. Econometric models use proxies to represent these variables such as investment for capital and employment for labor. In order to gauge the impact of broadband, it is used as the technology variable.

The following table summarizes the impact of fixed broadband on GDP from various studies.

Cross-section/panel models, fixed broadband Impact

STUDY	NUMBER OF COUNTRIES	YEARS	INCREASE IN GDP PER 10 PERCENTAGE POINT INCREASE IN FIXED BROADBAND PENETRATION	COMMENT
QIANG ET AL 2009 (HIGH-INCOME ECONOMIES)	120	1980-2006	1.2	IMPACT ON PER CAPITAL GDP
QIANG ED AL 2009 (LOW-INCOME ECONOMIES)		1980-2006	1.4	IMPACT ON PER CAPITAL GDP
CZERNICH ET AL 2009	25 OECD (300 OBSERVATIONS)	1996-2007	0.9 - 1.5+	IMPACT ON PER CAPITAL GDP
KOUTRCUMPIS 2009	15 EUROPEAN UNION (60 OBSERVATIONS)	2003-2006	0.3 - 0.9 +	IMPACT ON PER CAPITAL GDP
ZABALLOS AND LOPEX-RIVAS 2012	26 LATIN AMERICA AND CARIBBEAN (121) OBSERVATIONS	2003-2009	3.2	IMPACT ON PER CAPITAL GDP

Note: + More than one regression method used
Source: Adapted from studies listed in first column

The various models used to measure the impact of broadband on the economy shared some common findings, including:

- Almost every study found a positive economic impact from fixed broadband to varying degrees. For every 10% increase in fixed broadband penetration, one can expect an impact on GDP per capita ranging from 0.9 to 3.2 percent.
- The impact is only noticeable after a certain threshold of broadband adoption/penetration. The exact level is unknown.

POTENTIAL JOB CREATION

Rural America comprises the largest portion of unserved and underserved broadband population. Of the 7,035,613 housing units identified as either unserved (cannot access broadband service) or underserved by the National Broadband Plan, a plurality is located in what the Census Bureau classifies as rural counties. This is no surprise since the broadband deployment plans of national carriers do not prioritize rural fixed or mobile broadband capital investment. In these territories, lower customer density and/or populations that are depressed socio-economically do not result in attractive economics of network deployment.

Given this systematic lack of investment in providing rural areas with broadband services, the Federal Communications Commission, in its 2010 National Broadband Plan, identified the deployment of broadband technology in unserved and underserved communities as a national priority. In particular, the National Broadband Plan emphasized that wireless broadband, specifically the service offered within the 700 MHz (4g) frequency band, was among the most viable technologies for addressing these gaps.

If broadband availability in WV were to increase to 100% through deployment of 700 MHz wireless technology, this would result in 4,793 jobs created or saved from business expansion between 2011 and 2014. Of the total jobs, 910 will be new jobs resulting from new economic activities triggered by wireless broadband deployment in rural counties. Conversely, 3,883 jobs will be saved as a result of the combined impact of economic growth and enhanced capabilities that will be provided to those workers as a result of wireless broadband. The largest portion of jobs created or saved will be in rural isolated environments (3,042).

Increasing broadband availability to 100% would also cause the median income of each county to increase by $1,264 on average. This represents 3.43% increase in West Virginia's median income, which is $36,804. In summary, the study also concludes that there is a significant opportunity cost of not deploying 700 MHz service in West Virginia and achieving 100% broadband availability...

*** POTENTIAL JOB CREATION FINDINGS FROM: Economic Impact of Wireless Broadband In Rural America, Telecom Advisory Services, Raul L. Katz PhD (Columbia), Javier Avila, Giacomo Meille, February 24, 2011.**

As noted in the West Virginia State Broadband Plan 2020 -- 2025, "…. West Virginia lags much of the United States in access to broadband. In more than one metric, the State measures in the bottom tier, or even dead last, compared to other States across most access and adoption measures."

Access to the Internet has become a staple of modern life. Access provides connection to the world: commerce, public safety, education, health care, government services, digital technology, employment, family; the list of needs and uses is almost infinite. West Virginia's situation evolved over a 20-year period. It will take bold action and ambitious plans to restore this important state to the leadership position it deserves.

*For complete economic impact information please refer to Appendix 3.

PRELIMINARY DESIGNS & COST ESTIMATES

Preliminary Middle-Mile Network/Options for Connectivity to Internet Exchanges

The preliminary plan for the Regions 1 & 4 area is to construct middle-mile fiber to connect the eleven counties to existing fiber optic network(s). This will allow ultimate connectivity to the primary Internet exchange points in Ashburn, VA and Atlanta, GA. Another Internet exchange is in Columbus, OH.

In October of 2018, Zayo announced plans to construct a fiber route through West Virginia to connect Ashburn, VA to Columbus, OH. The location of this route is still unknown; however, it is assumed to be along the Route 50 corridor, north of this study area.

In November of 2019, Facebook held a groundbreaking ceremony to construct a fiber route through West Virginia to connect its data centers in Richmond, VA and Columbus, OH. The precise location of the route has not been disclosed, but it is assumed that it will follow the general I-77 corridor since it is dubbed the "New River Project:. Facebook's subsidiary, Middle Mile Infrastructure will act as the wholesale carrier offering network transport. This project provides much promise to the Regions 1 & 4 area. Although details are few, it is understood that this fiber will be available for interconnectivity and may even provide opportunities for lateral routes.

An immediate point of connectivity is in Bluefield, VA or Pearisburg, VA through LIT Networks. LIT Networks is a partnership of seven regional fiber networks from Virginia to Georgia that provides seamless optical transport to the major peering points in the southeast. This unique partnership of regional networks offers a high level of diversity for enterprise customers looking to connect with US Carriers, International Carriers, and wireless tower sites. LIT Networks is a dark fiber network that utilizes a common transport platform, which increases the value of its member networks by extending their ability to reach unserved and underserved markets.

The members of LIT Networks include;

- Mid-Atlantic Broadband Communities Corporation (MBC) - Managing Member
- Citizens Telephone Cooperative
- ERC Broadband
- NGN
- Point Broadband
- Ridgelink, LLC
- Scott County Telephone Cooperative

West Virginia Small Wireless Facilities Deployment Act

In March of 2019, the WV Legislature enacted Senate Bill 3 known as the "West Virginia Small Wireless Facilities Deployment Act". The Act established a voluntary program where electric utilities may investigate the feasibility of constructing and operating a middle-mile fiber optic project within the utility's distribution system. (WV Code §31G-1-2)

Two reports have been delivered to the West Virginia Broadband Enhancement Council as of February 28, 2020:

- Broadband Feasibility Study prepared by Appalachian Power Company (APCo) and Wheeling Power Company (WPCo) - October 22, 2019 (Attached Appendix 4)
- Broadband Feasibility Study prepared by Monongahela Power (MonPower) and The Potomac Edison Company (PE) - January 23, 2020 (Attached Appendix 5)

Both studies included proposals for pilot projects.

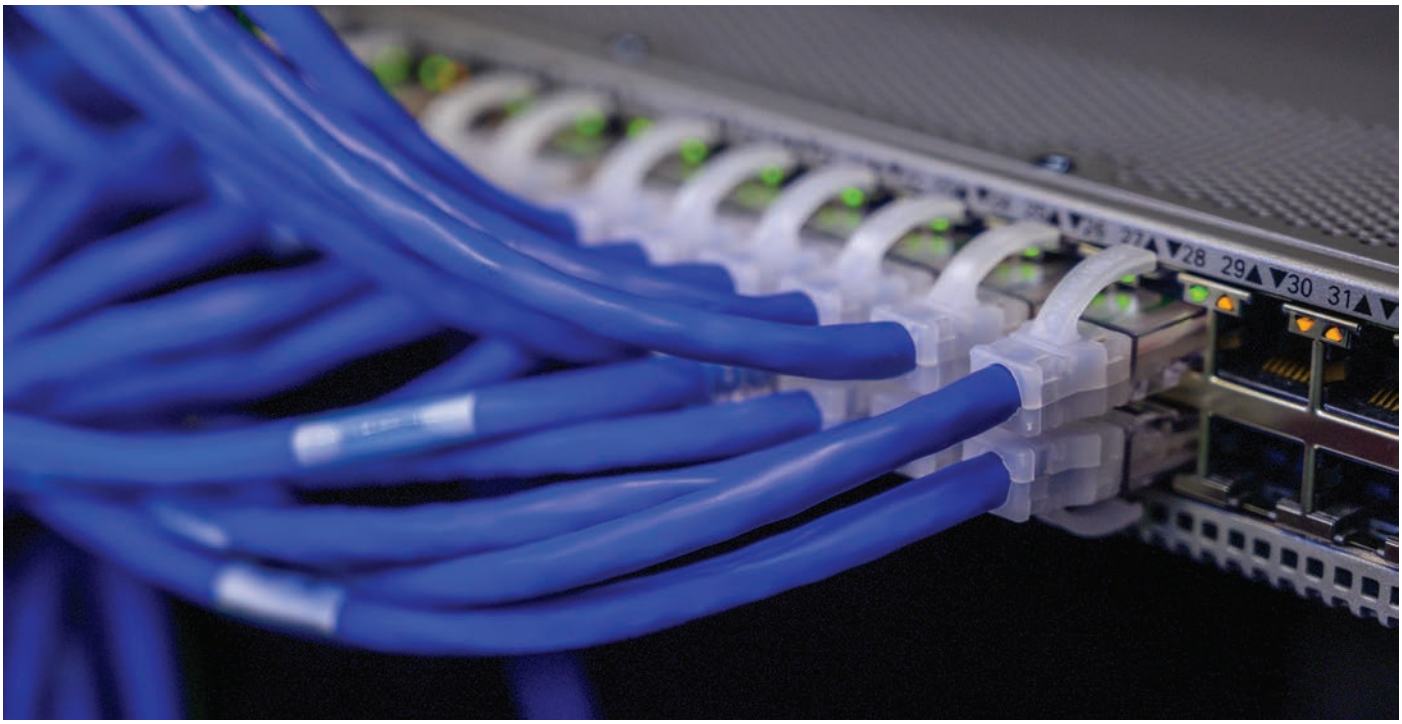
APCo / WPCo Pilot Project

The APCo WPCo pilot project is in Mingo and Logan Counties. Three variations of the project were proposed:

- Route 1 (AMI option) - Installation of approximately 414 miles of 96-strand 12 fiber optic cable on AP Co's distribution system in Mingo and Logan Counties. This mileage would be over and above that already planned for installation to connect APCo's transmission substations in Mingo and Logan Counties, back to Charleston and Huntington, West Virginia. The Route 1 option would provide a robust communi cations platform to support the future deployment of two, initial grid modernization initiatives that APCo has planned for its West Virginia electric service.
- Route 2 (DACR option) - Installation of approximately 244 miles of 96-strand fiber optic cable. This mileage would be over and above that already planned for installation to connect APCo's transmission substations in Mingo and Logan Counties back to Charleston and Huntington, West Virginia. The Route 2 option would extend fiber to DACR recloser devices at locations that APCo has identified for future DACR installations. Unlike the Route 1 option, however, this option would not extend fiber to all of APCo's expected AMI access points in Mingo and Logan Counties. Although some AMI access points could be connected to the fiber optic cable under the Route 2 option, others would require the use of a cellular and RF mesh communications platform.
- Route 3 (Substation option) - Installation of approximately 167 miles of fiber optic cable to link all substations in Mingo and Logan Counties. This mileage would be over and above that already planned for installation to link APCo's transmission substations in Mingo and Logan Counties back to Charleston and Huntington, West Virginia. This option would not provide a fiber optic cable communications platform to support the future installation of either AMI meters or DACR reclosers in Mingo and Logan Counties, and, based upon APCo's experience in Virginia, the Companies are doubtful that this option would provide a middle-mile broadband infrastructure sufficient for potential ISPs to bring broadband Internet service to Mingo and Logan Counties.

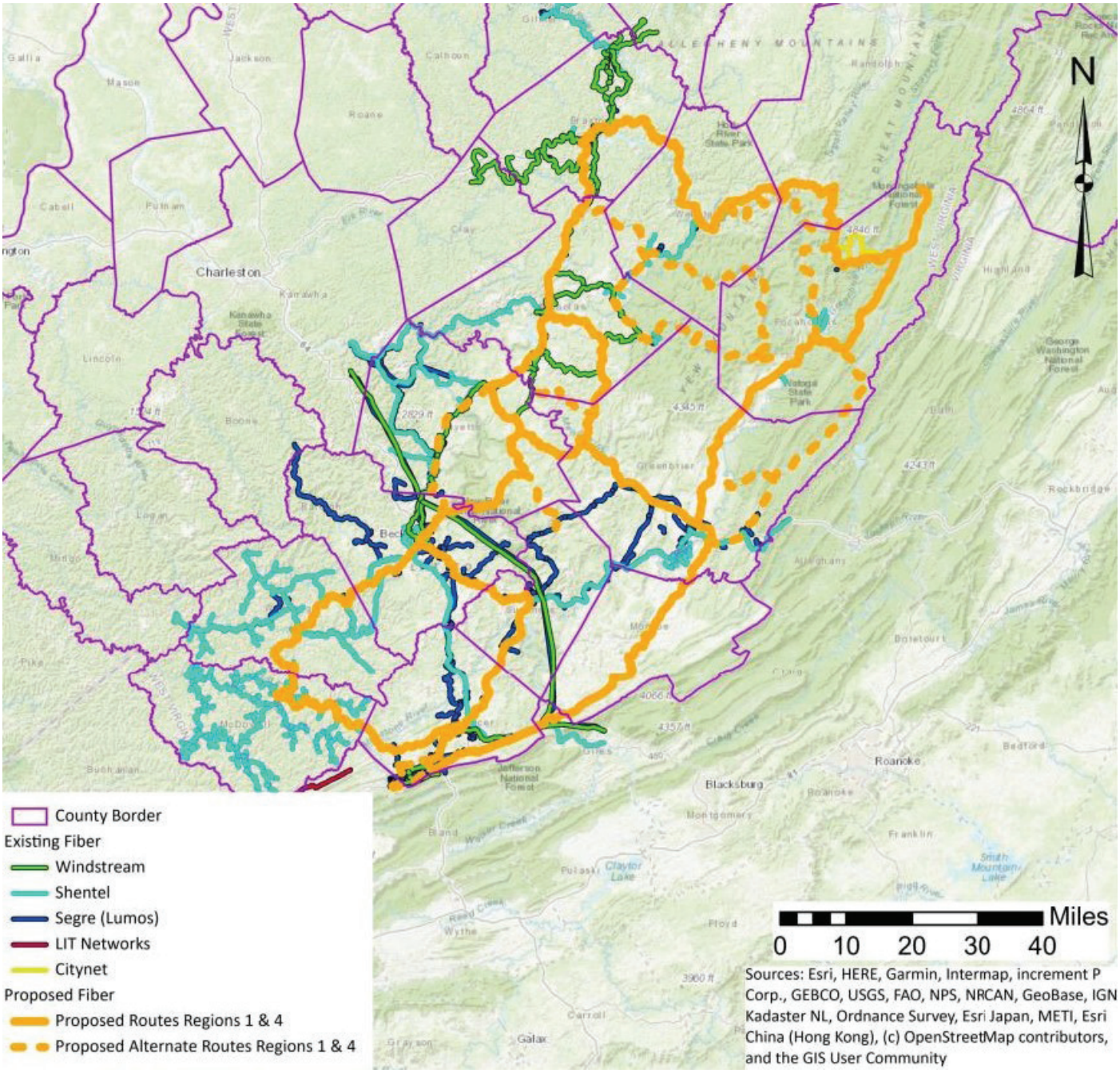
MonPower / PE Pilot Project

The MonPower / PE pilot project is in Wood and Ritchie Counties. The proposed project would provide approximately 142 miles of physical fiber access across the two adjacent counties. The proposed solution would provide dedicated dark fiber strands to local Internet Service Providers ("ISP") or "last-mile providers" as part of the overall initiative. The preliminary design provides a ring solution that will support both: i) point to point ("PT-PT"); and II) diverse network fiber solutions.



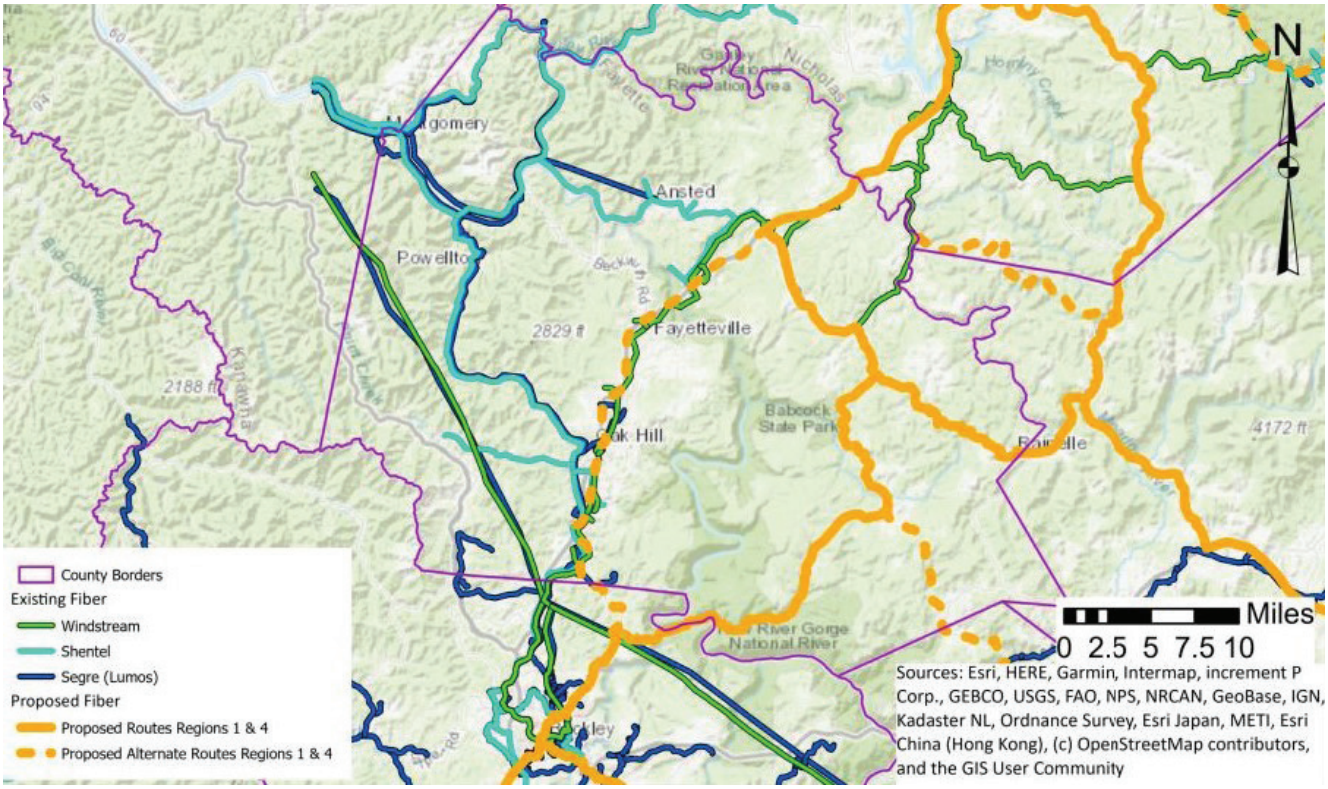
PRELIMINARY DESIGNS & COST ESTIMATES (CONTINUED)

The plan below shows proposed fiber routes in orange and with connectivity to existing fiber networks.

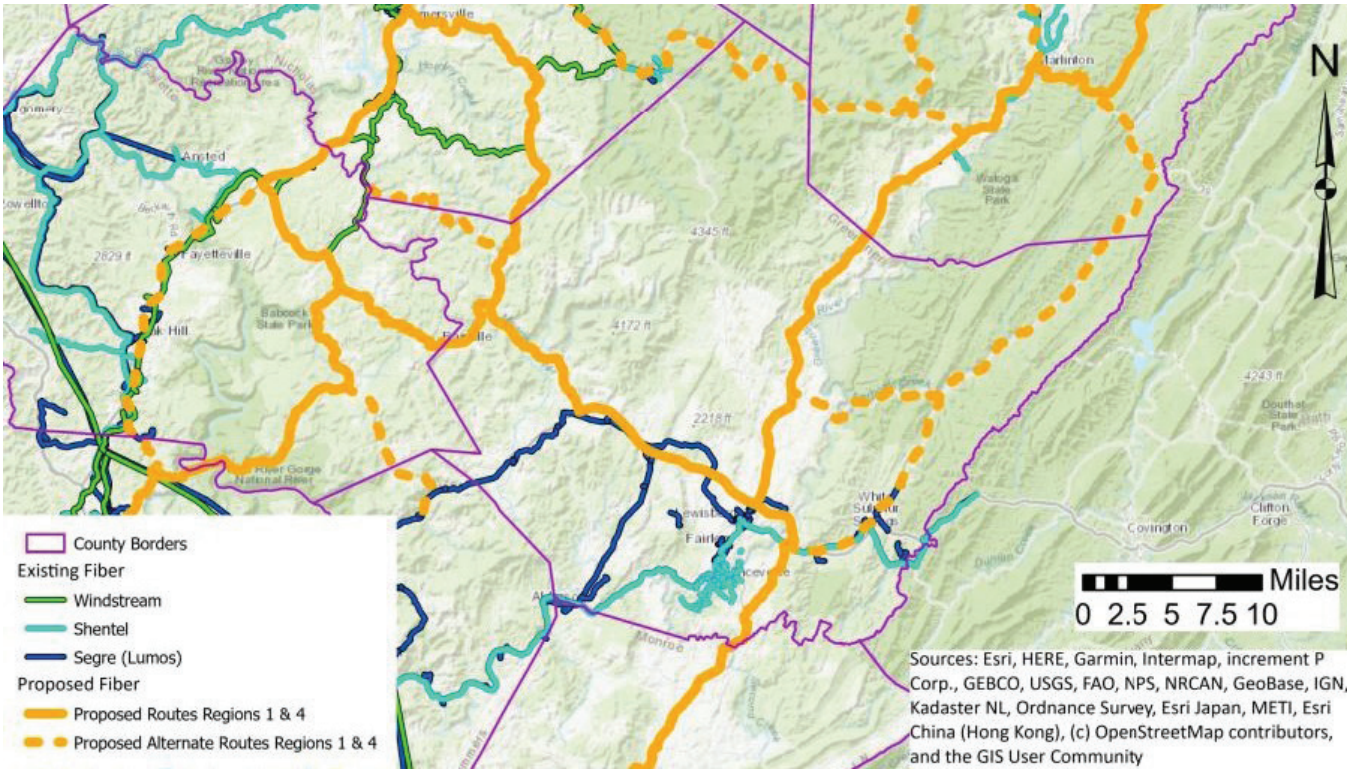


The plan is detailed in the exhibits on the following pages per county.

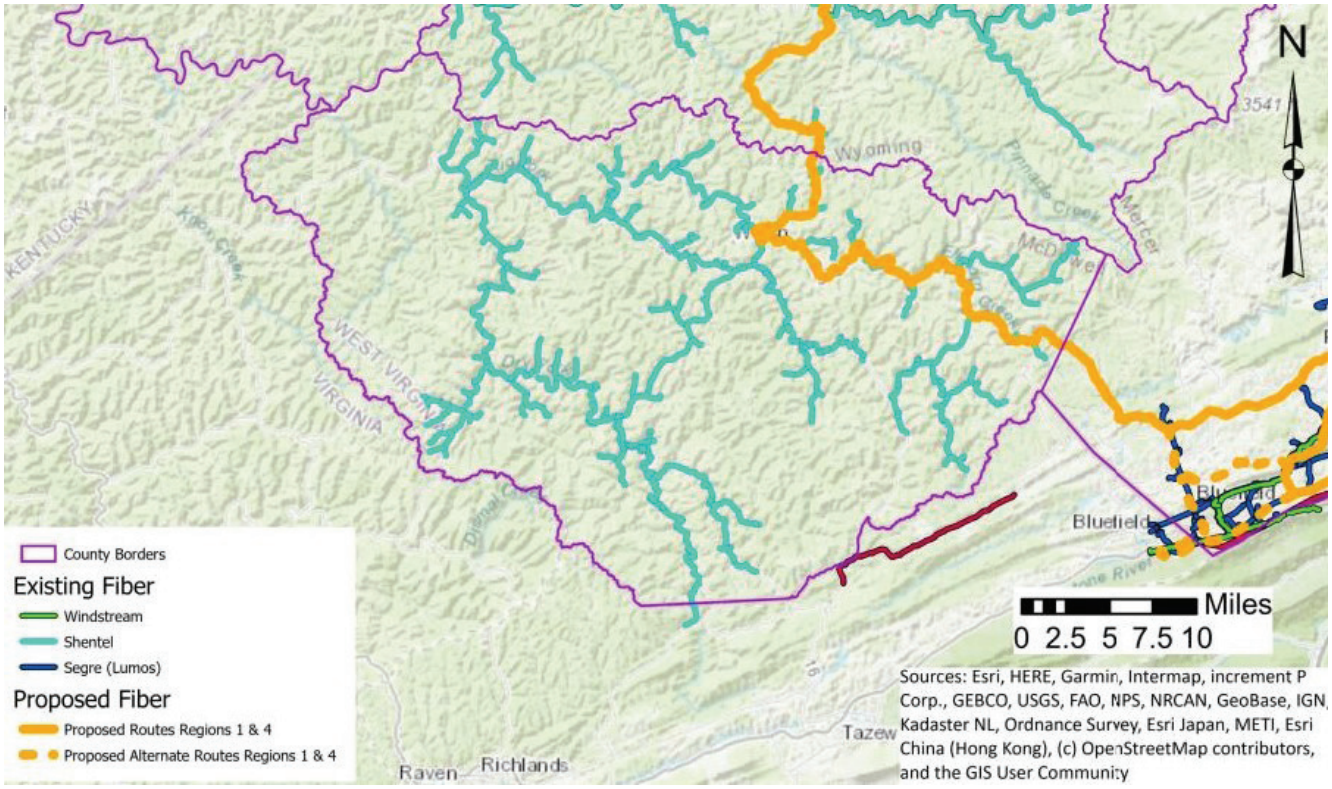
FAYETTE COUNTY



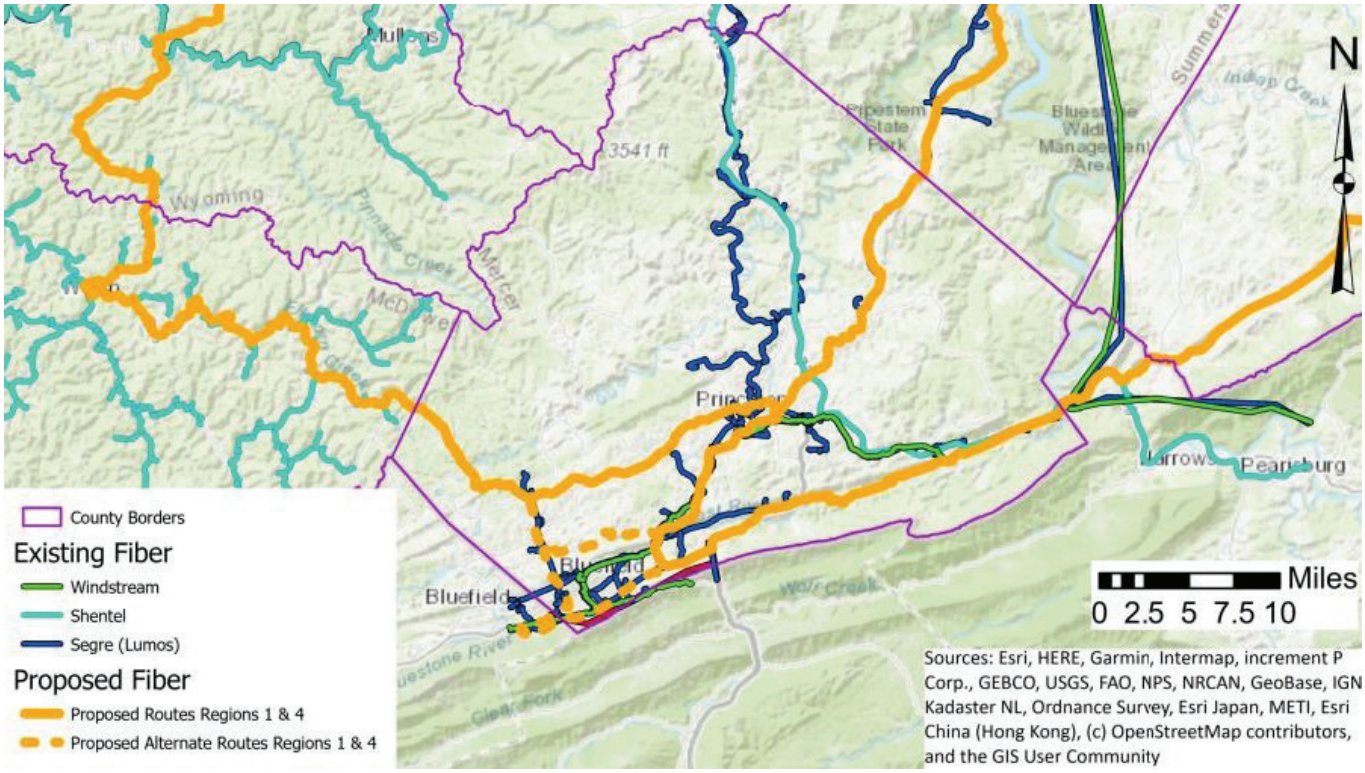
GREENBRIER COUNTY



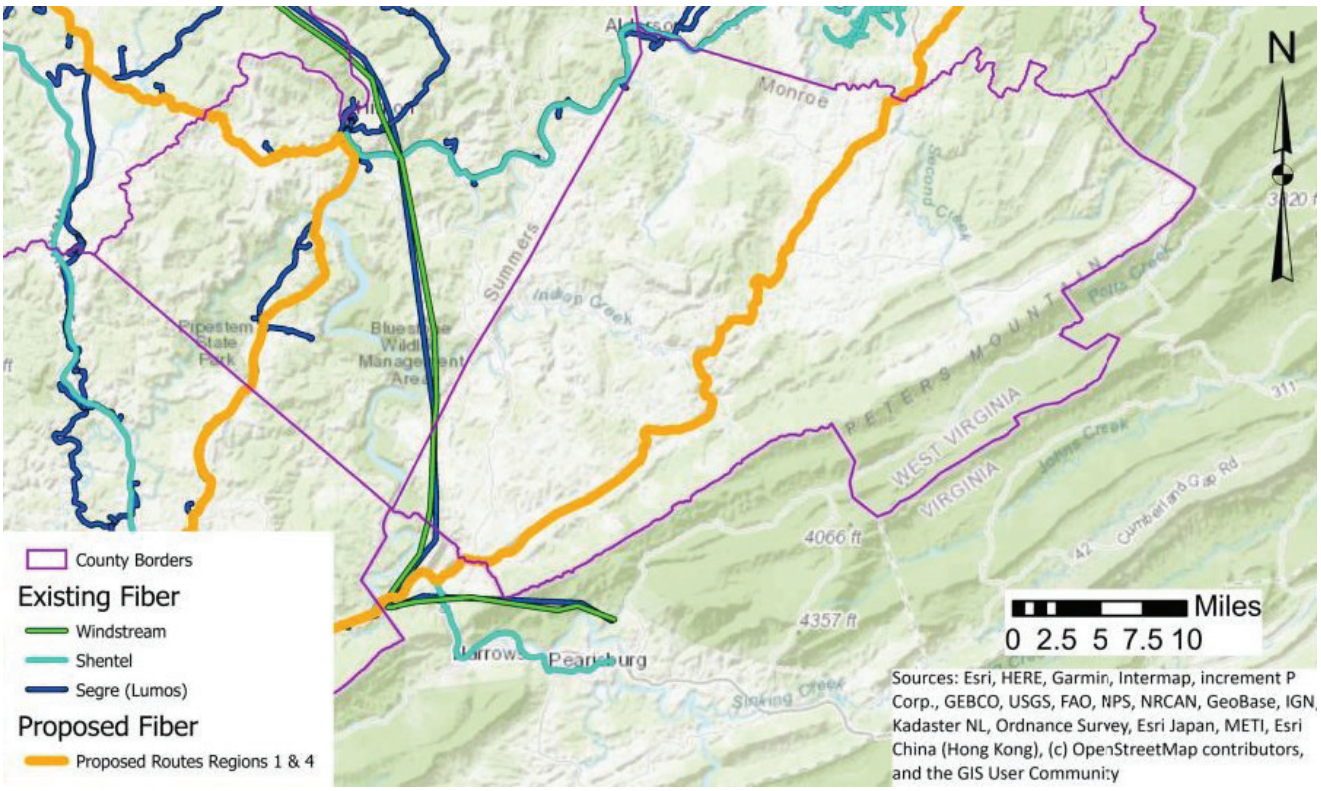
MCDOWELL COUNTY



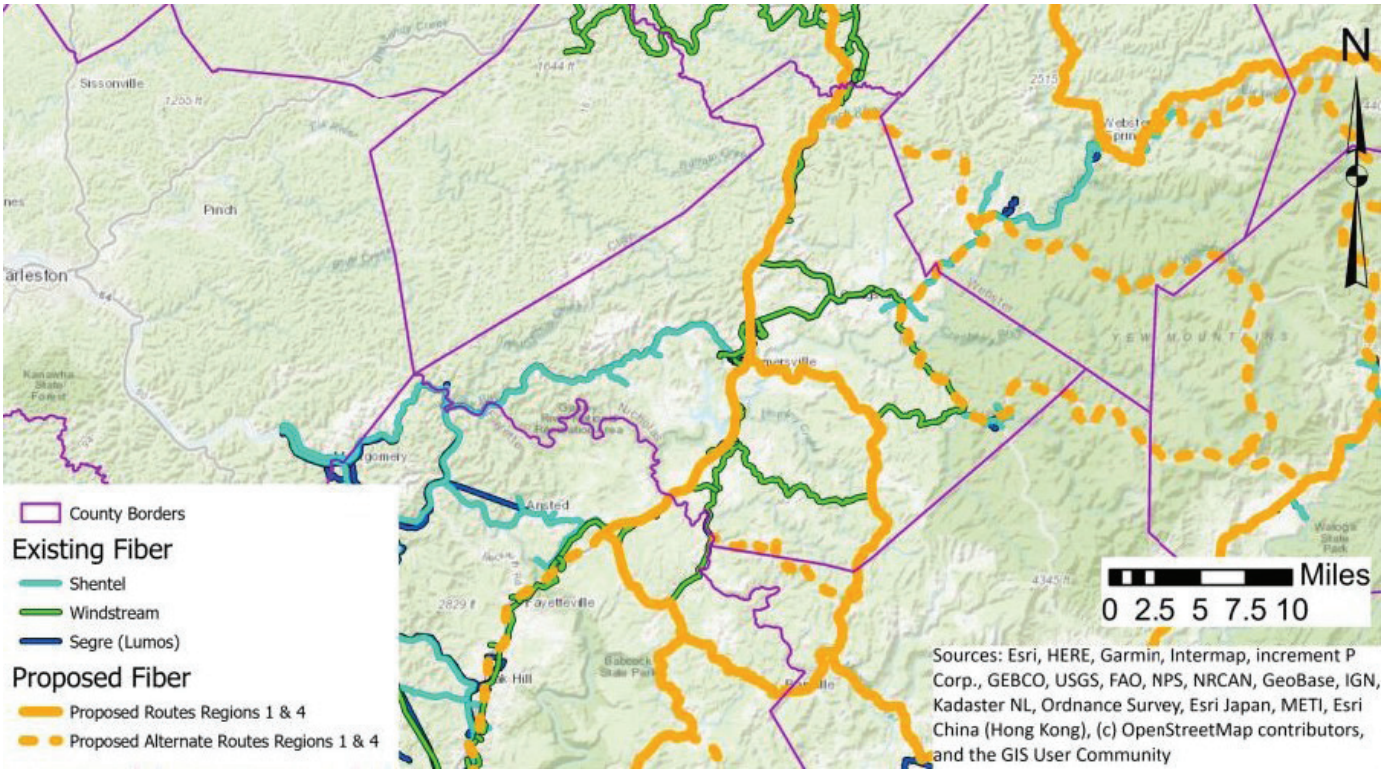
MERCER COUNTY



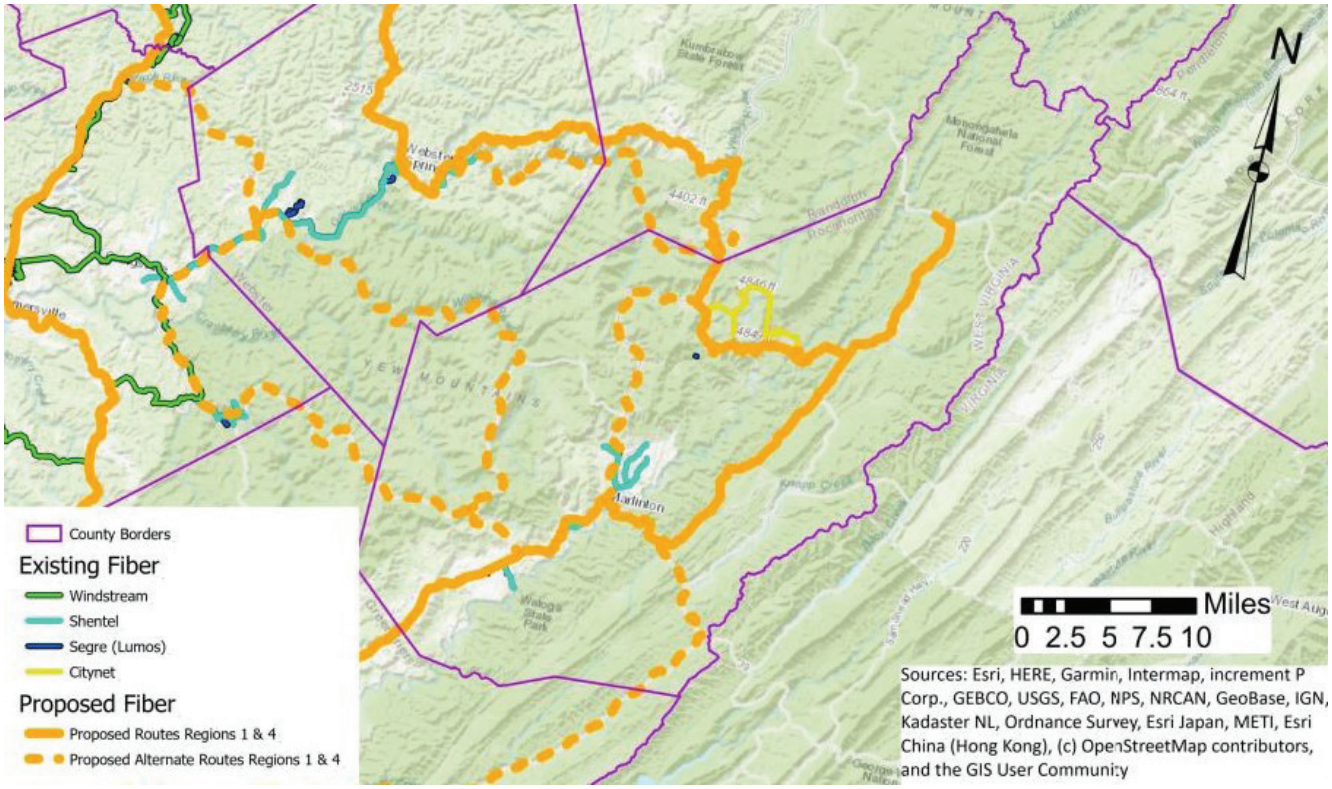
MONROE COUNTY



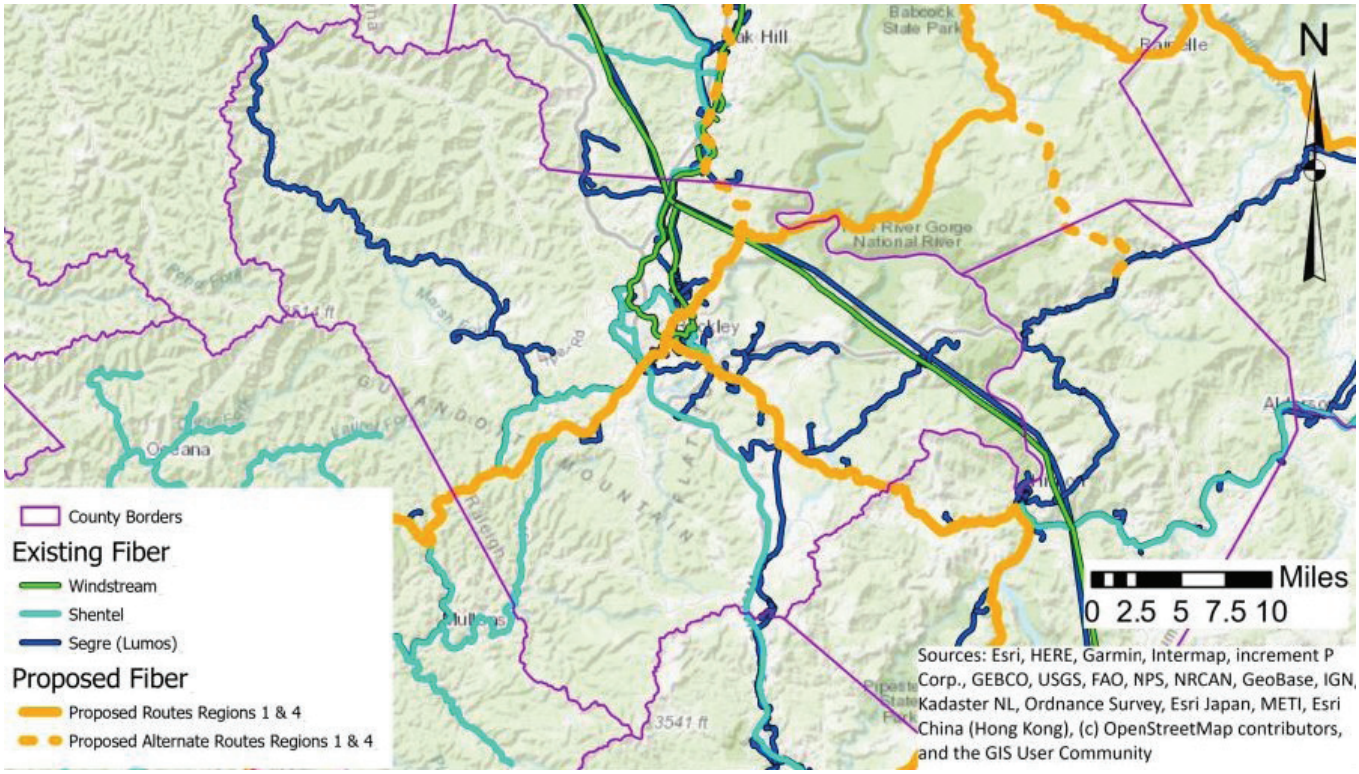
NICHOLAS COUNTY



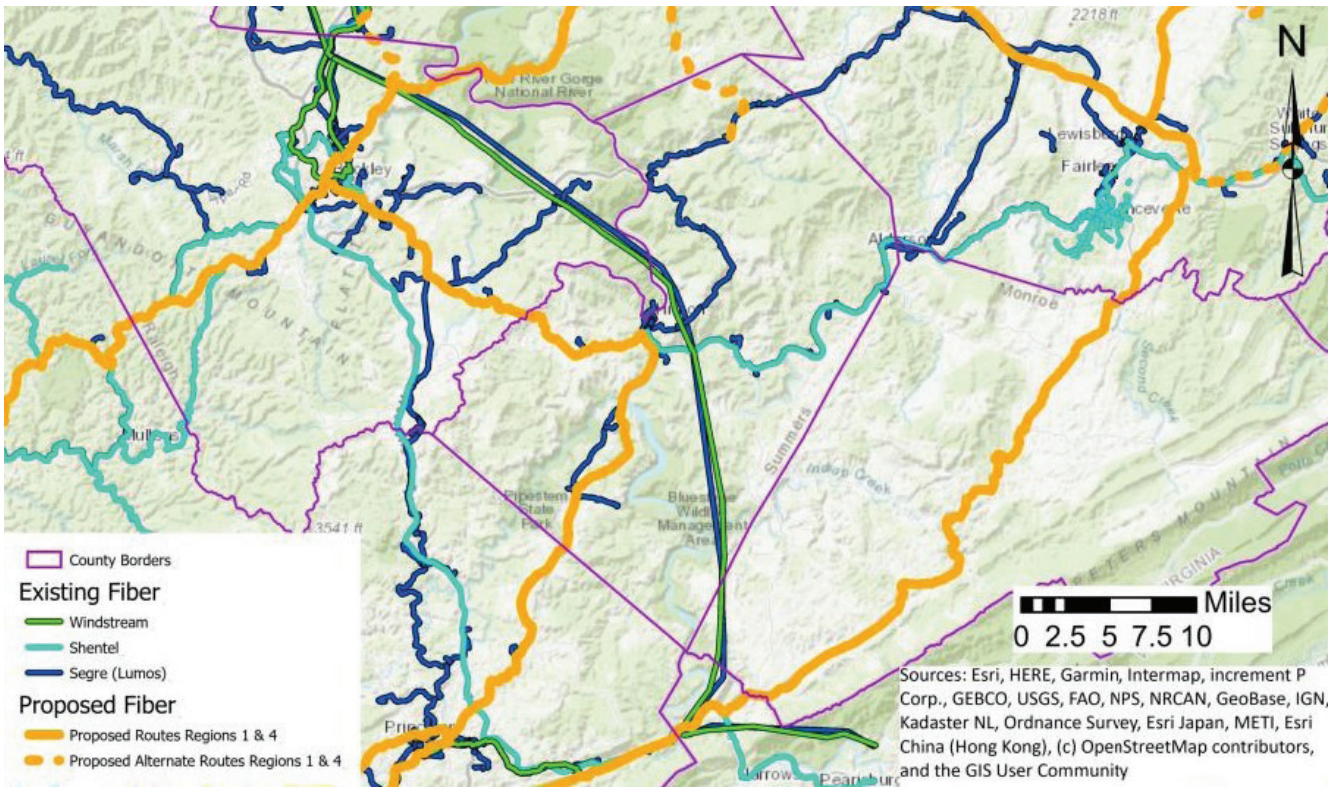
POCAHONTAS COUNTY



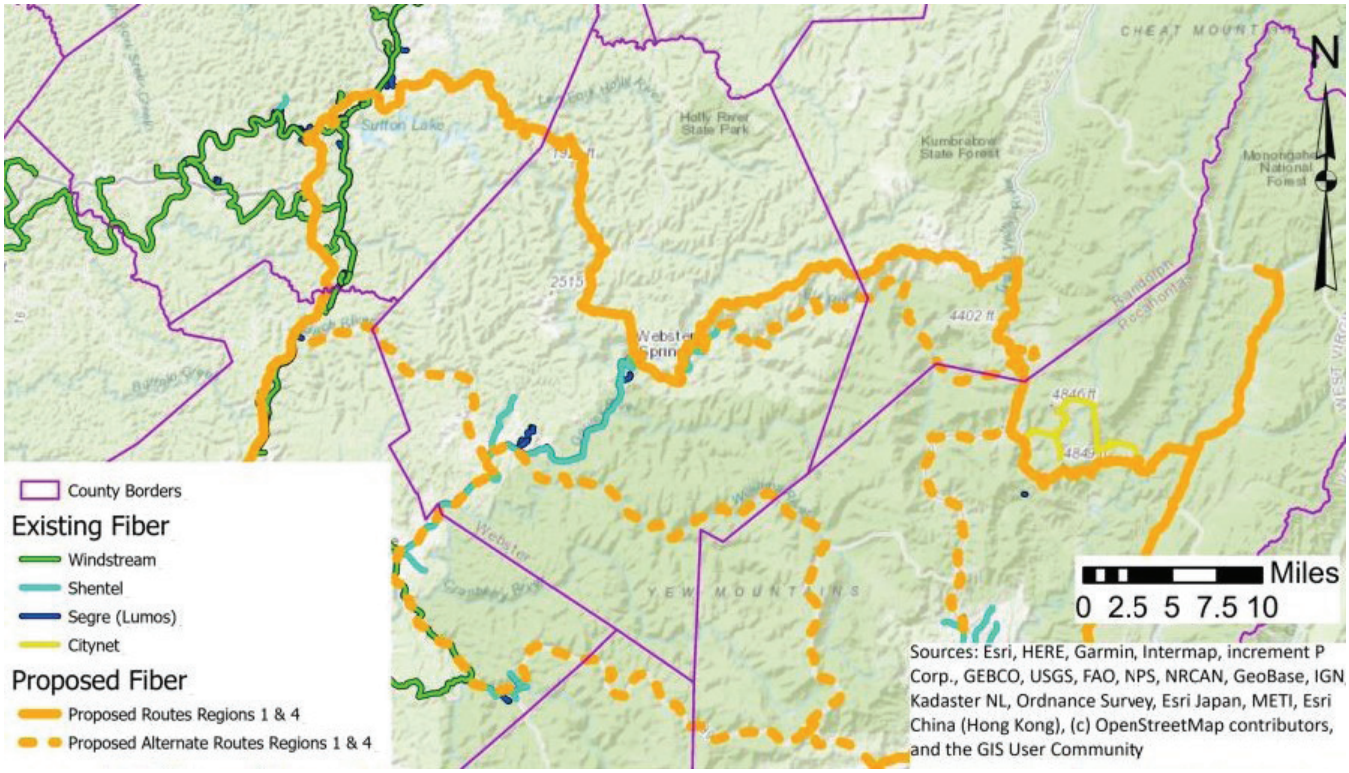
RALEIGH COUNTY



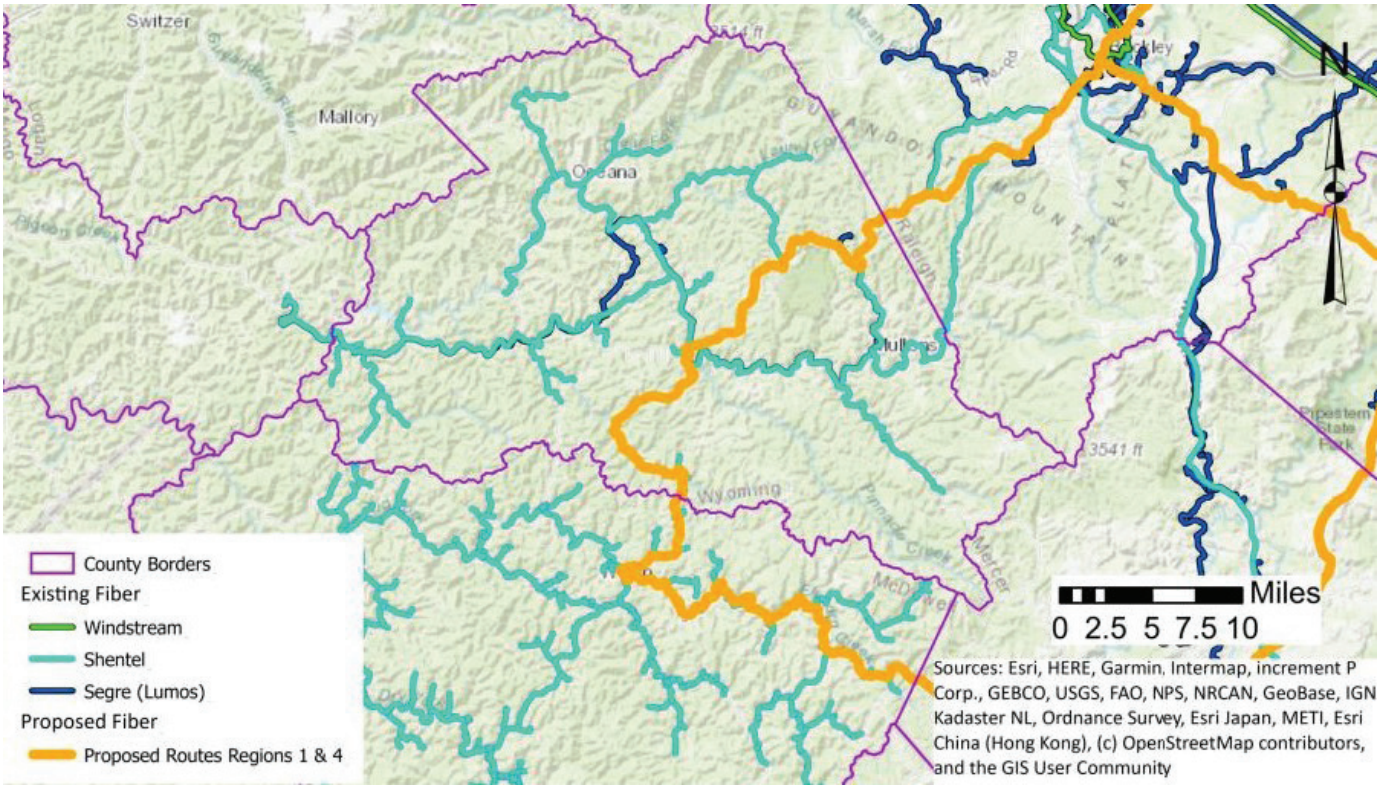
SUMMER COUNTY



WEBSTER COUNTY



WYOMING COUNTY



The plan is broken into many segments with the intent that the entire plan can be accomplished in multiple phases.

The tables below summarize the proposed fiber construction for both underground construction and aerial construction. These numbers represent overall budget numbers for design, permitting and construction. Underground construction is roughly 2.35 times as expensive as aerial construction. The Pros/Cons of each construction method are summarized below.

Pros of Underground Fiber	Cons of Underground Fiber
Less susceptible to damage	Risk of cables being damaged if not properly located before an excavation
Ability to lease pre-existing conduit	High cost of emergency repairs
Pros of Aerial Fiber	**Cons of Aerial Fiber**
Easily modified to add additional capacity	More susceptible to damage (storm damage, vehicle accidents, animal damage)
	Time to deploy can be extensive due to make-ready requirements

WEST VIRGINIA REGIONS 1 & 4 - REGIONAL BROADBAND INITIATIVE
AERIAL CONSTRUCTION

INPUT COST PER MILE $40,000

COUNTY	MILES	COST PER MILE	ESTIMATED COST	ESTIMATE PER COUNTY
MCDOWELL	27.1	$40,000	$1,084,000	$1,084,000
WYOMING	27.8	$40,000	$1,112,000	$1,112,000
MERCER A	18.8	$40,000	$752,000	$2,536,000
MERCER B	31.7	$40,000	$1,268,000	
MERCER C	12.9	$40,000	$516,000	
RALEIGH A	13.9	$40,000	$556,000	$1,568,000
RALEIGH B	10.8	$40,000	$432,000	
RALEIGH C	14.5	$40,000	$580,000	
SUMMERS	21.6	$40,000	$864,000	$864,000
MONROE	35.0	$40,000	$1,400,000	$1,400,000
FAYETTE A	21.8	$40,000	$872,000	$1,848,000
FAYETTE B	5.0	$40,000	$200,000	
FAYETTE C	19.4	$40,000	$776,000	
NICHOLAS A	11.2	$40,000	$448,000	$2,184,000
NICHOLAS B	20.0	$40,000	$800,000	
NICHOLAS C	23.4	$40,000	$936,000	
WEBSTER A (BRAXTON CO)	31.9	$40,000	$1,276,000	$2,760,000
WEBSTER B	19.4	$40,000	$776,000	
WEBSTER C	17.7	$40,000	$708,000	
GREENBRIER A	28.4	$40,000	$1,136,000	$2,772,000
GREENBRIER B	13.0	$40,000	$520,000	
GREENBRIER C	6.5	$40,000	$260,000	
GREENBRIER D	21.4	$40,000	$856,000	
POCAHONTAS A (RANDOLPH CO)	19.8	$40,000	$792,000	$3,744,000
POCAHONTAS B	18.9	$40,000	$756,000	
POCAHONTAS C	12.7	$40,000	$508,000	
POCAHONTAS D	24.2	$40,000	$968,000	
POCAHONTAS E	10.7	$40,000	$428,000	
POCAHONTAS F	7.3	$40,000	$292,000	
TOTALS	546.8		$21,872,000	

WEST VIRGINIA REGIONS 1 & 4 - REGIONAL BROADBAND INITIATIVE
UNDERGROUND CONSTRUCTION

INPUT COST PER MILE $95,000

COUNTY	MILES	COST PER MILE	ESTIMATED COST	ESTIMATE PER COUNTY
MCDOWELL	27.1	$95,000	$2,574,500	$2,574,000
WYOMING	27.8	$95,000	$2,641,000	$2,641,000
MERCER A	18.8	$95,000	$1,786,000	$6,023,000
MERCER B	31.7	$95,000	$3,011,500	
MERCER C	12.9	$95,000	$1,225,500	
RALEIGH A	13.9	$95,000	$1,320,500	$3,724,000
RALEIGH B	10.8	$95,000	$1,026,000	
RALEIGH C	14.5	$95,000	$1,377,500	
SUMMERS	21.6	$95,000	$2,052,000	$2,052,000
MONROE	35.0	$95,000	$3,352,000	$3,325,000
FAYETTE A	21.8	$95,000	$2,071,000	$4,389,000
FAYETTE B	5.0	$95,000	$475,000	
FAYETTE C	19.4	$95,000	$1,843,000	
NICHOLAS A	11.2	$95,000	$1,064,000	$5,187,000
NICHOLAS B	20.0	$95,000	$1,900,000	
NICHOLAS C	23.4	$95,000	$2,223,000	
WEBSTER A (BRAXTON CO)	31.9	$95,000	$3,030,500	$6,555,000
WEBSTER B	19.4	$95,000	$1,843,000	
WEBSTER C	17.7	$95,000	$1,681,500	
GREENBRIER A	28.4	$95,000	$2,698,000	$6,583,500
GREENBRIER B	13.0	$95,000	$1,235,000	
GREENBRIER C	6.5	$95,000	$617,000	
GREENBRIER D	21.4	$95,000	$2,033,000	
POCAHONTAS A (RANDOLPH CO)	19.8	$95,000	$1,881,000	$8,892,000
POCAHONTAS B	18.9	$95,000	$1,795,500	
POCAHONTAS C	12.7	$95,000	$1,206,500	
POCAHONTAS D	24.2	$95,000	$2,299,000	
POCAHONTAS E	10.7	$95,000	$1,016,500	
POCAHONTAS F	7.3	$95,000	$693,500	
TOTALS	546.8		$51,946,000	

PRELIMINARY DESIGNS & COST ESTIMATES (CONTINUED)

Last-Mile Projects

A key component of this Development and Implementation Study is the identification and development of last-mile project areas. A total of 38 projects were identified in Regions 1 & 4. In addition, ten additional projects were developed in Clay, Calhoun & Roane Counties (CCR). CCR is now a part of Regional Optical Communication (ROC).

Project areas were identified primarily by omitting areas with any prior federal funding allocated for broadband, the area's current broadband speeds, the availability of existing broadband providers in the area, and the population density within the project areas.

The Federal Communications Commission's (FCC) Connect America Fund adopted systems to accelerate broadband build-out to areas who lack access to infrastructure capable of providing 10/1 Mbps (download speed / upload speed) fixed broadband. In 2018, the FCC conducted a Phase II Auction (Auction 903) to allocate funds to eligible areas across the U.S. The areas that were allocated federal funding, as a result of Auction 903, were considered ineligible. Additionally, the Rural Utilities Service (RUS), a Rural Development Agency of the United States Department of Agriculture (USDA), provides the Rural Broadband Access Loan and Loan Guarantee Program to furnish loans and loan guarantees to provide funds for the costs of construction, improvement, or acquisition of facilities and equipment needed to provide service at the broadband lending speed in eligible rural areas. The areas that were in the RUS's list of protected borrowers, associated with the Loan Program, were considered ineligible.

The FCC requires broadband providers to file data utilizing the FCC's Form 477 on the extents of the provider's internet coverage and speeds. The providers provide the FCC with a list of census blocks in which they can or do offer service to at least one location within said census block. The FCC gathers this data and updates their online mapping tool known as the Fixed Broadband Deployment map twice per year. This map provides the broadband provider's deployment technology and speeds within all census blocks in the U.S. Additionally, the West Virginia Broadband Enhancement Council (Council) provides users the ability to conduct speed tests and surveys to help map the broadband presence and quality of service in communities across the state. The FCC's map and the Council's speed tests were utilized to help determine served, under-served, and unserved areas within Regions 1 & 4.

Unserved areas were determined to be areas where the FCC and Council's data illustrated internet speeds of less than 10/1 Mbps. Additionally, under-served areas were determined to be areas where the data illustrated speeds of greater than 10/1 Mbps but less than 25/3 Mbps. Finally, served areas were determined to be areas where the data illustrated speeds of 25/3 Mbps or greater.

Furthermore, a factor in determining eligible project areas was the presence of an existing fiber source in the surrounding area. Eligible project areas were determined to be areas typically within ten (10) miles of an existing fiber source. Areas outside of the ten (10) mile range were either divided into phased projects or discarded all together. The determining factor in whether or not a project was phased was the population density along the proposed route.

Population density was a major factor in determining eligible project areas within Regions 1 & 4. Google Earth and Maps and census data were utilized in accessing the population within the project areas.

The project areas were ranked by scoring factors correlating to the following items: Capital costs, CDBG Eligible/Ineligible areas, number of households, percent of households with children, and median household income.

PRELIMINARY DESIGNS & COST ESTIMATES (CONTINUED)

We developed the following ranking model:

Criteria	Weighting	Maximum Value	Minimum Value
CDBG HUD Eligible	40 points	HUD Eligible = 40	HUD Marginal = 20 HUD Ineligible = 0
Number of Households (HH)	20 points	586 HH is the largest = 20 pts	10 HH is the smallest = 1 pt
% of HH with Children	20 points	35% = 20 pts	17% = 1 pt
Income per HH (as a proxy for knowledge workers)	10 points	$51,930 = 10 pts	$17,539 = 1 pt
CAPEX est per HH (note lower cost per HH is a better value than higher cost)	10 points	$2,459 = 10 pts	$8,666 = 1 pt

Based upon this ranking methodology, we developed a model that rates and ranks all 48 communities of interest. The community that generates the highest score should, theoretically, be the one that is addressed first. Of course, in network deployments there are always additional circumstances to consider. This prioritization is a guideline only to be used to prioritize focus.

Community	Region	Total Score	Rank
Summers County - State Rte 20	1	72.9	1
Raleigh County - Bragg	1	65.0	2
Mercer County - Beeson	1	64.9	3
McDowell County - Northfork	1	63.5	4
Greenbrier County - Organ Cave	4	62.0	5
McDowell County - Panther	1	61.7	6
Webster County - Rte 9	4	61.4	7
Webster County - State Rte 82 Phase II	4	55.7	8
Nicholas County - Mt. Lookout	4	49.0	9
Nicholas County - Mt. Nebo	4	47.5	10
Monroe County - Bozoo	1	46.1	11
Greenbrier County - U.S. Rte 219 Phase II	4	43.0	12
Fayette County - Rte 7	4	42.3	13
Greenbrier County - State Rte 92 Phase II	4	41.3	14
Fayette County - U.S. Rte 60	4	40.4	15
Pocahontas County - U.S. Rte 219 Phase I	4	39.9	16
Roane County - Spencer	CCR	39.6	17
Monroe County - Greenville	1	39.3	18
Nicholas County - State Rte 39 Phase II	4	39.0	19
Nicholas County - State Rte 39 Phase I	4	38.9	20
Nicholas County - State Rte 82 Phase I	4	37.5	21
Pocahontas County - State Rte 39 Phase I	4	37.3	22
Roane County - Reedy	CCR	36.2	23
Summers County - Tug Creek Mtn	1	35.9	24
Summers County - Forest Hill	1	35.7	25
Clay County - Clay Junction	CCR	35.1	26
Clay County - Big Otter	CCR	31.7	27
Raleigh County - State Rte 3	1	31.7	28
Greenbrier County - State Rte 92 Phase I	4	30.8	29
Clay County - Ivydale	CCR	30.4	30
Clay County - Clay	CCR	30.4	31
Pocahontas County - Jacox	4	30.4	32
Greenbrier County - Hokes Mill	4	30.3	33
Pocahontas County - State Rte 39 Phase II	4	29.3	34
Wyoming County - Coal Mtn	1	29.2	35
Fayette County - Rte 4	4	27.9	36
Webster County - State Rte 15	4	27.1	37
Pocahontas County - State Rte 92 Phase IV	4	26.7	38

Community	Region	Total Score	Rank
Clay County - Rte 11	CCR	26.0	39
Wyoming County - Wyco	1	25.9	40
Nicholas County - U.S. Rte 19	4	25.2	41
Roane County - Newton	CCR	24.8	42
Webster County - Rte 22	4	23.6	43
Mercer County - Egeria	1	22.7	44
Calhoun County - Orma	CCR	21.2	45
McDowell County - Ashland	1	21.1	46
Greenbrier County - State Rte 92 Phase III	4	19.4	47
Calhoun County - Nebo	CCR	14.1	48

The projects are also ranked per Region.

Region 1 Communities	Total Score	Rank
Summers County - State Rte 20	72.9	1
Raleigh County - Bragg	65.0	2
Mercer County - Beeson	64.9	3
McDowell County - Northfork	63.5	4
McDowell County - Panther	61.7	5
Monroe County - Bozoo	46.1	6
Monroe County - Greenville	39.3	7
Summers County - Tug Creek Mtn	35.9	8
Summers County - Forest Hill	35.7	9
Raleigh County - State Rte 3	31.7	10
Wyoming County - Coal Mtn	29.2	11
Wyoming County - Wyco	25.9	12
Mercer County - Egeria	22.7	13
McDowell County - Ashland	21.1	14

Region 4 Communities	Total Score	Rank
Greenbrier County - Organ Cave	62.0	1
Webster County - Rte 9	61.4	2
Webster County - State Rte 82 Phase II	55.7	3
Nicholas County - Mt. Lookout	49.0	4
Nicholas County - Mt. Nebo	47.5	5
Greenbrier County - U.S. Rte 219 Phase II	43.0	6
Fayette County - Rte 7	42.3	7
Greenbrier County - State Rte 92 Phase II	41.3	8
Fayette County - U.S. Rte 60	40.4	9
Pocahontas County - U.S. Rte 219 Phase I	39.9	10
Nicholas County - State Rte 39 Phase II	39.0	11
Nicholas County - State Rte 39 Phase I	38.9	12
Nicholas County - State Rte 82 Phase I	37.5	13
Pocahontas County - State Rte 39 Phase I	37.3	14
Greenbrier County - State Rte 92 Phase I	30.8	15
Pocahontas County - Jacox	30.4	16
Greenbrier County - Hokes Mill	30.3	17
Pocahontas County - State Rte 39 Phase II	29.3	18
Fayette County - Rte 4	27.9	19
Webster County - State Rte 15	27.1	20
Pocahontas County - State Rte 92 Phase IV	26.7	21
Nicholas County - U.S. Rte 19	25.2	22
Webster County - Rte 22	23.6	23
Greenbrier County - State Rte 92 Phase III	19.4	24

CCR Communities	Total Score	Rank
Roane County - Spencer	39.6	1
Roane County - Reedy	36.2	2
Clay County - Clay Junction	35.1	3
Clay County - Big Otter	31.7	4
Clay County - Ivydale	30.4	5
Clay County - Clay	30.4	6
Clay County - Rte 11	26.0	7
Roane County - Newton	24.8	8
Calhoun County - Orma	21.2	9
Calhoun County - Nebo	14.1	10

Project exhibits and preliminary statements of probable project cost are included as Appendix 6

PRELIMINARY INFRASTRUCTURE APPLICATIONS

The goal of this study is to expand the broadband connectivity in Regions 1 & 4. As discussed in the Broadband Planning section, there are several funding opportunities for broadband expansion.

USDA RECONNECT

In March of 2018, Congress passed the Consolidated Appropriations Act, 2018 (the Act), which established a new broadband loan and grant pilot program, now called the Rural eConnectivity Pilot Program (ReConnect Program). The Act budgeted $600,000,000 for this first round of funding. The $600 million was broken into three categories:

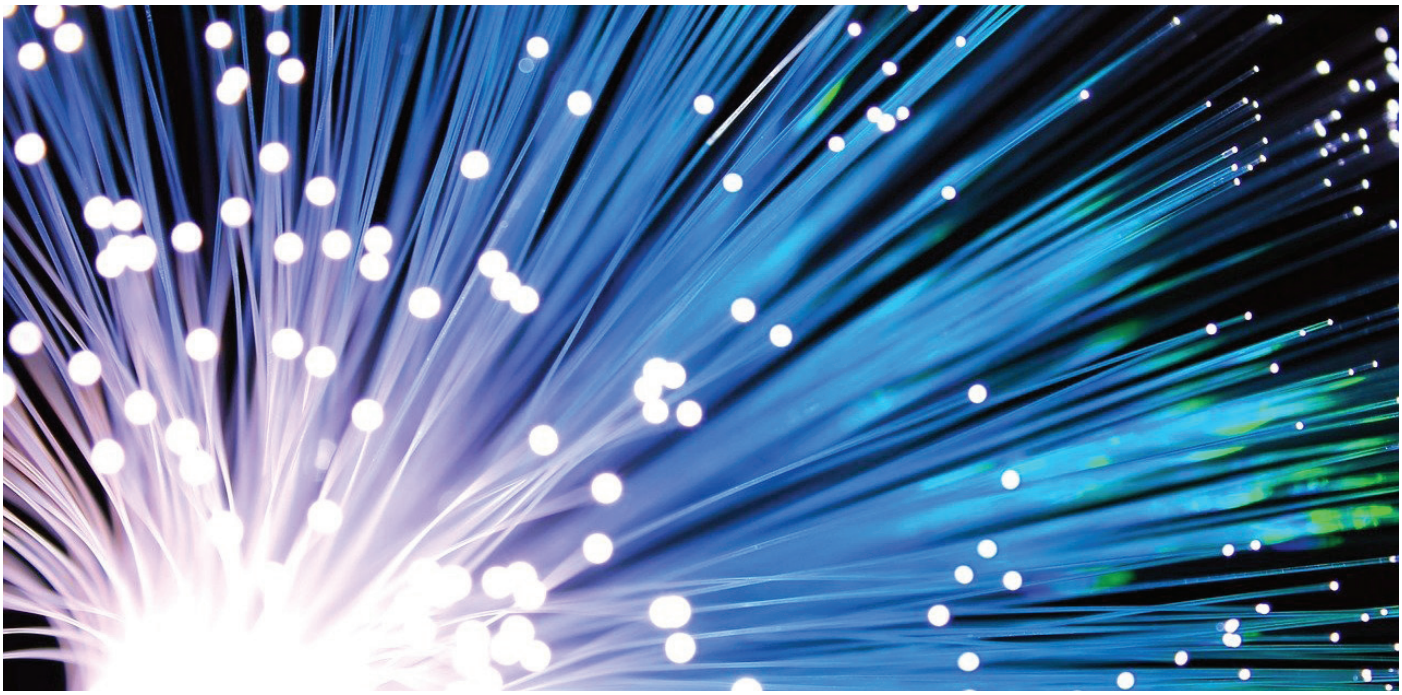
- 100% Loan ($200,000)
- 50% Loan/50% Grant ($200,000)
- 100% Grant ($200,000)

Regions 1 & 4, through Regional Optical Communications (ROC), discussed several potential projects for submission to the ReConnect Program. In the end, two projects rose to the top. Neither of these projects were awarded in the initial round of funding. It is anticipated that these projects, and potentially others, will be submitted in the next round of funding.

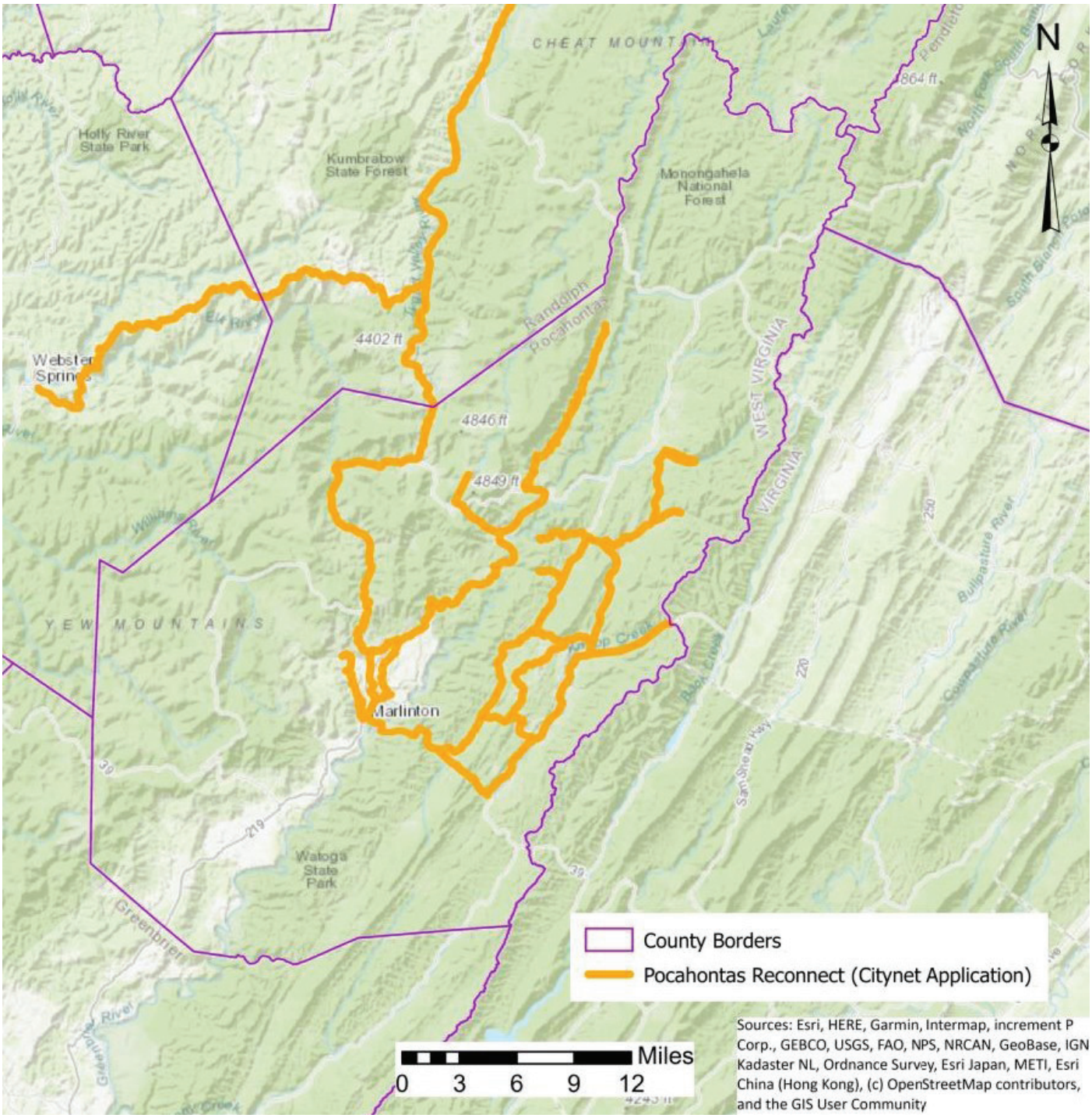
The first is a project for Pocahontas County. This project was originally planned to be a standalone project submitted by either the Pocahontas County Commission or the Greenbrier Valley Partnership. After discussions with the private ISP partner, CityNet, it was determined that CityNet would add the Pocahontas project to their application for a project in Randolph and Webster counties.

The second project is a project in Monroe, Summers and Greenbrier counties. This project would connect to LIT Networks in Pearisburg, VA and provide to service the unserved communities of Peterstown, Forest Hill, Talcott, Alderson and Asbury, along with the residents/business/farms along the route. The termination of the project was at a location determined to be a tie-in to a future CityNet fiber route.

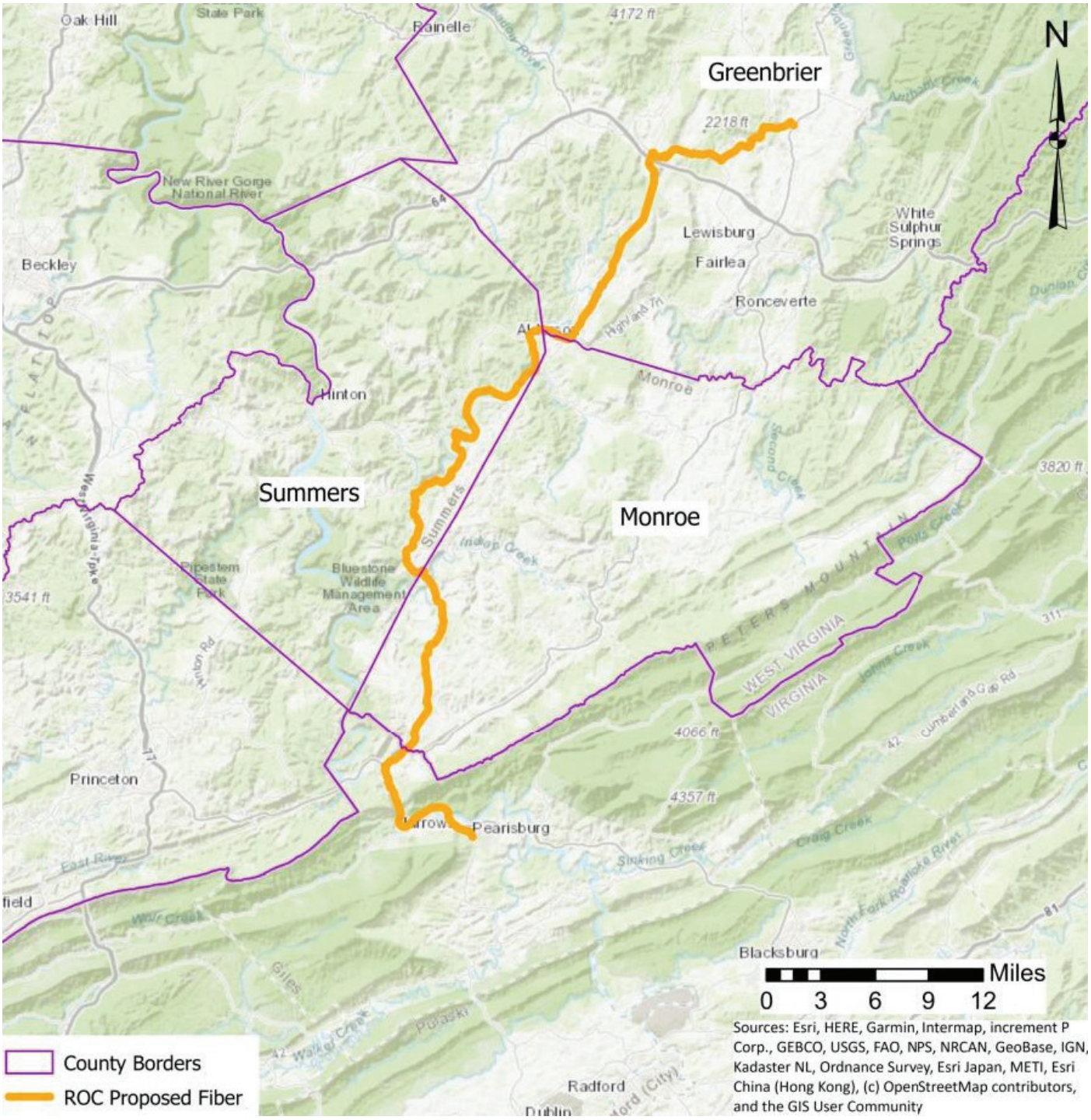
Following are details of the projects.



POCAHONTAS RECONNECT (CITYNET APPLICATION)



ROC RECONNECT

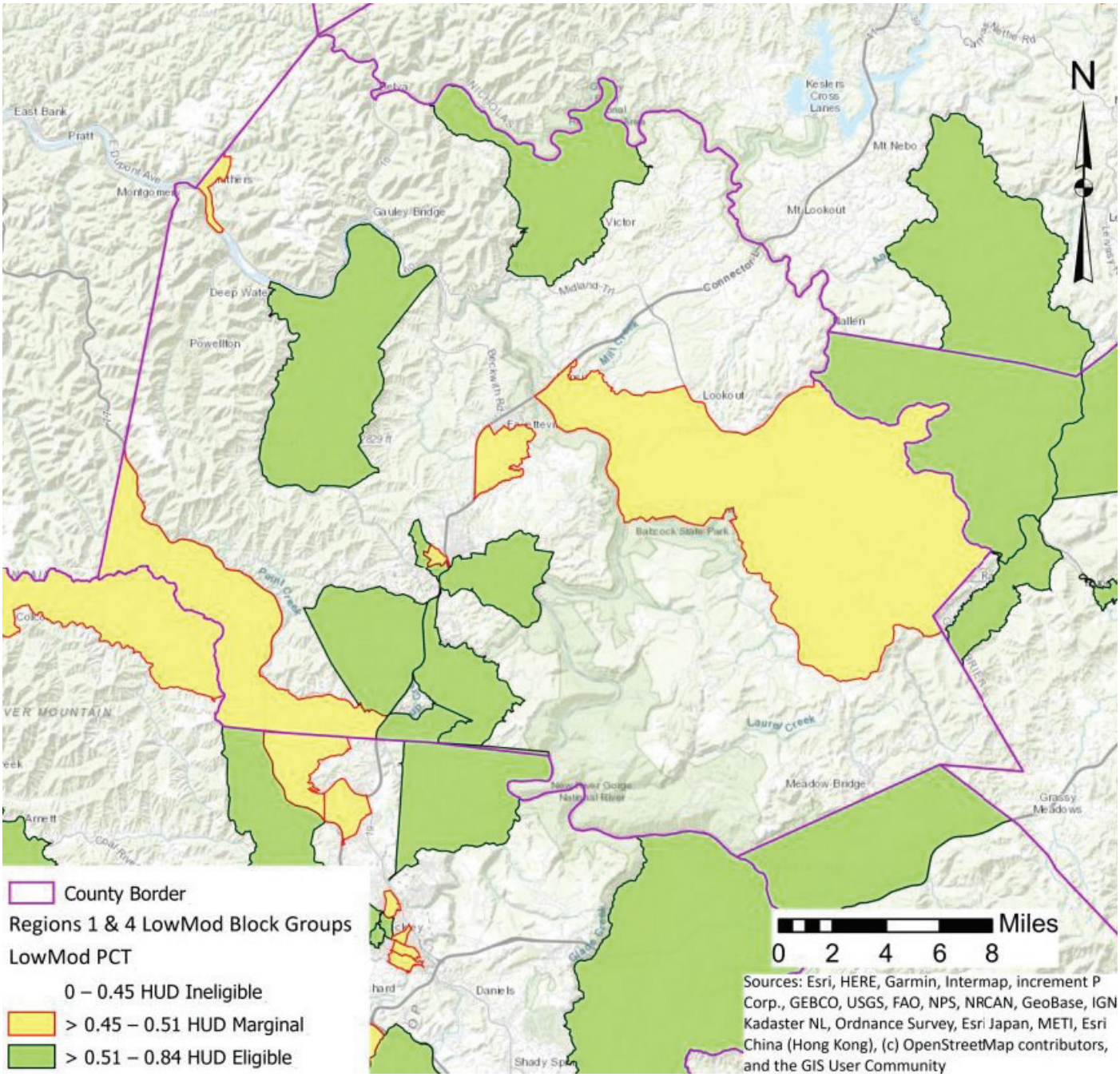


CDBG PROJECT AREAS

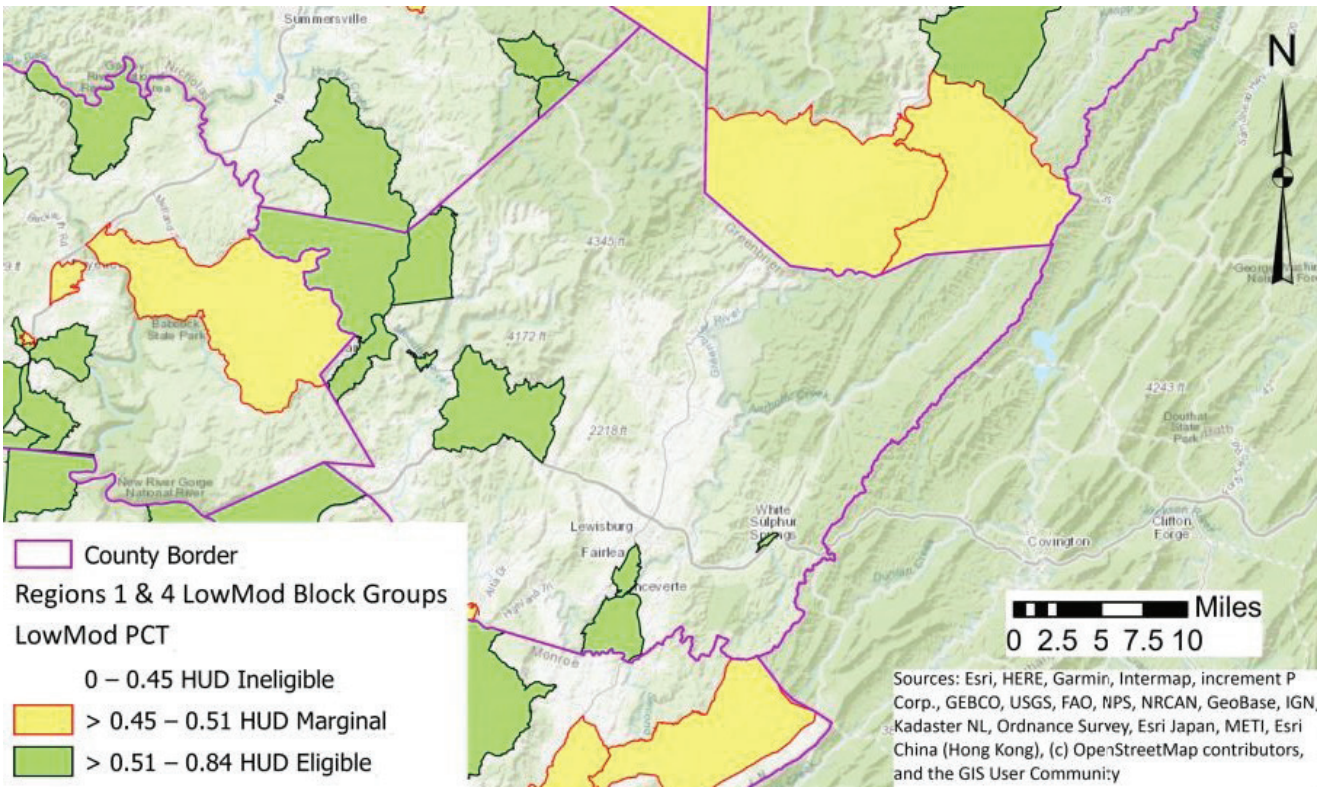
Applications for the 2019 round of CDBG funding were due on September 30, 2019. Several projects were submitted from the communities in Regions 1 & 4.

This program is unique in that it will only fund projects that are within HUD eligible census blocks. Blocks are eligible if 51% of the residents are of low- and moderate-income. The eligible blocks are shown below.

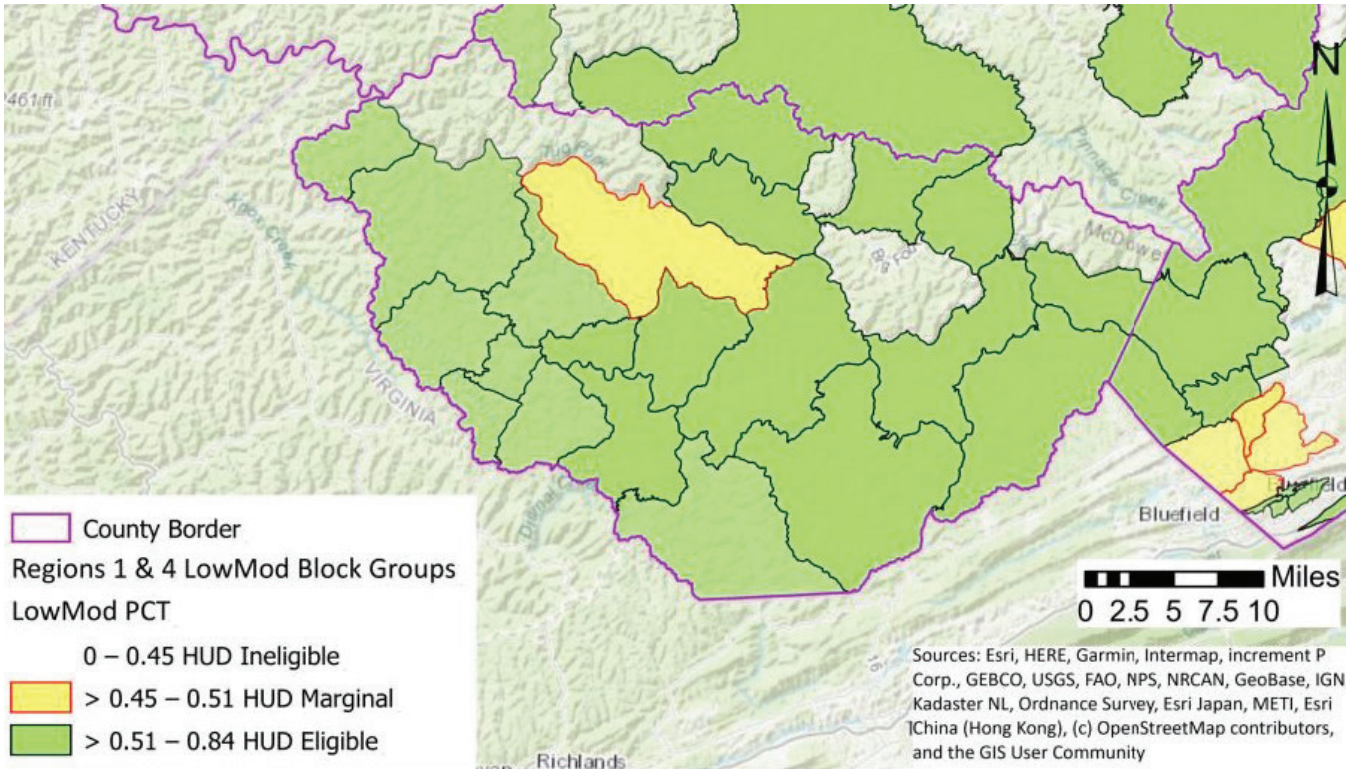
FAYETTE COUNTY



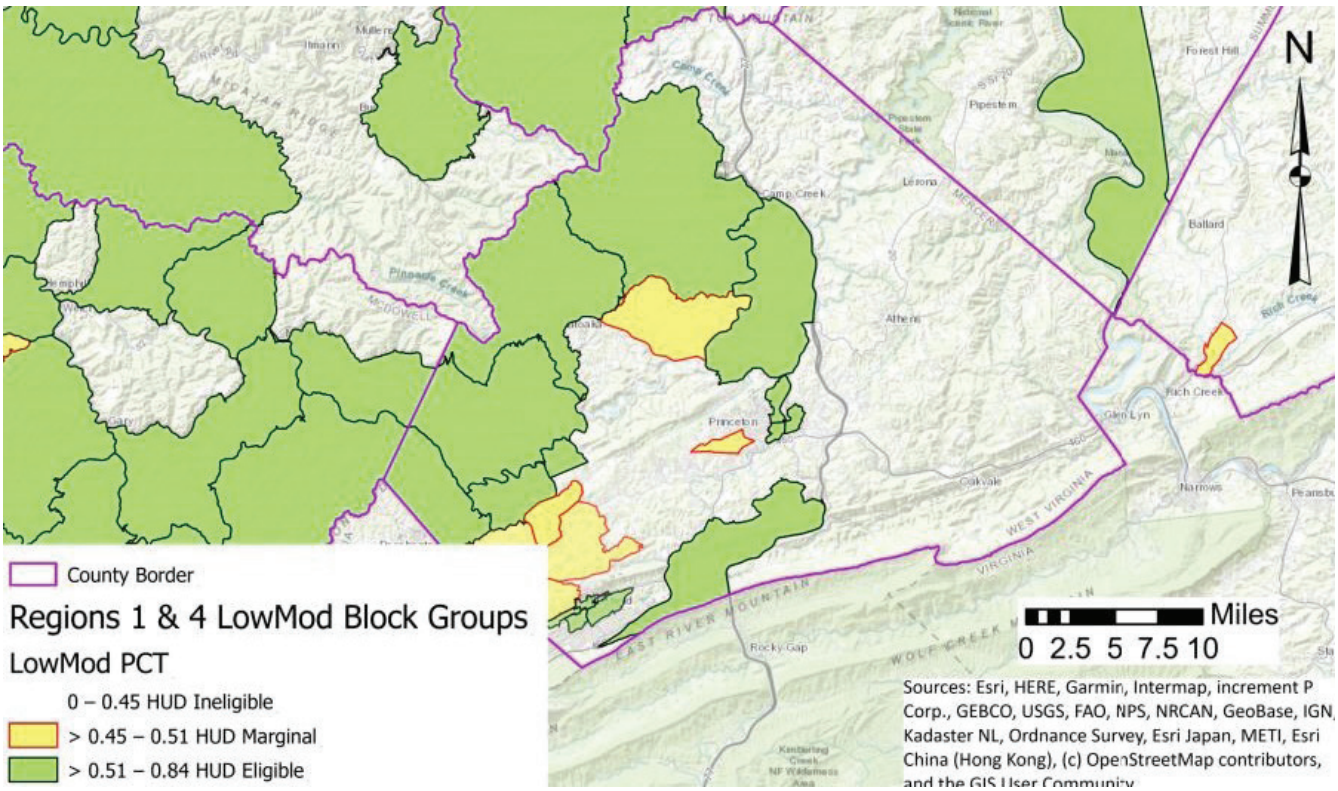
GREENBRIER COUNTY



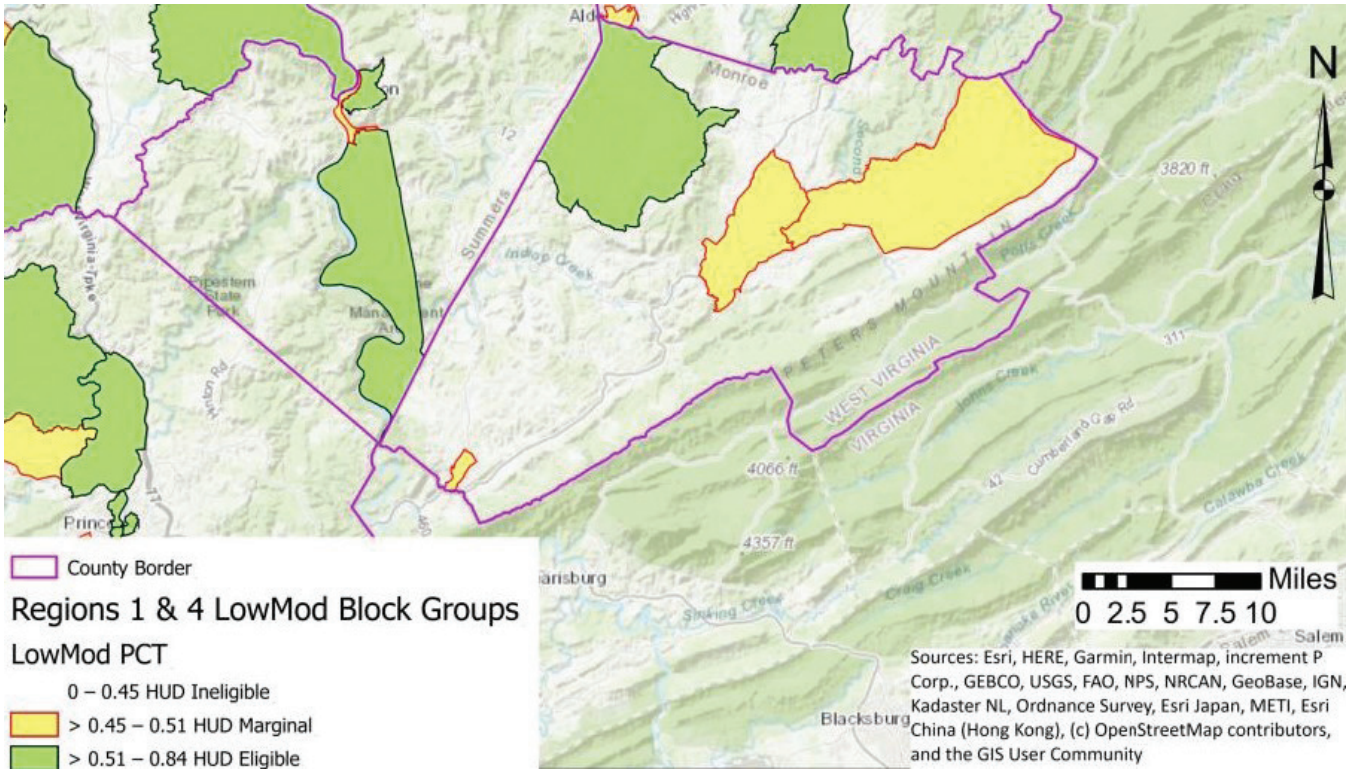
MCDOWELL COUNTY



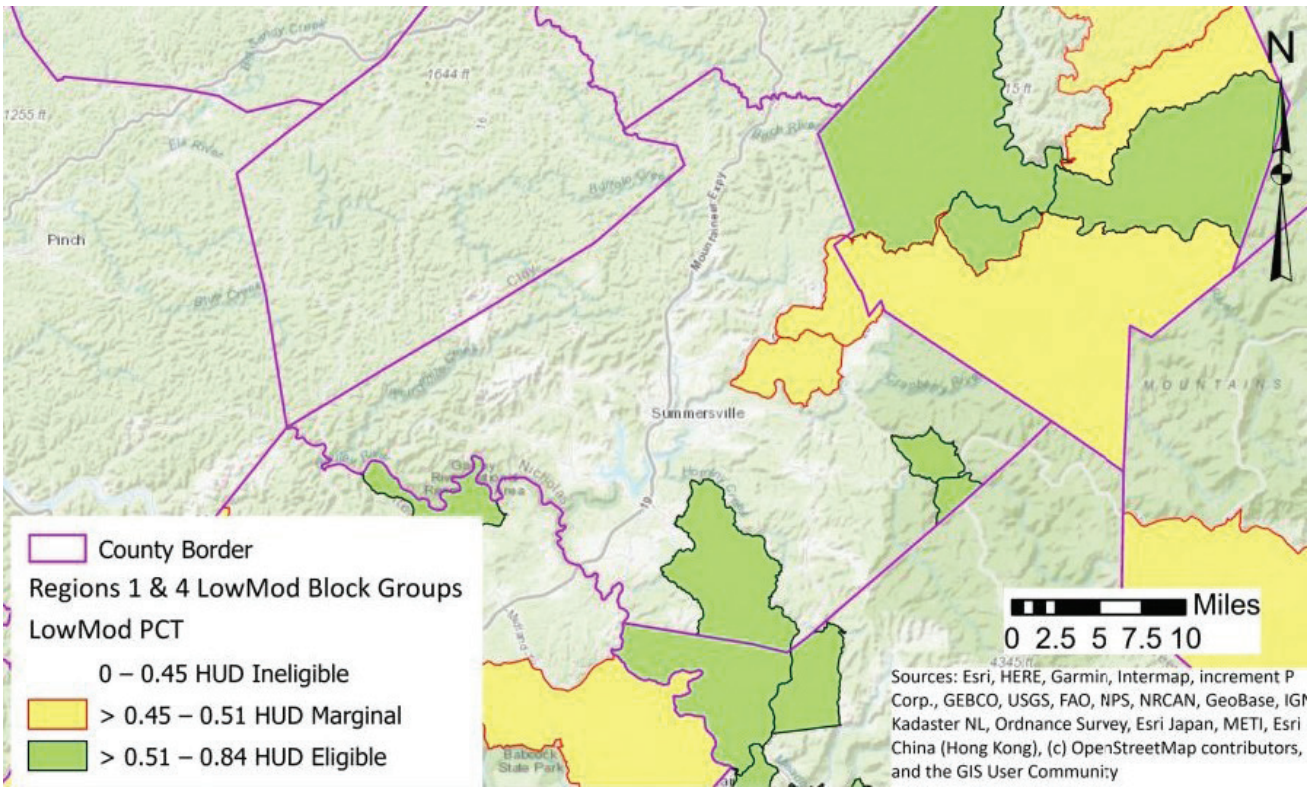
MERCER COUNTY



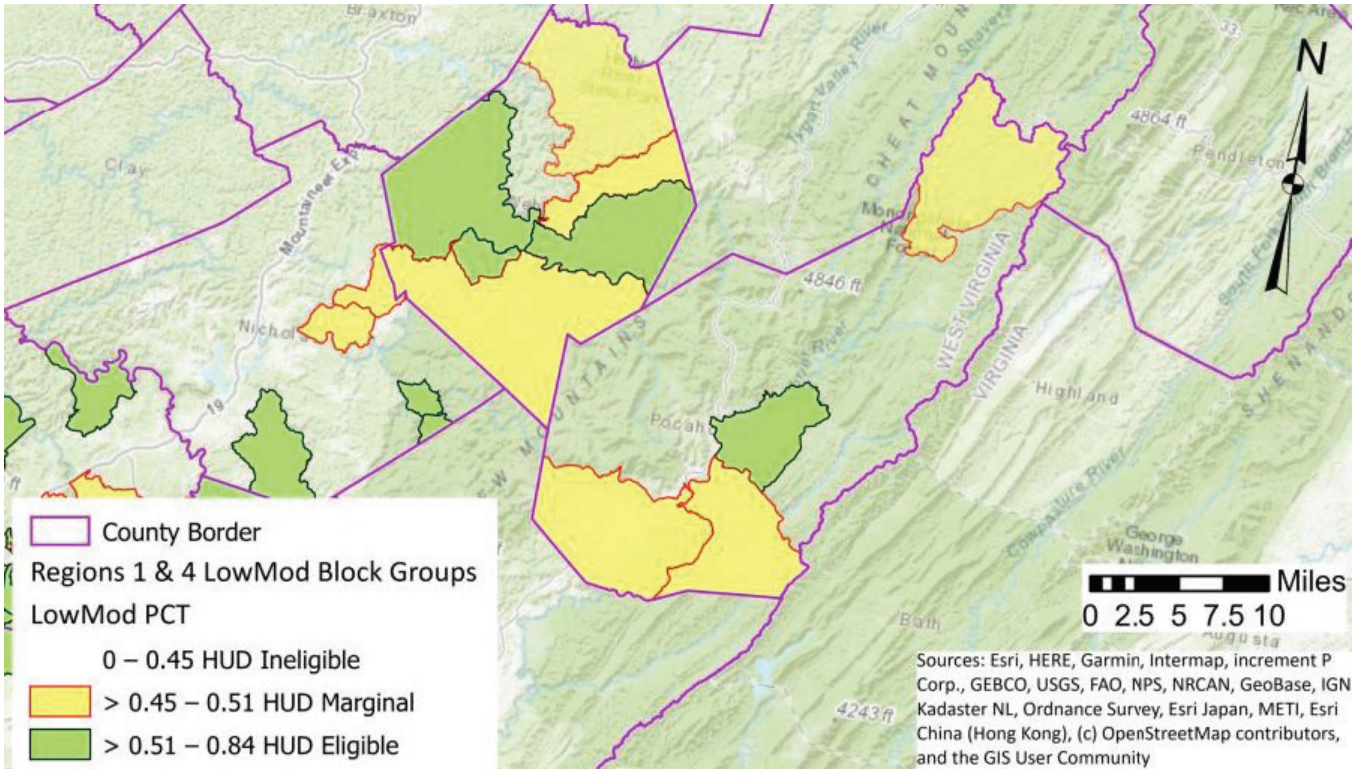
MONROE COUNTY



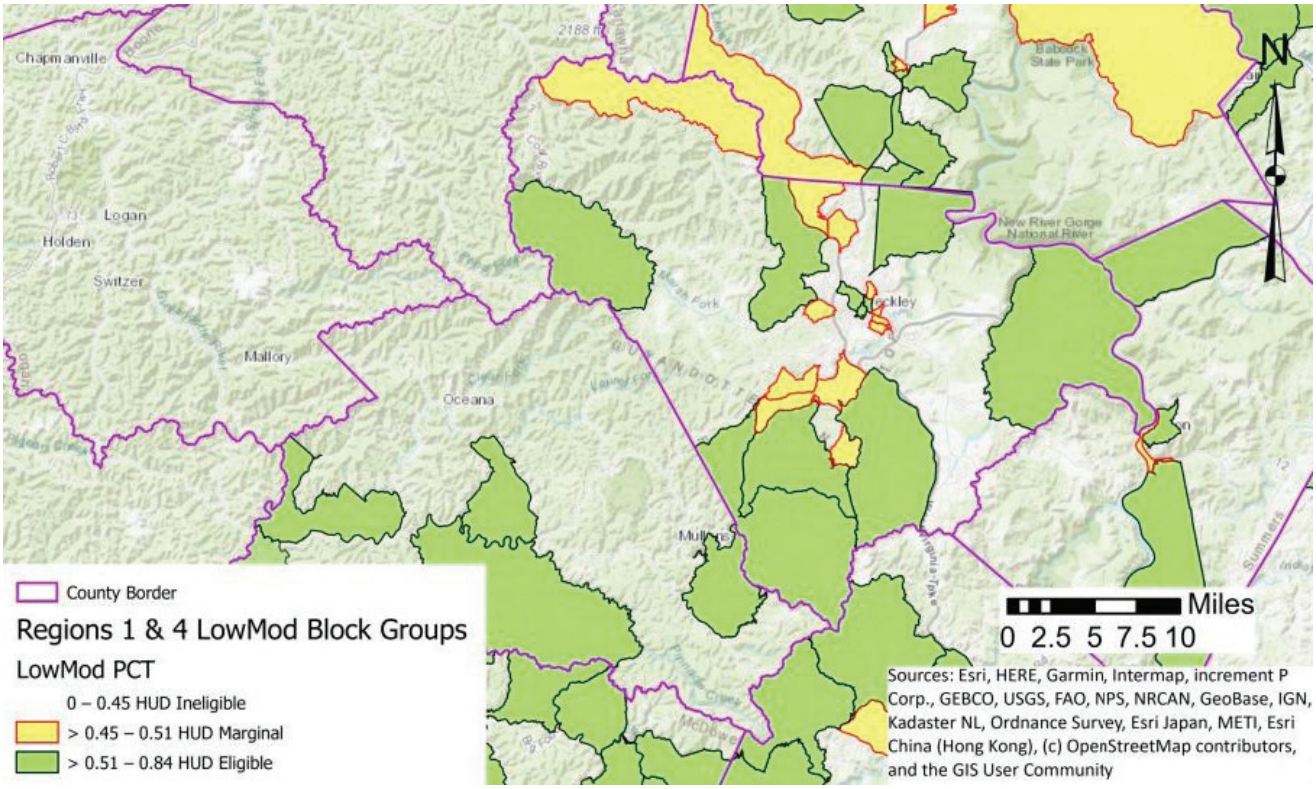
NICHOLAS COUNTY



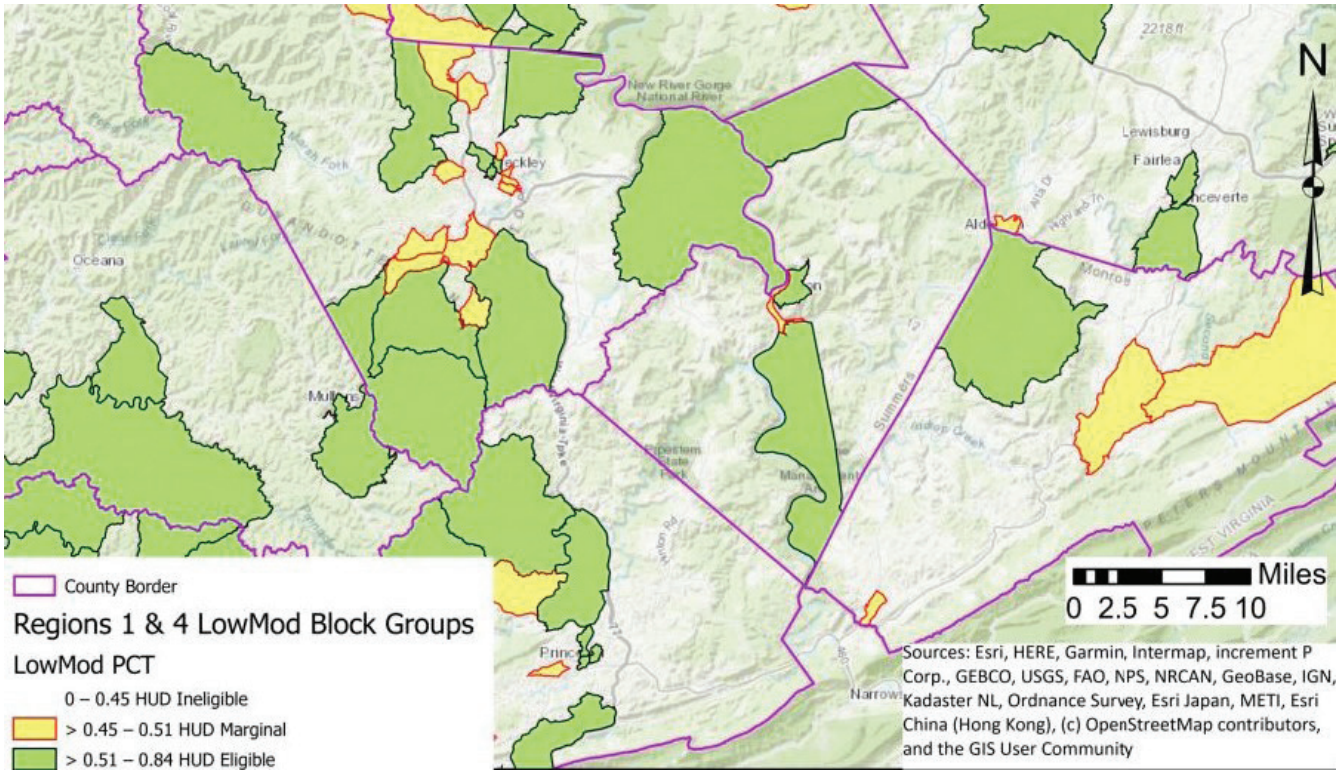
POCAHONTAS COUNTY



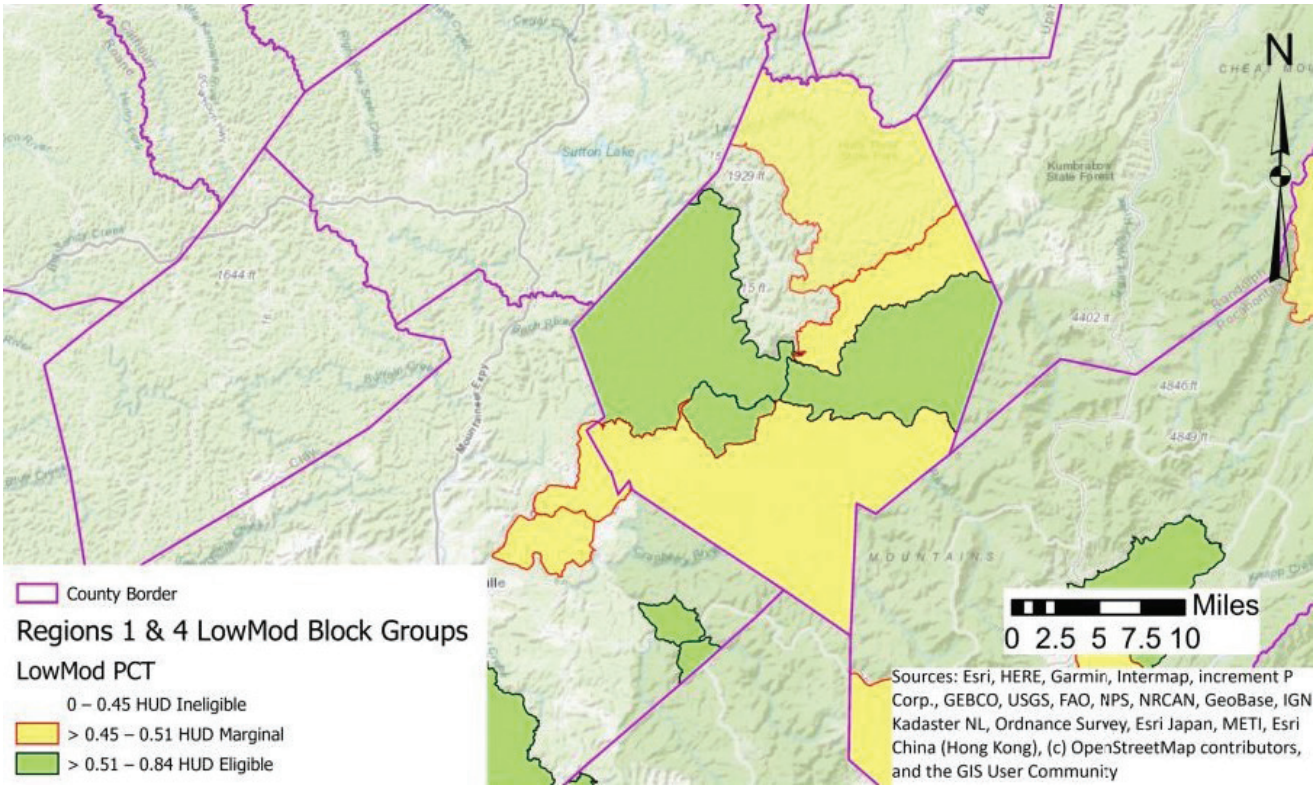
RALEIGH COUNTY



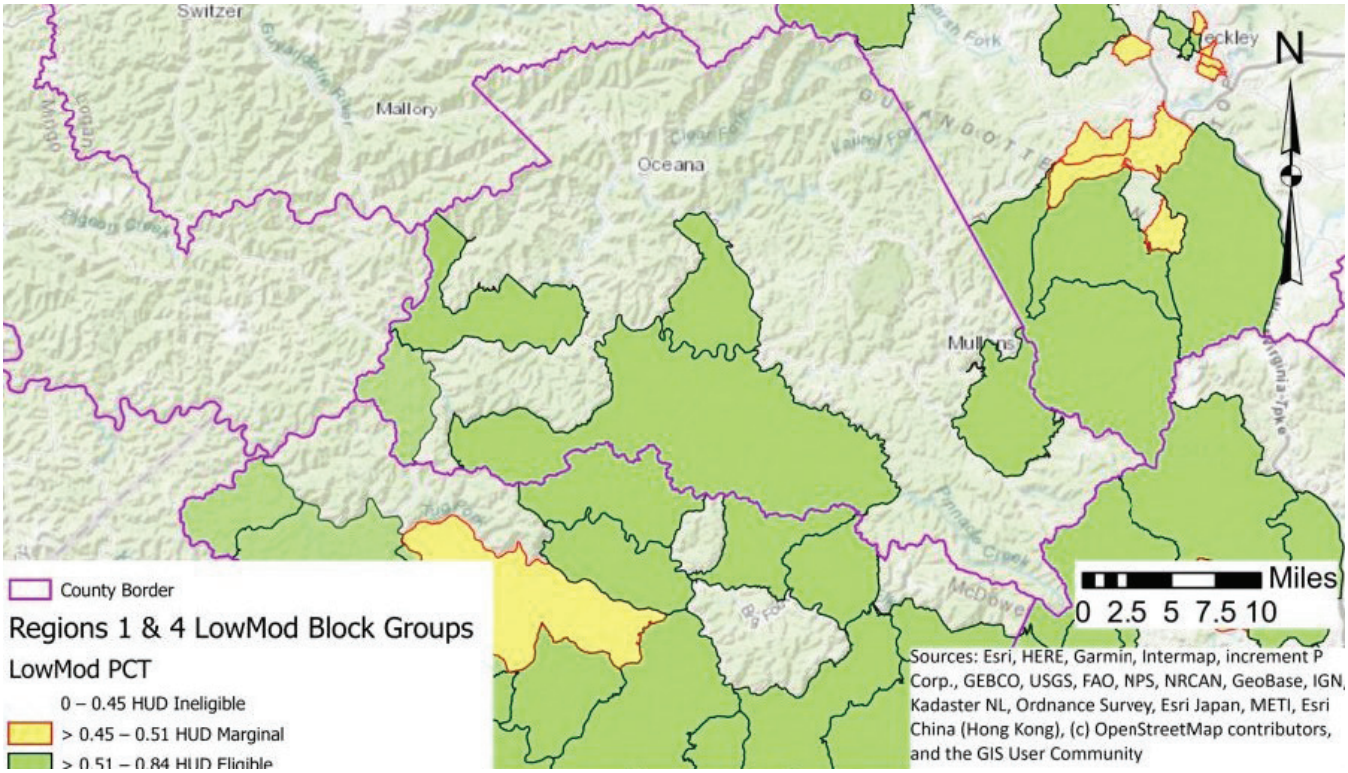
SUMMERS COUNTY



WEBSTER COUNTY



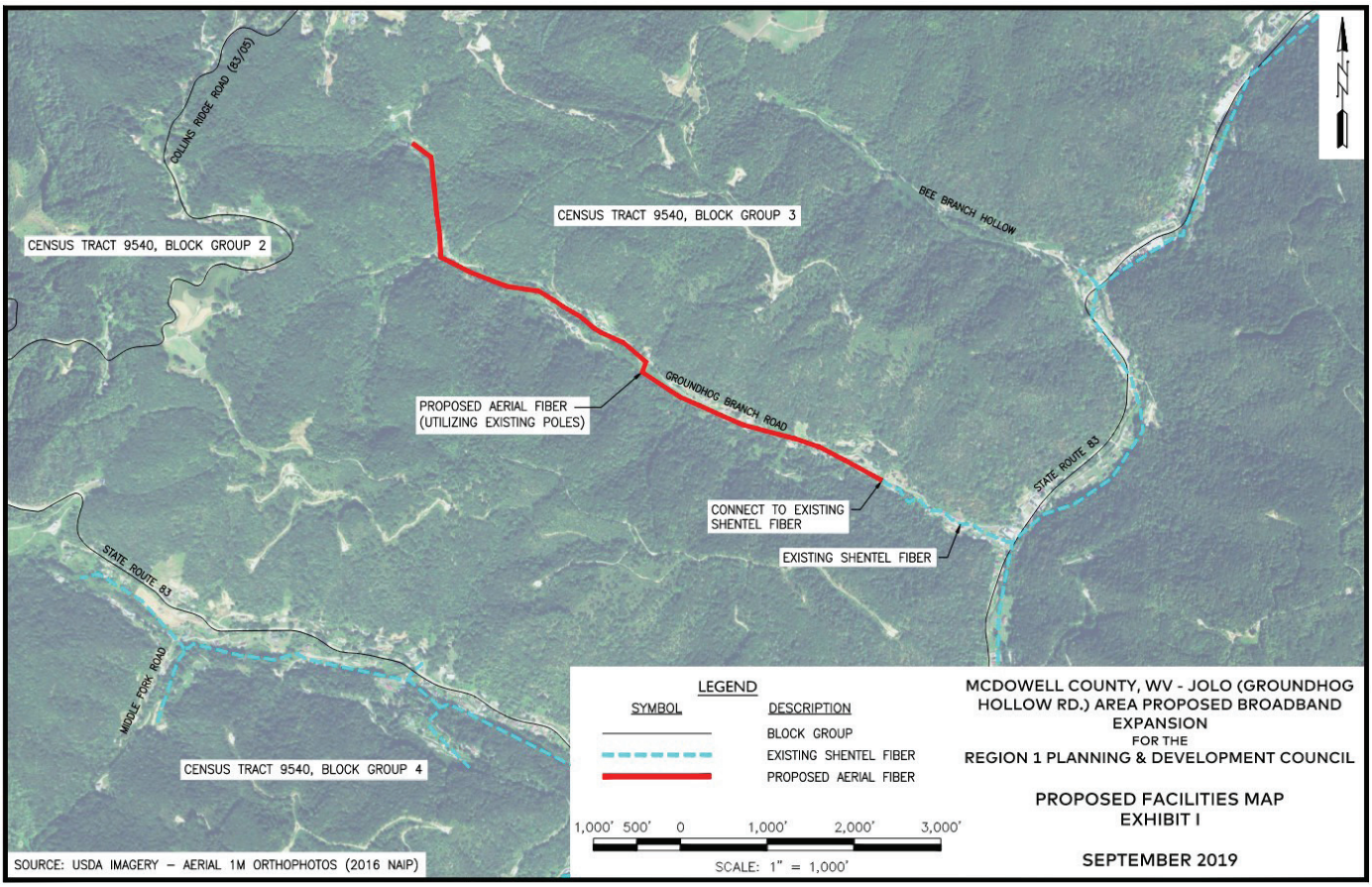
WYOMING COUNTY

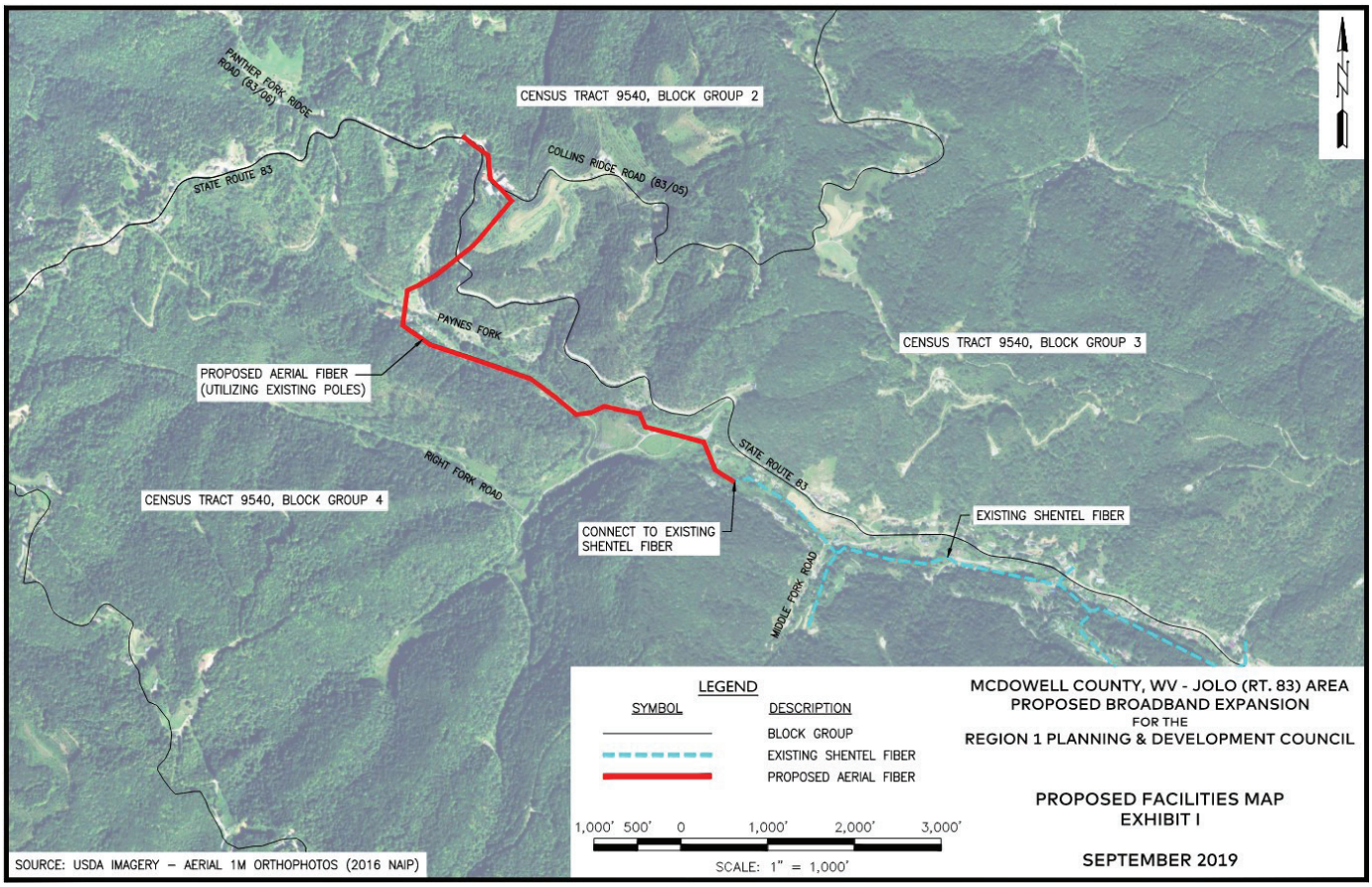


CDBG PROJECT AREAS (CONTINUED)

The following projects were developed for CDBG funding applications.

MCDOWELL COUNTY - JOLO COMMUNITY



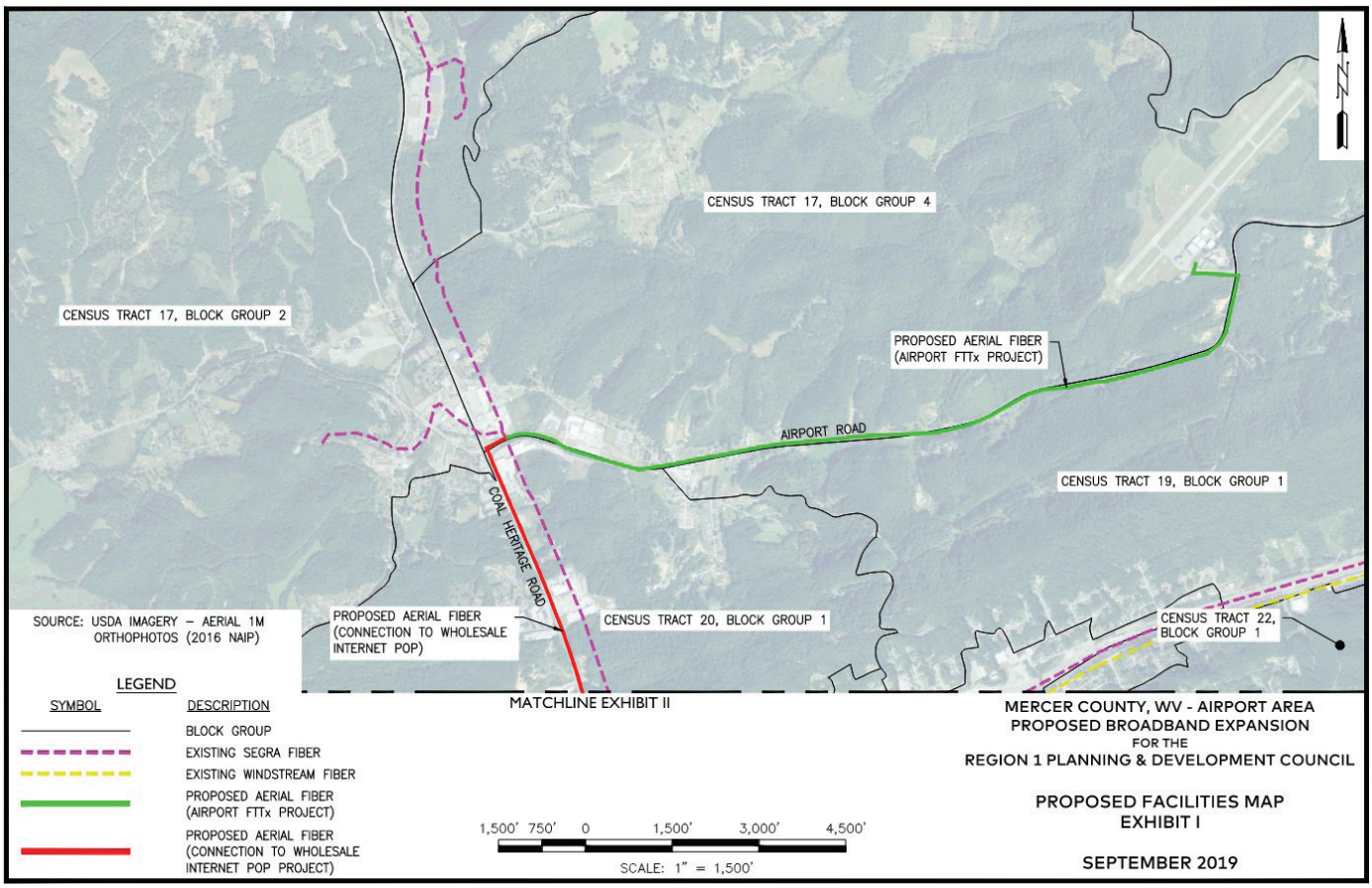


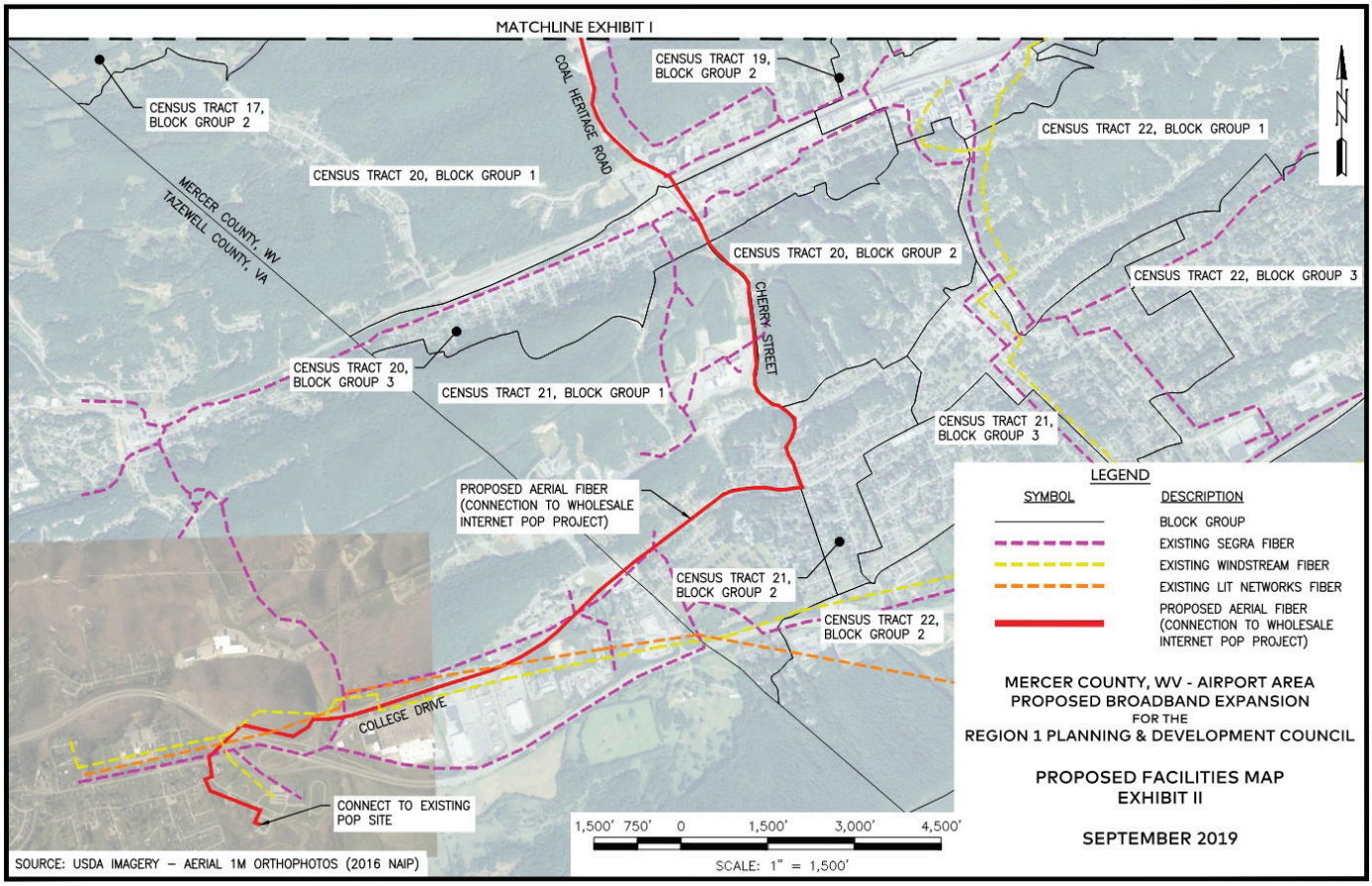
PRELIMINARY STATEMENT OF PROBABLE PROJECT COST
FOR THE
JOLO AREA BROADBAND PROJECT
28-Aug-19

DESIGN, PERMITTING, & CONSTRUCTION COSTS:

GROUNDHOG BRANCH ROAD PROJECT	
7,291 L.F. Aerial Fiber Optic @ $8/L.F.	$58,328
25 EA Fiber Drop (1,500 ft or less) @ $1,000/EA	$25,000
Sub-Total Cost	$83,328
STATE ROUTE 83 PROJECT	
7,505 L.F. Aerial Fiber Optic @ $8/L.F.	$60,040
21 EA Fiber Drop (1,500 ft or less) @ $1,000/EA	$21,000
Sub-Total Cost	$81,040
RELATED COST	
Bonds, Taxes, Permits and Insurance @ $4,109	$4,109
Mobilization and Temporary Facilities @ $4,109	$4,109
Legal and Administrative Costs @ $10,000	$10,000
Total Related Cost	$18,218
Sub-Total Project Cost	$182,586
Contingency Cost (15%)	$27,388
TOTAL PROJECT COST	**$209,974**

MERCER COUNTY - MERCER COUNTY AIRPORT



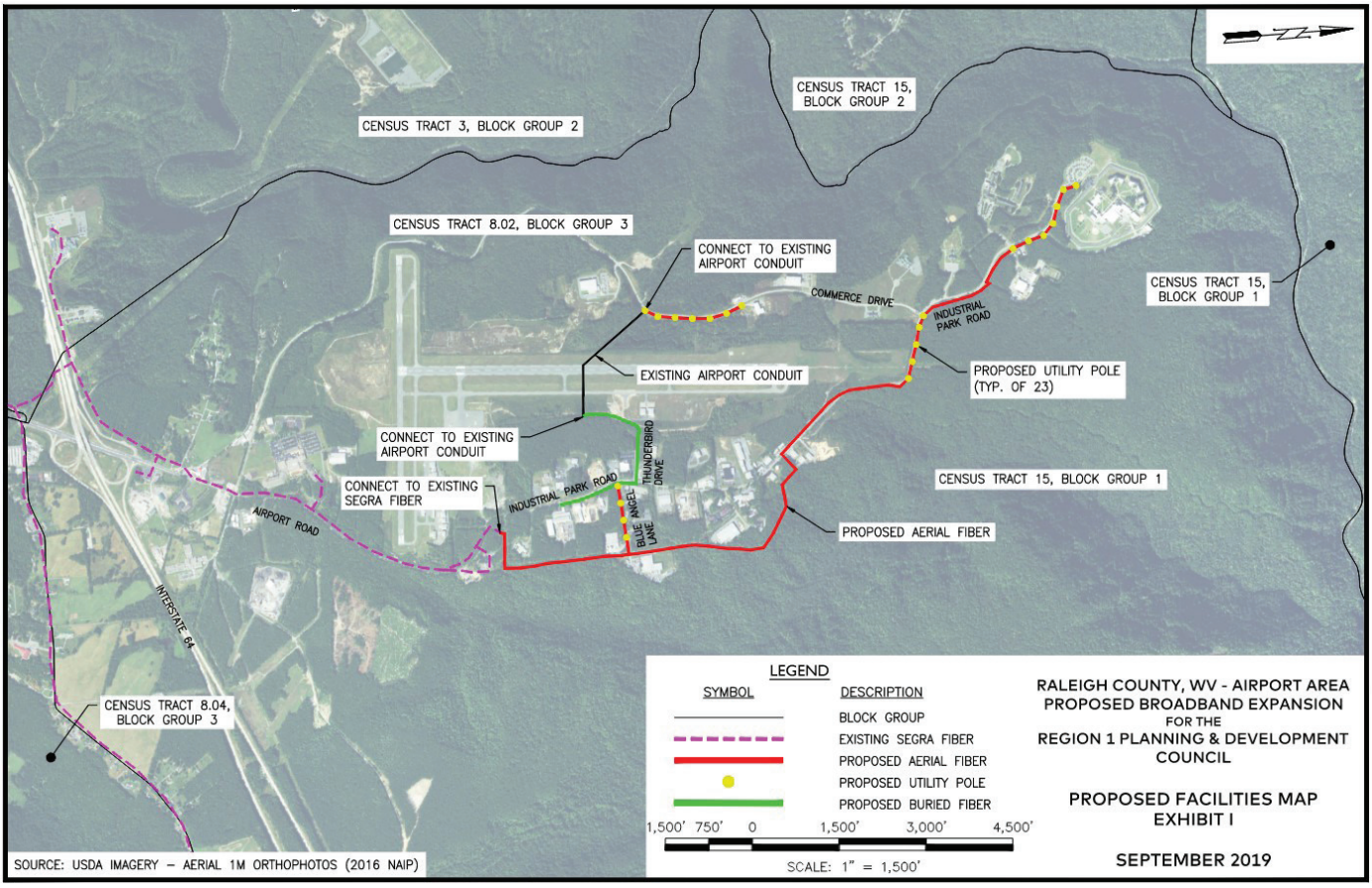


PRELIMINARY STATEMENT OF PROBABLE PROJECT COST
FOR THE
MERCER COUNTY, WV AIRPORT AREA BROADBAND PROJECT
6-Sep-19

DESIGN, PERMITTING, & CONSTRUCTION COSTS:

AIRPORT FTTx PROJECT		
15,023 L.F. Aerial Fiber Optic @ $8/L.F.		$120,184
122 EA Fiber Drop (1,500 ft or less) @ $1,000/EA		$122,000
	Sub-Total Cost	$242,184
CONNECTION TO WHOLESALE INTERNET POP PROJECT		
28,060 L.F. Aerial Fiber Optic @ $8/L.F.		$224,480
	Sub-Total Cost	$224,480
RELATED COST		
Bonds, Taxes, Permits and Insurance @ $11,667		$11,667
Mobilization and Temporary Facilities @ $11,667		$11,667
Legal and Administrative Costs @ $10,000		$10,000
	Total Related Cost	$33,333
	Sub-Total Project Cost	$499,997
	Contingency Cost (15%)	$75,000
	TOTAL PROJECT COST	**$574,997**

RALEIGH COUNTY - RALEIGH COUNTY AIRPORT

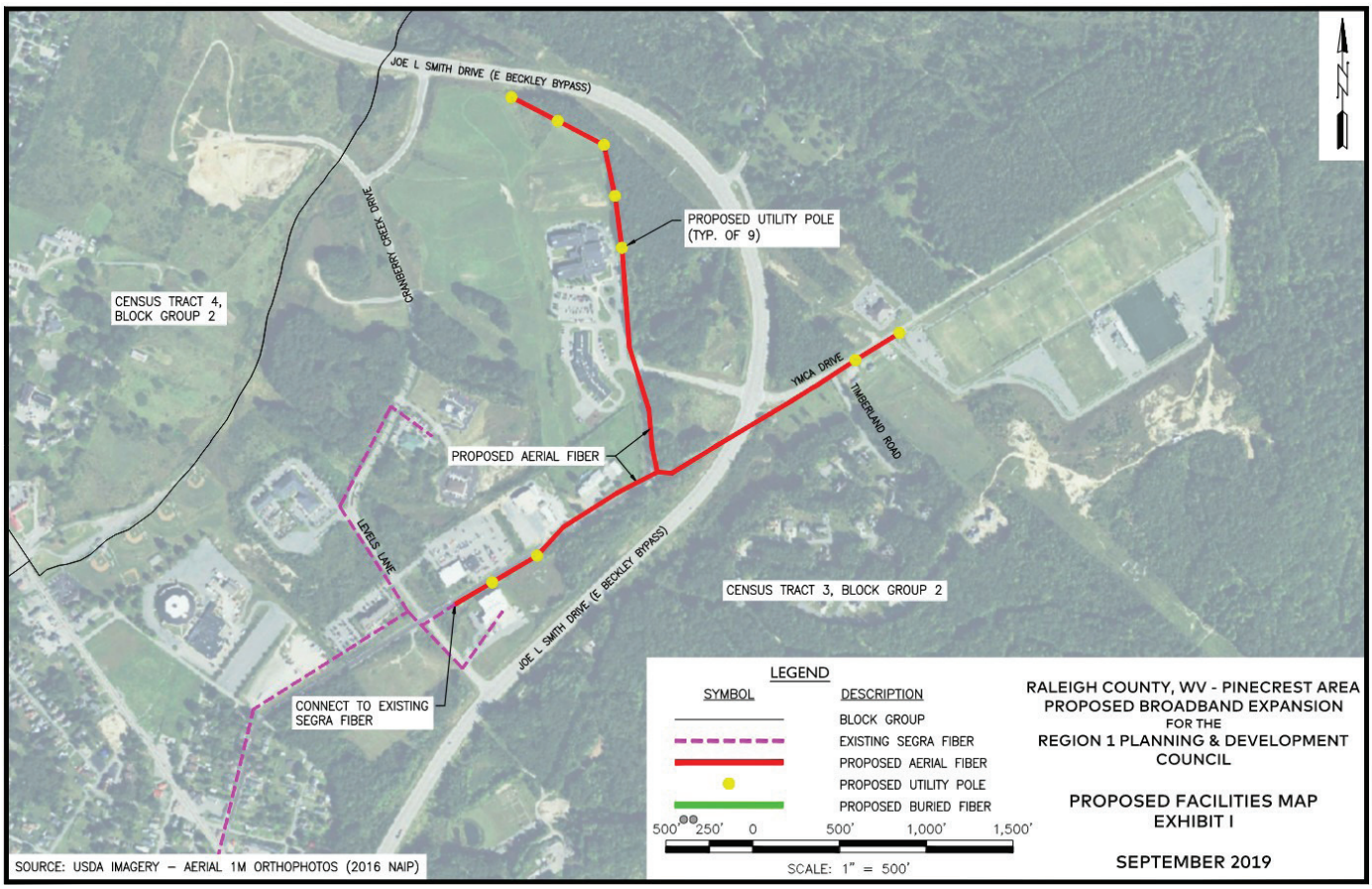


PRELIMINARY STATEMENT OF PROBABLE PROJECT COST
FOR THE
AIRPORT AREA BROADBAND PROJECT
30-Aug-19

DESIGN, PERMITTING, & CONSTRUCTION COSTS:

5,704 L.F. Buried Fiber Optic (Includes L.F. of Existing Airport Conduit) @ $18/L.F.	$102,672
26,488 L.F. Aerial Fiber Optic @ $8/L.F.	$211,904
53 EA Utility Pole @$2,500/EA	$132,500
34 EA Fiber Drop (1,500 ft or less) @$1,000/EA	$34,000
Bonds, Taxes, Permits and Insurance @ $12,027	$12,027
Mobilization and Temporary Facilities @ $12,027	$12,027
Legal and Administrative Costs @ $10,000	$10,000
Sub-Total Cost	$515,130
Contingency Cost (15%)	$77,269
TOTAL COST	**$592,399**

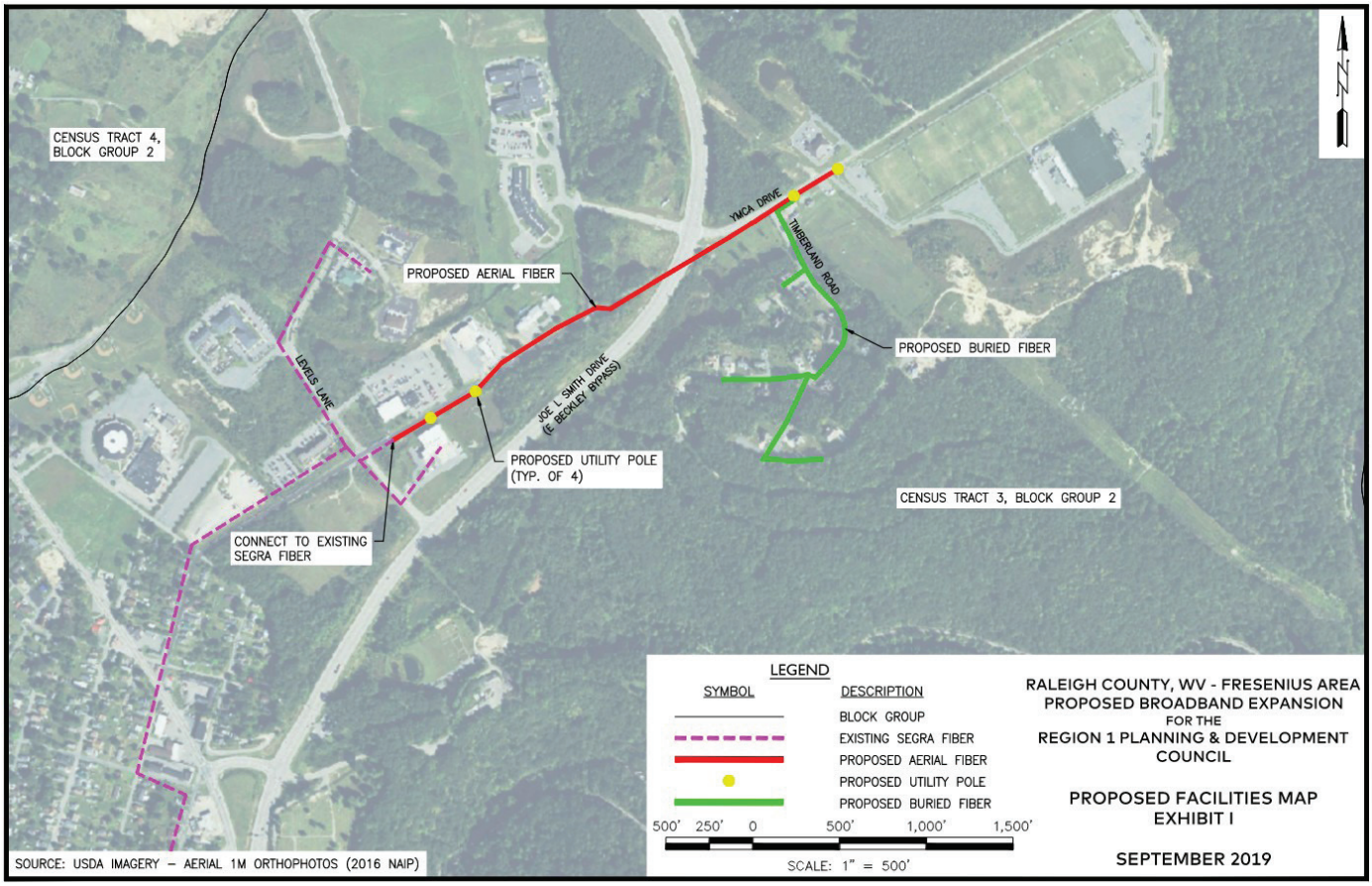
RALEIGH COUNTY - PINECREST AND FRESENIUS AREA



PRELIMINARY STATEMENT OF PROBABLE PROJECT COST
FOR THE
PINECREST AREA BROADBAND PROJECT
27-Aug-19

DESIGN, PERMITTING, & CONSTRUCTION COSTS:

5,539 L.F. Aerial Fiber Optic @ $8/L.F.	$44,312
9 EA Utility Pole @$2,500/EA	$22,500
5 EA Fiber Drop (1,500 ft or less) @$1,000/EA	$5,000
Bonds, Taxes, Permits and Insurance @ $1,795	$1,795
Mobilization and Temporary Facilities @ $1,795	$1,795
Legal and Administrative Costs @ $10,000	$10,000
Sub-Total Cost	$85,403
Contingency Cost (15%)	$12,810
TOTAL COST	**$98,213**

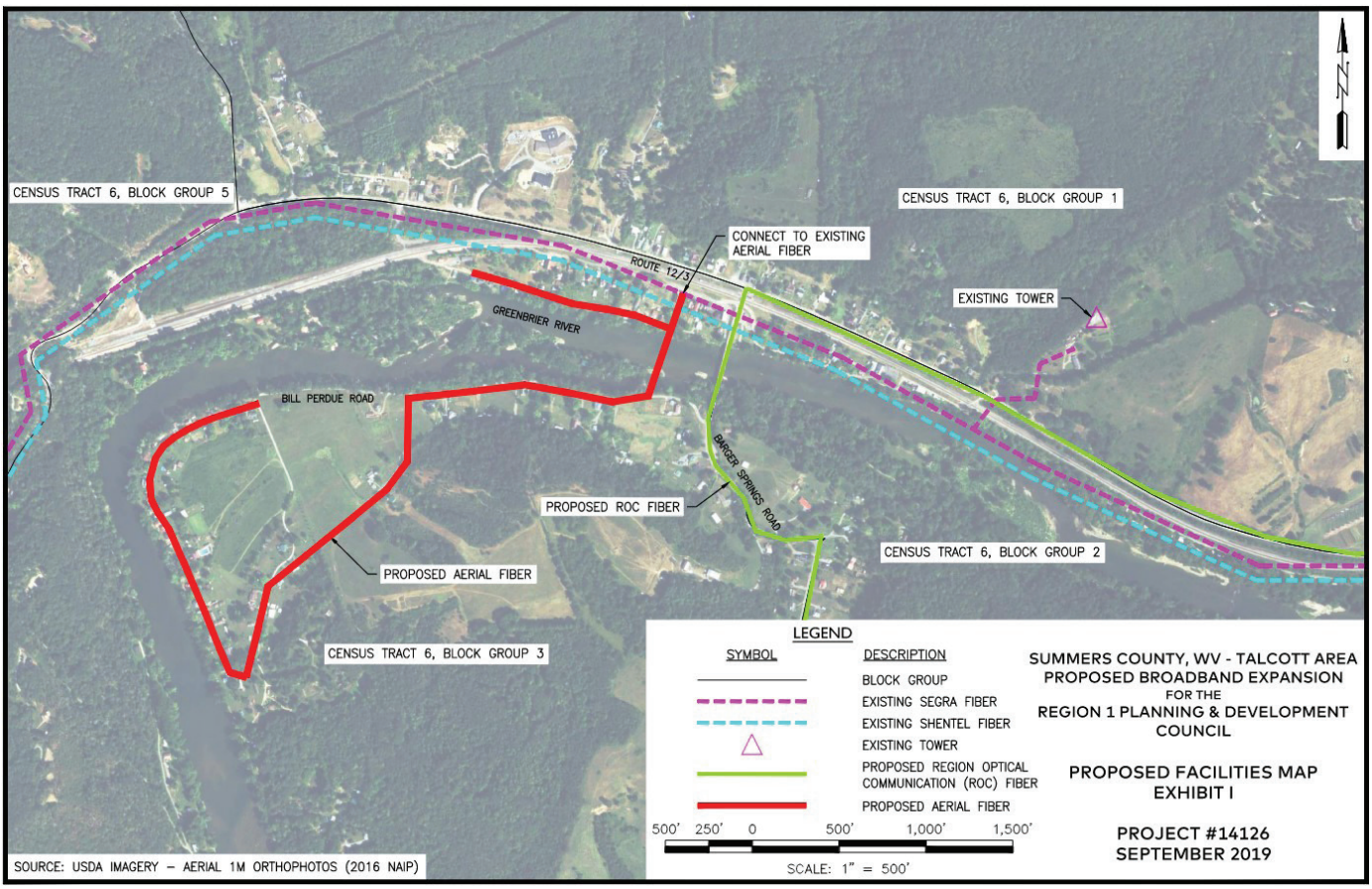


PRELIMINARY STATEMENT OF PROBABLE PROJECT COST
FOR THE
FRESENIUS AREA BROADBAND PROJECT
27-Aug-19

DESIGN, PERMITTING, & CONSTRUCTION COSTS:

2,877 L.F. Buried Fiber Optic @ $18/L.F.	$51,786
3,026 L.F. Aerial Fiber Optic @ $8/L.F.	$24,208
4 EA Utility Pole @$2,500/EA	$10,000
22EA Fiber Drop (1,500 ft or less) @$1,000/EA	$22,000
Bonds, Taxes, Permits and Insurance @ $2,700	$2,700
Mobilization and Temporary Facilities @ $2,700	$2,700
Legal and Administrative Costs @ $10,000	$10,000
Sub-Total Cost	$123,394
Contingency Cost (15%)	$18,509
TOTAL COST	**$141,903**

SUMMERS COUNTY - TALCOTT AREA

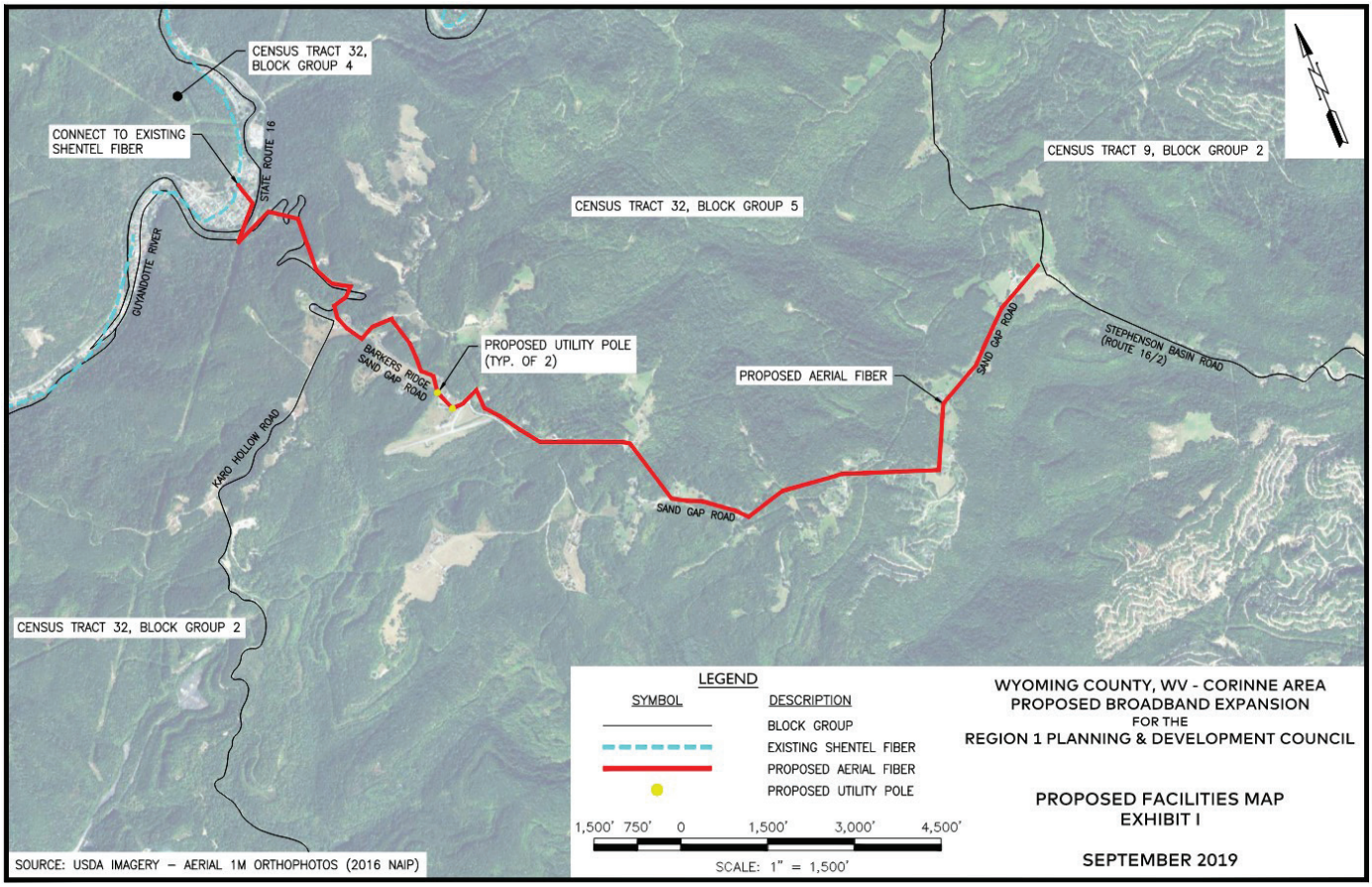


PRELIMINARY STATEMENT OF PROBABLE PROJECT COST
FOR THE
TALCOTT, WV BROADBAND PROJECT
20-Aug-19

DESIGN, PERMITTING, & CONSTRUCTION COSTS:

8,818 L.F. Aerial Fiber Optic @ $8/L.F.	$70,544
78 EA Fiber Service Drop (1,500 ft or less) @ $1,000/EA	$78,000
Bonds, Taxes, Permits and Insurance @ $3,714/LS	$3,714
Mobilization and Temporary Facilities @ $3,714/LS	$3,714
Legal and Administrative Costs @ $10,000/LS	$10,000
Sub-Total Cost	$165,971
Contingency Cost (15%)	$24,896
TOTAL COST	**$190,867**

WYOMING COUNTY - CORINNE AREA

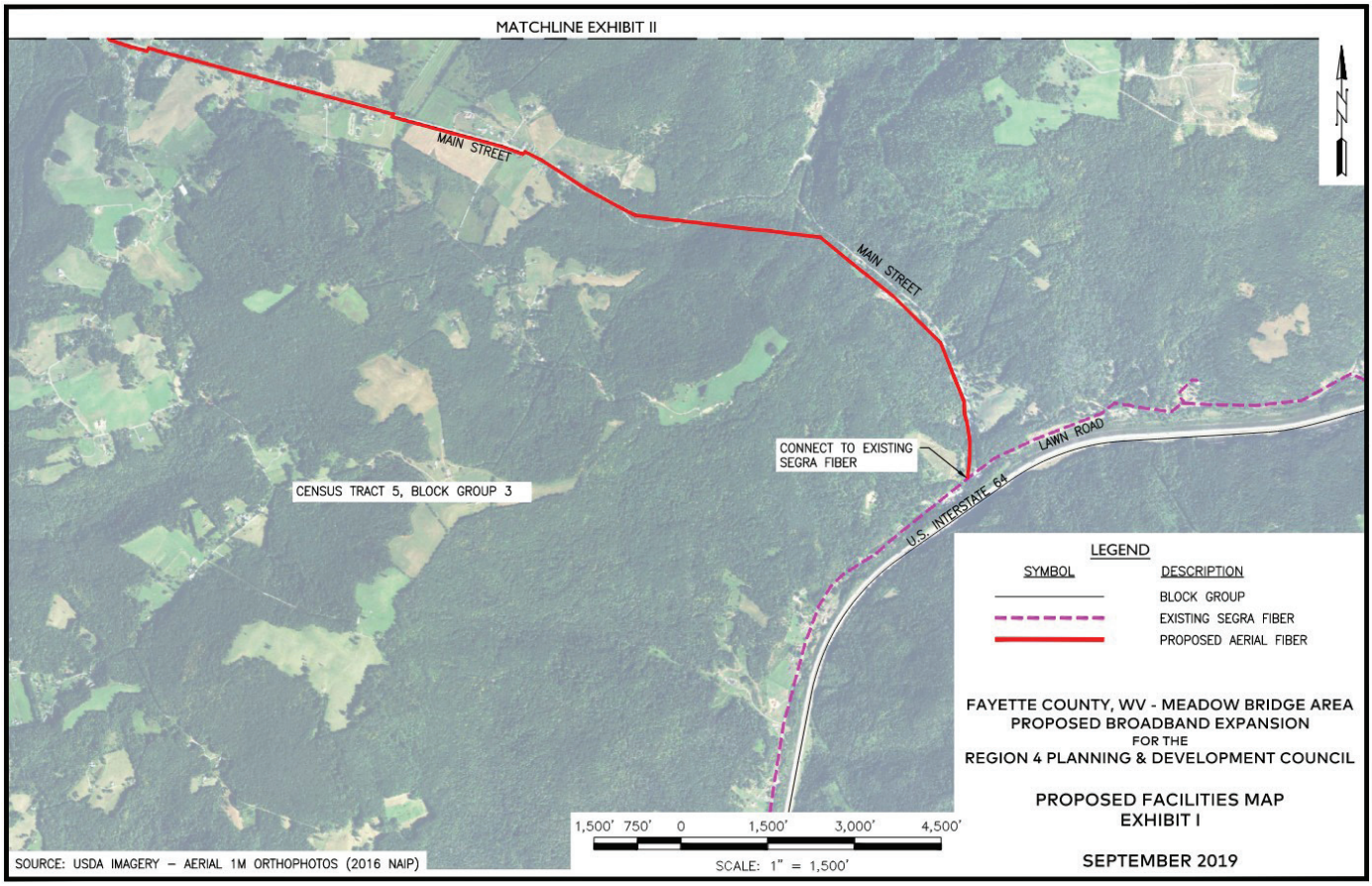


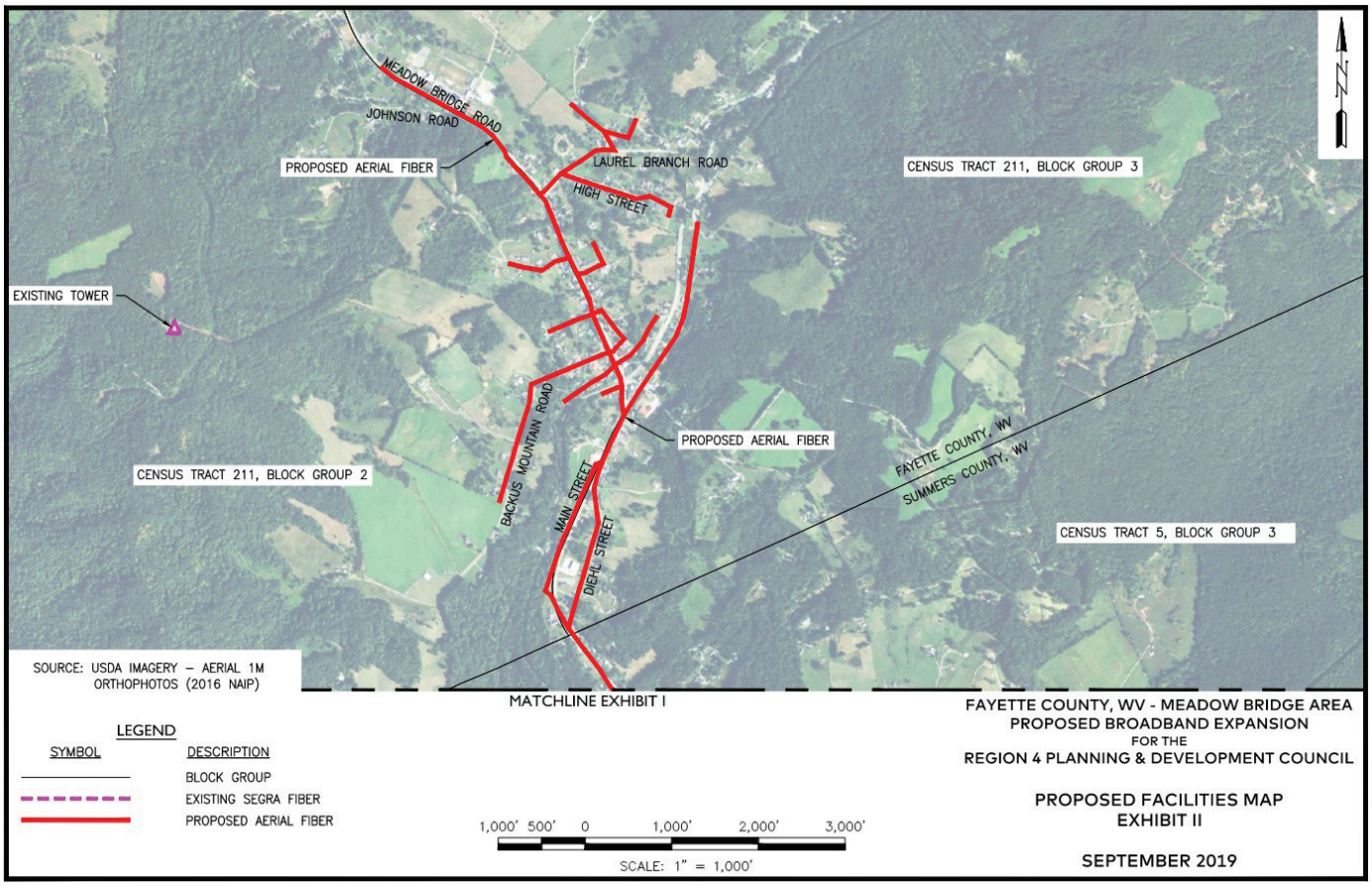
PRELIMINARY STATEMENT OF PROBABLE PROJECT COST
FOR THE
CORINNE AREA BROADBAND PROJECT
3-Sep-19

DESIGN, PERMITTING, & CONSTRUCTION COSTS:

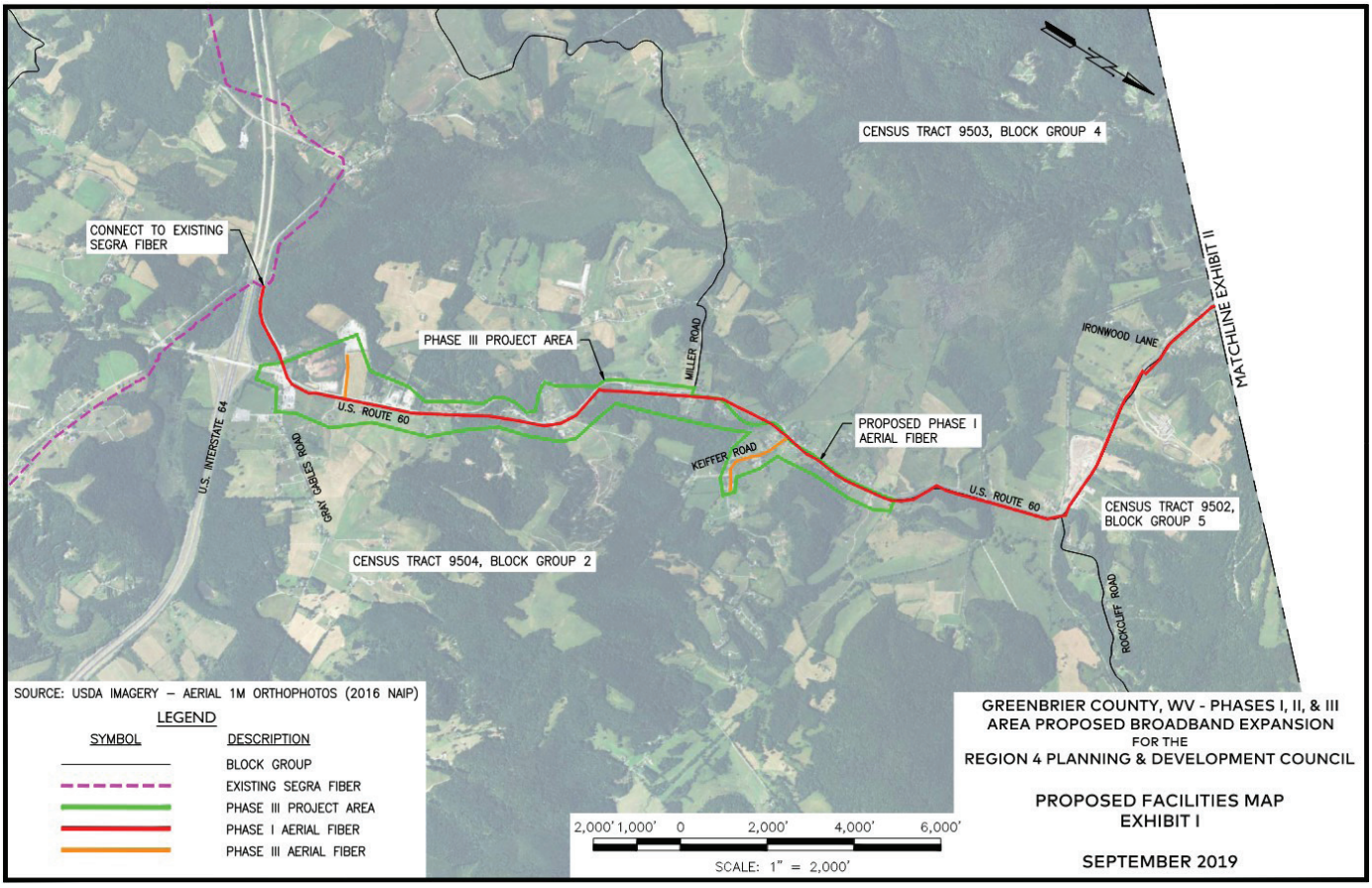
21,572 L.F. Aerial Fiber Optic @ $8/L.F.	$172,576
2 EA Utility Pole @$2,500/EA	$5,000
65 EA Fiber Drop (1,500 ft or less) @ $1,000/EA	$65,000
Bonds, Taxes, Permits and Insurance @ $6,064	$6,064
Mobilization and Temporary Facilities @ $6,064	$6,064
Legal and Administrative Costs @ $10,000	$10,000
Sub-Total Cost	$264,705
Contingency Cost (15%)	$39,706
TOTAL COST	**$304,411**

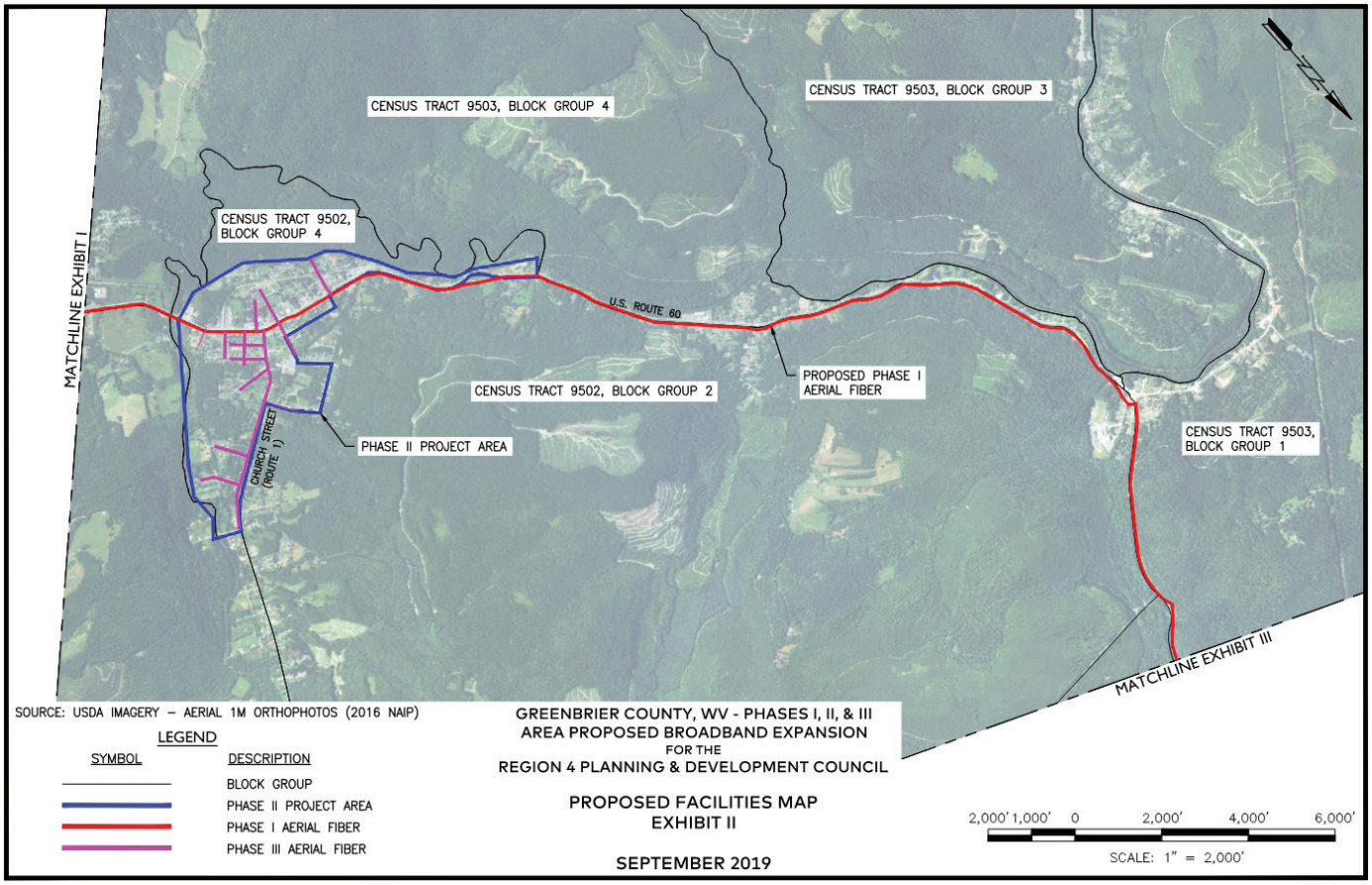
FAYETTE COUNTY - MEADOW BRIDGE

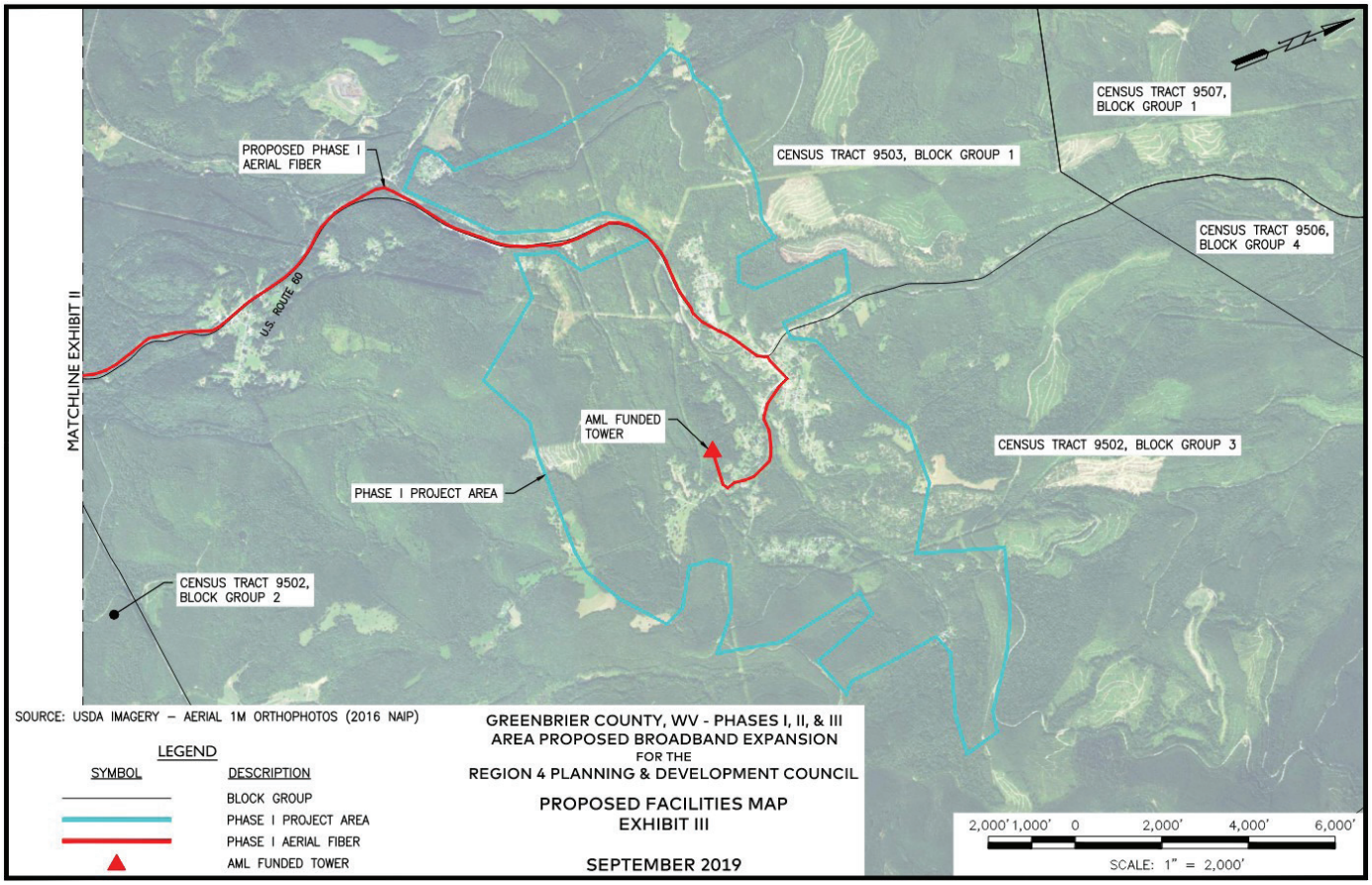




GREENBRIER COUNTY - QUINWOOD/RUPERT/CRAWLEY AREAS







PRELIMINARY STATEMENT OF PROBABLE PROJECT COST
FOR THE
GREENBRIER COUNTY - PHASE I (QUINWOOD) AREA BROADBAND PROJECT
30-Sep-19

DESIGN, PERMITTING, & CONSTRUCTION COSTS:

84,450 L.F. Aerial Fiber Optic @ $8/L.F.	$675,600
1 L.S. Wireless Tower Equipment on AML Tower @ $5,000/L.S.	$5,000
399 EA Wireless Customer Equipment @ $250/EA	$99,750
Bonds, Taxes, Permits and Insurance @ $19,509	$19,509
Mobilization and Temporary Facilities @ $19,509	$19,509
Legal and Administrative Costs @ $10,000	$10,000
Sub-Total Cost	$829,368
Contingency Cost (15%)	$124,405
TOTAL COST	**$953,773**

PRELIMINARY STATEMENT OF PROBABLE PROJECT COST
FOR THE
GREENBRIER COUNTY - PHASE II (RUPERT) AREA BROADBAND PROJECT
30-Sep-19

DESIGN, PERMITTING, & CONSTRUCTION COSTS:

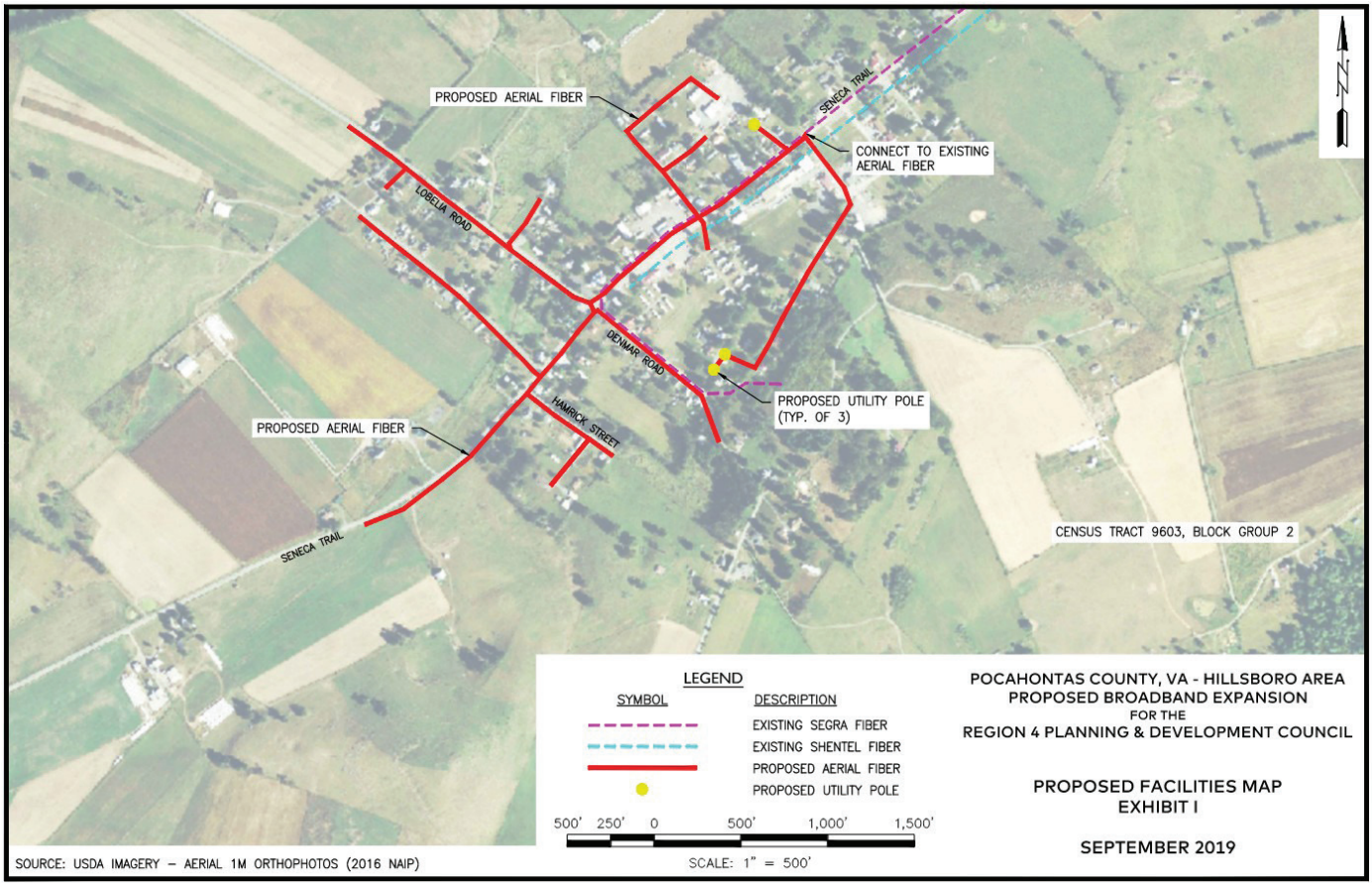
14,535 L.F. Aerial Fiber Optic @ $8/L.F.	$116,280
380 EA Fiber Drop (1,500 ft or less) @ $1,000/EA	$380,000
Bonds, Taxes, Permits and Insurance @ $12,407	$12,407
Mobilization and Temporary Facilities @ $12,407	$12,407
Legal and Administrative Costs @ $10,000	$10,000
Sub-Total Cost	$531,094
Contingency Cost (15%)	$79,664
TOTAL COST	**$610,758**

PRELIMINARY STATEMENT OF PROBABLE PROJECT COST
FOR THE
GREENBRIER COUNTY - PHASE III (CRAWLEY) AREA BROADBAND PROJECT
30-Sep-19

DESIGN, PERMITTING, & CONSTRUCTION COSTS:

3,087 L.F. Aerial Fiber Optic @ $8/L.F.	$24,696
84 EA Fiber Drop (1,500 ft or less) @ $1,000/EA	$84,000
Bonds, Taxes, Permits and Insurance @ $2,717	$2,717
Mobilization and Temporary Facilities @ $2,717	$2,717
Legal and Administrative Costs @ $10,000	$10,000
Sub-Total Cost	$124,131
Contingency Cost (15%)	$18,620
TOTAL COST	**$142,750**

POCAHONTAS COUNTY - HILLSBORO AREA



PRELIMINARY STATEMENT OF PROBABLE PROJECT COST
FOR THE
HILLSBORO, WV BROADBAND PROJECT
16-Sep-19

DESIGN, PERMITTING, & CONSTRUCTION COSTS:

13,443 L.F. Aerial Fiber Optic @ $8/L.F.	$107,544
3 EA Utility Pole @$2,500/EA	$7,500
121EA Fiber Drop (1,500 ft or less) @ $1,000/EA	$121,000
Bonds, Taxes, Permits and Insurance @ $5,901	$5,901
Mobilization and Temporary Facilities @ $5,901	$5,901
Legal and Administrative Costs @ $10,000/LS	$10,000
Sub-Total Cost	$257,846
Contingency Cost (15%)	$38,677
TOTAL COST	**$296,523**

CONCLUSION/SUMMARY

As documented throughout this study, there is overwhelming evidence to support the need for broadband infrastructure throughout Southern West Virginia. However, as a result of existing low population densities, economic development, and topography; the current model of relying on private ISPs to extend existing infrastructure has resulted in many under served and unserved areas.

If the approach to broadband service in Southern West Virginia is not significantly modified, historical evidence suggests that no major upgrades or expansions to the existing broadband network should be expected in the foreseeable future. Therefore, Southern West Virginia is not only behind the majority of the nation with regards to available broadband services, it is reasonable to assume that the existing gap between Southern West Virginia and the nation will continue to widen. If this scenario is realized, the following can be expected:

- New business prospects will decline,
- Retainment of existing businesses will decline,
- Business productivity compared to other portions of the nation will decline,
- The population, including our youth, will decline, and
- Tourism will decline.

To prevent the issues referenced above from being a reality, it is recommended that Regions 1 & 4 and ROC continue and/or proceed with the following:

- Continue an aggressive public outreach program to educate citizens and politicians on the importance of broadband services in rural areas.
- Continue negotiations with existing and proposed backbone fiber owners in or near Southern West Virginia for middle-mile extensions.
- Finalize all legal requirements to develop public-private partnerships so public entities can bear the capital cost associated with broadband infrastructure projects, which will provide the opportunity for private ISPs to operate and maintain the broadband once it is constructed and for Internet charges to users to be in line with national averages.
- Utilize the "Preliminary Middle-Mile Network" and "Last-Mile Projects" sections in this report to deter mine the initial broadband infrastructure upgrade projects in Southern West Virginia.
- Utilize project specific funding sources identified in Appendix 2 to apply for financial assistance for broadband infrastructure projects.
- Procure professional services to design, bid and advertise, and oversee construction of the selected broadband infrastructure projects.
- Maintain and continue to develop relationships with backbone fiber owners and private ISPs.
- Continue the well-established proactive approach of understanding available technologies that provide a means to share data (download/upload) in Southern West Virginia.

Regions 1 & 4 should be commended for recognizing the need for broadband services, leading the effort to raise broadband awareness, and ultimately establishing ROC as a regional coalition supporting broadband enhancements throughout Southern West Virginia. In addition to supporting broadband, ROC provides a unique opportunity to utilize a regional approach to develop broadband infrastructure. If ROC continues to promote the importance of broadband and spearheads broadband infrastructure projects, there is a high probability that Southern West Virginia will be a model for broadband enhancement in West Virginia and other rural areas throughout the nation.

The dedication of Regions 1 & 4 and ROC to the future success of Southern West Virginia is evident as referenced throughout this study. We look forward to witnessing and being a part of the future successes to come.

THANK YOU

THOMPSON & LITTON

B R A S G

Blue Ridge Advisory Services Group

Region I Planning and Development Council

Region 4 Planning & Development Council