Application to DHCD Submitted through CAMS

County of Frederick, Virginia

Frederick County Broadband Expansion Apple Pie Ridge

Application ID:	64508282019074803
Application Status:	Pending
Program Name:	Virginia Telecommunications Initiative 2020
Organization Name:	County of Frederick, Virginia
Organization Address:	107 N. Kent Street Winchester, VA 22601
Profile Manager Name:	Jay Tibbs
Profile Manager Phone:	(540) 665-6382
Profile Manager Email:	jtibbs@co.frederick.va.us

Project Name:	Frederick County Broadband Expansion Apple Pie Ridge
Project Contact Name:	Allen Varner
Project Contact Phone:	(540) 722-8261
Project Contact Email:	svarner@fcva.us
Project Location:	107 N. Kent St. Winchester, VA 22601-5039
Project Service Area:	Frederick County

Total Requested Amount: $997,171.00

Required Annual Audit Status: No Current Audits Found

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Frederick County Broadband Expansion Apple Pie Ridge

Budget Information:

Cost/Activity Category	DHCD Request	Other Funding	Total
Telecommunications	**$997,171.00**	**$332,390.00**	**$1,329,561.00**
Construction	$997,171.00	$332,390.00	$1,329,561.00
Total:	**$997,171.00**	**$332,390.00**	**$1,329,561.00**

Budget Narrative:

The proposed project represents a partnership between Comcast and Frederick County. Comcast, the co-applicant, upon award of the VATI grant, will be responsible for any matching funds and will provide the labor and materials to complete the provision of services to the area delineated in the attached map. Comcast will provide approximately 25% of the projected construction costs of $1,329,561, totaling approximately $332,390. Frederick County will assist in providing in -kind contributions including application analysis and preparation, coordination with the Department of Housing and Community Development, assistance with right of way permitting, and participating in further concert with Comcast as the project is approved and construction begins. The value of these services will depend on the level of activity occurring as the project commences.

Questions and Responses:

1. Project Area

   Explain why and how the project area(s) was selected. Describe theproposed geographic area including specific boundaries of the project area (e.g. street names, local and regional boundaries, etc.). Attach a copy of the map of your project area(s). Label map: Attachment 1 –Project Area Map.

Answer:

The geographic area for this proposed project is in the Apple Pie Ridge area of Frederick County. The eligible project area includes the area north of Apple Pie Ridge Road and Songbird Lane, Cottonwood Drive and its secondary streets, Ashland Drive and Hannah Court, portions of Old Baltimore Road, Lavender Hills Lane and Bronze Manor Court, portions of Green Springs Road and its secondary streets, Warm Springs Road and its secondary streets, White Hall Road to Cedar Hill Road and its secondary streets, and Mara Lane.

The project area was selected after consultation between the co-applicants to review the needs of the County's residents and the extent of the existing Comcast service. The project area as identified meets the eligibility criteria established by the Virginia General Assembly and the Department of Housing and Community Development ("DHCD") for a Virginia Telecommunication Initiative ("VATI") award.

Attachments: Attachment 1 - Project Area Map.pdf

2.

Describe your outreach efforts to identify existing providers in the selected project area. Provide a detailed explanation of how this information was compiled and the source(s). Provide a map and list of all existing providers (fixed and wireless) and speeds offered within the project area. Label Map: Attachment 2 – Existing Provider Map; label documentation: Attachment 3 – Documentation on CAF Funding Area.

Answer:

Frederick County used several sources to identify the unserved areas of the County. These sources are:

1. Frederick County Broadband Study 2013 (Center for Innovative Technology CIT) – A broadband study for Frederick County and the City of Winchester was conducted in 2013 by the Center for Innovative Technology (CIT), Virginia Tech, and The Center for Geospatial Information Technology. The 2013 study noted that Frederick County has several significant coverage gaps, which still exist today. Additionally, the study identified the existing providers in specific areas of the county. The rural nature of the County has been challenging for providers to create a business case to reach the less densely populated, unserved areas.
2. The County used the Federal Communications Commission's Fixed Broadband Deployment portal to identify potential providers as well.
3. Along with our public notification of intent to apply for the Virginia Telecommunications Initiative Grant, we asked citizens in the proposed area to contact us to provide comments and perform a speed test of their current connection, if any. Those that have access to the Internet use a mix of wireless Internet service providers and satellite-based Internet. The overwhelming majority of citizens reported speed test results under the 10Mbps threshold set by DHCD for the VATI requirements.
4. The County used current local GIS data on existing telecom companies and Cable Franchise zones to further the list of potential providers. Frederick County contacted multiple fixed broadband providers in our jurisdiction to gauge interest in partnering with Frederick County on the VATI Grant. Comcast expressed interest and had infrastructure closest to the proposed area.
5. The County sent out a notice of intent to apply for the VATI Grant through our local newspaper, social media, and the County website. Additionally, as we received comments from citizens, we asked those citizens to contact their neighbors and have them contact the County. We created an email account to track citizen correspondence for the current grant cycle and for future grant requests

Attachments: Attachment 2 - Existing Provider Map.pdf, Attachment 3 - Documentation on CAF Funding Area.pdf

3. Project Need/Description

To be eligible for VATI, applicants must demonstrate that the proposed project area(s) is unserved. An unserved area is defined as an area with speeds of 10 Mbps / 1 Mbps or less and with less than 10 percent service overlap within the project area. Describe any anticipated service overlap with current providers within the project area. Provide specific information as to how you determined the percentage overlap. Label Attachment: Attachment 4 –

Documentation Unserved Area VATI Criteria.

Answer:

The proposed project area is unserved based on data available through the Federal Communications Commission's publicly available Form 477 and direct information from broadband providers. Comcast and Frederick County anticipate no service overlap within the project area as there are no current providers that would declassify the section.

While the attached map of FCC Form 477 data shows several providers offering Internet service in the census blocks encompassing the project area, Frederick County has verified that none of these providers offer service that would result in classifying the project area as served according to the VATI guidelines.

Further, based on the sources identified above, the project area is unserved. Comcast is the closest provider that offers broadband service at speeds in excess of the VATI threshold. As noted, if wireless or satellite service is available, that service is provided at speeds less than 10 Mbps / 1 Mbps.

Attachments: Attachment 4 - Documentation Unserved Area VATI Criteria.pdf, Attachment 14 - Form 477 Submitted by Comcast.pdf

4. Provide the number of residential serviceable units in the project area(s). Describe the eligible premises that will be served by the proposed project and the basis for these projections.

Answer:

Frederick County does not have an independent population estimate, however 2017 U.S. Census Bureau data show the population of the census tract 502 encompassing the Apple Pie Ridge was approximately 701.
There is a total of 313 residential and commercial locations within the proposed service area in Frederick County. The number of locations was determined after a physical "walk out" of the area around Apple Pie Ridge Road. The "walk out" was performed by Comcast. Comcast proposes to expand its network so that each of these 313 locations is serviceable without a customer contribution.
In addition, upon completion of this project, Comcast customers who subscribe to an Xfinity Internet package will have access to Xfinity WiFi hotspots, including those that would be newly added to the Apple Pie Ridge area, for no additional cost. Moreover, these Apple Pie Ridge area customers would be able to access any of Comcast's hotspots throughout Virginia and across the country. Comcast has the country's largest WiFi network, including more than 19 million hotspots nationwide and over 600,000 in Virginia. Even non-subscribers of Xfinity Internet can gain WiFi hotspot access using a WiFi On Demand pass.
Frederick County worked with the Frederick County Public School Planner to identify the number of families with children receiving free or reduced lunch through the National School Lunch Program. The proposed area has 46 high school students, 31 middle school students, and 58 elementary school students. Of the 135 students, 24 receive free or reduced lunch and 19 are designated with special needs. The Frederick County Public School system issues laptops to middle and high school students. Access to high-speed internet has been reported as a barrier for the middle and high school students using the devices for schoolwork at home.
The County also worked with its local Social Services Department to identify 28 families with economic and social needs in the proposed area. Through feedback from its citizens, the County heard countless stories of families struggling to get internet access for their children to not only excel in school but to simply keep up. They are driving to Public Wi-Fi areas, such as McDonald's or a public library to do homework and research.
The following quotes from parents highlight these issues:

"We live in Pleasant Valley Farms Subdivision, just off Warm Springs Road. Fast, reliable, affordable internet is a necessity for families providing the best possible education to their children. My wife is enrolled in an online Doctoral program to further her education. Too often, over the years, our children and my wife have become frustrated with internet outages while working online with homework assignments. We pay over $80 per month for the best service we can find, however, this system goes down, mainly during storms, several times per year, often at the worst times. This leaves us with having to drive to areas with internet access so our daughters or my wife can locate internet service to complete their assignments. Please bring our area into the 21st Century by bringing this long overdue service to our area."

"I live in Apple Pie Meadows, a community of 30 houses just north of Whitehall road. Can you tell me if our neighborhood will be included in the grant proposal? If not is there a way for us to apply? We have struggled with slow Internet for years and, quite frankly, as FCPS issues chromebooks for each student, my kids have a hard time doing homework at Home. We often have to drive to McDs or Handimart to do homework."

Through construction of Comcast's network to the Apple Pie Ridge area, more Frederick County school students would have Internet access, plus all qualifying low-income families will also have access to Comcast's Internet Essentials program. Internet Essentials is the nation's largest and most comprehensive broadband adoption program and Comcast's number one community impact initiative. It provides low-cost Internet service, the option to purchase an Internet-ready computer, and access to free digital literacy training online.
Since launching in 2011, Comcast has made dozens of improvements to the program, including 12 eligibility expansions—bringing Internet Essentials to new audiences such as public housing residents, low-income veterans, seniors, community college students, and new this year, to all qualified low-income households living in Comcast's service area. Since 2011, Internet Essentials has connected more than eight million low-income Americans (in 2 million households) to the Internet at home.

5. Indicate the numbers of businesses and community anchor institutions the proposed project will pass in the project area. Also indicate the number of home-based businesses. Provide specific information.

Answer:

The proposed service area has approximately 28 commercial businesses. The County has heard from several citizens that express interest in starting home-based businesses but the lack of reliable internet is a prohibiting factor.

Attachments: Attachment 17 - Frederick County VA Business Table.pdf

6. Understanding that projected take rates are an estimate, provide the anticipated take rate for the proposed service within one year of project completion and describe the basis for the estimate. Also detail all actions (e.g. marketing activities, outreach plan) to be implemented to reach the identified potential serviceable units within the project area.

Answer:

Comcast's business model is not dependent upon a specific take rate. Forecasting a take rate with a high degree of accuracy is most challenging as the actual number of customers who choose to subscribe is beyond the parties' control.

Comcast's take rate estimate for Apple Pie Ridge is based upon several unique factors. Frederick County's support

for the project and involvement with the community is expected to add heightened awareness earlier than might otherwise occur. The public nature of the VATI program is also expected to add to the early awareness of residents of broadband availability and positively enhance the take rate. All of the factors combined inform our estimate that, on the high end, some 45% to 55% of residents may take service within the first year after project completion.

These projections for overall subscriber levels are dependent on several factors and even an initial prediction may change as the project progresses. Comparisons between applicants may not provide a useful measure of broadband access as each applicant will have different service offerings, marketing campaigns, and other intangibles that could drive take rates. For example, Comcast take rates may vary from those of other providers because Comcast offers more services than broadband alone – including video, telephone, mobile telephone, and home security – and the company offers bundled pricing promotions from time to time. These additional products and pricing options can change the value proposition of Comcast service for each household that is unique among providers.

Comcast does undertake various actions to make residents aware that service is available. During the construction phase, before the service is active, the presence of Comcast vehicles visually alerts residents that service is coming. Comcast personnel involved with the construction in the public rights of way are often asked about availability. Soon after completing construction, Comcast provides notice to potential customers of service availability on a rolling basis. It typically employs various communication tactics to inform residents of availability. These tactics can include direct mail pieces, door hangers, and visits by Comcast sales representatives to residents' homes. These efforts augment existing advertising campaigns already in place within Frederick County for Comcast's existing customer base. Once service is established, Comcast may communicate with these residents through direct mail, direct e-mail, radio ads, video ads, and other marketing tactics.

7. For wireless projects only: Please explain the ownership of the proposed wireless infrastructure. Will the wireless co-applicant own or lease the radio mast, tower, or other raised structure onto which the wireless infrastructure will be installed?

Answer:

Not applicable.

8. Provide the proposed download and upload speeds for the project area. Detail whether that speed is based on dedicated or shared bandwidth, and detail the technology that will be used. This description can be illustrated by a map or schematic diagram, as appropriate. Describe the Internet service offerings to be provided after completion of this project and your price structure for these services. The service offerings should include all relevant tiers.

Answer:

In 2018, Comcast increased the download speeds of several of its residential "Performance," "Performance Pro," and "Blast!" broadband options. The broadband infrastructure Comcast would put in place in the Apple Pie Ridge area would offer all customers six residential and business broadband options that exceed the minimum requirements for VATI, as noted in the tables below:

Residential Tier	Speeds up to
Performance	60 Mbps down / 5 Mbps up

Performance Pro	150 / 5
Blast!	250 / 10
Extreme Pro	400 / 10
Gig	1000 (1 Gbps) / 35
Gigabit Pro	2000 (2 Gbps) / 2000 (2 Gbps)

Business Tier	Speeds up to
Starter	25 Mbps down / 5 Mbps up
Business Internet 75	75 / 15
Business Internet 150	150 / 20
Business Internet 300	300 / 25
Business Internet 500	500 / 35
Business Internet 1G	1000 (1 Gbps) / 35

Comcast will utilize DOCSIS technology in building the network. DOCSIS technology is an international telecommunications standard that permits the addition of high-bandwidth data transfer to an existing cable TV system. It is employed by many cable television operators, including Comcast, to provide Internet access over an existing HFC infrastructure. The industry continues to deliver great speeds over DOCSIS 3.0, and is moving purposefully toward increased adoption of DOCSIS 3.1, which Comcast deployed in Frederick County in 2018. DOCSIS 3.1 enables Comcast to bring broadband speeds of up to almost 1 Gbps to a service area.

Comcast proposes to complete the construction of the area with a hybrid fiber coaxial (“HFC”) solution, emanating from the closest facility to the project. Fiber optic cables would be constructed to the service area, commonly referred to as a serving node, where optical signals would be converted to electrical or radio frequency for distribution on the coaxial network.

Upon completion of the Apple Pie build, Comcast will be able to offer its full suite of products and services to residents in the proposed service area, including broadband services, voice, video, and home security. With respect to broadband service, Comcast’s 1 Gigabit Internet service will use DOCSIS 3.1 technology to deliver the speeds through its HFC network. To enjoy the service, all customers need to do is install a DOCSIS 3.1 cable modem, which can be rented from Comcast or purchased on their own.

Residential Xfinity Internet and Video customers will also have access to Xfinity X1. X1 is a video platform that delivers the simplest, fastest, and most complete way for customers to access all of their entertainment on all of their screens. Features include Netflix and Amazon Prime Video access for those with a membership, YouTube

access, advanced search and recommendations, and Xfinity apps for home and on the go. Xfinity X1 customers can also use the X1 Voice Remote for voice commands to change channels, search for shows, get recommendations, and more.

In addition, upon completion of this project, Comcast customers who subscribe to an Xfinity Internet package will have access to Xfinity WiFi hotspots, including those that would be newly added to the Apple Pie Project area, for no additional cost. Moreover, these customers would be able to access any of Comcast's hotspots throughout Virginia and across the country. Comcast has the country's largest WiFi network, including more than 19 million hotspots nationwide and over 600,000 in Virginia. Even non-subscribers of Xfinity Internet can gain WiFi hotspot access using a WiFi On Demand pass.

Comcast Small and Medium Business customers will have access to gig speeds through the newly launched "Business Internet 1 Gig" product. Comcast's "Business Internet 1 Gig" and "Business Internet 500" speed tiers are now available to business customers using the company's existing network.

With respect to broadband service, Comcast's 1 Gigabit Internet service will use DOCSIS 3.1 technology to deliver the speeds through its HFC network. Pricing for all relevant residential Xfinity Internet tiers is listed below.

Residential Tier	Xfinity Internet Service Only	With Xfinity TV or Voice Service
Performance	$74.95	$61.95
Performance Pro	$89.95	$76.95
Blast!	$94.95	$79.95
Extreme Pro	$99.95	$86.95
Gig	$104.95	$91.95
Gigabit Pro	$299.95	$299.95

Comcast Business customers will have access to gig speeds through the "Business Internet 1 Gig" product. Comcast's "Business Internet 1 Gig" and "Business Internet 500" speed tiers are available to business customers using the company's existing network. Pricing for all relevant Comcast Business SMB Internet tiers is listed below.

Business Tier	Standalone Pricing
Starter	$69.95
Business Internet 75	$149.95
Business Internet 150	$249.95

Business Internet 300	$349.95
Business Internet 500	$399.95
Business Internet 1G	$499.95

Residents and businesses in the proposed service area will be offered broadband services of the same quality and

9. Provide a description of the network system design used to deliver broadband service from the network's primary Internet point(s) of presence to end users, including the network components that already exist and the ones that would be added by the proposed project. Also describe specific advantages of using this technology. Provide a detailed explanation on how this information was compiled and source(s). For wireless projects, provide a propagation map including the proposed project. Label Map: Attachment 5 – Propagation Map Wireless Project

Answer:

Comcast has built a fiber backbone at the core of its network that stretches across the country with more than 600,000 route miles of fiber-optic and coaxial plant nationwide – using the industry's most advanced optics/lasers and Internet Protocol ("IP") routing technologies. Dozens of converged regional area networks interconnect to create this fiber backbone that delivers video, voice, and high-speed Internet services to tens of millions of customers throughout the country. IP technology ties all of this together, creating a highly scalable connectivity platform or "IP core." Comcast has been building fiber into its networks incrementally over the past decade. In 2015, Comcast introduced Gigabit Pro, the industry's first residential fiber-to-the-home 2 Gigabit-per-second ("Gbps") service ever offered by an Internet service provider in the United States. In 2018, Comcast announced that it is the nation's largest provider of gigabit broadband, providing access to nearly 58 million homes and businesses.

Comcast's hybrid fiber coaxial ("HFC") network model offers the most flexibility and the best economics now and into the future. The company can surgically add speed, capacity, and fiber to its networks in a smart and economically feasible way.

Comcast's existing HFC network will deliver speeds up to 1 Gbps to residential customers. These speeds are among the fastest and most widely available and include access to the nation's largest WiFi network of more than 19 million hotspots. Combined with the company's recently launched Xfinity xFi platform, a new and personalized home WiFi experience, Comcast would provide its Apple Pie Ridge area customers with the fastest speeds, the best WiFi coverage, and ultimate WiFi control in their homes.

Comcast proposes to complete the construction of the area with a hybrid fiber coaxial solution, emanating from the closest facility to the project. Fiber optic cables would be constructed to the service area, commonly referred to as a serving node, where optical signals would be converted to electrical or radio frequency for distribution on the coaxial network.

Upon completion of the Apple Pie Ridge Area Project build, Comcast will be able to offer its full suite of products and services to residents in the proposed service area, including broadband services, voice, video, and home security. With respect to broadband service, Comcast's 1 Gigabit Internet service will use DOCSIS 3.1 technology to deliver the speeds through its HFC network. To enjoy the service, all customers need to do is install a DOCSIS

3.1 cable modem, which can be rented from Comcast or purchased on their own.

According to the FCC's "Eighth Measuring Broadband America: A Report on Consumer Fixed Broadband Performance in the United States,"[1] Comcast's actual upload and download speeds were over 100% of what was advertised. Residents and businesses in the proposed service area will be offered broadband services of the same quality and current price as those offered in other Comcast service areas. Comcast will not offer a separate rate applicable to only those customers within the project area included in this proposal. The customer will ultimately decide which service tier best suits their needs and preferences.

Residential Xfinity Internet and Video customers will also have access to Xfinity X1. X1 is a video platform that delivers the simplest, fastest, and most complete way for customers to access all of their entertainment on all of their screens. Features include Netflix and Amazon Prime Video access for those with a membership, YouTube access, advanced search and recommendations, and Xfinity apps for home and on the go. Xfinity X1 customers can also use the X1 Voice Remote for voice commands to change channels, search for shows, get recommendations, and more.

In addition, upon completion of this project, Comcast customers who subscribe to an Xfinity Internet package will have access to Xfinity WiFi hotspots, including those that would be newly added to the Overlook Project area, for no additional cost. Moreover, these customers would be able to access any of Comcast's hotspots throughout Virginia and across the country. Comcast has the country's largest WiFi network, including more than 19 million hotspots nationwide and over 600,000 in Virginia. Even non-subscribers of Xfinity Internet can gain WiFi hotspot access using a WiFi On Demand pass.

Comcast Small and Medium Business customers will have access to gig speeds through the "Business Internet 1 Gig" product. Comcast's "Business Internet 1 Gig" and "Business Internet 500" speed tiers are now available to business customers using the company's existing network.

Attachments: Not Applicable

10. Project Readiness

What is the current state of project development (e.g. planning, preliminary engineering, identifying easements/permits, final design, etc.)? Prepare a detailed project timeline or construction schedule which identifies specific tasks, staff, contractor(s) responsible, collection of data, etc., and estimated start and completion dates. Provide any Memorandums of Understanding (MOUs) or Memorandums of Agreement (MOAs) (drafts are allowable), letters of support, etc. The timeline should include all activities being completed within 12 months of contract execution with DHCD. Label Attachments: Attachment 6 – Timeline/Project Management Plan; Attachment 7 – Relationship between Applicant/Co-Applicant; Attachment 8 – Letters of Support;

i. If the partnership is formalized in a written agreement, provide a copy of that agreement.

ii. If the partnership has not been formalized, provide a short description of the project management role, financial commitment, or other contribution to the project for the applicant, co-applicant, and any additional partners.

iii. If applicant is not a locality(s) in which the project will occur, please provide a letter of support from that

locality.

Answer:

The Frederick County Board of Supervisors unanimously approved a resolution to partner with Comcast to jointly apply for the VATI Grant. The expansion of broadband is a named top priority for the Frederick County Board of Supervisors.

The Apple Pie Ridge project is in the preliminary engineering phase. Final design will commence upon the award of the grant by DHCD and will continue to completion on or before the construction deadline pursuant to a final grant agreement. Comcast is confident it can complete the proposed work on time and within budget. Workflow is included in the attached project management plan.

The specific initial tasks include project engineering and right of way preparation. Comcast may need to obtain the necessary permits from the Virginia Department of Transportation ("VDOT") to place facilities underground in the VDOT right of way and will need support from the county in ensuring that necessary power supplies are coordinated and installed with the local electric company. Comcast will ask Frederick County officials to assist in obtaining these permits and power supplies expeditiously. This coordination will need to begin immediately upon notice of the grant award. Material procurement and some pre-construction work will occur during this period and will enable Comcast to proceed with actual construction as soon as VDOT issues the right of way permits.

Comcast anticipates completing the project within 12 months after contract execution between the County and DHCD. As contemplated by the 2020 VATI Guidelines, Comcast may request an extension if it encounters permitting, pole attachment, or other circumstances beyond its control which may delay the project timeline.

Activation of all HFC plant will be completed by both in-house Comcast employees and select contract personnel. The final quality control inspection of all new infrastructure will be completed by Comcast employees to ensure all new construction meets or exceeds FCC standards. As noted above, an additional notice of service availability will be provided not later than 20 days prior to the Completion Date.

Attachments: Attachment 6 - Timeline_Project Management Plan.pdf, Attachment 7 - Relationship Between Applicant and CoApplicant.pdf, Attachment 8 - Letters Of Support.pdf

11. Matching funds: Provide a description of the matching funds the applicant and co-applicant will invest in the proposed project (VATI funding cannot exceed 80 percent of total project cost). The Funding Sources Table must be completed. Label Attachments: Attachment 9 - Documentation of Match Funding; Attachment 10 – Funding Sources Table;

i. For each element of matching funds in the description, indicate the type of match (e.g. cash, salary expense, or in-kind contribution).

ii. Identify whether the applicant or co-applicant is responsible for providing each element of the proposed matching funds.

iii. Include copies of vendor quotes or documented cost estimates supporting the proposed budget.

Answer:

The proposed project represents a partnership between Comcast and Frederick County. Comcast, the co-applicant, upon award of the VATI grant, will be responsible for any matching funds and will provide the labor and materials to complete the provision of services to the area delineated in the attached map. Comcast will provide approximately 25% of the projected construction costs of $1,329,561, totaling approximately $332,390. Frederick County will assist in providing in-kind contributions including application analysis and preparation, coordination with the Department of Housing and Community Development, assistance with right of way permitting, and participating in further concert with Comcast as the project is approved and construction begins. The value of these services will depend on the level of activity occurring as the project commences.

A breakdown of costs is attached below.

Name	Locations	Mileage	HP/Mile	Total Cost	Comcast Cost	Requested Gap Funding	VATI Gap Funding
Apple Pie Ridge	313	21.7	14.4	$1,329,561	$332,390	$997,170	75%

Attachments: Attachment 9 - Documentation of Match Funding.pdf, Attachment 10 - Funding Sources Table.pdf

12. Applicant and Co-Applicant: A description of the public-private partnership involved in the project. Detail the local government assistance: Local government co-applicants should demonstrate assistance to project that will lower overall cost and further assist in the timely completion of construction, including assistance with permits, rights of way, easements, and other issues that may hinder or delay timely construction and increase cost. Provide detail if this project includes additional partners such as municipal providers, middle-mile providers, or investor-owned utilities

Answer:

The project area for this application was selected in part because of a need for service and the absence of any contractual or legal requirements for Comcast, or any other provider, to extend service there.

Frederick County supervisors voted to proceed with a VATI application in partnership with Comcast at their meeting on August 14, 2019. The staff of Frederick County coordinated this partnership arrangement with Comcast. Comcast and Frederick County will complete a formal agreement to make review of work and processing of payments as efficient as possible. Comcast anticipates submitting invoices at the mid-point of the project and at project completion.

The partners have agreed in principle on the following responsibilities:

· *Frederick County intends to partner with Comcast as a co-applicant for a VATI grant to extend broadband service to unserved areas of Frederick County.*

· *Frederick County would complete the grant application (with Comcast's assistance); submit the completed application(s) to the Virginia DHCD; and manage the processing of work payments. Because Frederick County will be the funded applicant in the event of award, the county would timely process all VATI related Comcast invoices that applied directly to the approved work plans, design, and statement of work. Any delays in completing the work as planned would be negotiated with DHCD as partners.*

· *Frederick County also would provide services and support for any necessary citizen engagement activities, including but not limited to: processing applications for right of way in a manner consistent with all local, state, and federal law; advocating and describing the benefits of the project to those affected; and working with Comcast and other partner agencies (e.g. VDOT) and private industry (e.g. Dominion Energy) to help coordinate construction and/or pole attachments.*

· *Comcast would provide accurate VATI construction plans; associated material and work invoices to match the construction plans; detailed descriptions of necessary right of way or pole attachments; and timely notice of other needs to Frederick County.*

· *This general agreement proceeds from the notice of VATI award to the completion of the projects.*

13. Identify key individuals, including name and title, who will be responsible for the management of the project. Provide a concise description of their role and responsibilities for the project. Present this information in table format.

Answer:

Name	Title	Responsibility
Nathan Daugherty	Sr. Manager, Comcast Gov. Affairs	Coordination with Frederick County
Brian Engle	Manager, Comcast Construction	Supervision of construction
Scott Varner	Director of Information Technology, Frederick County	Coordination with Comcast; conduct project administration including invoice processing with DHCD

14. Project Budget and Cost Appropriateness

Applicants shall provide a detailed budget as to how the grant funds will be utilized, including an itemization of equipment and construction costs and a justification of proposed expenses. Expenses should substantiated by clear cost estimates. Label Attachment: Attachment 11 – Derivation of Costs; Attachment 12 - Documentation of

Supporting Costs; Attachment 13 – Supporting Documentation of Cost Estimates.

Answer:

Comcast will provide approximately 25% of the projected construction costs of $1,329,561, totaling approximately $332,390. Frederick County will assist in providing in-kind contributions including application analysis and preparation, coordination with the Department of Housing and Community Development, assistance with right of way permitting, and participating in further concert with Comcast as the project is approved and construction begins. The value of these services will depend on the level of activity occurring as the project commences.

Attachments: Attachment 11 - Derivation of Costs.pdf, Attachment 12 - Documentation Of Supporting Costs.pdf, Attachment 13 - Supporting Documentation of Cost Estimates.pdf

15. The cost benefit index is comprised of three factors: (i) state share for the total project cost, (ii) state cost per unit passed, and (iii) the internet speed. From these statistics, individual cost benefit scores are calculated. Finally, the three component scores are averaged together and converted to a 30-point scale to form a composite score. Please provide the following three pieces of information:

    a. Total State funding requested / Total Project cost

    b. Number of serviceable units

    c. Highest residential speed available

Answer:

a. Total State funding requested / Total Project cost: $997,170 / $1,329,561, or 75% of total project cost

b. Number of serviceable units: 313

c. Highest residential speed available: 1Gig

16. A brief description of applicant and co-applicant’s history or experience with managing grants and constructing broadband communication facilities in the Commonwealth of Virginia and elsewhere.

Answer:

Frederick County has a long history of managing grants at the State, Federal and Local level. Several grants are referenced below:

Department of Environmental Quality/Fund Board ($16,330), Department of Criminal Justice ($207,470), Department of Criminal Justice ($107,984), Department of Criminal Justice ($503,040), VDOT ($340,000), VDOT ($1,089,000), McKee Foods ($20,000).

Comcast has significant experience constructing broadband communications facilities. It is a leading communications provider in Virginia, offering video, high-speed Internet, home security, and phone services to residential customers under the Xfinity brand and also providing services to businesses through its Comcast Business suite of products. Comcast has invested in technology to build an advanced network that delivers among the fastest broadband speeds, and brings customers personalized video, communications, and home management offerings. Comcast has invested billions of dollars to create a network across the U.S. that makes broadband

widely available, as part of its commitment to provide superior services to its customers.

Since 2011, Comcast made more than $1.8 billion in technology and infrastructure investments in Virginia to offer reliably fast speeds even during peak use periods. The company has invested significant resources in both local and national Network Operations Centers ("XOC") to ensure continued proactive monitoring of network health, increased its Internet speeds for customers 17 times in 18 years, and doubled the capacity of its broadband network every 18-24 months.

In Virginia, Comcast employs over 1,900 people. It invests more than $216 million annually in payroll, benefits, and training for its Virginia workforce. The company maintains a large, locally based engineering technical operations team that works around the clock to maintain network reliability and to directly support the company's business and residential customers. For many decades, Comcast, through its Beltway Region, has served over 140 communities in Virginia. Many of these communities are very rural in nature.

Comcast has experience partnering with public agencies to deploy broadband infrastructure in unserved areas. Comcast was awarded two Virginia Telecommunications Initiative grants in 2018. Both construction projects are now complete with Internet service offered to residences and businesses throughout the project footprints. Comcast was also awarded a VATI grant in 2019. Comcast is on schedule to fulfill its grant obligations for this grant, and planning and construction for the project is ongoing.

In 2018 Comcast also earned a Last Mile Broadband grant from the Virginia Tobacco Region Revitalization Commission to provide broadband access to nearly 7,000 homes and businesses. It is currently planning to complete construction in 2020, approximately 1.5 years ahead of schedule.

In Massachusetts, Comcast was awarded a grant of $4,000,000 from the Massachusetts Technology Collaborative ("Mass Tech") for construction of line extensions to areas in nine towns whose costs to construct exceeded Comcast's economic standards. Comcast completed the project on time, on budget, and reached 20% more homes than the 1,000 originally anticipated. Comcast was also awarded a grant of $805,800 by Mass Tech for construction of approximately 27 miles of line extensions in Montgomery, Massachusetts, a town which is currently unserved.

In 2013 and 2014, Comcast received two grants from the Vermont Telecommunication Authority ("VTA") totaling $336,558 to provide service to areas that were economically unfeasible for construction. In 2015 and 2017, the Vermont Department of Public Service ("DPS") twice awarded Comcast funds from its Connectivity Initiative grant totaling $359,850. Comcast has either fulfilled or is on schedule to fulfill its grant obligations to the VTA and DPS.

17. Commonwealth Priorities

Additional points will be awarded to proposed projects that reflect Commonwealth priorities. Please describe if the project fits into a larger locality or regional universal broadband plan.

Answer:

A broadband study for Frederick County and The City of Winchester was conducted in 2013 by the Center for Innovative Technology (CIT), Virginia Tech, and The Center for Geospatial Information Technology. The 2013 study noted that Frederick County has several significant coverage gaps, which still exist today. Additionally, the

study identified the existing providers. The rural nature of our County has been challenging for providers to create a business case to reach the less densely populated, underserved/unserved areas. This project reflects the priorities of the study in building out the last mile service for our citizens. The County annually reviews the plan and updates the coverage map to highlight progress and continuing need.

Attachments: Attachment 16 - Frederick County VA 2013 Broadband Study.pdf

18. Additional Information

Any other equitable factor that the applicant desires to include. Applicants are limited to four additional attachments. Label Additional Attachments as:

a. Attachment 14 – Two most recent Form 477 submitted to the FCC or equivalent

b. Attachment 15 – Copy of Public Notice

c. Attachment 16 – XXXXXXX

d. Attachment 17 – XXXXXXX

e. Attachment 18 – XXXXXXX

f. Attachment 19 – XXXXXXX

Answer:

Attachments: Attachment 14 - Form 477 Submitted by Comcast.pdf, Attachment 15 - Copy of Public Notice.pdf, Attachment 16 - Frederick County VA 2013 Broadband Study.pdf, Attachment 17 - Frederick County VA Business Table.pdf, Attachment 18 - Comcast Rate Card.pdf

Attachments:

Map(s) of project area, including proposed infrastructure

Attachment1ProjectAreaMap93201913648.pdf

Map(s) or schematic of existing broadband providers (inventory of existing assets)

Attachment2ExistingProviderMap93201923323.pdf

Documentation that proposed project area is not designated for Connect America Funding (CAF)

Attachment3DocumentationonCAFFundingArea93201923331.pdf

Application to DHCD Submitted through CAMS

County of Frederick, Virginia

Frederick County Broadband Expansion Apple Pie Ridge

Documentation that proposed project area is unserved based on VATI criteria

Attachment4DocumentationUnservedAreaVATICriteria93201923341.pdf

Propagation Map if Wireless Project

Attachment5PropagationMapWirelessProjectNotApplicable93201923418.pdf

Project Management Plan

Attachment6TimelineProjectManagementPlan93201923430.pdf

Documentation of relationship between applicant and co-applicant (formal or informal)

Attachment7RelationshipBetweenApplicantandCoApplicant93201923437.pdf

Letters of Support

Attachment8LettersOfSupport93201923450.pdf

Documentation for in-kind contributions, including value(s)

Attachment9DocumentationofMatchFunding93201923504.pdf

Funding Sources Table

Attachment10FundingSourcesTable93201923516.pdf

Derivation of Cost (Project Budget)

Attachment11DerivationofCosts93201923522.pdf

Documentation supporting project costs (i.e. vendor quotes)

Attachment12DocumentationOfSupportingCosts93201923533.pdf

Supporting documentation for costs estimates

Attachment13SupportingDocumentationofCostEstimates93201923540.pdf

Two most recent Form 477 submitted to FCC

Attachment14Form477SubmittedbyComcast93201923546.pdf

Application to DHCD Submitted through CAMS

County of Frederick, Virginia

Frederick County Broadband Expansion Apple Pie Ridge

Copy of Public Notice

Attachment15CopyofPublicNotice93201923555.pdf

Optional

Attachment16FrederickCountyVA2013BroadbandStudy93201923607.pdf

Optional

Attachment17FrederickCountyVABusinessTable93201923615.pdf

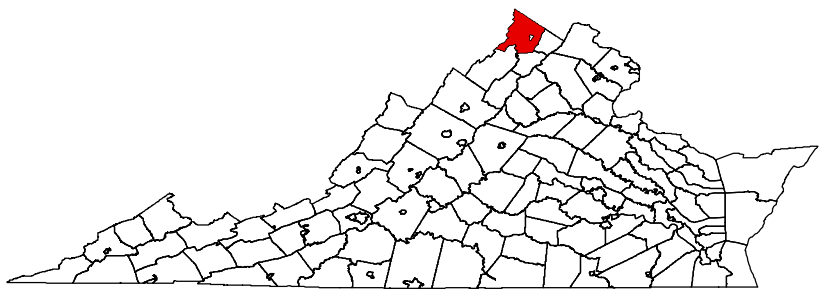
Optional

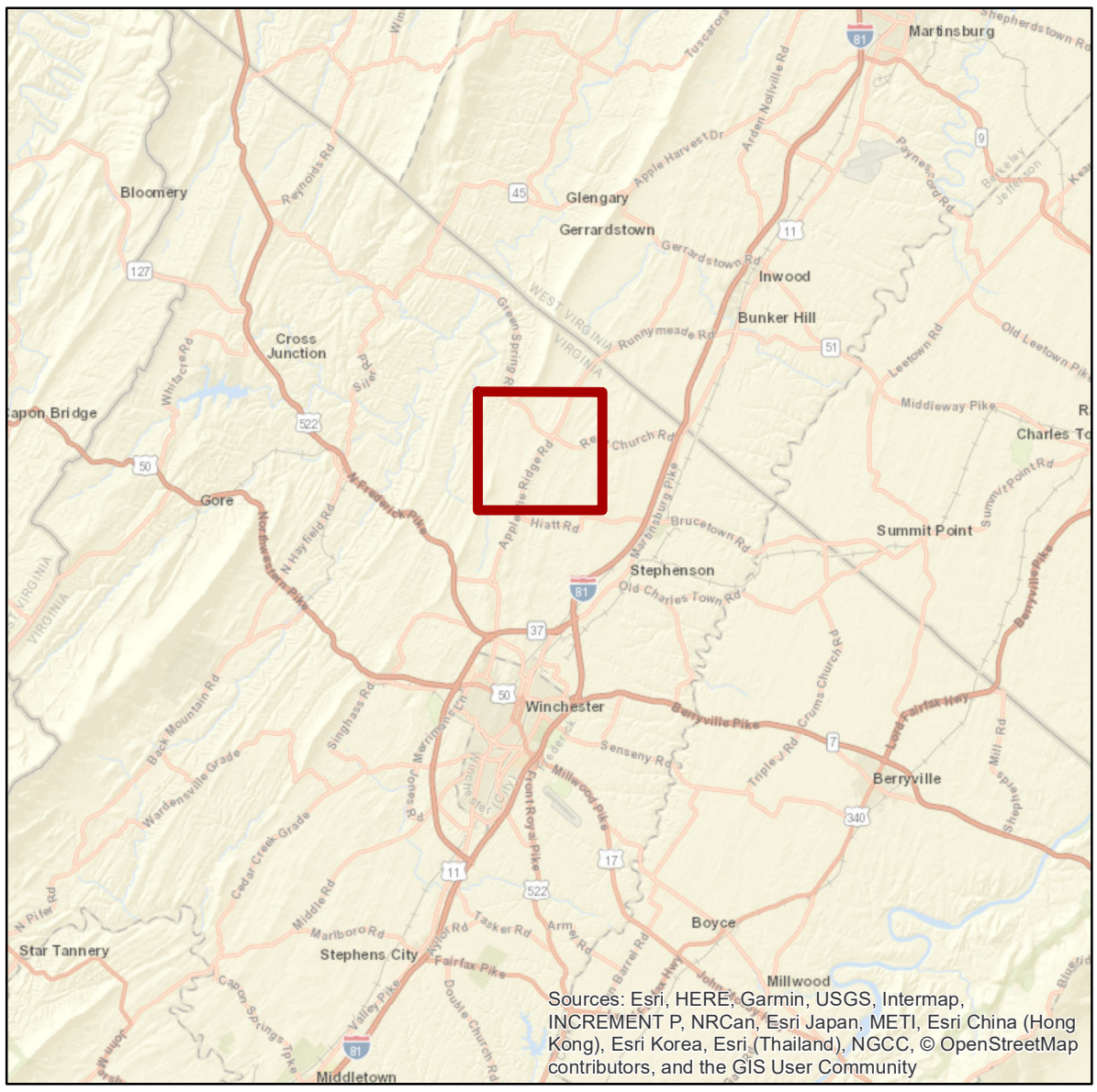
Attachment18ComcastRateCard93201923623.pdf

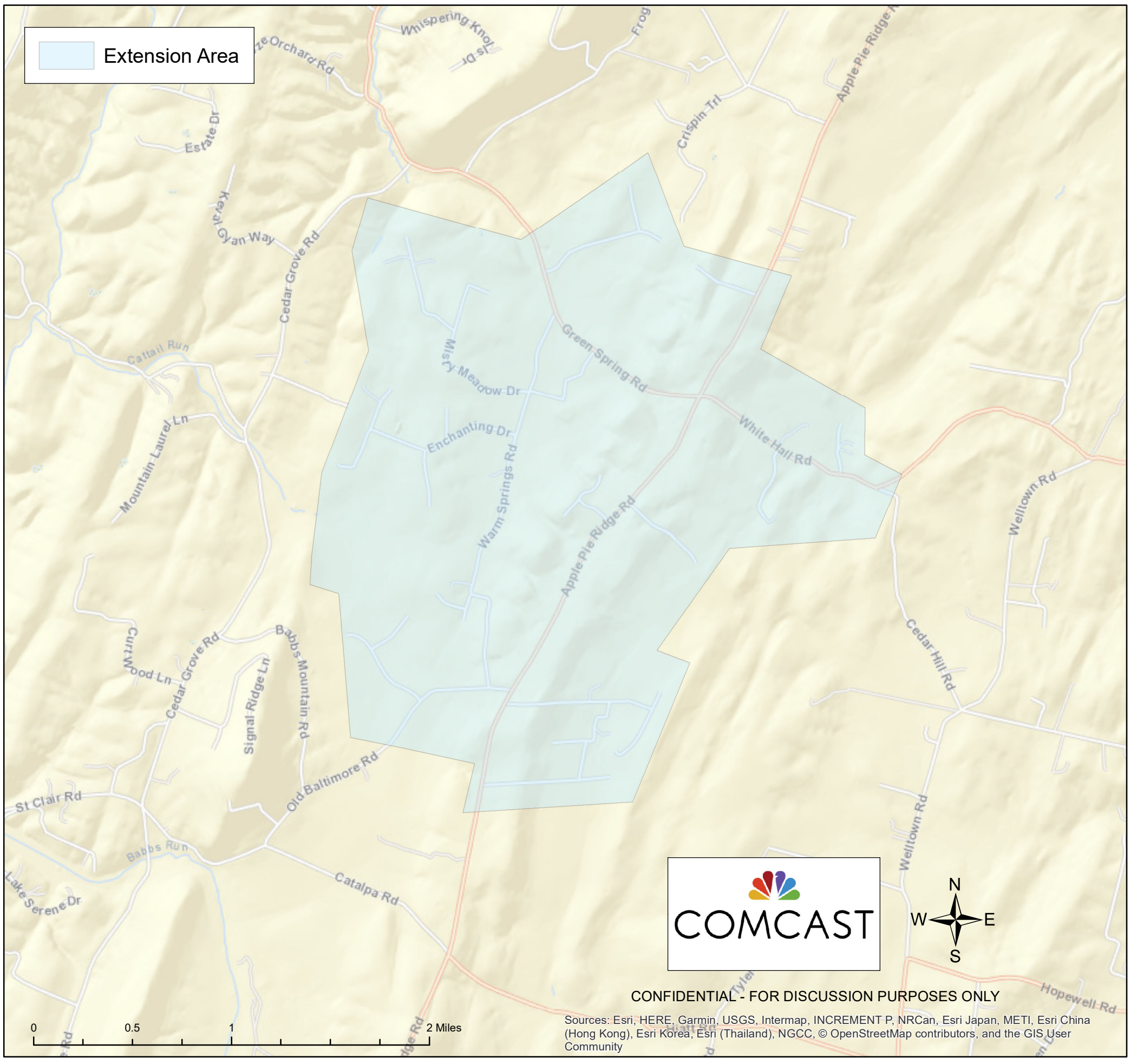
Notes:
Not Applicable.

FREDERICK COUNTY SERVICE EXTENSION

APPLE PIE RIDGE RD AREA



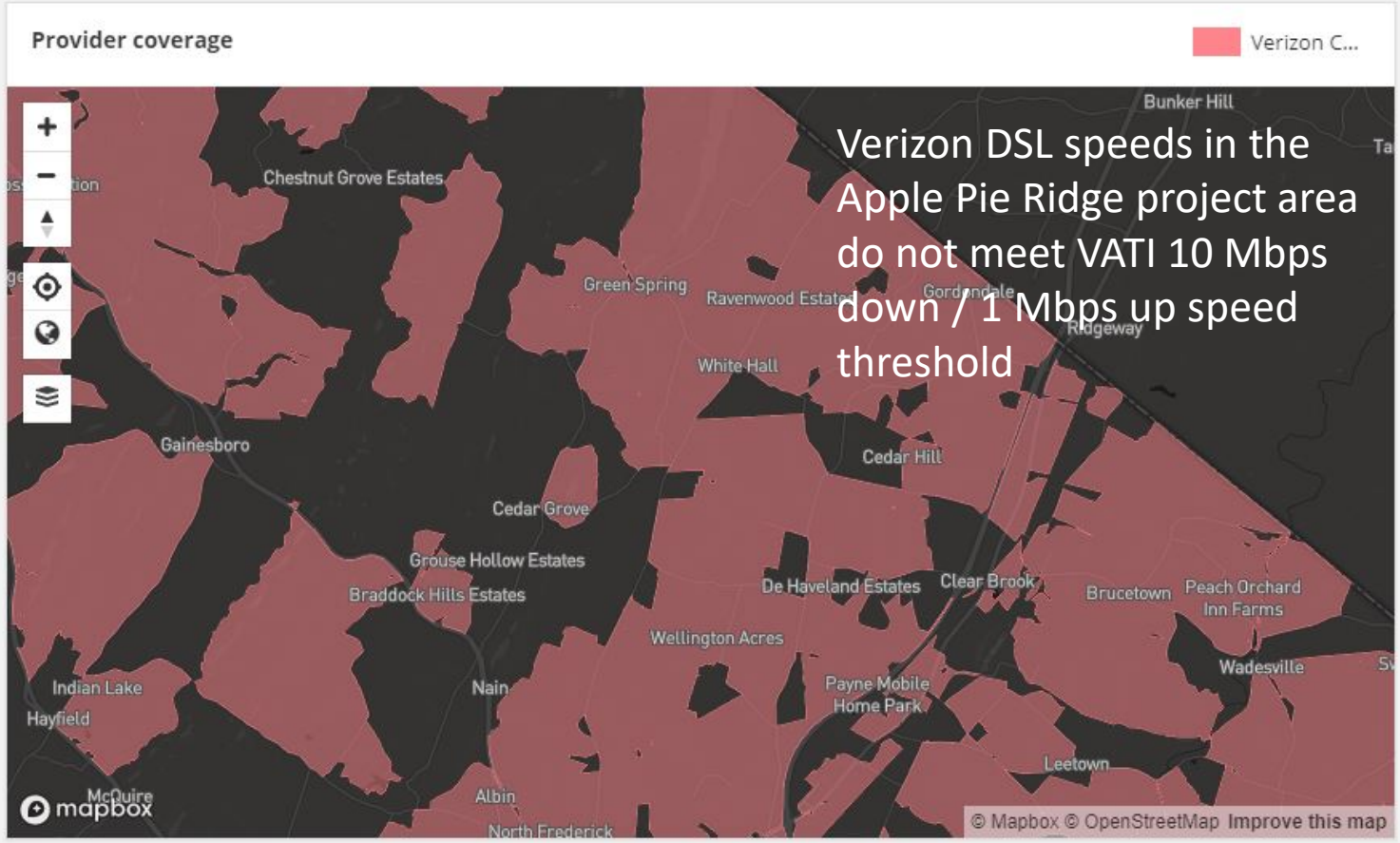


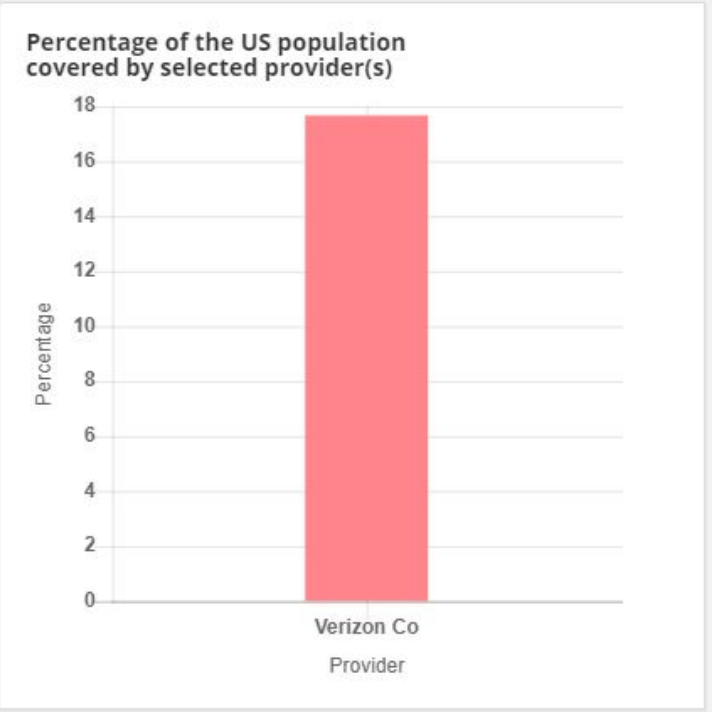


Map of Existing Providers - Verizon

Provider coverage overlap and population coverage

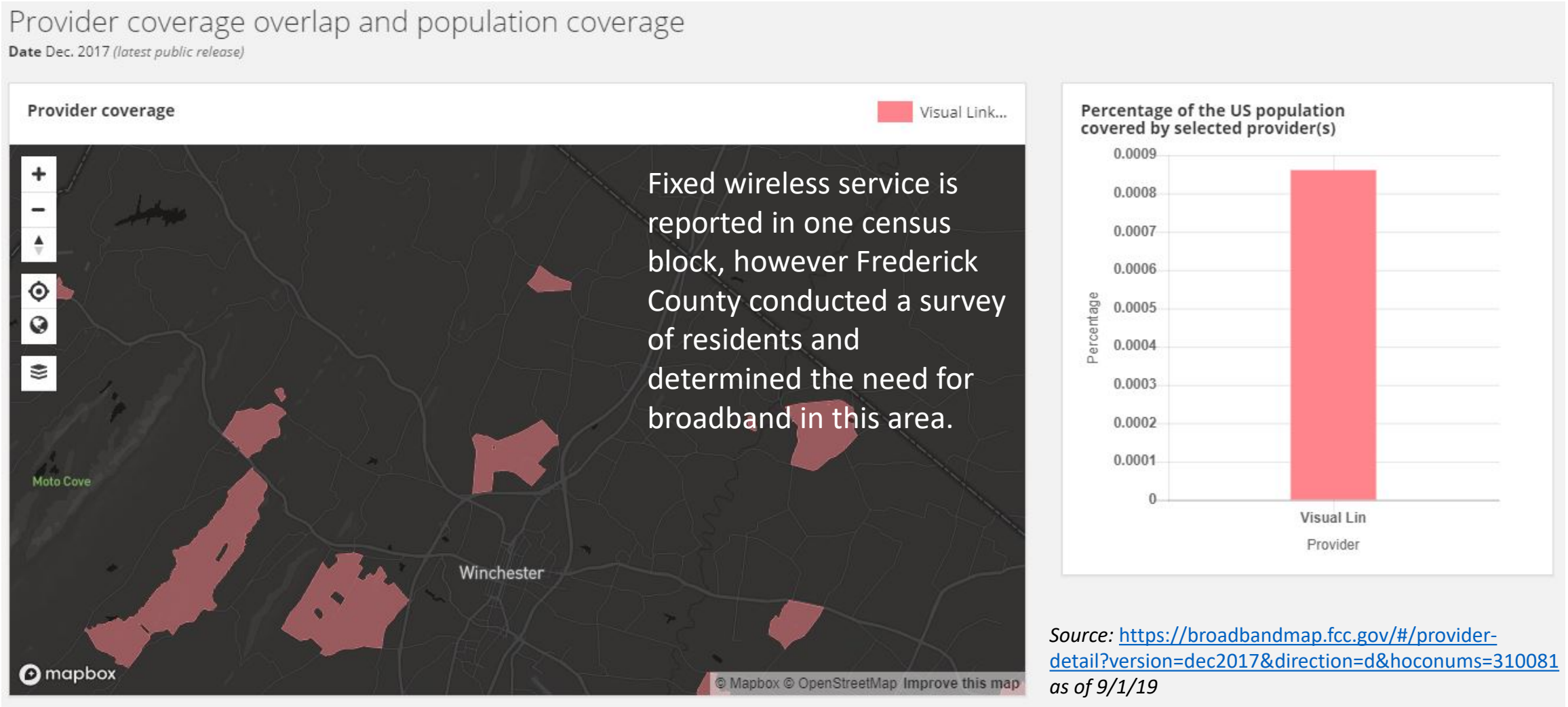
Date Dec. 2017 *(latest public release)*





Source: https://broadbandmap.fcc.gov/#/provider-detail?version=dec2017&direction=d&hoconums=131425 as *of 9/1/19*

Map of Existing Providers – Visual Link Internet LLC

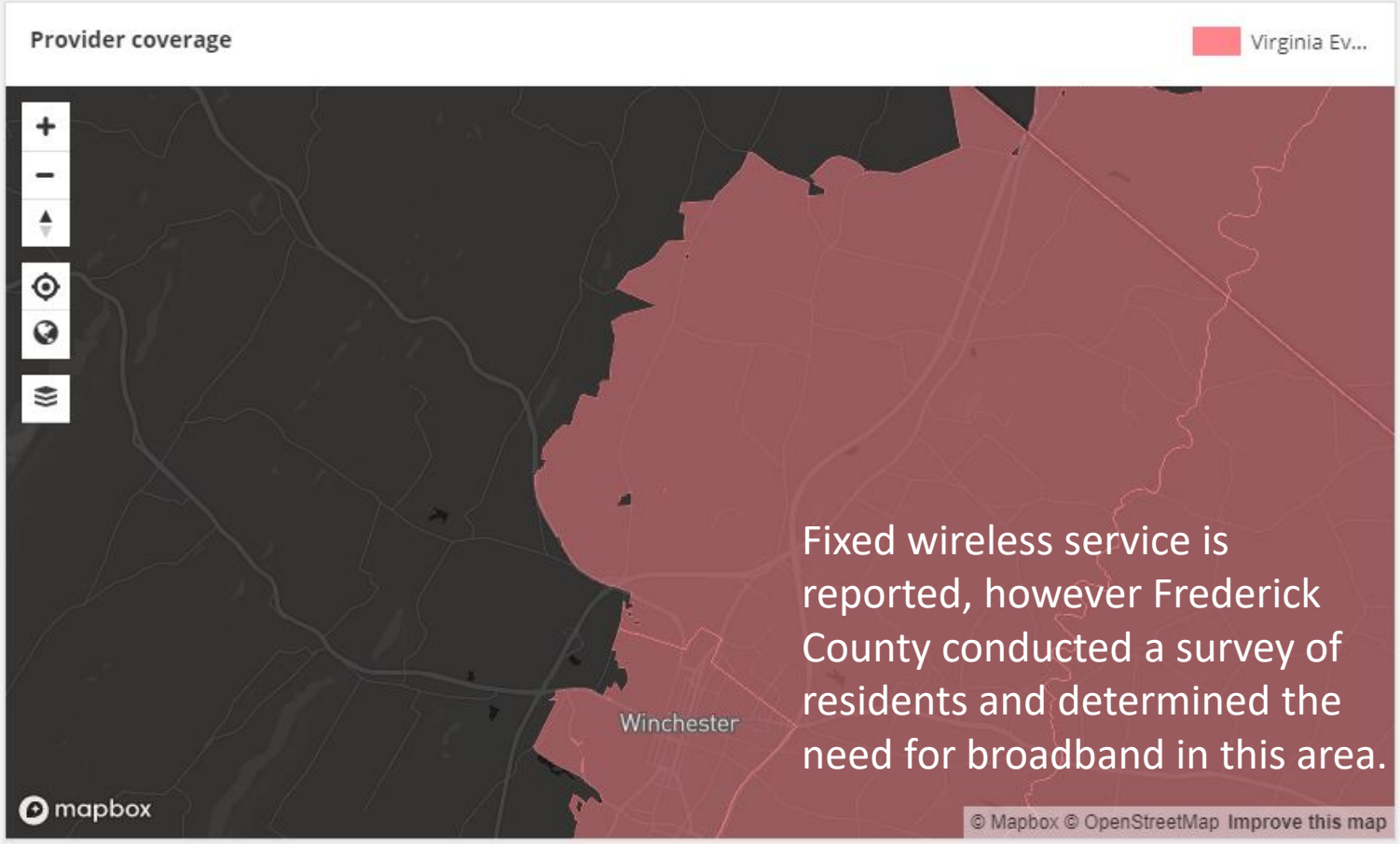


Source: https://broadbandmap.fcc.gov/#/provider-detail?version=dec2017&direction=d&hoconums=310081 *as of 9/1/19*

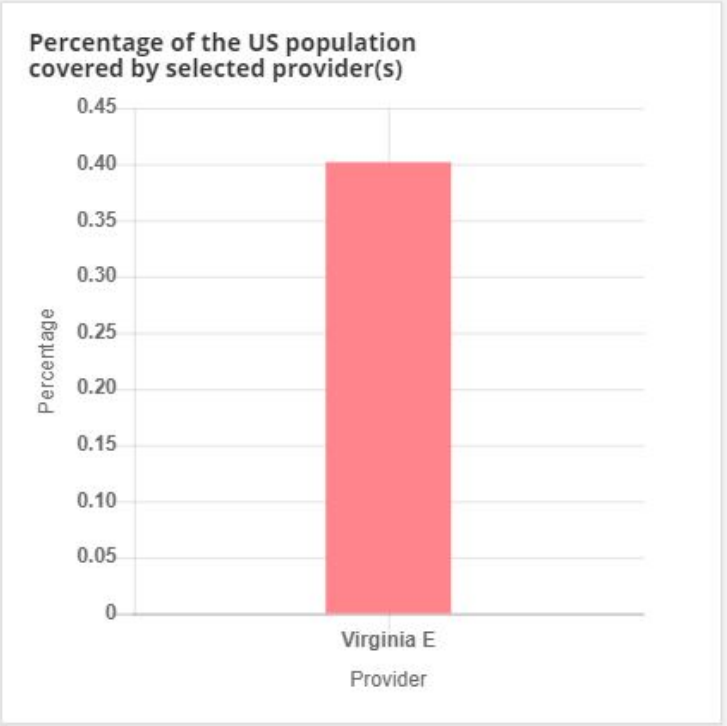
Map of Existing Providers – Virginia Everywhere LLC

Provider coverage overlap and population coverage

Date Dec. 2017 *(latest public release)*

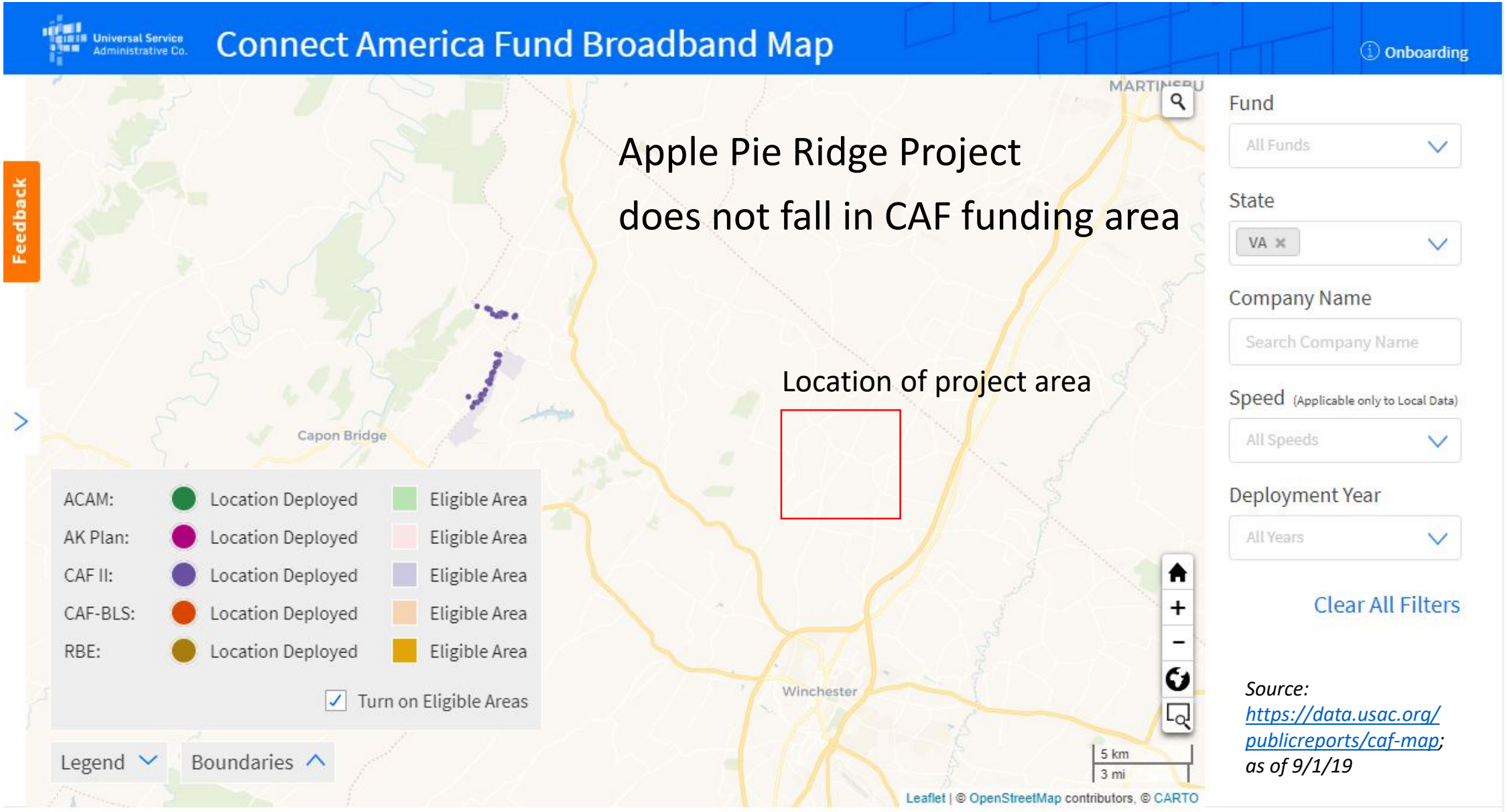


Fixed wireless service is reported, however Frederick County conducted a survey of residents and determined the need for broadband in this area.



Source: https://broadbandmap.fcc.gov/#/provider-detail?version=dec2017&direction=d&hoconums=300170 *as of 9/1/19*

Documentation of CAF Funding Area



Source: https://data.usac.org/publicreports/caf-map; as of 9/1/19

Frederick County, VA Broadband Study Map

Map Features

- Streets
- Broadband Gaps 2018 - 2019
- Unserved Addresses
- FIBER
- CABLE

ID	Community	Pop
1	Mountain Falls	529
2	Overlook Rd	36
3	Chimney Cir DSL	90
4	Westernview Dr	17
5	Veteran-Chapel-Meadow	93
6	Middle - Germany DSL	98
7	Easy Living	66
8	Wampler	33
9	Apple Pie-Warm Springs	79
10	BlueRidge	82
11	Saddleback	19
12	Greensprings	25
13	Wardensville	94
14	Nixon	36
15	Hollow-Fletcher-Harry	134
16	Files-Leaning	23
17	How ards_Shockeysville	69
18	Inez-Carters DSL	34
19	Double Church DSL	60
20	Apple Pie - Green Spring DSL	402
21	Cacapon - Hands DSL	13
22	Acorn - Whipporw ill DSL	38
23	Bush - George DSL	22

2020 VATI Grant Proposal Area

Broadband gaps for 2020 Telecommunications grant were identified as areas of relatively high populations in rural Frederick County, VA that show little or no broadband coverage based on Virginia Broadband Maps produced by VITA.

N
W E
S

0 1 2 4 6 8 Miles

Map Produced By:
Frederick County Dept.
of Information Technology
GIS Division.
Drafted 08/30/2019

COMCAST
324 West Main Street
Charlottesville, VA 22903

September 3, 2019

ATTACHMENT 5. Propagation Map if Wireless Project

Attachment 5 is not applicable to this grant application.

		Proposed Timeline - Comcast / Frederick County Broadband Project														
Task	**Responsible Entity**	**January 2020**	**February**	**March**	**April**	**May**	**June**	**June**	**July**	**August**	**September**	**October**	**November**	**December**	**January 2020**	**February**
VATI project awards announced	VA DHCD															
Finalize grant agreement(s)	Comcast, Frederick County, VA, DHCD															
Project engineering	Comcast, Frederick County															
Obtain permits from VDOT for VDOT right of way	Frederick County, Comcast															
Materials procurement	Comcast															
Construction/installation of fiber	Comcast															
Turn-up, test and database work	Comcast															
Service availability notification to potential customers	Comcast															
Final field inspection	Comcast, Frederick County, VA DHCD															

COMCAST
324 West Main Street
Charlottesville, VA 22903

September 3, 2019

ATTACHMENT 7. Documentation of Relationship Between Applicant and Co-Applicant (formal or informal)

Frederick County supervisors voted to proceed with a VATI application in partnership with Comcast at their meeting on August 14, 2019. The staff of Frederick County coordinated this partnership arrangement with Comcast. Comcast and Frederick County will complete a formal agreement to make review of work and processing of payments as efficient as possible. Comcast anticipates submitting invoices at the mid-point of the project and at project completion.

The partners have agreed in principle on the following responsibilities:

· *Frederick County intends to partner with Comcast as a co-applicant for a VATI grant to extend broadband service to unserved areas of Frederick County.*

· *Frederick County would complete the grant application (with Comcast's assistance); submit the completed application(s) to the Virginia DHCD; and manage the processing of work payments. Because Frederick County will be the funded applicant in the event of award, the county would timely process all VATI related Comcast invoices that applied directly to the approved work plans, design, and statement of work. Any delays in completing the work as planned would be negotiated with DHCD as partners.*

· *Frederick County also would provide services and support for any necessary citizen engagement activities, including but not limited to: processing applications for right of way in a manner consistent with all local, state, and federal law; advocating and describing the benefits of the project to those affected; and working with Comcast and other partner agencies (e.g. VDOT) and private industry (e.g. Dominion Energy) to help coordinate construction and/or pole attachments.*

· *Comcast would provide accurate VATI construction plans; associated material and work invoices to match the construction plans; detailed descriptions of necessary right of way or pole attachments; and timely notice of other needs to Frederick County.*

· *This general agreement proceeds from the notice of VATI award to the completion of the projects.*

A RESOLUTION APPROVING THE FILING OF A GRANT APPLICATION WITH THE VIRGINIA DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT

WHEREAS, Virginia's Department of Housing and Community Development ("DHCD") administers the Virginia Telecommunication Initiative ("VATI") grant program to assist in constructing "last–mile" broadband telecommunications infrastructure in the unserved areas of the Commonwealth. Guidelines for the grant application were posted in June of 2019 and the deadline for applications has been set for 3 September 2019; and

WHEREAS, the program guidelines for grant application require a government entity as the applicant with a qualified and experienced private sector broadband provider as the co-applicant; and

WHEREAS, Comcast Cable has offered, in conjunction with DHCD's Virginia Telecommunication Initiative to extend parts of its system in the Apple Pie Ridge area of the County. This project will bring high speed internet to portions of Apple Pie Ridge and could involve many miles of construction.

NOW, THEREFORE, BE IT RESOLVED, that the Board of Supervisors of the County of Frederick, Virginia, does hereby approve the submittal of a grant application to the Virginia Department of Housing and Community Development to assist in constructing "last–mile" broadband telecommunications infrastructure in the unserved areas of the Commonwealth and authorizes the County Administrator to take such action necessary to file the grant application with DHCD with the co-applicant, Comcast Cable, and execute any necessary agreements with DHCD and Comcast should a grant be awarded.

ADOPTED this 14th day of August, 2019.

VOTE:

Charles S. DeHaven, Jr.	**Aye**	**Gary A. Lofton**	**Aye**
Blaine P. Dunn	**Aye**	**J. Douglas McCarthy**	**Aye**
Judith McCann-Slaughter	**Aye**	**Robert W. Wells**	**Aye**
Shannon G. Trout	**Aye**		

A COPY TESTE:

Kris C. Tierney
Clerk, Board of Supervisors

Resolution No.: 011-19

VATI Announcement Comments

Mr. Varner,
Please accept this email as our complete support for the proposal for bringing reliable, cost effective, internet service to the Apple Pie Ridge area.

We live in Pleasant Valley Farms Subdivision, just off Warm Springs Road. Fast, reliable, affordable internet is a necessity for families providing the best possible education to their children. My wife is enrolled in an online Doctoral program to further her education. Too often, over the years, our children and my wife have become frustrated with internet outages while working online with homework assignments. We pay over $80 per month for the best service we can find, however, this system goes down, mainly during storms, several times per year, often at the worst times. This leaves us with having to drive to areas with internet access so our daughters or my wife can locate internet service to complete their assignments.

Please bring our area into the 21st Century by bringing this long overdue service to our area.

Mr Varner,

I live in Apple Pie Meadows, a community of 30 houses just north of Whitehall road. Can you tell me if our neighborhood will be included in the grant proposal? If not is there a way for us to apply?

We have struggled with slow Internet for years and, quite frankly, as FCPS issues chromebooks for each student, my kids have a hard time doing homework at Home. We often have to drive to McDs or Handimart to do homework.

Scott Varner,

Thanks for your work on the High Speed Internet Grant. I am curious if it will extend to my residence at 395 Enchanting Drive, Winchester, VA. The article in the Winchester Star indicated it would be in our area. We were planning to sell our home and the lack of good internet service was one of reasons for our decision to sell. If high speed internet is a future possibility, I might be able to avoid moving. Let me know if I can be of any assistance with this project.

Mr. Varner,

My wife and I live on Apple Pie Ridge Road, north of Songbird Lane and south of White Hall. (See address below.)

We desperately need high speed internet. Please count us as supporters of the county's efforts to secure high speed internet in our area.

If we can help in any way, don't hesitate to contact us.

Hello Scott,

I live at 3355 Apple Pie Ridge Rd with 5 children at home. As long as you get the cable up to me, I will be overjoyed at this expansion. You cannot imagine (maybe you can) sharing the internet with 4 teenage girls and a 10 year old is like.

Hi,

I live at 340 Greenspring Dr. and I desperately need high-speed Internet. I work out of my home.

Additionally, I have a son who visits and has to leave our home to use high speed Internet at the walking mall and it would be fabulous if he did not have to do that.

Anything you could do to assist with getting Greenspring Estates access to high-speed Internet would be most appreciated!

Would love to have broadband communications after living here for 23-years and limited options and little to no cell phone services. Our subdivision has 17-homes that I'm almost certain would be interested in another option of faster broadband services.

Dear Mr. Varner,

Please include our neighborhood in the Greenspring Road area high speed internet extension. My next-door neighbor has 11 children, and I run a business out of my house. High speed Internet would benefit us immensely.

Hello Mr. Varner,

We are a family with 10 kids, 3 at James Wood High, and 4 at Sacred Heart. As I am sure you are aware, the need for high speed internet has become almost mandatory for students in school these days. It seems every year more and more of their work, assignments, projects, etc are done online.

We saw the article in the Winchester Star that mentioned Green Spring Road, but not specifically Green Spring Estates, which is our location, 150 Greenspring Dr, Winchester, VA 22603.

Hopefully this information will help with the addition of our neighborhood to the plan to bring high-speed internet to our area. I know there are many other families with children who would love if this came to our area.

Hello again Scott Varner,

I was so pleased to read in yesterday's *Winchester Star* that the county is seeking a grant to expand broadband "in the Apple Pie Ridge area." That's my area, BUT are you stopping the service at Mara

Road, which is what the article implies? That excludes me, and my neighbors. Mara Road is just up the road, maybe one-quarter mile. Please consider applying to expand the service all the way to the West Virginia line. Can you let me know if that is a possibility, and if not, why? It's agonizing to think we would be so close but still have no benefits.

Scott Varner,

I am a resident in Green Spring Estates off of Green Spring Rd. My address is 155 Green Spring Ct. I have heard that the county is seeking a grant to expand broadband in the Apple Pie Ridge area. If the grant is awarded please consider Green Springs Estates as an area to expand high speed Internet.

We have two children in elementary school and as they rise in their education level it is getting harder to get by with spotty AT&T wireless internet. My wife and I do have concerns of our children not having access to the internet for their education.

I also feel that our property values are effective due to the lack of access to Internet. With high speed Internet access our property values would increase.

I read that AT&T has launched their last satellite and will be phasing out Directv dishes. They are moving towards internet streaming tv service. Currently we can not stream tv at our location with their wireless service. They may change their tower to 5G in the future but we live to far from the tower to receive a 5G signal. Therefore if AT&T phases out Directv we will only have Dish as an option. This would put Dish into the position of having an monopoly for all rural areas. Competition is always better for the consumer.

As years past high speed Internet is almost as important as electricity. It is getting harder to get by with limited options. If the county is awarded a grant, please consider Green Spring Estates as an area to expand high speed Internet.

As residents of Green Spring Estates, We are requesting high speed Internet to come to our subdivision. We take online classes and sometimes work from home. Securing a strong and consistent signal is always questionable at best.

Mr. Varner,

My community is Frog Hollow Estates located off of Frog Hollow Rd. We suffer from poor internet speeds and connectivity, have no options for improvement, and it is extremely expensive. We would welcome the opportunity for better, more reliable, and less costly broadband. We are hopeful that this grant will be awarded and that this community will be included.

I was excited to read about your decision to apply for a grant to expand broadband in the Apple Pie region of Frederick County.

I recently built a house on Howard's Chapel Road and was dismayed to find out that my only option for internet access was through a satellite provider. My experience with this service has been less than desirable with speeds often dropping below 1 mbps. Fortunately, my children are grown but for other families, I'm not sure how they manage since evenings are when the speeds are the slowest. However, I do work from home and having this limited of internet service presents challenges.

If there is anything I can do to help with this, please let me know. I just moved to the area in November and would be pleased to assist in any way possible.

Good morning,

We live on Cottonwood Drive, one of the scheduled streets to be served by the proposed new service. We are fully in favor of the project.

We moved from the Philadelphia area (a COMCAST and FIOS rich environment) ten years ago and found ourselves returning to the 19th century in terms of internet access and speeds of delivery (up and down). COMCAST would be a breath of fresh air. Both my wife and I work from home and an upgrade will be most beneficial.

If you need further information or statements, please let us know.

I read in the Winchester Star about the proposed grant application and extending Comcast in the Welltown Pike area. It said that the extension would go to Cedar Hill. Is there any thoughts for it to go a bit farther? We live on Briarwood Lane which is very close to Cedar Hill. Our internet options here are limited.

Mr. Varner,

I am a resident of the Cottonwood neighborhood off of Apple Pie Ridge Road. I read with great interest the recent article in the Winchester Star concerning the possibility of the expansion of high speed internet to our area. I wholeheartedly support the expansion of the service to our area and if it becomes a reality my three school age children will be forever grateful.

Good morning

I live off of Apple Pie Ridge Road, in the Cottonwood community, and i'm so excited about this project. Our internet and phone access is very poor and hinders my chances of teleworking. I certainly hope we get the project moving and get high speed internet; it would for sure improves our lives in this beautiful community.

Thank you for leading this effort

Mr. Varner,

This is great news that we possibly could get more funding to expand our broadband infrastructure outside of with Winchester City limits. I am all for expanding the infrastructure. I recently moved from Lake Holiday (Comcast Serviced) to Miller Rd which is only three minutes from Winchester City limits and we currently do not have broadband services. The Comcast line ends about a mile from my house. I work out of my house and require broadband services. I pay Winchester Wireless $100.00 for 10 mb speed which we never top out at that. I know this funding \ grant is for the Apple Pie Ridge area but is there any plans in the works to come out Cedar Creek Grade to Miller Rd, Tavistock Estates, and Singhass Rd? I know the Comcast line only goes about a mile pass Merrimans Lane on Cedar Creek Garde and also goes down Roundhill Rd near Singhass rd. Please consider this area when funding comes available.

This is wonderful news, although it may not cover the area in which I live. Peeper Lane off of Frog Hollow Road is close to Green Springs and it appears the locations being expanded pass right by us. There are 14 lots, 10 households on Pepper Lane that would be served by this expansion if we were included. We have a number of people on the Lane who work from home who would greatly benefit from this improvement in broadband as well as a number of people who need this access service just to do daily household administrative tasks. It takes so long to upgrade our computers, do our banking and download information, What a wonderful service this would provide.

Please, please, please....include Peeper Lane in this expansion.

Hi I am responding to the tweet you all sent out. When will you all be looking at Shady Creek Rd? It does not have broadband services down our road and it would be nice to have it.

Good evening.

I am please to hear Frederick County is considering submitting a telecommunications grant to for broadband in the Apple Pie Ridge area.

Our student's need to have internet to be able to do their homework and small businesses need to able to serve their customers. I hope Frederick County will pursue this grant opportunity and future grants for Mountain Falls, Star Tannery and other needed areas of the County.

Thank you for trying to get High Speed Internet down the Apple Pie Ridge Rd. Area. We live at 313 White Hall Rd. We are approximately 3 miles from a major highway (interstate 81) and less than a 10 minute drive into town. We have wanted high speed Internet for a long time and feel we are unreasonably far away. We actually have our home for sale presently. A potential buyer set up a visit last week but cancelled when they found out they could not work from home because of the lack of high speed Internet.

So, if we stay or move it will be much appreciated!

Dear Mr. Varner,

I am writing in support of the grant application for expansion of high speed internet into portions of Frederick County, specifically the Apple Pie Ridge area.

My family has lived on Cotton Ridge Road (in Cottonwood subdivision) for the past 28 years and have endured substandard phone line service with such intense back round noise that we had to cancel our service despite multiple attempts to have it repaired by Verizon. Thus, I have no access to land line phone, DSL, cable or fiberoptic connectivity. This has left me with satellite, line of site, or wireless internet options, and I have tried all 3 and none are adequate in this part of the county. My current download speeds with Wave2net are 1.8 MPS and uploads of about the same. I tried multiple satellite options, but none were reliable or sufficiently fast for modern applications. I have applied to every wireless carrier in our area for a high speed wireless "hotspot" module for the home, but my address was always rejected, presumably due to contractual or legislative barriers.

It also happens that this particular neighborhood is poorly positioned in terms of reception for most wireless cell towers such that many of us, myself included, live in a communication vacuum. My internet service is inadequate to support internet phone calling or Virtual Privacy Networks (VPN), so during peak traffic times I cannot communicate with sufficient reliability from my home (since I have no land line), which imperils my family's safety as well as the connectivity of our security system for activating police or fire calls. At times even my ability to respond to my pager or access the electronic health system data base of Winchester Medical Center as an on call physician is compromised, interfering with timely and accurate communication. There are several other physicians, health care providers and first responders who live in this part of Apple Pie Ridge.

Portions of the county that are as or more remote than ours have had high speed cable or fiberoptic internet and TV for many years, and I know that the county has been intent on addressing this for some time.

I am most grateful for your efforts to improve the connectivity of this otherwise lovely and peaceful sector of Frederick County. All of our residents deserve the convenience and safety of reliable access to the web and related communications. Thank you for reading my comments.

Good Morning!

I wanted to reach out in regards to the expanding broadband to Apple Pie Ridge Area Article. We are getting ready to start building a home off of Cedar Grove Road and would love to get broadband to the area. Please let us know if there is something we can do to reach out to Comcast to get it down our driveway, etc. This would be a great improvement to the area!

I also work for United Rentals, so if s trencher or mini excavator is needed to assist with installing underground cables, please let me know and I will see what I can do. Have a great weekend.

To whom it may concern,

The article in the Star got our interest as we live in Cottonwood subdivision. It is imperative that we have a reliable fast internet. I am self employed and use it

every day to conduct business. My wife is in the medical field and needs a reliable way to do her patient charts as well. We would be more than happy to attend meetings or what ever it will take to make this happen.

I saw the Winchester Star article stating high speed internet expanding in the Apple Pie Ridge area. My mother and two daughters both have homes on Sinking Spring Ln in Gore, VA 22637 and have Comcast. Comcast stops right at Gore where they live. We are only five minutes from them on Hollow Rd in Gore, VA and cannot get internet service. Frontier stops at the West Virginia Line. Therefore, we are in a dead zone in between. I tried Winchester Wireless but would lose service every weekend and replaced my router three times so I gave up on that. Can you please please please assist with this??? Are we on the list to get Comcast extended to us as well? Thank you for your time and assistance!!

Mr. Varner,
I read the article in the newspaper in regards to expanding the broadband service in the Apple Pie Ridge service. I was wondering if you could help in the Gore area. I live right off of Parishville Rd, five miles from where Comcast cut off their service in Gore, and three miles from Frontier Internet in WV.
On Parishville Rd the residents, have access to Winchester Wireless. My neighbor across the road had that for a while, but had so many outages that she cancelled it.
I have written to Comcast, to extend their service , but to no avail. I've tried Wave2net, and I have no signal.
Years ago, I came into Frederick County Information Technology and signed a petition to increase the internet in Frederick County. I have two options, satellite or hot spot. I literally live in a dead zone, and I know that my neighbors feel the same way.

Dear Mr. Varner,

As new residents to the beautiful community of 'Cottonwood' along the Apple Pie Ridge to White Hall area, we would like to add our support for including our development/ neighborhood in the broadband expansion plan.

It has been an absolute shock to us that in this day and age we have almost no cell phone coverage not just at our house/ yard but even driving through the neighborhood. This was almost scary being new and given our reliance on emaps via our phones, especially as we try to learn the topography of the area.

We were/ are concerned if any of our elder family member(s) is visiting and if there is any need to reach EMS/ 911 for any kind of emergency and how the lack of signal reception would impact the situation.

As parents of a 6 year old who has been progressively getting her homework and learning through online venues, we feel she is regressing not being able to do so since our move, again hard to convince someone her age that the learning/ lessons are only as good as the network speed enabling the content.

On the safety front again, like any other family, we are trying to ensure we remain connected to our neighbors and community but that is questionable knowing the limitations of what we can do within the current infrastructure. We really hope this issues does not become a deterrent for other families to move into the community because whether we like it or not technology and connectivity is as crucial as good schools, roads etc. and other factors are.

Please include our plea to the list already provided by our area. We are very hopeful that with kind intervention from your office, we might be able to get included in the grant and have yet one more reason to be happy with our move to the community.

To Whom It May Concern:

Expanding Comcast broadband service in the Apple Pie Ridge area is long overdue and very much needed. Adults can have the option of working at home to help eliminate traffic problems. And most importantly, there are a multitude of children in this area who would benefit from the internet service when doing homework that requires research, and even uploading assignments to their school system and teachers. The available internet services are expensive and sporadic, and one has to rely on their cell phone coverage for internet, and that's even if they have cell service. You cannot imagine the frustration of having to drive to a WiFi cafe late at night to finish a school project because the cell service dropped.

I sincerely encourage seeking the grant funding to expand Comcast broadband service in the Apple Pie Ridge area of Frederick County. And when the funding is approved, moving forward quickly to provide this much needed resource. It's something some of us take for granted.....

Thank you.

Hi Scott,

I read with great excitement that broadband internet access might be coming to our area. My road, Frog Hollow, is not listed in the Winchester Star article, but we are very lose to the area discussed and I am hoping we will be included in the grant application.

Thank you,

We support a real need to expand the broadband services. We have lived on White Hall Road, Winchester, VA for fourteen years. During this time, we have used at least 4 different internet services. None of them have been able to provide the speed and service.

A better broadband is needed for the residents to do on line classes for education, and a host of other items that is required from a better internet. This area is also in need of a cable service that is not offered in area at this time. Thank you for your efforts to expand this service.

Hello Mr. Varner,

I am writing in regards to the grant Frederick Co will be submitting to the state for funding broadband access. I read the article in the Winchester Star last week with great excitement after seeing the headline.

My family and I live off Cattail Rd in an area of the county that does not have quality internet access. We love where we live, except for that one major pitfall. Our young kids will be starting school within the next few years, and as they grow I imagine our internet needs will grow as well. But satellite internet is slow and data allowances are limited.

As I said, the article's headline had me excited, but after reading it I was disappointed to find that it appears our part of the county is not included in the grant proposal. We are just next door to the Apple Pie Ridge area that is targeted, which makes it all the more frustrating. It appears that the county is simply prioritizing a wealthier area to receive this funding. Why not shoot for the moon and apply for enough grant money to cover all of the underserved areas of the county? We all deserve access to quality internet service, which in this day and age is really more of a utility than a luxury. Please don't leave us out!

Hi Scott. I live at 3615 Apple Pie Ridge Road. I am hoping that the Comcast coverage will make it to my home with the grant expansion. I currently have Winchester Wireless services. The reliability is inconsistent, at best. I pay $85 per month. I did a speed check and it was 6.99. I had to have a neighbor's tree cut down, at my cost, as it was impeding the signal transfer for the service. This is a temporary fix, as there are many more trees that have the potential to create the same problem. Please let me know if there is anything else you need from me, or that I can do to help with securing Comcast services.

Scott,

We live out in Apple Pie Meadows which is a development of 32 lots about a mile past the White Hall 4 way stop. I was told by a neighbor to email you to get information on what we need to do to try to get Comcast services in our area.

Please let me know.

Hello, My wife talked with Scott Varner this afternoon about the possible grant to expand broadband high speed internet. We live on White Hall Rd and would very much like to have better internet service.

He said something about checking to see what our current internet speed is and include that with our comments.

Can you tell me where I go to check my internet speed? Is this the email I use to leave comments?

Mr Varner. We are residents of Frederick County living off of Apple Pie Ridge on Cottonwood Drive. We have been living with little or no serviceable internet since we moved here 14 years ago. We still have a land line, as sporadic as it is, because we don't have reliable cell or internet service. Our fire alarm system has to be on the land line because it is the only system that is deemed reliable.

The expansion of truly high speed internet to this area is critical for safety, education, and small business. Safety due to no way to contact emergency services by cell unless outside or up on a hill. Reliable internet would allow WiFi calling capability.

Education is obvious due to the rapid use of internet based projects and research by the school system. The lack of reliable and painfully slow internet that is currently available puts students in this area at a real disadvantage. Many of the residents in this area also have small businesses. It is close to impossible to conduct business without making a trip into town to find a reliable and faster internet connection. I can't tell you how many times we have had to travel to a HandiMart or McDonalds in order to conduct online business due to poor or no internet. This is the 21st Century and our part of the Commonwealth is sorely behind in technology.

Thank you for the effort.

Good evening. My name is Vince Lang. I live on Crimson Drive, which is off of Apple Pie Ridge Road in Winchester, VA. Although my family and I have only lived in this home for about 1 year, we previously lived in Gore/Cross Junction area for 11 years. We have lived without internet activity (other than our phones) for this entire time. Although many friends and family can not believe we live in such a "backwards" or "deprived and destitute" community, we have managed to live without the advances of most people across our state and country.

However, our jobs are becoming more heavily dependent on internet connectivity. With not only our society, but our world, becoming more computer driven by the day it is becoming more and more challenging to be a teacher in this county without internet service. I am unable to complete many of the necessary requirements and expectations of my job at home. By this injustice, I then have to spend more time at work and away from my family sending emails, grading online assignments, and completing online modules for certification and professional development. This does not include my wife's job as a therapist, who can't even complete online CEU's for continuing education in her field.

Our children are both in the Frederick County Public School system and they are being held at a huge disadvantage to other children their age without having the ability to become accustomed what the internet can provide. Computer Science and Coding have been a major component in higher level education in the past, but it is currently becoming a component in the elementary and secondary levels. By not providing this county with internet services, we are hindering the growth of all of our children in this area. If a grant is available and internet companies can provide service in the Apple Pie Ridge Road

region (clear out to the WV line) and the county does not partake in the grant to its fullest extent, you are not only hindering the current households to today's technology, but you are impeding the growth of all children and their ability to become productive, competitive members of society.

I would have loved to complete the "speed test" that was sent to us via email to help the county collect data for their grant. However, with no current internet service, that speed would be ZERO seeing how my phone can not even connect as a hot-spot anymore. I would imagine that there are many more in the same boat as my wife and I. With this being said, many people are not able to send you speed test results from a lack of any internet service and would show that the data is worthless for a county that doesn't provide competitive internet services for many of its residents.

Hello

I support the placement of fiber optic line along Apple Pie Ridge Road. I live along Cottonwood dr. At this time we have no reliable WiFi or telephone communication support. Landlines are not well supported with repair or upkeep and WiFi signals are subject to weather (wind and cloud coverage). With the increase in educational on line requirements, we are subjecting students (high school, college and technical training) to negative learning. Many have to drive into McDonald's to get internet support for on line learning! And even more importantly, the need to communicate with emergency services in unreliable. We can't always contact police or fire and rescue in an emergency without having to walk or drive to the end of the driveway or up to Apple Pie Ridge Road. Please support the installation of fiber optic cable along Apple Pie Ridge Road

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Good morning Mr. Varner,

We wanted to express our enthusiasm over the idea that improved internet and cable services may be expanded to our area in Cottonwood Estates along Apple Pie Ridge Road. We currently depend on hot spots via our cellular service to provide internet to work from home and for personal services such as Netflix. We would certainly be interested in being a customer of high speed internet if it were to become available in our area.

Please consider expanding to Cottonwood Estates at the 2500 block of Apple Pie Ridge Road.

My neighbor, Bob Grogg, gave me copies of the emails concerning Broadband Connection. I tried to take the speed test on my phone which is my primary connection to the Internet but there is a charge to download the app and the App Store would not allow me to download it because it would not update the expiration date of my credit card. My connection through my phone is rather quick but my connection through the hot spot on my mobile phone to my iPad is very slow if it happens at all. And staying connected is also difficult.

My internet connection and mobile phone through Consumer Cellular. My address is 115 Tuscarora Rd., Winchester. Our house faces Apple Pie Ridge Rd. I am hoping you are successful in the grant to extend broadband connection and hope we can be included.

COMCAST
324 West Main Street
Charlottesville, VA 22903

September 3, 2019

Kris C. Tierney
Frederick County Administrator
107 North Kent Street
Winchester, VA 22601

Dear Mr. Tierney:

The purpose of this letter is to provide documentation regarding the in-kind contributions for the projects proposed to the Virginia Telecommunication Initiative ("VATI") program.

The proposed project represents a partnership between Comcast and Frederick County. As indicated in the application, Comcast will provide approximately 25% of the projected construction costs of $1,329,561, totaling approximately $332,391. Frederick County will assist in providing in-kind contributions including application analysis and preparation, coordination with the Department of Housing and Community Development, assistance with right of way permitting, and participating in further concert with Comcast as the project is approved and construction begins. The value of these services will depend on the level of activity occurring as the project commences.

Should you have any questions regarding the information listed above, please do not hesitate to contact me.

Sincerely,

Nathan Daugherty
Sr. Manager, Government Affairs & Regulatory Affairs

Comcast / Frederick County Broadband Project - Development Funding Sources			
Source (e.g., HUD)	Amount	Status	Documentation Included
Comcast	$332,390	☒ committed ☐ pending	☒ Yes ☐ No
DHCD	$997,171	☐ committed ☒ pending	☐ Yes ☒ No
		☐ committed ☐ pending	☐ Yes ☐ No
		☐ committed ☐ pending	☐ Yes ☐ No
		☐ committed ☐ pending	☐ Yes ☐ No
Operating Funding Sources			
Source (e.g., HUD)	Amount	Status	Documentation Included
n/a		☐ committed ☐ pending	☐ Yes ☐ No
		☐ committed ☐ pending	☐ Yes ☐ No
		☐ committed ☐ pending	☐ Yes ☐ No
		☐ committed ☐ pending	☐ Yes ☐ No
		☐ committed ☐ pending	☐ Yes ☐ No

Comcast/Frederick

County VATI Derivation of Costs

Product	Total	VATI	Non-VATI	Source of Estimate	Date
Apple Pie Ridge Project					
Construction					
Broadband Construction - 17.4 miles	$1,329,561	$997,171	$332,390	Comcast survey	9/3/2019

COMCAST
324 West Main Street
Charlottesville, VA 22903

September 3, 2019

Kris C. Tierney
Frederick County Administrator
107 North Kent Street
Winchester, VA 22601

Dear Mr. Tierney:

The purpose of this letter is to provide information supporting the construction costs for the Apple Pie Ridge project proposed to the Virginia Telecommunications Initiative ("VATI") program.

The Apple Pie Ridge project consists of extending Comcast infrastructure from existing facilities into the area north of Apple Pie Ridge Road and Songbird Lane, Cottonwood Drive and its secondary streets, Ashland Drive and Hannah Court, portions of Old Baltimore Road, Lavender Hills Lane and Bronze Manor Court, portions of Green Springs Road and its secondary streets, Warm Springs Road and its secondary streets, White Hall Road to Cedar Hill Road and its secondary streets, and Mara Lane.

The total build is estimated to be 21.7 miles of infrastructure and laterals. Estimated budget costs for construction are:

Materials:	$319,095
Labor:	$930,693
Project Management:	$79,774
Total cost:	$1,329,561

Examples of items that are included in the Materials category are power supplies, fiber, conduit, splice enclosures, pedestals, and taps. Examples of items in the Labor category are in-house and contract labor to trench and backfill, lay conduct and fiber, perform administration of VDOT permits, and provide crew supervision. The itemized breakdown of construction costs is confidential and proprietary information.

Should you have any questions regarding the information listed above, please do not hesitate to contact Nathan Daugherty at nathan_daugherty@comcast.com or 434-238-0729.

Sincerely,

Tom Yates
Senior Director, Construction

COMCAST
324 West Main Street
Charlottesville, VA 22903

September 3, 2019

Kris C. Tierney
Frederick County Administrator
107 North Kent Street
Winchester, VA 22601

Dear Mr. Tierney:

The purpose of this letter is to provide information supporting documentation for cost estimates for the Apple Pie Ridge project proposed to the Virginia Telecommunications Initiative ("VATI") program.

Comcast's Construction and Design team managed projects that added thousands of miles to Comcast's regional hybrid fiber coaxial network in 2017-18. Comcast's construction estimates are determined through a detailed project analysis that includes a field survey, an analysis of permitting costs (internal or external), a network impact study to determine necessary hub site preparation and possible infrastructure requirements, and a financial evaluation for overall build costs and likely return-on-investment. When contract labor is utilized, costs are accrued according to the fee schedule in the contract. This design and construction process is standard within the telecommunications industry.

The precise amount to be spent on contract labor versus in house resources will be determined when the grant is approved and the work commences. The allocation of work will depend on the level of construction activity at that time. Any contracted engineering and design work outlined in this proposal will be performed by Comcast approved contractors.

Should you have any questions regarding the information listed above, please do not hesitate to contact Nathan Daugherty at nathan_daugherty@comcast.com or 434-238-0729.

Sincerely,

Tom Yates
Senior Director, Construction

COMCAST
324 West Main Street
Charlottesville, VA 22903

September 3, 2019

Kris C. Tierney
Frederick County Administrator
107 North Kent Street
Winchester, VA 22601

Dear Mr. Tierney:

The purpose of this letter is to provide information regarding the two most recent Form 477 submissions by Comcast to the Federal Communications Commission. Data from these submissions can be located at https://www.fcc.gov/general/broadband-deployment-data-fcc-form-477. Summaries of each are attached to this letter.

Should you have any questions regarding the information listed above, please do not hesitate to contact me.

Sincerely,

Nathan Daugherty
Sr. Manager, Government Affairs & Regulatory Affairs

Federal Communications Commission

(RETAIN FOR YOUR RECORDS)
Form 477 Filing Summary

FRN: **0003768165** | Data as of: **Dec 31, 2018** | Operations: **Non-ILEC** | Submission Status: **Original - Submitted** | Last Updated: **Mar 6, 2019 11:43:12**

Filer Identification

Section	Question	Response
Filer Information	Company Name	COMCAST CABLE COMMUNICATIONS, LLC
	Holding Company Name	Comcast Corporation
	SAC ID	
	499 ID	812736, 820956, 822102, 823798, 825948, 827142, 832043
Data Contact Information	Data Contact Name	Joanne Horstmann
	Data Contact Phone Number	(610) 665-2546
	Data Contact E-mail	joanne_horstmann@cable.comcast.com
Emergency Operations Contact Information	Emergency Operations Name	Edge Services Desk
	Emergency Operations Phone Number	(800) 777-9824
	Emergency Operations E-mail	CNOC_Voice_EventMgmt@cable.comcast.com
Certifying Official Contact Information	Certifying Official Name	Julie Laine
	Certifying Official Phone Number	(215) 286-2334
	Certifying Official E-mail	Julie_Laine@comcast.com

Data Submitted

Form Section	File Name	Date & Time	Number of Rows
Fixed Broadband Deployment	55.csv	Mar 6, 2019 10:24:06	1644
	54.csv	Mar 6, 2019 10:23:04	15801
	53.csv	Mar 6, 2019 10:21:53	74667
	51.csv	Mar 6, 2019 10:20:41	60837
	50.csv	Mar 6, 2019 10:19:16	10630
	49.csv	Mar 6, 2019 10:17:20	30370
	48.csv	Mar 6, 2019 10:15:57	65358
	47.csv	Mar 6, 2019 10:14:18	63236
	36.csv	Mar 6, 2019 10:13:14	1698
	35.csv	Mar 6, 2019 10:13:14	22660

Form Section	File Name	Date & Time	Number of Rows
	34.csv	Mar 6, 2019 10:13:14	77336
	33.csv	Mar 6, 2019 10:13:14	17064
	29.csv	Mar 6, 2019 10:13:14	5377
	28.csv	Mar 6, 2019 10:13:13	20394
	27.csv	Mar 6, 2019 10:13:13	34274
	26.csv	Mar 6, 2019 10:13:13	97886
	25.csv	Mar 6, 2019 10:13:13	86271
	24.csv	Mar 6, 2019 10:13:13	68768
	23.csv	Mar 6, 2019 10:13:13	2159
	22.csv	Mar 6, 2019 10:13:13	10354
	21.csv	Mar 6, 2019 10:13:13	5740
	45.csv	Mar 6, 2019 10:07:30	13212
	42.csv	Mar 6, 2019 10:05:43	180886
	20.csv	Mar 6, 2019 10:04:30	1423
	18.csv	Mar 6, 2019 10:04:29	89717
	17.csv	Mar 6, 2019 10:04:29	174924
	16.csv	Mar 6, 2019 10:04:29	47
	13.csv	Mar 6, 2019 10:04:29	67676
	12.csv	Mar 6, 2019 10:04:29	156513
	11.csv	Mar 6, 2019 10:04:29	5073
	10.csv	Mar 6, 2019 10:02:31	13840
	09.csv	Mar 6, 2019 10:02:31	25089
	08.csv	Mar 6, 2019 10:02:31	62692
	06.csv	Mar 6, 2019 10:02:31	138878
	05.csv	Mar 6, 2019 10:02:31	8454
	04.csv	Mar 6, 2019 10:02:31	3940
	01.csv	Mar 6, 2019 10:02:31	21183
	41.csv	Mar 6, 2019 10:01:33	38072
	39.csv	Mar 6, 2019 10:00:45	5871
	37.csv	Mar 6, 2019 09:59:48	144
Fixed Broadband Subscription	53.csv	Feb 27, 2019 15:17:24	21083
	48.csv	Feb 27, 2019 15:17:24	20216
	55.csv	Feb 27, 2019 15:09:11	400

Form Section	File Name	Date & Time	Number of Rows
	54.csv	Feb 27, 2019 15:09:11	2893
	51.csv	Feb 27, 2019 15:09:11	15993
	50.csv	Feb 27, 2019 15:09:11	2451
	49.csv	Feb 27, 2019 15:09:10	9308
	47.csv	Feb 27, 2019 15:09:10	16888
	45.csv	Feb 27, 2019 15:06:12	2691
	42.csv	Feb 27, 2019 15:06:12	41012
	41.csv	Feb 27, 2019 15:06:12	9478
	25.csv	Feb 27, 2019 15:05:24	22956
	39.csv	Feb 27, 2019 15:04:45	944
	37.csv	Feb 27, 2019 15:02:15	35
	18.csv	Feb 27, 2019 14:56:48	17567
	17.csv	Feb 27, 2019 14:56:48	42931
	16.csv	Feb 27, 2019 14:56:48	10
	13.csv	Feb 27, 2019 14:56:48	20865
	12.csv	Feb 27, 2019 14:56:48	40656
	11.csv	Feb 27, 2019 14:56:48	3020
	36.csv	Feb 27, 2019 14:52:24	421
	35.csv	Feb 27, 2019 14:52:24	5186
	34.csv	Feb 27, 2019 14:52:24	20079
	33.csv	Feb 27, 2019 14:52:24	3985
	29.csv	Feb 27, 2019 14:52:24	1464
	28.csv	Feb 27, 2019 14:52:24	4051
	27.csv	Feb 27, 2019 14:52:23	11901
	10.csv	Feb 27, 2019 14:50:04	3458
	09.csv	Feb 27, 2019 14:50:03	8020
	08.csv	Feb 27, 2019 14:50:03	18759
	06.csv	Feb 27, 2019 14:50:03	48079
	05.csv	Feb 27, 2019 14:50:03	1896
	04.csv	Feb 27, 2019 14:50:03	1657
	01.csv	Feb 27, 2019 14:50:03	4314
	26.csv	Feb 27, 2019 14:46:25	30211
	24.csv	Feb 27, 2019 14:46:24	21378

Form Section	File Name	Date & Time	Number of Rows
	23.csv	Feb 27, 2019 14:46:24	436
	22.csv	Feb 27, 2019 14:46:24	2195
	21.csv	Feb 27, 2019 14:46:24	947
	20.csv	Feb 27, 2019 14:46:24	537
Fixed Voice Subscription	48.csv	Feb 27, 2019 14:31:10	1190
	37.csv	Feb 27, 2019 14:31:10	36
	55.csv	Feb 27, 2019 14:21:01	44
	54.csv	Feb 27, 2019 14:21:01	227
	53.csv	Feb 27, 2019 14:21:01	1164
	51.csv	Feb 27, 2019 14:21:01	1069
	50.csv	Feb 27, 2019 14:21:01	162
	49.csv	Feb 27, 2019 14:21:01	508
	47.csv	Feb 27, 2019 14:21:01	993
	45.csv	Feb 27, 2019 14:21:01	180
	42.csv	Feb 27, 2019 14:21:01	2559
	41.csv	Feb 27, 2019 14:21:01	541
	39.csv	Feb 27, 2019 14:21:00	81
	36.csv	Feb 27, 2019 14:21:00	65
	35.csv	Feb 27, 2019 14:21:00	329
	34.csv	Feb 27, 2019 14:21:00	1303
	33.csv	Feb 27, 2019 14:21:00	249
	29.csv	Feb 27, 2019 14:21:00	109
	28.csv	Feb 27, 2019 14:21:00	277
	27.csv	Feb 27, 2019 14:21:00	667
	26.csv	Feb 27, 2019 14:21:00	1991
	25.csv	Feb 27, 2019 14:21:00	1315
	24.csv	Feb 27, 2019 14:13:03	1316
	23.csv	Feb 27, 2019 14:13:03	54
	22.csv	Feb 27, 2019 14:13:03	154
	21.csv	Feb 27, 2019 14:13:03	94
	20.csv	Feb 27, 2019 14:13:03	38
	18.csv	Feb 27, 2019 14:13:03	1090
	17.csv	Feb 27, 2019 14:13:03	2502

Form Section	File Name	Date & Time	Number of Rows
	16.csv	Feb 27, 2019 14:13:03	3
	13.csv	Feb 27, 2019 14:13:03	1240
	12.csv	Feb 27, 2019 14:13:03	2541
	11.csv	Feb 27, 2019 14:13:03	179
	10.csv	Feb 27, 2019 14:08:19	202
	09.csv	Feb 27, 2019 14:08:19	504
	08.csv	Feb 27, 2019 14:08:19	1044
	06.csv	Feb 27, 2019 14:08:19	2865
	05.csv	Feb 27, 2019 14:08:19	133
	04.csv	Feb 27, 2019 14:08:19	132
	01.csv	Feb 27, 2019 14:08:19	305

Fixed Broadband Deployment

Census Block Counts by State, DBA Name and Technology

State	DBA Name	Technology	Blocks
Alabama	Comcast	Cable Modem – DOCSIS 3.0	5146
		Cable Modem – DOCSIS 3.1	16037
Arizona	Comcast	Cable Modem – DOCSIS 3.1	3940
Arkansas	Comcast	Cable Modem – DOCSIS 3.0	17
		Cable Modem – DOCSIS 3.1	8437
California	Comcast	Cable Modem – DOCSIS 3.0	804
		Cable Modem – DOCSIS 3.1	138051
		Optical Carrier/Fiber to the End User	23
Colorado	Comcast	Cable Modem – DOCSIS 3.0	282
		Cable Modem – DOCSIS 3.1	62406
		Optical Carrier/Fiber to the End User	4
Connecticut	Comcast	Cable Modem – DOCSIS 3.0	4426
		Cable Modem – DOCSIS 3.1	20662
		Optical Carrier/Fiber to the End User	1
Delaware	Comcast	Cable Modem – DOCSIS 3.0	599
		Cable Modem – DOCSIS 3.1	13240
		Optical Carrier/Fiber to the End User	1
District of Columbia	Comcast	Cable Modem – DOCSIS 3.0	170

State	DBA Name	Technology	Blocks
		Cable Modem – DOCSIS 3.1	4902
		Optical Carrier/Fiber to the End User	1
Florida	Comcast	Cable Modem – DOCSIS 3.0	10119
		Cable Modem – DOCSIS 3.1	146390
		Optical Carrier/Fiber to the End User	4
Georgia	Comcast	Cable Modem – DOCSIS 3.0	10945
		Cable Modem – DOCSIS 3.1	56728
		Optical Carrier/Fiber to the End User	3
Idaho	Comcast	Cable Modem – DOCSIS 3.1	47
Illinois	Comcast	Cable Modem – DOCSIS 3.0	743
		Cable Modem – DOCSIS 3.1	174173
		Optical Carrier/Fiber to the End User	8
Indiana	Comcast	Cable Modem – DOCSIS 3.0	3912
		Cable Modem – DOCSIS 3.1	85804
		Optical Carrier/Fiber to the End User	1
Kansas	Comcast	Cable Modem – DOCSIS 3.0	3
		Cable Modem – DOCSIS 3.1	1420
Kentucky	Comcast	Cable Modem – DOCSIS 3.0	5180
		Cable Modem – DOCSIS 3.1	560
Louisiana	Comcast	Cable Modem – DOCSIS 3.0	58
		Cable Modem – DOCSIS 3.1	10296
Maine	Comcast	Cable Modem – DOCSIS 3.0	186
		Cable Modem – DOCSIS 3.1	1973
Maryland	Comcast	Cable Modem – DOCSIS 3.0	5771
		Cable Modem – DOCSIS 3.1	62991
		Optical Carrier/Fiber to the End User	6
Massachusetts	Comcast	Cable Modem – DOCSIS 3.0	3971
		Cable Modem – DOCSIS 3.1	82284
		Optical Carrier/Fiber to the End User	16
Michigan	Comcast	Cable Modem – DOCSIS 3.0	9485
		Cable Modem – DOCSIS 3.1	88399
		Optical Carrier/Fiber to the End User	2
Minnesota	Comcast	Cable Modem – DOCSIS 3.0	28

State	DBA Name	Technology	Blocks
		Cable Modem – DOCSIS 3.1	34244
		Optical Carrier/Fiber to the End User	2
Mississippi	Comcast	Cable Modem – DOCSIS 3.0	7447
		Cable Modem – DOCSIS 3.1	12947
Missouri	Comcast	Cable Modem – DOCSIS 3.0	1
		Cable Modem – DOCSIS 3.1	5376
New Hampshire	Comcast	Cable Modem – DOCSIS 3.0	653
		Cable Modem – DOCSIS 3.1	16402
		Optical Carrier/Fiber to the End User	9
New Jersey	Comcast	Cable Modem – DOCSIS 3.0	4213
		Cable Modem – DOCSIS 3.1	73118
		Optical Carrier/Fiber to the End User	5
New Mexico	Comcast	Cable Modem – DOCSIS 3.0	2669
		Cable Modem – DOCSIS 3.1	19990
		Optical Carrier/Fiber to the End User	1
New York	Comcast	Cable Modem – DOCSIS 3.0	59
		Cable Modem – DOCSIS 3.1	1639
North Carolina	Comcast	Cable Modem – DOCSIS 3.0	9
		Cable Modem – DOCSIS 3.1	135
Ohio	Comcast	Cable Modem – DOCSIS 3.0	349
		Cable Modem – DOCSIS 3.1	5522
Oregon	Comcast	Cable Modem – DOCSIS 3.0	42
		Cable Modem – DOCSIS 3.1	38021
		Optical Carrier/Fiber to the End User	9
Pennsylvania	Comcast	Cable Modem – DOCSIS 3.0	9989
		Cable Modem – DOCSIS 3.1	170885
		Optical Carrier/Fiber to the End User	12
South Carolina	Comcast	Cable Modem – DOCSIS 3.0	3174
		Cable Modem – DOCSIS 3.1	10038
Tennessee	Comcast	Cable Modem – DOCSIS 3.0	10094
		Cable Modem – DOCSIS 3.1	53135
		Optical Carrier/Fiber to the End User	7
Texas	Comcast	Cable Modem – DOCSIS 3.0	311

State	DBA Name	Technology	Blocks
		Cable Modem – DOCSIS 3.1	65036
		Optical Carrier/Fiber to the End User	11
Utah	Comcast	Cable Modem – DOCSIS 3.0	78
		Cable Modem – DOCSIS 3.1	30291
		Optical Carrier/Fiber to the End User	1
Vermont	Comcast	Cable Modem – DOCSIS 3.0	504
		Cable Modem – DOCSIS 3.1	10126
Virginia	Comcast	Cable Modem – DOCSIS 3.0	12438
		Cable Modem – DOCSIS 3.1	48395
		Optical Carrier/Fiber to the End User	4
Washington	Comcast	Cable Modem – DOCSIS 3.0	63
		Cable Modem – DOCSIS 3.1	74596
		Optical Carrier/Fiber to the End User	8
West Virginia	Comcast	Cable Modem – DOCSIS 3.0	3797
		Cable Modem – DOCSIS 3.1	12003
		Optical Carrier/Fiber to the End User	1
Wisconsin	Comcast	Cable Modem – DOCSIS 3.1	1644
Total			**1780158**

Fixed Broadband Subscription

Fixed Broadband Subscriptions by State, Technology and End-user Type

State	Technology	Census Tracts	Subscriptions		
			Consumer	Business / Govt	Total
Alabama	Cable Modem	4314	138114	16408	154522
Arizona	Cable Modem	1657	93468	3536	97004
Arkansas	Cable Modem	1896	58726	8285	67011
California	Cable Modem	48058	2746541	197417	2943958
	Optical Carrier/Fiber to the End User	21	25	0	25
Colorado	Cable Modem	18755	1144523	82087	1226610
	Optical Carrier/Fiber to the End User	4	4	0	4
Connecticut	Cable Modem	8019	458982	41003	499985
	Optical Carrier/Fiber to the End User	1	1	0	1
Delaware	Cable Modem	3457	190265	16048	206313
	Optical Carrier/Fiber to the End User	1	1	0	1

State	Technology	Census Tracts	Subscriptions		
			Consumer	Business / Govt	Total
District of Columbia	Cable Modem	3019	132236	14999	147235
	Optical Carrier/Fiber to the End User	1	1	0	1
Florida	Cable Modem	40652	2390180	230652	2620832
	Optical Carrier/Fiber to the End User	4	4	0	4
Georgia	Cable Modem	20862	1153484	110101	1263585
	Optical Carrier/Fiber to the End User	3	3	0	3
Idaho	Cable Modem	10	106	6	112
Illinois	Cable Modem	42923	2066959	166984	2233943
	Optical Carrier/Fiber to the End User	8	8	0	8
Indiana	Cable Modem	17566	770802	63498	834300
	Optical Carrier/Fiber to the End User	1	1	0	1
Kansas	Cable Modem	537	15347	1406	16753
Kentucky	Cable Modem	947	44970	3947	48917
Louisiana	Cable Modem	2195	86901	9466	96367
Maine	Cable Modem	436	32938	2130	35068
Maryland	Cable Modem	21372	918093	82782	1000875
	Optical Carrier/Fiber to the End User	6	6	0	6
Massachusetts	Cable Modem	22942	1460260	121246	1581506
	Optical Carrier/Fiber to the End User	14	16	0	16
Michigan	Cable Modem	30209	1259656	103579	1363235
	Optical Carrier/Fiber to the End User	2	2	0	2
Minnesota	Cable Modem	11899	625487	48546	674033
	Optical Carrier/Fiber to the End User	2	2	0	2
Mississippi	Cable Modem	4051	162307	18765	181072
Missouri	Cable Modem	1464	67900	4217	72117
New Hampshire	Cable Modem	3977	309360	24754	334114
	Optical Carrier/Fiber to the End User	8	9	0	9
New Jersey	Cable Modem	20074	1093491	86031	1179522
	Optical Carrier/Fiber to the End User	5	5	0	5
New Mexico	Cable Modem	5185	233112	19277	252389
	Optical Carrier/Fiber to the End User	1	1	0	1
New York	Cable Modem	421	21243	1570	22813

State	Technology	Census Tracts	Subscriptions		
			Consumer	Business / Govt	Total
North Carolina	Cable Modem	35	556	66	622
Ohio	Cable Modem	944	36327	3270	39597
Oregon	Cable Modem	9469	630789	54424	685213
	Optical Carrier/Fiber to the End User	9	9	0	9
Pennsylvania	Cable Modem	41000	1885330	165682	2051012
	Optical Carrier/Fiber to the End User	12	12	0	12
South Carolina	Cable Modem	2691	125678	12367	138045
Tennessee	Cable Modem	16881	708301	72129	780430
	Optical Carrier/Fiber to the End User	7	7	0	7
Texas	Cable Modem	20205	981666	104864	1086530
	Optical Carrier/Fiber to the End User	11	11	0	11
Utah	Cable Modem	9307	436762	34456	471218
	Optical Carrier/Fiber to the End User	1	1	0	1
Vermont	Cable Modem	2451	122143	11936	134079
Virginia	Cable Modem	15989	756338	69285	825623
	Optical Carrier/Fiber to the End User	4	4	0	4
Washington	Cable Modem	21075	1501401	99943	1601344
	Optical Carrier/Fiber to the End User	8	8	0	8
West Virginia	Cable Modem	2892	139666	10325	149991
	Optical Carrier/Fiber to the End User	1	1	0	1
Wisconsin	Cable Modem	400	19322	1691	21013
Total		**480371**	**25019872**	**2119178**	**27139050**

Fixed Broadband Subscriptions by Bandwidths and End-user Type

Downstream Bandwidth (in Mbps)	Upstream Bandwidth (in Mbps)	Consumer	Business / Govt	Total
3.000	0.770	226867	7426	234293
5.000	1.000	3813	0	3813
6.000	1.000	0	2350	2350
7.000	1.000	0	4711	4711
8.000	2.000	1855	0	1855
10.000	2.000	611	0	611
15.000	2.000	1088418	0	1088418
16.000	2.000	2770	9788	12558

Downstream Bandwidth (in Mbps)	Upstream Bandwidth (in Mbps)	Consumer	Business / Govt	Total
19.000	4.000	518	0	518
20.000	1.000	135043	0	135043
22.000	5.000	0	42895	42895
25.000	2.000	621920	0	621920
25.000	4.000	65	0	65
25.000	5.000	4960	541468	546428
25.000	10.000	0	187524	187524
27.000	7.000	0	33294	33294
50.000	5.000	3842	0	3842
50.000	10.000	1734	493055	494789
55.000	5.000	16	0	16
60.000	5.000	3712149	0	3712149
70.000	5.000	165642	0	165642
75.000	5.000	133153	0	133153
75.000	10.000	404	0	404
75.000	15.000	6	342257	342263
100.000	5.000	185305	0	185305
100.000	10.000	280320	3501	283821
100.000	20.000	0	104812	104812
105.000	10.000	113048	0	113048
105.000	20.000	188808	0	188808
150.000	5.000	5104672	0	5104672
150.000	10.000	5091950	0	5091950
150.000	15.000	27297	0	27297
150.000	20.000	100328	239069	339397
200.000	10.000	882	0	882
205.000	20.000	10	0	10
250.000	10.000	4561845	0	4561845
250.000	20.000	1131801	0	1131801
250.000	25.000	80771	1465	82236
300.000	25.000	66419	46890	113309
400.000	10.000	1507553	0	1507553
500.000	35.000	0	5360	5360

Downstream Bandwidth (in Mbps)	Upstream Bandwidth (in Mbps)	Consumer	Business / Govt	Total
986.500	35.000	474935	10361	485296
1000.000	1000.000	0	42952	42952
2000.000	2000.000	142	0	142
Total		**25019872**	**2119178**	**27139050**

Fixed Broadband Subscriptions by Technology, Bandwidths and End-user Type

Technology	Downstream Bandwidth (in Mbps)	Upstream Bandwidth (in Mbps)	Consumer	Business / Govt	Total
Cable Modem	3.000	0.770	226867	7426	234293
	5.000	1.000	3813	0	3813
	6.000	1.000	0	2350	2350
	7.000	1.000	0	4711	4711
	8.000	2.000	1855	0	1855
	10.000	2.000	611	0	611
	15.000	2.000	1088418	0	1088418
	16.000	2.000	2770	9788	12558
	19.000	4.000	518	0	518
	20.000	1.000	135043	0	135043
	22.000	5.000	0	42895	42895
	25.000	2.000	621920	0	621920
	25.000	4.000	65	0	65
	25.000	5.000	4960	541468	546428
	25.000	10.000	0	187524	187524
	27.000	7.000	0	33294	33294
	50.000	5.000	3842	0	3842
	50.000	10.000	1734	493055	494789
	55.000	5.000	16	0	16
	60.000	5.000	3712149	0	3712149
	70.000	5.000	165642	0	165642
	75.000	5.000	133153	0	133153
	75.000	10.000	404	0	404
	75.000	15.000	6	342257	342263
	100.000	5.000	185305	0	185305
	100.000	10.000	280320	3501	283821

Technology	Downstream Bandwidth (in Mbps)	Upstream Bandwidth (in Mbps)	Consumer	Business / Govt	Total
	100.000	20.000	0	104812	104812
	105.000	10.000	113048	0	113048
	105.000	20.000	188808	0	188808
	150.000	5.000	5104672	0	5104672
	150.000	10.000	5091950	0	5091950
	150.000	15.000	27297	0	27297
	150.000	20.000	100328	239069	339397
	200.000	10.000	882	0	882
	205.000	20.000	10	0	10
	250.000	10.000	4561845	0	4561845
	250.000	20.000	1131801	0	1131801
	250.000	25.000	80771	1465	82236
	300.000	25.000	66419	46890	113309
	400.000	10.000	1507553	0	1507553
	500.000	35.000	0	5360	5360
	986.500	35.000	474935	10361	485296
	1000.000	1000.000	0	42952	42952
Optical Carrier/Fiber to the End User	2000.000	2000.000	142	0	142
Total			**25019872**	**2119178**	**27139050**

Fixed Voice Subscription

VGE Lines and VoIP Subscriptions by State and End-user Type

State	Total VGE Lines	Consumer VGE Lines	Total VoIP Subscriptions	Consumer VoIP Subscriptions
Alabama	0	0	77738	49623
Arizona	0	0	45193	38661
Arkansas	0	0	32366	16635
California	0	0	1391487	998375
Colorado	0	0	573134	405529
Connecticut	0	0	358604	270004
Delaware	0	0	143484	112218
District of Columbia	0	0	73345	46970
Florida	0	0	1311660	860109
Georgia	0	0	613527	405090

State	Total VGE Lines	Consumer VGE Lines	Total VoIP Subscriptions	Consumer VoIP Subscriptions
Idaho	0	0	23	0
Illinois	0	0	1115178	764425
Indiana	0	0	397083	258069
Kansas	0	0	9771	7070
Kentucky	0	0	18866	12653
Louisiana	0	0	39989	27293
Maine	0	0	17031	14522
Maryland	0	0	623518	461779
Massachusetts	0	0	1141075	877862
Michigan	0	0	720546	493601
Minnesota	0	0	314434	224134
Mississippi	0	0	80744	52348
Missouri	0	0	36065	28956
New Hampshire	0	0	235711	185082
New Jersey	0	0	871338	699182
New Mexico	0	0	108245	69086
New York	0	0	19275	16210
North Carolina	0	0	901	0
Ohio	0	0	32142	24401
Oregon	0	0	326726	209211
Pennsylvania	0	0	1440673	1070417
South Carolina	0	0	57876	37988
Tennessee	0	0	358822	228430
Texas	0	0	519376	298825
Utah	0	0	199088	133825
Vermont	0	0	87758	66085
Virginia	0	0	475696	339654
Washington	0	0	771290	565072
West Virginia	0	0	81289	63207
Wisconsin	0	0	8946	5398
Total	**0**	**0**	**14730013**	**10437999**

Fixed Voice Subscription (iVoIP)

Over-the-top VoIP Subscriptions by State and End-user Type

State	Total	Consumer	Business / Govt
Alabama	0	0	0
Arizona	0	0	0
Arkansas	0	0	0
California	0	0	0
Colorado	0	0	0
Connecticut	0	0	0
Delaware	0	0	0
District of Columbia	0	0	0
Florida	0	0	0
Georgia	0	0	0
Idaho	0	0	0
Illinois	0	0	0
Indiana	0	0	0
Kansas	0	0	0
Kentucky	0	0	0
Louisiana	0	0	0
Maine	0	0	0
Maryland	0	0	0
Massachusetts	0	0	0
Michigan	0	0	0
Minnesota	0	0	0
Mississippi	0	0	0
Missouri	0	0	0
New Hampshire	0	0	0
New Jersey	0	0	0
New Mexico	0	0	0
New York	0	0	0
North Carolina	0	0	0
Ohio	0	0	0
Oregon	0	0	0
Pennsylvania	0	0	0
South Carolina	0	0	0

State	Total	Consumer	Business / Govt
Tennessee	0	0	0
Texas	0	0	0
Utah	0	0	0
Vermont	0	0	0
Virginia	0	0	0
Washington	0	0	0
West Virginia	0	0	0
Wisconsin	0	0	0
Total	**0**	**0**	**0**

All other VoIP Subscriptions by State, End-user Type, Bundle and Last-mile Medium

		by End-user Type		by Bundle		by Last-mile Medium			
State	Total	Consumer	Business / Government	Sold w/ Internet	Sold w/o Internet	FTTP	Coax	Fixed Wireless	Copper
Alabama	77738	49623	28115	74640	3098	0	77738	0	0
Arizona	45193	38661	6532	44335	858	0	45193	0	0
Arkansas	32366	16635	15731	31445	921	0	32366	0	0
California	1391487	998375	393112	1368046	23441	0	1391487	0	0
Colorado	573134	405529	167605	557369	15765	0	573134	0	0
Connecticut	358604	270004	88600	349456	9148	0	358604	0	0
Delaware	143484	112218	31266	139670	3814	0	143484	0	0
District of Columbia	73345	46970	26375	71709	1636	0	73345	0	0
Florida	1311660	860109	451551	1268443	43217	0	1311660	0	0
Georgia	613527	405090	208437	598330	15197	0	613527	0	0
Idaho	23	0	23	0	23	0	23	0	0
Illinois	1115178	764425	350753	1086282	28896	0	1115178	0	0
Indiana	397083	258069	139014	383993	13090	0	397083	0	0
Kansas	9771	7070	2701	9527	244	0	9771	0	0
Kentucky	18866	12653	6213	18130	736	0	18866	0	0
Louisiana	39989	27293	12696	38526	1463	0	39989	0	0
Maine	17031	14522	2509	16596	435	0	17031	0	0
Maryland	623518	461779	161739	610507	13011	0	623518	0	0
Massachusetts	1141075	877862	263213	1103637	37438	0	1141075	0	0
Michigan	720546	493601	226945	695291	25255	0	720546	0	0

State	Total	by End-user Type		by Bundle		by Last-mile Medium			
		Consumer	Business / Government	Sold w/ Internet	Sold w/o Internet	FTTP	Coax	Fixed Wireless	Copper
Minnesota	314434	224134	90300	307055	7379	0	314434	0	0
Mississippi	80744	52348	28396	77671	3073	0	80744	0	0
Missouri	36065	28956	7109	35235	830	0	36065	0	0
New Hampshire	235711	185082	50629	227442	8269	0	235711	0	0
New Jersey	871338	699182	172156	851861	19477	0	871338	0	0
New Mexico	108245	69086	39159	105897	2348	0	108245	0	0
New York	19275	16210	3065	18944	331	0	19275	0	0
North Carolina	901	0	901	0	901	0	901	0	0
Ohio	32142	24401	7741	31021	1121	0	32142	0	0
Oregon	326726	209211	117515	317287	9439	0	326726	0	0
Pennsylvania	1440673	1070417	370256	1396659	44014	0	1440673	0	0
South Carolina	57876	37988	19888	55982	1894	0	57876	0	0
Tennessee	358822	228430	130392	347692	11130	0	358822	0	0
Texas	519376	298825	220551	510264	9112	0	519376	0	0
Utah	199088	133825	65263	195140	3948	0	199088	0	0
Vermont	87758	66085	21673	85259	2499	0	87758	0	0
Virginia	475696	339654	136042	464974	10722	0	475696	0	0
Washington	771290	565072	206218	751703	19587	0	771290	0	0
West Virginia	81289	63207	18082	79199	2090	0	81289	0	0
Wisconsin	8946	5398	3548	8470	476	0	8946	0	0
Total	**14730013**	**10437999**	**4292014**	**14333687**	**396326**	**0**	**14730013**	**0**	**0**

Federal Communications Commission

(RETAIN FOR YOUR RECORDS)
Form 477 Filing Summary

FRN: **0003768165** | Data as of: **Jun 30, 2018** | Operations: **Non-ILEC** | Submission Status: **Original - Submitted** | Last Updated: **Aug 30, 2018 17:22:35**

Filer Identification

Section	Question	Response
Filer Information	Provider Name	COMCAST CABLE COMMUNICATIONS, LLC
	Holding Company Name	Comcast Corporation
	SAC ID	
	499 ID	812736, 820956, 822102, 823798, 825948, 827142, 832043
Data Contact Information	Data Contact Name	Joanne Horstmann
	Data Contact Phone Number	(610) 665-2546
	Data Contact E-mail	joanne_horstmann@cable.comcast.com
Emergency Operations Contact Information	Emergency Operations Name	Edge Service Desk
	Emergency Operations Phone Number	(800) 777-9824
	Emergency Operations E-mail	CNOC_Voice_EventMgmt@cable.comcast.com
Certifying Official Contact Information	Certifying Official Name	Julie Laine
	Certifying Official Phone Number	(215) 286-2334
	Certifying Official E-mail	Julie_Laine@comcast.com

Data Submitted

Form Section	File Name	Date & Time	Number of Rows
Fixed Broadband Deployment	36.csv	Aug 30, 2018 11:54:29	1689
	35.csv	Aug 30, 2018 11:54:29	22604
	34.csv	Aug 30, 2018 11:54:29	77078
	33.csv	Aug 29, 2018 16:26:46	16956
	29.csv	Aug 29, 2018 16:26:46	5357
	28.csv	Aug 29, 2018 16:26:46	20774
	27.csv	Aug 29, 2018 16:26:46	34275
	26.csv	Aug 29, 2018 16:26:46	97699
	55.csv	Aug 29, 2018 16:16:53	1639
	54.csv	Aug 29, 2018 16:16:14	15649

Form Section	File Name	Date & Time	Number of Rows
	53.csv	Aug 29, 2018 16:14:47	74580
	51.csv	Aug 29, 2018 16:13:42	60604
	50.csv	Aug 29, 2018 16:12:44	10589
	25.csv	Aug 29, 2018 16:12:11	86160
	23.csv	Aug 29, 2018 16:12:11	2134
	24.csv	Aug 29, 2018 16:12:11	68672
	22.csv	Aug 29, 2018 16:12:11	10354
	21.csv	Aug 29, 2018 16:12:11	5726
	49.csv	Aug 29, 2018 16:12:01	30199
	48.csv	Aug 29, 2018 16:11:25	65094
	47.csv	Aug 29, 2018 16:10:43	63275
	45.csv	Aug 29, 2018 16:10:09	13219
	42.csv	Aug 29, 2018 16:09:39	180414
	41.csv	Aug 29, 2018 16:08:27	38032
	39.csv	Aug 29, 2018 16:06:59	5854
	37.csv	Aug 29, 2018 16:05:52	145
	20.csv	Aug 29, 2018 16:00:36	1424
	18.csv	Aug 29, 2018 16:00:35	89638
	17.csv	Aug 29, 2018 16:00:35	174692
	16.csv	Aug 29, 2018 16:00:35	46
	13.csv	Aug 29, 2018 16:00:35	67489
	12.csv	Aug 29, 2018 15:58:55	156402
	11.csv	Aug 29, 2018 15:58:55	5082
	10.csv	Aug 29, 2018 15:58:55	13811
	09.csv	Aug 29, 2018 15:58:55	24502
	08.csv	Aug 29, 2018 15:58:55	62487
	06.csv	Aug 29, 2018 15:56:24	138664
	05.csv	Aug 29, 2018 15:56:24	8420
	04.csv	Aug 29, 2018 15:56:24	3933
	01.csv	Aug 29, 2018 15:56:24	21193
Fixed Broadband Subscription	53.csv	Aug 30, 2018 17:02:45	21669
	48.csv	Aug 30, 2018 16:55:01	20268
	55.csv	Aug 30, 2018 16:53:45	391

Form Section	File Name	Date & Time	Number of Rows
	54.csv	Aug 30, 2018 16:52:22	2736
	51.csv	Aug 30, 2018 16:50:40	15642
	50.csv	Aug 30, 2018 16:49:47	2449
	36.csv	Aug 30, 2018 16:49:20	395
	35.csv	Aug 30, 2018 16:49:20	5426
	34.csv	Aug 30, 2018 16:49:20	19611
	33.csv	Aug 30, 2018 16:49:20	3986
	29.csv	Aug 30, 2018 16:49:20	1448
	28.csv	Aug 30, 2018 16:49:20	3600
	27.csv	Aug 30, 2018 16:49:20	12341
	49.csv	Aug 30, 2018 16:47:55	9467
	47.csv	Aug 30, 2018 16:46:02	15850
	26.csv	Aug 30, 2018 16:45:15	27178
	24.csv	Aug 30, 2018 16:45:15	20580
	23.csv	Aug 30, 2018 16:45:15	436
	21.csv	Aug 30, 2018 16:45:15	954
	45.csv	Aug 30, 2018 16:44:50	2436
	42.csv	Aug 30, 2018 16:44:01	39940
	37.csv	Aug 30, 2018 16:42:58	34
	05.csv	Aug 30, 2018 16:39:15	1730
	20.csv	Aug 30, 2018 16:37:43	527
	18.csv	Aug 30, 2018 16:37:43	16166
	17.csv	Aug 30, 2018 16:37:43	40534
	13.csv	Aug 30, 2018 16:37:43	19985
	12.csv	Aug 30, 2018 16:37:43	37184
	10.csv	Aug 30, 2018 16:37:42	3333
	08.csv	Aug 30, 2018 16:37:42	19588
	06.csv	Aug 30, 2018 16:37:42	50729
	04.csv	Aug 30, 2018 16:37:42	1776
	01.csv	Aug 30, 2018 16:37:42	3980
	25.csv	Aug 30, 2018 16:19:29	23073
	22.csv	Aug 30, 2018 16:19:29	1963
	41.csv	Aug 30, 2018 16:18:53	9696

Form Section	File Name	Date & Time	Number of Rows
	39.csv	Aug 30, 2018 16:17:50	865
	16.csv	Aug 30, 2018 16:16:50	10
	11.csv	Aug 30, 2018 16:16:49	2958
	09.csv	Aug 30, 2018 16:16:49	7928
Fixed Voice Subscription	20.csv	Aug 30, 2018 10:48:08	35
	18.csv	Aug 30, 2018 10:48:07	1073
	17.csv	Aug 30, 2018 10:48:07	2488
	16.csv	Aug 30, 2018 10:48:07	2
	13.csv	Aug 30, 2018 10:48:07	1199
	12.csv	Aug 30, 2018 10:48:07	2481
	11.csv	Aug 30, 2018 10:48:07	179
	10.csv	Aug 30, 2018 10:48:07	199
	09.csv	Aug 30, 2018 10:48:07	489
	08.csv	Aug 30, 2018 10:48:07	1035
	06.csv	Aug 30, 2018 10:48:07	2806
	05.csv	Aug 30, 2018 10:48:07	122
	04.csv	Aug 30, 2018 10:48:07	118
	01.csv	Aug 30, 2018 10:48:07	302
	48.csv	Aug 30, 2018 10:15:32	1153
	55.csv	Aug 30, 2018 10:06:22	33
	54.csv	Aug 30, 2018 10:05:32	215
	53.csv	Aug 30, 2018 10:04:35	1140
	51.csv	Aug 30, 2018 09:59:56	1066
	50.csv	Aug 30, 2018 09:56:58	157
	49.csv	Aug 30, 2018 09:55:25	500
	47.csv	Aug 30, 2018 09:53:31	984
	42.csv	Aug 30, 2018 09:52:32	2507
	45.csv	Aug 30, 2018 09:50:48	179
	41.csv	Aug 30, 2018 09:47:44	533
	39.csv	Aug 30, 2018 09:46:26	73
	37.csv	Aug 30, 2018 09:43:55	20
	36.csv	Aug 30, 2018 09:19:44	52
	35.csv	Aug 30, 2018 09:19:44	326

Form Section	File Name	Date & Time	Number of Rows
	34.csv	Aug 30, 2018 09:19:44	1261
	33.csv	Aug 30, 2018 09:19:44	234
	29.csv	Aug 30, 2018 09:19:44	97
	28.csv	Aug 30, 2018 09:19:44	279
	27.csv	Aug 30, 2018 09:19:44	642
	26.csv	Aug 30, 2018 09:12:51	1943
	25.csv	Aug 30, 2018 09:12:51	1294
	24.csv	Aug 30, 2018 09:12:51	1312
	23.csv	Aug 30, 2018 09:12:51	39
	22.csv	Aug 30, 2018 09:12:51	148
	21.csv	Aug 30, 2018 09:12:51	91

Fixed Broadband Deployment

Census Block Counts by State, DBA Name and Technology

State	DBA Name	Technology	Blocks
Alabama	Comcast	Cable Modem – DOCSIS 3.0	6932
		Cable Modem – DOCSIS 3.1	14261
Arizona	Comcast	Cable Modem – DOCSIS 3.1	3933
Arkansas	Comcast	Cable Modem – DOCSIS 3.0	519
		Cable Modem – DOCSIS 3.1	7901
California	Comcast	Cable Modem – DOCSIS 3.0	718
		Cable Modem – DOCSIS 3.1	137919
		Optical Carrier/Fiber to the End User	27
Colorado	Comcast	Cable Modem – DOCSIS 3.0	269
		Cable Modem – DOCSIS 3.1	62214
		Optical Carrier/Fiber to the End User	4
Connecticut	Comcast	Cable Modem – DOCSIS 3.0	4399
		Cable Modem – DOCSIS 3.1	20102
		Optical Carrier/Fiber to the End User	1
Delaware	Comcast	Cable Modem – DOCSIS 3.0	610
		Cable Modem – DOCSIS 3.1	13200
		Optical Carrier/Fiber to the End User	1
District of Columbia	Comcast	Cable Modem – DOCSIS 3.0	170

State	DBA Name	Technology	Blocks
		Cable Modem – DOCSIS 3.1	4911
		Optical Carrier/Fiber to the End User	1
Florida	Comcast	Cable Modem – DOCSIS 3.0	19145
		Cable Modem – DOCSIS 3.1	137254
		Optical Carrier/Fiber to the End User	3
Georgia	Comcast	Cable Modem – DOCSIS 3.0	13459
		Cable Modem – DOCSIS 3.1	54027
		Optical Carrier/Fiber to the End User	3
Idaho	Comcast	Cable Modem – DOCSIS 3.1	46
Illinois	Comcast	Cable Modem – DOCSIS 3.0	9536
		Cable Modem – DOCSIS 3.1	165149
		Optical Carrier/Fiber to the End User	7
Indiana	Comcast	Cable Modem – DOCSIS 3.0	7924
		Cable Modem – DOCSIS 3.1	81713
		Optical Carrier/Fiber to the End User	1
Kansas	Comcast	Cable Modem – DOCSIS 3.0	4
		Cable Modem – DOCSIS 3.1	1420
Kentucky	Comcast	Cable Modem – DOCSIS 3.0	5192
		Cable Modem – DOCSIS 3.1	534
Louisiana	Comcast	Cable Modem – DOCSIS 3.0	622
		Cable Modem – DOCSIS 3.1	9732
Maine	Comcast	Cable Modem – DOCSIS 3.0	182
		Cable Modem – DOCSIS 3.1	1952
Maryland	Comcast	Cable Modem – DOCSIS 3.0	5874
		Cable Modem – DOCSIS 3.1	62793
		Optical Carrier/Fiber to the End User	5
Massachusetts	Comcast	Cable Modem – DOCSIS 3.0	3986
		Cable Modem – DOCSIS 3.1	82163
		Optical Carrier/Fiber to the End User	11
Michigan	Comcast	Cable Modem – DOCSIS 3.0	13822
		Cable Modem – DOCSIS 3.1	83876
		Optical Carrier/Fiber to the End User	1
Minnesota	Comcast	Cable Modem – DOCSIS 3.0	28

State	DBA Name	Technology	Blocks
		Cable Modem – DOCSIS 3.1	34245
		Optical Carrier/Fiber to the End User	2
Mississippi	Comcast	Cable Modem – DOCSIS 3.0	8690
		Cable Modem – DOCSIS 3.1	12084
Missouri	Comcast	Cable Modem – DOCSIS 3.0	1
		Cable Modem – DOCSIS 3.1	5356
New Hampshire	Comcast	Cable Modem – DOCSIS 3.0	654
		Cable Modem – DOCSIS 3.1	16294
		Optical Carrier/Fiber to the End User	8
New Jersey	Comcast	Cable Modem – DOCSIS 3.0	4154
		Cable Modem – DOCSIS 3.1	72921
		Optical Carrier/Fiber to the End User	3
New Mexico	Comcast	Cable Modem – DOCSIS 3.0	2668
		Cable Modem – DOCSIS 3.1	19935
		Optical Carrier/Fiber to the End User	1
New York	Comcast	Cable Modem – DOCSIS 3.0	57
		Cable Modem – DOCSIS 3.1	1632
North Carolina	Comcast	Cable Modem – DOCSIS 3.0	8
		Cable Modem – DOCSIS 3.1	137
Ohio	Comcast	Cable Modem – DOCSIS 3.0	338
		Cable Modem – DOCSIS 3.1	5516
Oregon	Comcast	Cable Modem – DOCSIS 3.0	41
		Cable Modem – DOCSIS 3.1	37982
		Optical Carrier/Fiber to the End User	9
Pennsylvania	Comcast	Cable Modem – DOCSIS 3.0	23723
		Cable Modem – DOCSIS 3.1	156681
		Optical Carrier/Fiber to the End User	10
South Carolina	Comcast	Cable Modem – DOCSIS 3.0	4296
		Cable Modem – DOCSIS 3.1	8923
Tennessee	Comcast	Cable Modem – DOCSIS 3.0	13100
		Cable Modem – DOCSIS 3.1	50168
		Optical Carrier/Fiber to the End User	7
Texas	Comcast	Cable Modem – DOCSIS 3.0	401

State	DBA Name	Technology	Blocks
		Cable Modem – DOCSIS 3.1	64681
		Optical Carrier/Fiber to the End User	12
Utah	Comcast	Cable Modem – DOCSIS 3.0	70
		Cable Modem – DOCSIS 3.1	30128
		Optical Carrier/Fiber to the End User	1
Vermont	Comcast	Cable Modem – DOCSIS 3.0	496
		Cable Modem – DOCSIS 3.1	10093
Virginia	Comcast	Cable Modem – DOCSIS 3.0	13378
		Cable Modem – DOCSIS 3.1	47224
		Optical Carrier/Fiber to the End User	2
Washington	Comcast	Cable Modem – DOCSIS 3.0	112
		Cable Modem – DOCSIS 3.1	74460
		Optical Carrier/Fiber to the End User	8
West Virginia	Comcast	Cable Modem – DOCSIS 3.0	3690
		Cable Modem – DOCSIS 3.1	11958
		Optical Carrier/Fiber to the End User	1
Wisconsin	Comcast	Cable Modem – DOCSIS 3.1	1639
Total			**1776554**

Fixed Broadband Subscription

Fixed Broadband Subscriptions by State, Technology and End-user Type

State	Technology	Census Tracts	Subscriptions		
			Consumer	Business / Govt	Total
Alabama	Cable Modem	3980	133774	16085	149859
Arizona	Cable Modem	1776	86496	3320	89816
Arkansas	Cable Modem	1730	55326	7918	63244
California	Cable Modem	50704	2671244	190503	2861747
	Optical Carrier/Fiber to the End User	25	30	0	30
Colorado	Cable Modem	19584	1095402	77910	1173312
	Optical Carrier/Fiber to the End User	4	4	0	4
Connecticut	Cable Modem	7927	437391	40079	477470
	Optical Carrier/Fiber to the End User	1	1	0	1
Delaware	Cable Modem	3332	181870	15554	197424
	Optical Carrier/Fiber to the End User	1	1	0	1

State	Technology	Census Tracts	Subscriptions		
			Consumer	Business / Govt	Total
District of Columbia	Cable Modem	2957	130064	14602	144666
	Optical Carrier/Fiber to the End User	1	1	0	1
Florida	Cable Modem	37181	2209461	223300	2432761
	Optical Carrier/Fiber to the End User	3	3	0	3
Georgia	Cable Modem	19982	1117348	105753	1223101
	Optical Carrier/Fiber to the End User	3	3	0	3
Idaho	Cable Modem	10	101	6	107
Illinois	Cable Modem	40527	1990200	159352	2149552
	Optical Carrier/Fiber to the End User	7	7	0	7
Indiana	Cable Modem	16165	734632	61140	795772
	Optical Carrier/Fiber to the End User	1	1	0	1
Kansas	Cable Modem	527	14981	1304	16285
Kentucky	Cable Modem	954	43617	3796	47413
Louisiana	Cable Modem	1963	82900	9325	92225
Maine	Cable Modem	436	32361	2083	34444
Maryland	Cable Modem	20575	884980	80637	965617
	Optical Carrier/Fiber to the End User	5	5	0	5
Massachusetts	Cable Modem	23063	1425965	119309	1545274
	Optical Carrier/Fiber to the End User	10	11	0	11
Michigan	Cable Modem	27177	1202166	99719	1301885
	Optical Carrier/Fiber to the End User	1	1	0	1
Minnesota	Cable Modem	12339	606419	45954	652373
	Optical Carrier/Fiber to the End User	2	2	0	2
Mississippi	Cable Modem	3600	155128	18489	173617
Missouri	Cable Modem	1448	65430	3895	69325
New Hampshire	Cable Modem	3978	302519	24587	327106
	Optical Carrier/Fiber to the End User	8	8	0	8
New Jersey	Cable Modem	19608	1071293	84513	1155806
	Optical Carrier/Fiber to the End User	3	3	0	3
New Mexico	Cable Modem	5425	219858	18220	238078
	Optical Carrier/Fiber to the End User	1	1	0	1
New York	Cable Modem	395	20878	1543	22421

State	Technology	Census Tracts	Subscriptions		
			Consumer	Business / Govt	Total
North Carolina	Cable Modem	34	533	64	597
Ohio	Cable Modem	865	34938	3167	38105
Oregon	Cable Modem	9687	613025	52703	665728
	Optical Carrier/Fiber to the End User	9	9	0	9
Pennsylvania	Cable Modem	39930	1813539	161382	1974921
	Optical Carrier/Fiber to the End User	10	10	0	10
South Carolina	Cable Modem	2436	121321	11782	133103
Tennessee	Cable Modem	15843	682723	69960	752683
	Optical Carrier/Fiber to the End User	7	7	0	7
Texas	Cable Modem	20256	929639	99945	1029584
	Optical Carrier/Fiber to the End User	12	12	0	12
Utah	Cable Modem	9466	417408	32644	450052
	Optical Carrier/Fiber to the End User	1	1	0	1
Vermont	Cable Modem	2449	114871	11649	126520
Virginia	Cable Modem	15640	722966	66604	789570
	Optical Carrier/Fiber to the End User	2	2	0	2
Washington	Cable Modem	21661	1456351	95681	1552032
	Optical Carrier/Fiber to the End User	8	8	0	8
West Virginia	Cable Modem	2735	130290	9907	140197
	Optical Carrier/Fiber to the End User	1	1	0	1
Wisconsin	Cable Modem	391	18454	1617	20071
Total		**468862**	**24027994**	**2046001**	**26073995**

Fixed Broadband Subscriptions by Bandwidths and End-user Type

Downstream Bandwidth (in Mbps)	Upstream Bandwidth (in Mbps)	Consumer	Business / Govt	Total
3.000	0.770	242684	7842	250526
5.000	0.614	4	0	4
5.000	1.000	4225	0	4225
6.000	1.000	0	3229	3229
7.000	1.000	0	4916	4916
8.000	2.000	1896	0	1896
10.000	2.000	52801	0	52801
15.000	2.000	936509	0	936509

Downstream Bandwidth (in Mbps)	Upstream Bandwidth (in Mbps)	Consumer	Business / Govt	Total
16.000	2.000	2617	11877	14494
16.000	3.000	1	0	1
19.000	4.000	651	0	651
20.000	1.000	62	0	62
22.000	5.000	157	42440	42597
25.000	2.000	467833	0	467833
25.000	4.000	8504	1	8505
25.000	5.000	16904	525923	542827
25.000	10.000	1	217002	217003
27.000	7.000	2	39490	39492
50.000	5.000	4093	0	4093
50.000	10.000	1671	561279	562950
55.000	5.000	2281	0	2281
60.000	5.000	3555998	0	3555998
70.000	5.000	192546	0	192546
75.000	5.000	151998	0	151998
75.000	10.000	1637	0	1637
75.000	15.000	27	238462	238489
100.000	5.000	61005	0	61005
100.000	10.000	5032672	3797	5036469
100.000	15.000	26934	0	26934
100.000	20.000	5	119421	119426
105.000	10.000	146037	0	146037
105.000	20.000	239745	0	239745
150.000	5.000	5128895	0	5128895
150.000	10.000	144699	0	144699
150.000	20.000	1193197	193925	1387122
150.000	35.000	23	0	23
200.000	10.000	99193	0	99193
205.000	20.000	28	0	28
250.000	10.000	4745001	0	4745001
250.000	25.000	109270	29554	138824
300.000	25.000	95349	26	95375

Downstream Bandwidth (in Mbps)	Upstream Bandwidth (in Mbps)	Consumer	Business / Govt	Total
400.000	10.000	1167643	0	1167643
500.000	35.000	0	2781	2781
986.500	35.000	193064	6054	199118
1000.000	1000.000	0	37982	37982
2000.000	2000.000	132	0	132
Total		**24027994**	**2046001**	**26073995**

Fixed Broadband Subscriptions by Technology, Bandwidths and End-user Type

Technology	Downstream Bandwidth (in Mbps)	Upstream Bandwidth (in Mbps)	Consumer	Business / Govt	Total
Cable Modem	3.000	0.770	242684	7842	250526
	5.000	0.614	4	0	4
	5.000	1.000	4225	0	4225
	6.000	1.000	0	3229	3229
	7.000	1.000	0	4916	4916
	8.000	2.000	1896	0	1896
	10.000	2.000	52801	0	52801
	15.000	2.000	936509	0	936509
	16.000	2.000	2617	11877	14494
	16.000	3.000	1	0	1
	19.000	4.000	651	0	651
	20.000	1.000	62	0	62
	22.000	5.000	157	42440	42597
	25.000	2.000	467833	0	467833
	25.000	4.000	8504	1	8505
	25.000	5.000	16904	525923	542827
	25.000	10.000	1	217002	217003
	27.000	7.000	2	39490	39492
	50.000	5.000	4093	0	4093
	50.000	10.000	1671	561279	562950
	55.000	5.000	2281	0	2281
	60.000	5.000	3555998	0	3555998
	70.000	5.000	192546	0	192546
	75.000	5.000	151998	0	151998

Technology	Downstream Bandwidth (in Mbps)	Upstream Bandwidth (in Mbps)	Consumer	Business / Govt	Total
	75.000	10.000	1637	0	1637
	75.000	15.000	27	238462	238489
	100.000	5.000	61005	0	61005
	100.000	10.000	5032672	3797	5036469
	100.000	15.000	26934	0	26934
	100.000	20.000	5	119421	119426
	105.000	10.000	146037	0	146037
	105.000	20.000	239745	0	239745
	150.000	5.000	5128895	0	5128895
	150.000	10.000	144699	0	144699
	150.000	20.000	1193197	193925	1387122
	150.000	35.000	23	0	23
	200.000	10.000	99193	0	99193
	205.000	20.000	28	0	28
	250.000	10.000	4745001	0	4745001
	250.000	25.000	109270	29554	138824
	300.000	25.000	95349	26	95375
	400.000	10.000	1167643	0	1167643
	500.000	35.000	0	2781	2781
	986.500	35.000	193064	6054	199118
	1000.000	1000.000	0	37982	37982
Optical Carrier/Fiber to the End User	2000.000	2000.000	132	0	132
Total			**24027994**	**2046001**	**26073995**

Fixed Voice Subscription

VGE Lines and VoIP Subscriptions by State and End-user Type

State	Total VGE Lines	Consumer VGE Lines	Total VoIP Subscriptions	Consumer VoIP Subscriptions
Alabama	0	0	80980	52618
Arizona	0	0	44950	38412
Arkansas	0	0	33259	17958
California	0	0	1391915	1003247
Colorado	0	0	571074	406056
Connecticut	0	0	355316	267225

State	Total VGE Lines	Consumer VGE Lines	Total VoIP Subscriptions	Consumer VoIP Subscriptions
Delaware	0	0	141500	110525
District of Columbia	0	0	74160	48119
Florida	0	0	1336332	888839
Georgia	0	0	623561	420236
Idaho	0	0	21	0
Illinois	0	0	1147871	803219
Indiana	0	0	409654	273374
Kansas	0	0	9634	7085
Kentucky	0	0	19588	13545
Louisiana	0	0	41409	28739
Maine	0	0	16819	14364
Maryland	0	0	619293	460018
Massachusetts	0	0	1140649	878823
Michigan	0	0	737026	514163
Minnesota	0	0	315690	228321
Mississippi	0	0	83498	54893
Missouri	0	0	35626	28695
New Hampshire	0	0	236064	186008
New Jersey	0	0	869615	697919
New Mexico	0	0	106557	68421
New York	0	0	19184	16143
North Carolina	0	0	835	0
Ohio	0	0	31652	24072
Oregon	0	0	330053	213330
Pennsylvania	0	0	1426141	1060115
South Carolina	0	0	58880	39162
Tennessee	0	0	368143	238942
Texas	0	0	510400	294402
Utah	0	0	197180	132190
Vermont	0	0	87075	65684
Virginia	0	0	466056	332898
Washington	0	0	773573	572347
West Virginia	0	0	79074	61472

State	Total VGE Lines	Consumer VGE Lines	Total VoIP Subscriptions	Consumer VoIP Subscriptions
Wisconsin	0	0	8733	5289
Total	**0**	**0**	**14799040**	**10566868**

Fixed Voice Subscription (iVoIP)

Over-the-top VoIP Subscriptions by State and End-user Type

State	Total	Consumer	Business / Govt
Alabama	0	0	0
Arizona	0	0	0
Arkansas	0	0	0
California	0	0	0
Colorado	0	0	0
Connecticut	0	0	0
Delaware	0	0	0
District of Columbia	0	0	0
Florida	0	0	0
Georgia	0	0	0
Idaho	0	0	0
Illinois	0	0	0
Indiana	0	0	0
Kansas	0	0	0
Kentucky	0	0	0
Louisiana	0	0	0
Maine	0	0	0
Maryland	0	0	0
Massachusetts	0	0	0
Michigan	0	0	0
Minnesota	0	0	0
Mississippi	0	0	0
Missouri	0	0	0
New Hampshire	0	0	0
New Jersey	0	0	0
New Mexico	0	0	0
New York	0	0	0

State	Total	Consumer	Business / Govt
North Carolina	0	0	0
Ohio	0	0	0
Oregon	0	0	0
Pennsylvania	0	0	0
South Carolina	0	0	0
Tennessee	0	0	0
Texas	0	0	0
Utah	0	0	0
Vermont	0	0	0
Virginia	0	0	0
Washington	0	0	0
West Virginia	0	0	0
Wisconsin	0	0	0
Total	**0**	**0**	**0**

All other VoIP Subscriptions by State, End-user Type, Bundle and Last-mile Medium

State	Total	by End-user Type		by Bundle		by Last-mile Medium			
		Consumer	Business / Government	Sold w/ Internet	Sold w/o Internet	FTTP	Coax	Fixed Wireless	Copper
Alabama	80980	52618	28362	77665	3315	0	80980	0	0
Arizona	44950	38412	6538	44111	839	0	44950	0	0
Arkansas	33259	17958	15301	32294	965	0	33259	0	0
California	1391915	1003247	388668	1368613	23302	0	1391915	0	0
Colorado	571074	406056	165018	555028	16046	0	571074	0	0
Connecticut	355316	267225	88091	345555	9761	0	355316	0	0
Delaware	141500	110525	30975	137546	3954	0	141500	0	0
District of Columbia	74160	48119	26041	72523	1637	0	74160	0	0
Florida	1336332	888839	447493	1291344	44988	0	1336332	0	0
Georgia	623561	420236	203325	608164	15397	0	623561	0	0
Idaho	21	0	21	0	21	0	21	0	0
Illinois	1147871	803219	344652	1118806	29065	0	1147871	0	0
Indiana	409654	273374	136280	396404	13250	0	409654	0	0
Kansas	9634	7085	2549	9392	242	0	9634	0	0
Kentucky	19588	13545	6043	18823	765	0	19588	0	0

State	Total	by End-user Type		by Bundle		by Last-mile Medium			
		Consumer	Business / Government	Sold w/ Internet	Sold w/o Internet	FTTP	Coax	Fixed Wireless	Copper
Louisiana	41409	28739	12670	39875	1534	0	41409	0	0
Maine	16819	14364	2455	16396	423	0	16819	0	0
Maryland	619293	460018	159275	605958	13335	0	619293	0	0
Massachusetts	1140649	878823	261826	1100630	40019	0	1140649	0	0
Michigan	737026	514163	222863	710857	26169	0	737026	0	0
Minnesota	315690	228321	87369	308389	7301	0	315690	0	0
Mississippi	83498	54893	28605	80212	3286	0	83498	0	0
Missouri	35626	28695	6931	34781	845	0	35626	0	0
New Hampshire	236064	186008	50056	228340	7724	0	236064	0	0
New Jersey	869615	697919	171696	849727	19888	0	869615	0	0
New Mexico	106557	68421	38136	104236	2321	0	106557	0	0
New York	19184	16143	3041	18847	337	0	19184	0	0
North Carolina	835	0	835	0	835	0	835	0	0
Ohio	31652	24072	7580	30422	1230	0	31652	0	0
Oregon	330053	213330	116723	320388	9665	0	330053	0	0
Pennsylvania	1426141	1060115	366026	1380002	46139	0	1426141	0	0
South Carolina	58880	39162	19718	56910	1970	0	58880	0	0
Tennessee	368143	238942	129201	356529	11614	0	368143	0	0
Texas	510400	294402	215998	501398	9002	0	510400	0	0
Utah	197180	132190	64990	193188	3992	0	197180	0	0
Vermont	87075	65684	21391	84399	2676	0	87075	0	0
Virginia	466056	332898	133158	455100	10956	0	466056	0	0
Washington	773573	572347	201226	753713	19860	0	773573	0	0
West Virginia	79074	61472	17602	76843	2231	0	79074	0	0
Wisconsin	8733	5289	3444	8200	533	0	8733	0	0
Total	**14799040**	**10566868**	**4232172**	**14391608**	**407432**	**0**	**14799040**	**0**	**0**

COMCAST
324 West Main Street
Charlottesville, VA 22903

September 3, 2019

ATTACHMENT 15. Copy of Public Notice

Frederick County posted the following Public Notice to its website on August 4, 2019. It can be accessed online at https://www.fcva.us/Home/Components/News/News/832/17.

PRESS RELEASE

COUNTY OF FREDERICK
VIRGINIA
Contact: Karen Vacchio, Public Information Officer

107 N. Kent Street
Winchester, VA 22601
Phone: 540-722-8307

FOR IMMEDIATE RELEASE

Frederick County Applying for Telecommunications Initiative Grant

Frederick County intends to apply for a 2020 Virginia Department of Housing and Community Development Telecommunications Initiative grant to support the deployment of broadband service to serve the Apple Pie Ridge Road area of Frederick County, Virginia. The purpose of this Public Notice is to solicit comment from the public.

The County desires expansion of broadband access in unserved areas; this program utilizes a Public/Private Partnership. The network will be designed to serve customers at speeds of 25 Mbps upload and better. The build of this network is contingent upon the award of a grant.

The eligible project area heads north from Apple Pie Ridge Road and Songbird Lane, includes Cottonwood Drive and associated streets, Ashland Drive and Hannah Court, portions of Old Baltimore Road, Lavender Hills Lane and Bronze Manor Court, portions of Green Springs Road and associated streets, Warm Springs Road and associated streets, White Hall Road to Cedar Hill Road and associated streets, and Mara Lane.

Comments are invited and will be received on this project up to close of business August 16th. Please submit comments to Scott Varner, Director of Information Technology and GIS, 107 N. Kent St., Winchester, Virginia, (540) 722-8261, mailto:svarner@fcva.us?subject=Telecommunications Grant. All comments will be submitted with the application.

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Frederick County & City of Winchester, Virginia

Broadband Study

October 21, 2013

CIT BROADBAND
CENTER FOR INNOVATIVE TECHNOLOGY

Disclaimer

Technology and telecommunications are changing rapidly every day. CIT Broadband has made our best effort to apply current knowledge and experience to the business and technical recommendations in this study. The CIT Broadband team believes the recommendations made in 2013 are accurate and representative of the current state of the broadband industry. These recommendations may not accurately represent broadband technology advances over time.

This study and associated broadband recommendations are for planning purposes only and are not intended to replace formal engineering studies that are required for broadband infrastructure implementation. This study information is not suitable for building a network or system and is not expressed nor implied.

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Executive Summary

In July 2012, the Thomas Jefferson Institute for Public Policy released its annual Virginia Economic Forecast which stresses the importance of broadband and the need for lawmakers to pursue policies that will promote affordable, wide-spread broadband.

"To maximize the benefits to all of Virginia, broadband internet access has to be affordable, widely available, and deep in terms of its functional capacity. Undoubtedly, private sector firms and entrepreneurs need to lead this initiative with the Virginia government primarily providing a level playing field so competition and innovation can flourish."

In October 2012 staff of the Digital Policy Institute published an article highlighting the many ways that citizens can benefit by having broadband. These benefits include financial savings, entertainment savings, increased productivity, educational benefits, improved voice communications with savings, societal participation, informed electorate, healthcare access, improved public and emergency services, and enhanced environmental protection by reducing the carbon footprint of consumers and businesses. Entrepreneurs can save startup costs by leveraging the Internet for online accounting services, marketing materials, voice-over-IP, developing their own business website, mobile applications to achieve productivity and efficiency, incorporating their business using online tools, and video conferencing to save in travel costs. There are significant reasons for every community to have broadband connectivity options.

Community broadband variables include:

- providers – where are they providing service and what type of service (fiber, cable, etc.) is provided
- infrastructure – where do fiber and vertical assets (towers) exist, who owns the infrastructure and how accessible is it,
- needs – where are the broadband service gaps, what are the broadband needs for the community anchor institutions (schools, hospitals, public safety, etc.) now and in the future

In addition to the variables listed above there are additional constraints that must be taken into account when evaluating and planning for broadband deployments. They include population density, technology awareness and adoption (digital literacy and usage) and resources (assets and funding).

This study is structured to identify the variables and the constraints and to recommend options for filling the gaps in current broadband service coverage and strategies to consider for addressing future demand.

Ideally every community wants their citizens and businesses to have access to a variety of choices for adequate and affordable broadband. Competition helps drive prices down and

every citizen should have the opportunity to obtain the broadband service that fits both their online and socio-economic needs. Beyond pursuing connectivity for every citizen, community leaders can help support and promote digital literacy education as a means of cultivating the economic benefits of Internet connectivity through increased adoption and utilization. This study examined broadband connectivity and reviewed area digital literacy options. Included are strategies for increasing broadband service and recommendations for improved adoption and utilization. Currently there are 100 computers available for public access in the local libraries and 6 digital literacy classes offered every month by those libraries. Included in this study is information regarding additional online education resources and a recommendation for the county and city to help promote the education opportunities.

The City of Winchester is well served by many broadband technologies including fiber, digital subscriber line (DSL) and cable. Frederick County has several significant coverage gaps -- most notably in the Gainsboro and Back Creek areas. Based on provider reported coverage data as of December 2012, 12.9% of County residents have no wireline broadband service option as compared to only 0.6% of City residents. The City of Winchester and Frederick County have more than 15 broadband providers serving the area representing all types of broadband technologies as well as upstream fiber providers (serving the last mile providers). The bandwidth is available and the providers are present, however, the challenge is to create a business case for the providers to reach the less densely populated, more rural under-served and unserved areas of the county.

There is no “silver bullet”. No solution works in every community, and there is no single business model that is appropriate for every situation. Most commonly, a hybrid system of technologies including wired and wireless options ends up being the most efficient and cost effective way to provide services. Therefore, it is important for the city and the county to include different broadband solutions to serve the different areas of the city and the county. The city and the densely populated areas of the county (located on the fringes of the city) enjoy mostly adequate wired service. However, as the population becomes less dense it becomes challenging for incumbent wireline providers to make the business case to extend their fiber or cable to remote neighborhoods in the more rural areas of the county. In these areas it is generally easier to make the business case for fixed wireless broadband service. Fixed wireless technology is the most economical and easily deployed last mile broadband service for rural areas and it is quickly advancing towards the capability of delivering speeds up to 1000Mbps. Since the Frederick County has rural areas that are less densely populated, it is recommended that the county form a public-private partnership with a fixed wireless Internet service provider to address the un-/under-served areas. As part of the partnership it is recommended that the county allows the provider space on existing towers and other vertical assets at no or a very low cost. Since some of the county’s fire and rescue stations lack adequate broadband, the county may want to consider “trading” space on some towers in exchange for Internet service to those stations. Providing access to publicly owned towers will facilitate and expedite the expansion of the wireless network into the under and un-served areas and reduce the need to spend scarce capital resources building duplicative infrastructure. Unfortunately, Frederick County’s citizens’ perception of fixed wireless technology is not positive. This perception could make “selling” the deployment of a fixed wireless solution difficult however including the stipulations for customer service goals and network model redundancy and modularity included in this study, in the partnership

agreement can drive positive outcomes that can be be marketed to change that perception and increase adoption.

In support of a potential wireless deployment in the county, this study provides a comprehensive list of all vertical assets (towers) in the area and identifies towers that are key to reaching the under and unserved areas. Additionally the study recommends that additional towers be constructed to ensure complete coverage for all unserved areas. It is important to note that should the county choose to move forward with tower construction, all of the new towers should be constructed to accommodate at least five providers of varying technologies with adequate ground space and easements for equipment co-location. Building the towers with excess capacity will ultimately reduce the total overall number of towers needed in the future.

The costs for constructing the recommended three new towers are estimated to be approximately $237,000 per tower which will cover the structure, telecommunications cabinet and concrete pad. Additionally there also may be costs incurred for the land (purchase or lease), road access to the site, utilities and maintenance. Should the county pursue this option, it is recommended that Frederick County pursue a Telecommunications Project grant from VDHCD to fund the construction of the new towers.

Finally, the study includes some general fiber recommendations to ensure adequate fiber exists to support business areas and public safety.

There is much to be gained by forming partnerships with existing providers. Establishing an ongoing dialogue with local providers can often lead to collaborative opportunities that will enhance availability/affordability for citizens. For instance, if a cellular provider builds a tower with a fiber feed, a fixed wireless provider may leverage that tower and fiber feed to extend their fixed wireless network into an under-/unserved area. Additionally some of the identified unserved areas border cable service areas. Discussions with the cable provider about these identified areas may uncover solutions that would facilitate extending the service to provide the needed coverage.

The commonwealth provides a number of structural options for broadband deployments ranging from a simple contract to the creation of a Broadband (Wireless) Authority. In this study, it is recommended that the city/county evaluate all available legal options and determine which is most appropriate and or comfortable for the county to embrace. Additional information on the legal structure options can be found on wired.virginia.gov.

In addition to going through a decision making process related to technologies and possible tower construction, the county must make one crucial decision - what role does the county/city want to play in broadband expansion?

The Community

The Goals

Frederick County and the City of Winchester formed a Broadband Management Team to address the inconsistencies of broadband options throughout the area. The team identified the following goals:

- Broadband options for all citizens, ideally a competitive broadband environment
    - The team highlighted having options to support teleworking which is important since 25.3% of the community's population commute outside of the county to work (based on Commuting Trends provided by the economic development commission).
- An environment that stimulates economic development and presents an attractive environment for businesses and entrepreneurs
- Enhanced educational opportunities for all K-12, higher education and adult education
- Quality healthcare available locally including telehealth support
- Improved public safety communication services
- Overall improved quality of life

Additionally the schools have a strategic technology plan that focuses on the use of technology to support communications between parents and teachers, collaboration between students, and distance learning. The plan states over eight percent of the teachers rely upon dial-up access to the Internet. The communities need broadband access for the teachers and the students to support this strategic technology plan.

The Champion

A well-informed, passionate and persistent local champion is essential to any community initiative. This person or group will drive the initiative(s) and rally the support of community stakeholders which include residents, business owners, community anchor institutions and government officials.

This plan presents options for broadband expansion and can serve as the strategic broadband plan for Frederick County and the City of Winchester. However, plans are only valuable if there are people willing to devote their time and energy to ensure the community is engaged and executing the plan. A local champion is the person or group that will drive the community to implement the plan.

It is recommended that the Frederick County Broadband Management Team be the initial champion. This group has the connections to county and city government officials, the understanding of the needs, the organizational structure to drive the creation of partnerships and manage the efforts required to expand broadband options for the community. The Broadband Management Team indicated early on that the plan's components may be individually assigned later.

Virginia Models

Types of Models

There are many case studies available across the nation demonstrating the creative ways communities have worked to bring broadband to their areas. There are approximately 70 municipal-owned networks across the nation. Municipal network success can often be measured in terms of new jobs and lowering incumbent pricing. Most municipal networks are based on the municipal owned utility. The challenge is typically marketing against the incumbent provider and attaining the cash-flow they need to sell 'triple play' – phone, Internet and cable TV – as most customers want to bundle services. Municipal networks are costly in the early years due to the costs of building the infrastructure and typically there are many legal fees spent on court cases with incumbents.

Another still emerging model is the public-private partnership model. These partnerships can be structured in many ways depending on the amount of control the public body wants to maintain over the network. Success with partnerships is better measured in regards to telehealth, education, telework, etc. and not as much in revenue for the public organization. Public bodies typically do realize telecom savings by leveraging the network for telecom and facility connectivity. Generally these partnerships are found more in rural areas and tend to be based on terrestrial wireless solutions. The major challenges are terrain and tree canopy as these land features disrupt radio signals.

Following are just a few summary examples of each type of model with more details available in the Appendix A beginning on Page 92. There are many more examples of these various models across Virginia and the nation, as this is not intended to be a comprehensive list.

Utility Owned Fiber

Municipal utilities are positioned to more easily deliver FTTP (fiber-to-the-premise) as they already own connections to all facilities to either serve water or electricity. These organizations still have some cultural shifts to add broadband to their service line as it requires different skill sets to market, install and support than either water or electricity. Two examples of this model are included in Appendix A (Page 97) – Bristol Virginia Utilities and Danville.

Rural Telecom Digital Subscriber Line (DSL)

Rural telecommunications companies are typically some of the fastest at delivering broadband over copper wires known as Digital Subscriber Line (DSL). These rural telecom companies have historically benefited from the Federal Universal Service Fund (USF) which was created to spur development in rural areas. Two examples of this model are provided in the Appendix (page 99) – Citizens Coop and Highland County.

Public-Private Partnership

Public-Private partnerships have been created between local governments and private broadband providers as well as between local/regional Broadband Authorities and private providers. Typically the local government or authority will contribute infrastructure and or funding while the private provider designs, builds, operates and maintains the broadband network. These partnerships result in a win-win situation by providing broadband options to citizens while also supporting business growth of the provider. One example of this model is included in the Appendix (Page 101) – Franklin County.

Authority or Co-op Owned Open Access Fiber Network

Some regions of Virginia have open-access fiber networks to incent broadband service deployment expansion over the fiber. Typically these builds are headed by either a broadband authority or an electric/utility co-operative. The fiber network is referred to as "open access" because the intent is for any broadband provider to be able to leverage the fiber for transport of their services to extend their services beyond their own infrastructure. Two examples of this model are provided in the Appendix (Page 103) – Eastern Shore and Lenowisco.

Authority Owned and Operated Wireless

A few broadband authorities have chosen – as legislation clearly supports – to build and operate their own wireless broadband network. These networks leverage existing government-owned towers in addition to construction of new towers and provide service to community anchor institutions as well as citizens. There is one example of this model included in the Appendix (page 104) – Dickenson County.

Municipal Utility Broadband over Power Lines

In 2005 Manassas became the first implementation of broadband over power lines (BPL) in the nation. This system uses the electrical grid and wiring in the homes to deliver the

broadband connection. Communications Technology, Inc. in Chantilly initially operated the network for the city, but in 2008, the city took it over. The service is less costly and not as fast as DSL or cable but certainly better than dial-up. The city stated in 2010 the service was costing $170,000 annually and decided to end the service. At the time of termination the service had approximately 520 residential and business customers.

Applicable Legislation

Federal Legislation

The Federal Communications Act of 1996 had a goal of allowing anyone to enter into any communications business and to allow any communications business to compete in any market against other providers. This act provides local governments zoning authority over the deployment of wireless telecom facilities. Local governments cannot discriminate or inhibit deployment of wireless telecom infrastructure.

The Federal government formally recognized the importance of broadband to education, economic development and healthcare with the signing of the Broadband Data Improvement Act in 2008. This bill was written to improve the quality of the federal and state data regarding the availability and quality of broadband services and to promote the deployment of affordable broadband services to all parts of the nation. It supported, among other items, the efforts by states to expand broadband services.

In 2009 the American Recovery and Reinvestment Act specifically provided states with funding to collect broadband service data and map availability. Many states, like Virginia, obtained funding to expand their state broadband initiative beyond the data collection and mapping. Virginia's broadband initiative includes efforts to assess Health Information Technology use (e.g. telehealth, electronic health information exchange, electronic health records, etc.), assess e-Commerce use and adoption, development of a Community Broadband Planning Strategies guide, assessment of the impact of broadband on the healthcare and employment of Virginia veterans, and radio frequency propagation modeling.

State Legislation

Virginia has been active for many years passing legislation that eases broadband deployment and the most notable of that legislation is following.

Virginia Wireless Service Authorities Act (2003)

Authorizes any locality to create a wireless service authority, which may provide qualifying communications services as authorized by Article 5.1 (§ 56-484.7:1 et seq.) of Chapter 15 of

Title 56. The authority shall have many of the powers typically granted to authorities, including the issuance of revenue bonds.

High-speed and Broadband Internet Access in Underserved Areas (2006 – HB 400)

This bill adds a provision in the Governor's Development Opportunity Fund to allow grants or loans for the purpose of installing, extending, or increasing the capacity of high-speed or broadband internet access. The bill also amends § 2.2-2238.1 to require the Virginia Economic Development Partnership Authority to review and evaluate, in its program developed under the section, existing industrial sites and infrastructure that will provide broadband or high-speed internet access to rural and underserved areas of the Commonwealth.

Virginia Public-Private Education Facilities and Infrastructure Act; Provision of Wireless Broadband Services (2007 – HB 2381)

This bill specifies that the Virginia Public-Private Education Facilities and Infrastructure Act can be used for projects related to the technology and infrastructure necessary to deploy wireless broadband services to schools, businesses, and residential areas. The bill also authorizes the Virginia Resources Authority to fund wireless broadband projects.

State Owned Communications Towers; Broadband Service (2008 – HB 1329)

Requires state agencies to lease or convey a license or other interest in a state-owned communication tower for which they are responsible to qualified providers of wireless broadband service in order to deploy broadband Internet service in areas of the Commonwealth that do not have access to terrestrial broadband or radio frequency Internet service. The requirement is subject to the provider presenting a spectrum and certified structural analysis of the tower and proof that the tower satisfies all applicable local government requirements. The conveyance shall require payment of such consideration as the Director of the Department of General Services deems appropriate and which is commensurate with the consideration paid for use of comparable space on similar towers. This bill is identical to SB 206.

Virginia Resources Authority; Broadband Services (2008 – HB 632)

The bill clarifies that the Virginia Resources Authority may be used as a funding mechanism for all projects involving the provision of broadband services, and not just those utilizing wireless broadband technologies.

Office of Telework Promotion and Broadband Assistance (2008 – HB 1017)

Codifies Executive Order 35 (2006) creating the Office of Telework Promotion and Broadband Assistance under the Secretary of Technology. The goals of the Office are to encourage telework as a family-friendly, business-friendly public policy that promotes workplace efficiency and reduces strain on transportation infrastructure. In conjunction with efforts to promote telework, the Office shall work with public and private entities to develop widespread access to broadband services. The provisions of this act expire on July 1, 2018.

Broadband Advisory Council (2009 – HB2423/SB1336)

This establishes the Governor's Broadband Advisory Council. The purpose of the Council shall be to advise the Governor on policy and funding priorities to expedite deployment and reduce the cost of broadband access in the Commonwealth. The council shall be staffed by the Office of Telework Promotion and Broadband Assistance. Technical amendments to the bill adjust the membership of the Council.

Virginia Broadband Infrastructure Loan Fund (2009 – HB 2665)

Creates the Virginia Broadband Infrastructure Loan Fund. The Fund would be administered by the Virginia Resources Authority. Money in the Fund would be used exclusively for the financing of broadband infrastructure projects undertaken by a local government. Priority for loans would be given to projects that will utilize private industry in operating and maintaining the projects where private involvement will provide cost savings, to projects that serve two or more local governments, and to projects in unserved areas.

Municipal Networks and "Triple-Play"

Most municipal networks find their customers want to bundle services such as subscribing to Internet and phone, or Internet and Cable TV, or "triple play" meaning all three services – phone, Internet and Cable TV. Virginia has legislation that limits a municipality from providing cable TV services. Virginia allows municipal electric utilities to become certificated municipal local exchange carriers and to offer all communications services that their systems are capable of supporting (except for cable services), provided that they do not subsidize services, that they impute private sector costs into their rates, that they do not charge rates lower than the incumbents, and that they comply with numerous procedural, financing, reporting and other requirements that do not apply to the private sector. (*VA Code §§ 56-265.4:4, 56-484.7:1*). In order to provide cable service, a municipality must first obtain a report from an independent feasibility consultant demonstrating that average annual revenues from cable service alone will exceed average annual costs *in the first year of operation*, as well as over the first five years of operation. (*VA Code § 15.2-2108.6*) This requirement, without more, makes it impossible for any Virginia municipality other than those providing the service prior to December 31, 2002 (e.g. Bristol) to provide cable service, as no public or private cable system can cover all of its costs in its first year of operation.

Virginia Infrastructure Project Loan Fund (2010 – HB 672)

Creates the Virginia Infrastructure Project Loan Fund. The Fund would be administered by the Virginia Resources Authority. Money in the Fund would be used exclusively for the financing of landfill gas energy projects and sewerage system or wastewater treatment projects undertaken by a local government. The measure also specifies that a landfill gas energy project constitutes a "project" under the Virginia Resources Authority Act.

Telecommunications Service Providers or Cable Television System; rates for pole attachments (2012 – HB 1186)

Authorizes the State Corporation Commission to determine just and reasonable rates, and certain terms and conditions of service, for attachments to electric cooperative poles by telecommunications service providers and cable television systems. The authority may be exercised if, after good faith negotiations, the parties cannot reach an agreement regarding

the attachment. Fees may be assessed to allow the Commission to recover appropriate costs of such proceedings.

The Current State

Broadband in the Area

In Frederick County, 12.2% of the population has no wireline broadband service as compared to the national average of 3.5%. In Winchester, only 1.2% of the population is not served by wireless (cellular) service. Wireline service is considered the best technology for delivering higher broadband speeds and supporting the more critical applications such as telework, health IT, video conferencing, distance learning, etc. Fixed wireless technology has the capability today of delivering broadband speeds that can support critical applications, however, this technology is not included in the national broadband map data analysis presented below.

The following table provides statistics from the National Broadband Map for both Frederick County and Winchester including a ranking of each within the state based on two metrics: ranking based on localities with more than one wireline provider and ranking based on speed minimum of 3Mpbs download and 768Kbps upload. There are a total of 134 localities listed in these rankings.

Locality	Sq. Miles	Pop.	Housing Units	Pop Density	# Wire Prov	# of Wireless Prov	% Pop served by DSL	% Pop served by Cable	% Pop served by Mobile Wireless	Rank of VA Localities >1 Wireline Provider	Rank of VA Localities w/ speed min 3/768
Frederick County	415	82,487	33,027	189	4	4	68.3%	77.6%	99.7%	101	59
Winchester	9.23	26,710	12,172	2818	4	4	95.5%	97.3%	100%	47	16

Table 1 Ranking of County & City in Virginia Broadband Statistics

Population density plays a significant role in the business case for providers – particularly wireline – to expand services. The county and the city are fortunate in having high population density in comparison with other rural areas. Improved broadband options could support more teleworking, reducing traffic and improving quality of life.

Demand Aggregation

e-Corridors Speed Test Results

A Speed Test campaign was conducted in the City of Winchester and Frederick County in April 2013. Approximately 638 citizens participated in recording their internet speed test and 176 "dead zones" (areas with no option for broadband service) reported with two of those in the City of Winchester. Forty-percent of county speed tests reported less than 4Mbps download speed which is considered minimum broadband. The map view below shows the reported speed test and dead zones (red dots). In many areas there are dead zones reported directly next to speed tests which most likely reflect areas being served by wireless technology where terrain and tree canopy can prevent service to every home.

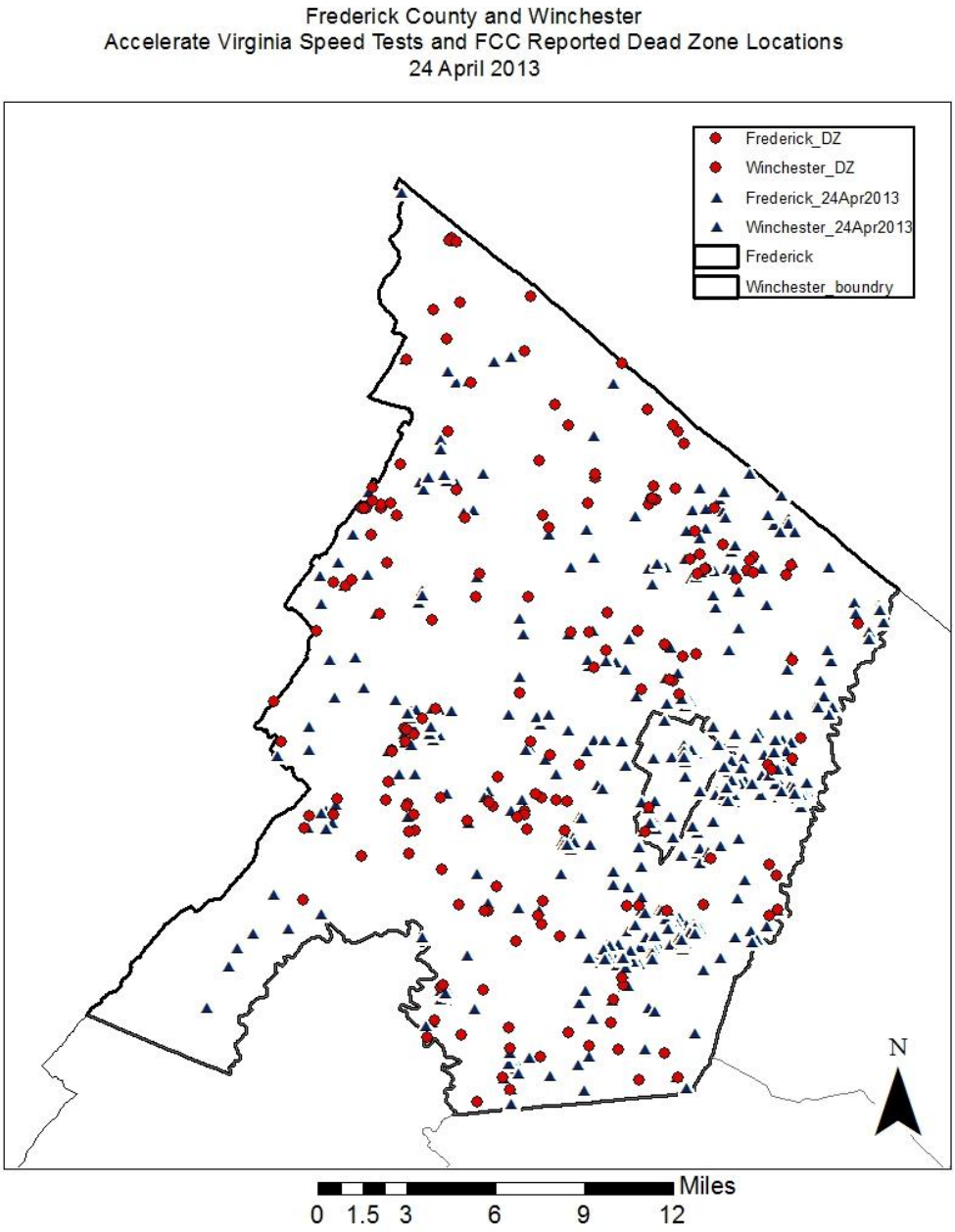


Figure 1 Frederick and Winchester April 2013 Speed Test Campaign Results

Community Anchor Institutions

Community Anchor Institutions (CAIs) are facilities in the community that need broadband connectivity to provide essential services and enhance community life. These facilities include:

- Colleges and universities
- Hospitals and health-care facilities
- K-12 Schools and private schools
- Libraries
- Local Government offices
- Public safety facilities

One of the goals of the National Broadband Plan is to ensure that all CAIs have low-cost broadband connectivity. Additionally these facilities represent consistent broadband demand for an area and can be key in demonstrating the unmet demand to providers.

Frederick County has built fiber connections (1Gb) between schools and feeding those schools with a Comcast Internet connection providing 200Mbps download. The schools may quickly (if not already) consume that bandwidth and will certainly need more in the future – most likely a full 1Gbps access. This additional bandwidth will support the schools' strategic plan and the ability to access resources at universities across the nation.

The city has a star topology with their central offices as the hub and delivering 1Gb of bandwidth to each school. This is a strong infrastructure and should support the schools for many years and through the use of many different broadband applications. However, the Internet service provided to the schools is only 45Mbps and there is only one service provider so there is no Internet service redundancy. The city has a strategic technology plan to address these deficiencies over the next year.

The county and the city have 78 CAIs which include 1 community college, 1 university, 2 libraries, 16 healthcare facilities, 5 government facilities, 16 public safety facilities, 7 law enforcement facilities and 30 schools. The list compiled during this study can be found in Appendix C (Page 111).

The following map view shows most of the CAIs in the county and city with the exception of some of the smaller medical facilities.

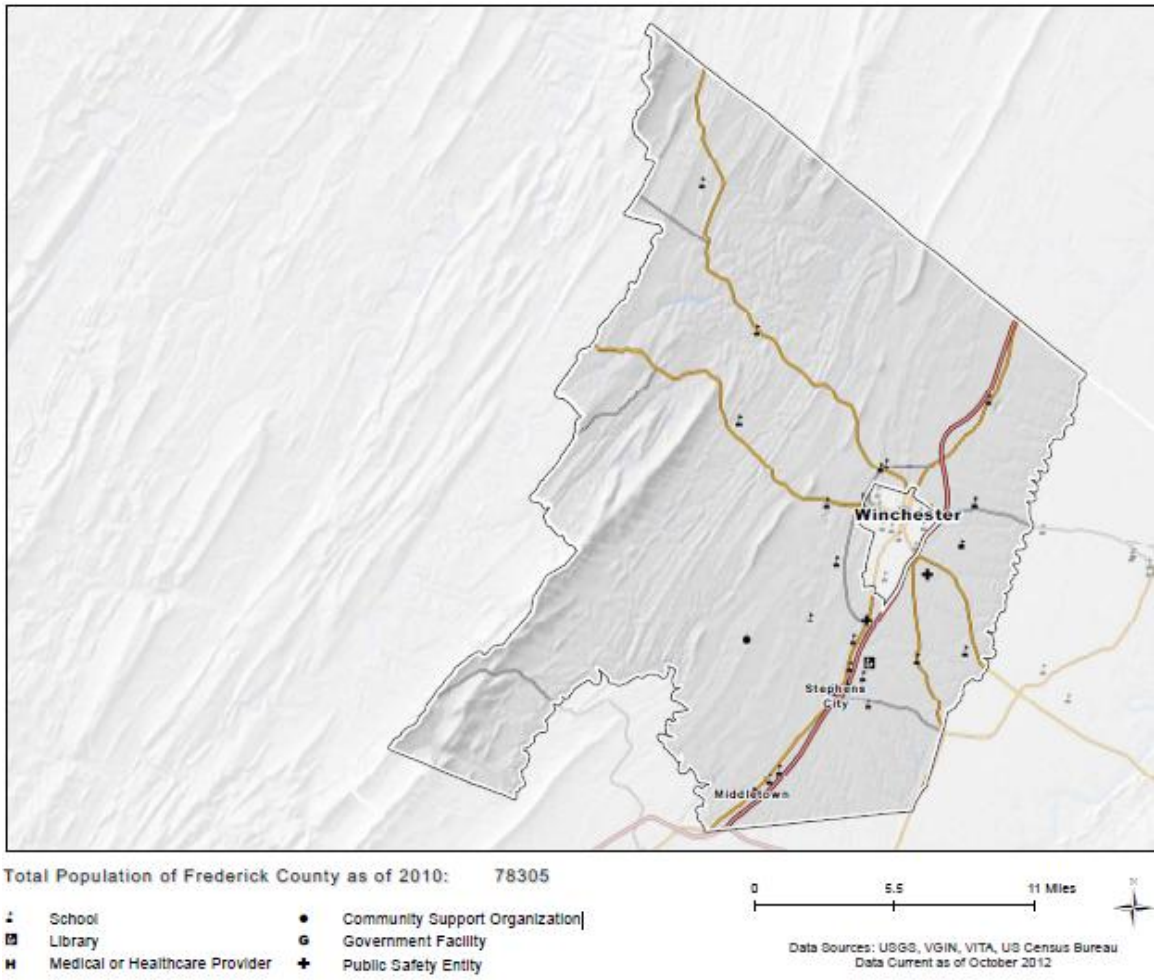


Figure 2 Frederick County - Community Anchor Institutions (CAIs)

CAI Future Plans

It is important to consider the strategic technology plans of all the CAIs as these plans will stipulate future broadband requirements. How are the schools, libraries, local governments, first responders and medical facilities going to leverage Internet applications and technology in the next three to five years? This information is vital to planning any future broadband networks as well as vital to the ability to demonstrate future demand for any Internet service providers.

Libraries are becoming the institutions to provide digital literacy training and support for online job hunting and application, especially when a locality does not have a workforce development organization. Libraries also provide public access computers for citizens that do not have any computers or Internet service in the home. The changing role of public libraries places large demand on their need for Internet bandwidth and technical resources.

Medical Facilities Leverage of Broadband

As part of the Commonwealth's State Broadband Initiative an annual survey is conducted with medical facilities to determine the use of Health Information Technology (HealthIT). There were 14 facilities in Winchester that participated in the last three surveys and only five participating in the 2012 survey. 71% responded they are currently using electronic health records, only one is participating in health information exchange (seven planning to implement) and four are participating in telehealth initiatives with four additional planning to implement telehealth. Nine facilities have fiber connections, two relying on cable and three using DSL. Eight of the facilities reported having download speeds greater than 6Mpbs and as high as 71Mbps. This indicates the major medical facilities are advancing in their use of HealthIT but certainly could do more and based on reported connectivity could and should have greater bandwidths, if those reported speeds are accurate.

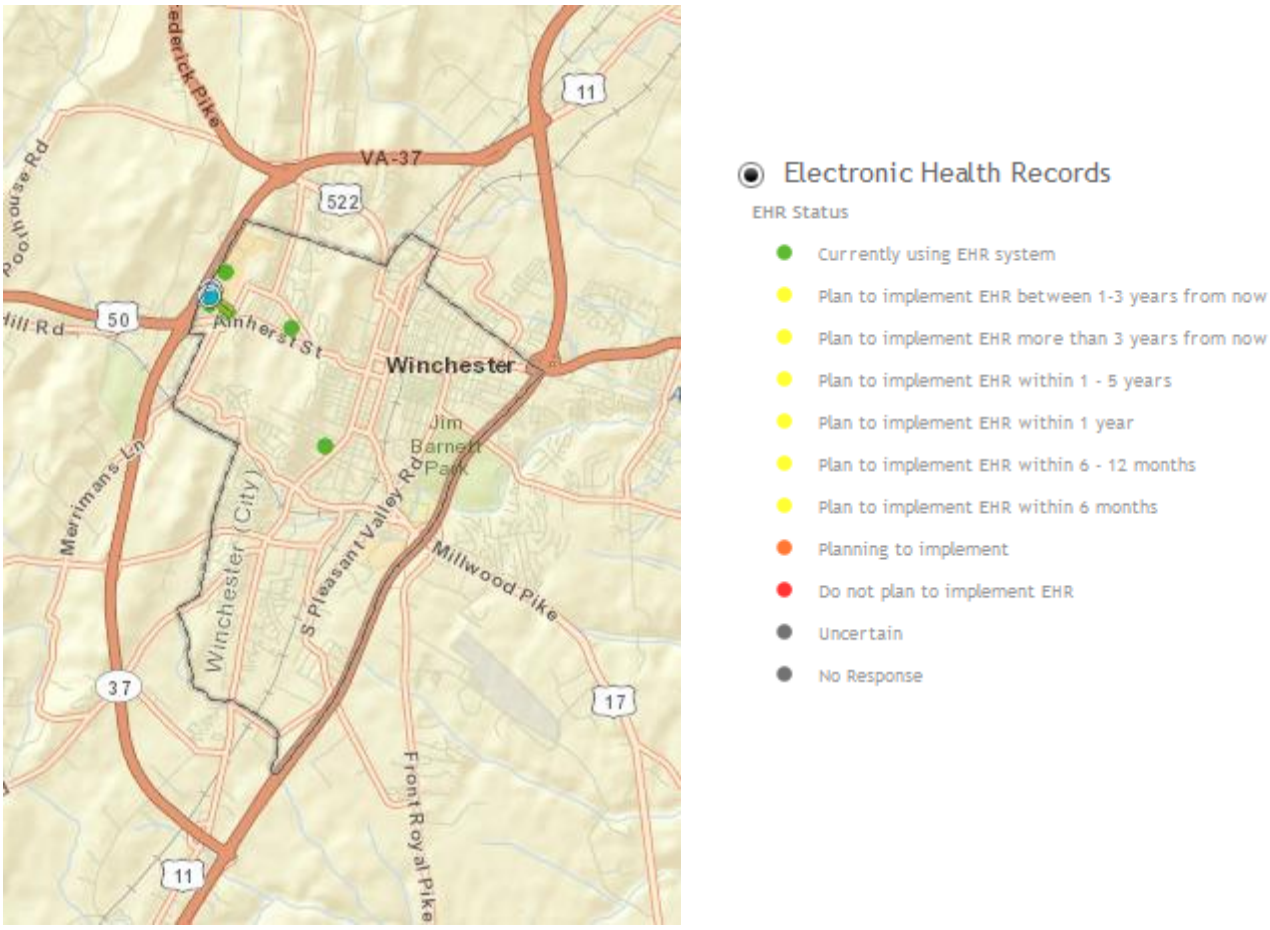


Figure 3 Winchester Medical Facilities Reporting Usage of EHRs

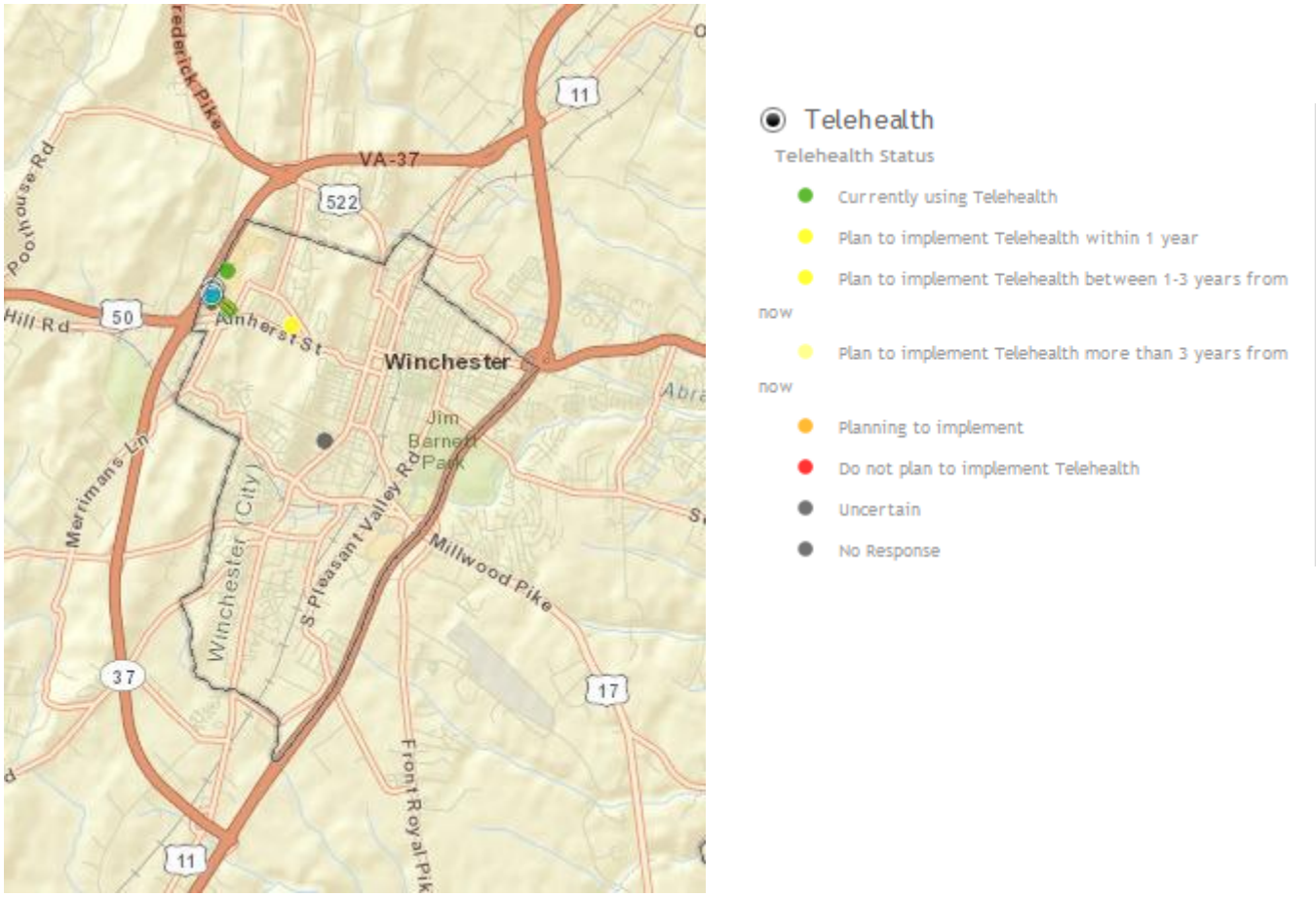


Figure 4 Winchester Medical Facilities Reporting Usage of Telehealth

Asset Inventory

Vertical Assets

Vertical assets (towers) are important in delivery of broadband through cellular service and fixed wireless technology. Towers should be constructed to accommodate at least 5 providers including having adequate ground space for cabinets to support required technology and power to leverage the most benefit from every tower constructed. Publicly owned towers are an asset to the community as they may be leveraged by broadband providers to extend service into the more rural areas.

Frederick County has a total of 165 vertical assets (towers and mono-poles) included in the Commonwealth's Vertical Asset Inventory – excluding those owned by individuals. The total assets break out as follows by type:

TYPE OF VERTICAL ASSET	NUMBER
Private: Business	109
Public: Local	35
Public: State	13
Private: Institutional/NonProfit	8
	165

Table 2 Vertical Asset Count by Type of Owner

The number of local and state-owned assets represents 29% of the total and these assets may be leveraged for broadband deployment. The remaining assets – privately owned by tower or communication companies – could possibly be leveraged depending on the structure owner. The structures would have to be examined through an engineering structural analysis study to determine if there is available space for additional equipment. However, in considering the publicly owned local assets, there is always the option of upgrading the asset if it is already at maximum capacity load. The location of many of these publicly owned assets are shown in the map below. A full inventory of vertical assets is provided in Appendix B beginning on page 101 and is available through the Commonwealth's Vertical Asset Inventory tool (online at http://www.vait.gis.bev.vt.edu/index.php).

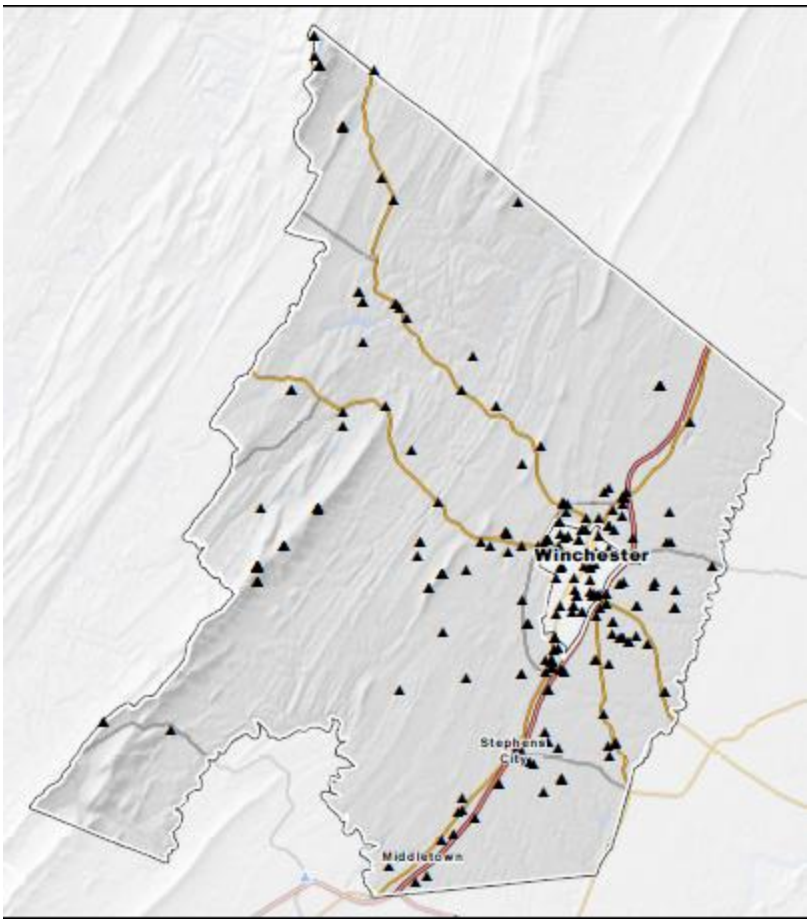


Figure 5 Frederick County Vertical Assets

Figure 6 Winchester Vertical Assets

Fiber Points of Presence (POPs) Serving Frederick County and Winchester

One component integral to delivering broadband is Internet Point-of-Presence (PoP) which is the access point to the Internet. If a community has fiber running through it with no PoP then it would be similar to having an interstate highway running through the community with no exits – the community would not benefit from having the interstate. PoPs are physical locations that house servers, routers, ATM switches and other equipment. They may be housed in a telecommunications provider's facility that an Internet service provider (ISP) leases or they may be a co-location facility that several providers share. Typically ISPs rely upon multiple PoPs for redundancy – ensuring their ability to provide service even if one network goes down.

Broadband services are dependent on a 'head end' or main fiber connection(s). Typically these head end facilities for Internet service providers are served by multiple primary ("upstream") Internet providers (such as Windstream, Level 3, Zayo Group, AT&T, etc.) to accomplish redundancy. These primary providers are interfaced in locations referred to as "point of presence" or POPs. The demarcation points were originally where long distance

telephone carriers could terminate their services and provide connections to local telephone companies. Today these POPs are access points to the Internet and are physical locations that may house servers, routers and switches and can be in facilities owned by telecommunication providers or Internet service providers.

In assessing an area to determine broadband options one must also evaluate the location of POPs to understand the challenges in bringing Internet service into an area. Level 3 has three routes of fiber into the Frederick County area – north, south and east – providing redundancy of service to the area. Additionally a large inter-connect data center for upstream providers is only 44 miles east of Frederick County and Winchester in Ashburn, Va. Windstream is another major upstream provider and they too have three routes into the area. Additionally Zayo Group has both dark and long haul fiber running through the county and the city but no indications of having a PoP in the area.

Figure 7 Level 3 Fiber in Frederick and Winchester

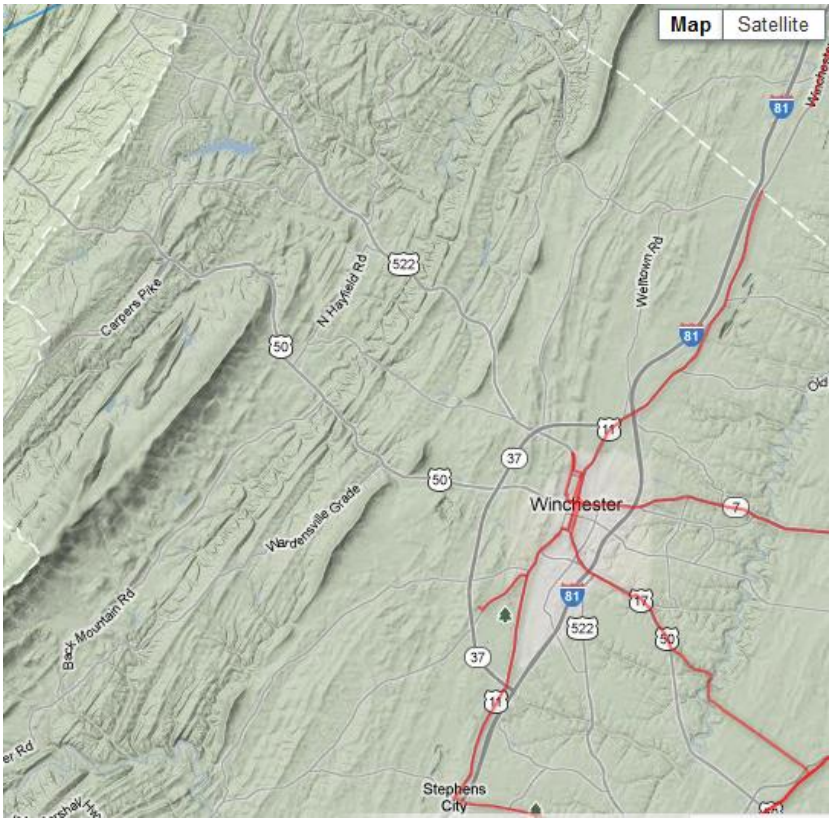


Figure 8 Windstream Fiber into Frederick County and Winchester

Figure 9 Zayo Fiber Metro Dark Fiber and Long Haul Dark Fiber

Existing Broadband Services

Types of Broadband Technologies

There are several types of technologies used today to deliver broadband services. The technologies vary in speed and costs. Keep in mind the following table of broadband speed tiers is provided by the FCC.

FCC Speed Tier Upload/Download Speeds Broadband		
	From	To
1st Generation	200 Kbps	768 Kbps
Tier 1 Broadband	768 Kbps	1.5 Mbps
Tier 2 Broadband	1.5 Mbps	3 Mbps
Tier 3 Broadband	3 Mbps	6 Mbps
Tier 4 Broadband	6 Mbps	10 Mbps
Tier 5 Broadband	10 Mbps	25 Mbps
Tier 6 Broadband	25 Mbps	100 Mbps
Tier 7 Broadband	Greater than 100 Mbps	

Table 3 Broadband Speed Tiers (FCC)

The available technologies today include:

- Fiber Optic – providing the fastest and most scalable service (Tier 7)
- mobile wireless (cellular) – available via smart phones or in the home but typically has a cap on monthly data usage (Tier 2 and some Tier 3)
- Digital Subscriber Lines (DSL) – service from the local telco provider with limited speeds and limited scalability (Tier 3)
- Cable TV – providing cable modem for Internet Access at satisfactory speeds but not as scalable and some including a cap on monthly data usage (Tiers 3 and 4)
- Fixed Wireless – providing speeds equivalent and now often exceeding that of cable or DSL at competitive prices, less costly and faster to deploy than wired services and have the ability to transmit radio signals 35+ miles (Tiers 3, 4 and 5 depending on the equipment and distance)
- Satellite – the newer satellite technology is capable of providing speeds equivalent to some of the wireline technologies (Tiers 4 and 5), however, there is still a latency issue affecting some applications.

These technologies vary in cost with fiber connectivity to the premise being the most costly in rural areas. The cost of deploying fiber includes many parameters in addition to distance such as frost index, wetlands percentage, soil texture and road intersections to cross. Developing a model to calculate cost dependent on area features and population density becomes very complex. The FCC provided some estimates but providers found these numbers to vary from their construction experience. One individual, Larry Thompson Vantage Point Solutions' CEO, began building a formula to calculate fiber build costs in rural areas in 2010. Mr. Thompson used his engineering skills and his firm's construction cost data to build a formula which he hopes to refine to provide a more useful model. The formula:

Cost per household = $3,072

+ $13,365 * (adjusted road miles/households)
- 0.8867 * households + $25.04 * frost index
+ $17,700 * wetlands percentage
+ $1,376 * soils texture
+ $165.40 * road intersection frequency

As complex as the formula appears, one can quickly discern there are many factors that affect the cost of fiber deployment and for rural areas, especially those involving wetlands, it is too costly.

Technologies currently available in the Area

Frederick County and Winchester are not unlike other areas in that there are several providers in the area but their service areas are not comprehensive throughout the region. The following information has been collected from the Virginia Broadband Map. In 2009 Virginia became one of the first states to map broadband availability and the only one to do it at no cost to the taxpayer. In 2010 all states began broadband mapping due to the national broadband mapping initiative, however due to early and continued success Virginia consistently collects more and better data than any other state. CIT has non-disclosure agreements with all providers ensuring that CIT protects their market service area details and hence cannot show specific provider coverage areas in the map. The Virginia Broadband Map displays coverage by type of technology such as mobile wireless, cable, fiber, etc. Although the mapping and data collection team makes every attempt to ensure the accuracy of the map data, the data originates from the providers and they are only required to report at the census block level which can cause some under-served areas to present as served. The NTIA set the rules for reporting broadband service data and a provider may report an entire census block as served even if they only serve one house or business in that block. Additionally, a provider may report an area as served even if they do not currently serve that block as long as they could physically deliver service within seven to ten business days.

The following chart lists the various Internet providers serving areas throughout the county and the city, the offered package speeds and associated costs. Not all of these providers are

available in all areas of the community – please refer to the following coverage maps to view the locations of the types of coverage that are available. This table provides a view of the types and costs of Internet service that some residents have access to and is for comparison only.

Current Residential Internet Options in Frederick County							
Provider	**Type**	**Package**	**Download Speed**	**Upload Speed**	**Monthly Data Usage Limit (GB)**	**Mthly Cost**	**Contract Required (Years)**
Level 3	Fiber	Business-Grade Tier 1	100mbps-1gbps	100mbps - 1gbps	?	$329-6,099	?
Comcast	Cable	Xfinity	10-25mbps	1.5 – 3mbps	250	$40-130	None?
Shentel	DSL	High Speed Internet	10- 25mbps	768k-1.5mbps	No limit	$40- 60	None
Lumos	DSL	Ultra-Fast DSL	3- 6mbps	200-768k	10	$30-35	1?
Verizon	DSL	High Speed Internet	1.5 – 3mbps	200-768k	No limit	$20-30	1?
Visual Link	DSL				No Limit	$30	1-2
ViaSAT	Satellite	Exede12	10- 25mbps	768k-1.5mbps	10 – 25	$50-130	2
Skycasters	Satellite	iDirect Satellite	6-10mbps	1.5-3mbps	1-30	$149-1,295	2
HughesNet	Satellite	Gen4	3-6mbps	768k-1.5mbps	20-40	$40-100	2
Starband	Satellite	Nova	768k-1.5mbps	200k-768k	Varies*	$50-100	?
Visual Link	Fixed Wireless	High Speed Wireless Internet	3-6mbps	1-2mbps	No Limit	$60-80	1-2
Wave2Net	Fixed Wireless	High Speed Wireless	2.5-30mbps	.5-10mbps	No limit	$50-160	2

Current Residential Internet Options in Frederick County							
Provider	**Type**	**Package**	**Download Speed**	**Upload Speed**	**Monthly Data Usage Limit (GB)**	**Mthly Cost**	**Contract Required (Years)**
		Internet					
Winchester Wireless	Fixed Wireless	High Speed Wireless Internet	3.2-10mbps	1-3.5mbps	?	$40-100	None
AT&T Wireless, Verizon Wireless, Sprint	Cellular (3G & 4G)	Wireless Mobile Broadband	768k–6mbps	200k – 1.5mbps	2 – 12	$15 – 80	1-2

Table 4 Residential Internet Service Options in the Area

Satellite Coverage

The Virginia Broadband Map includes satellite coverage and as expected this coverage is everywhere. Satellite service is improving with new technology that provides faster speeds however; there is still a latency issue. This service is also severely affected by weather conditions (rain, snow and ice as well as 'sun spots'). The latency may affect the ability to support virtual private network (VPN) connections typically required for teleworking.

Mobile Wireless (Cellular) Coverage

The following maps indicate the mobile wireless (or cellular) coverage in Frederick County and the City of Winchester. Mobile coverage is important to support citizen and business mobility, however, it is not viewed as the broadband fixed service required to support economic development, healthcare, first responders and educational broadband requirements. Frederick County has few areas without 4G and Winchester is indicated as completely covered with 4G service.

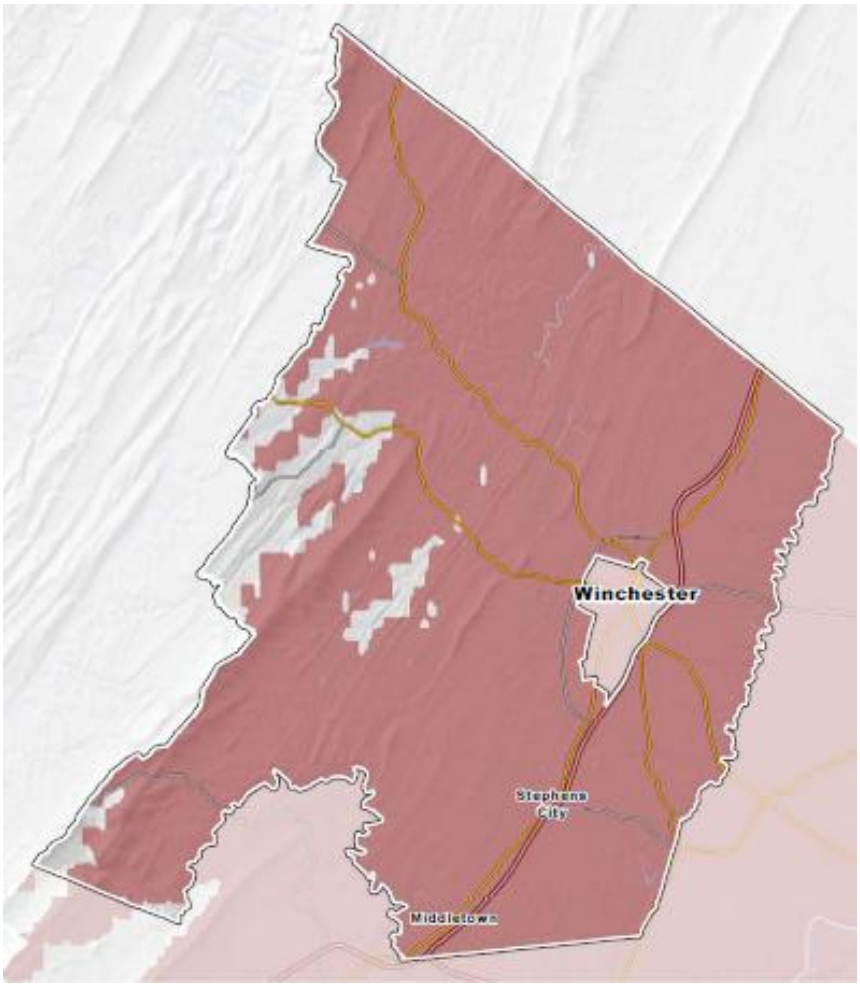


Figure 10 Frederick County 4G Coverage

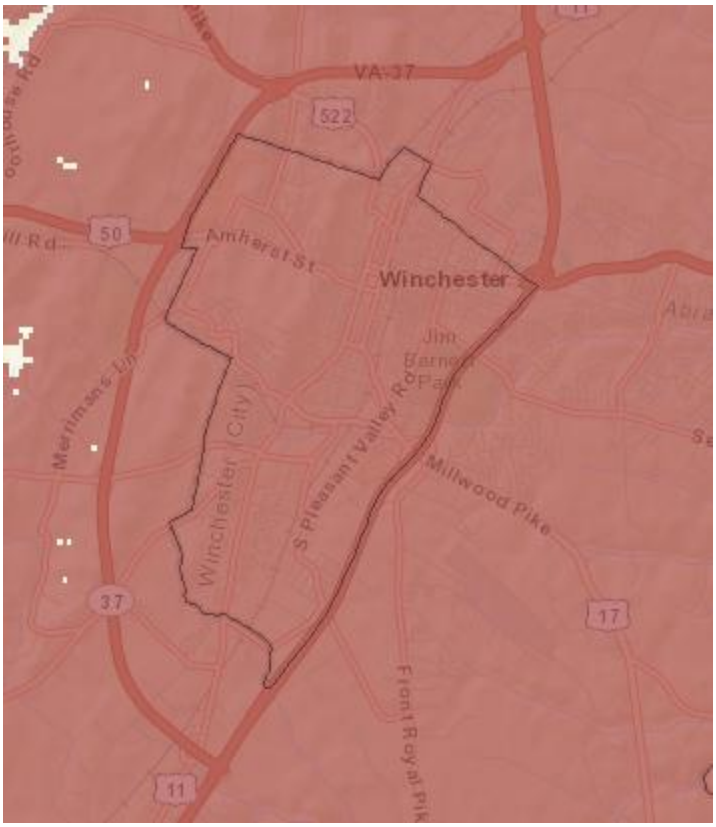


Figure 11 Winchester 4G Coverage (Dark orange indicates 4G/LTE Service)

Cable Coverage

Cable providers are held to the build-out requirements as stated in the franchise agreements and rarely are these requirements changed unless renegotiated at franchise renewal time. Occasionally when a franchise is being transferred to another company the locality can negotiate a few additional builds based on demand.

Cable providers have made huge strides in build-outs in the past few years to expand broadband services. Often the challenge is the cost of extending the cable plant to neighborhoods as there can be miles of few or no homes to reach a neighborhood in rural areas. Some localities are finding that neighborhoods are able to negotiate builds beyond the franchise requirements once they demonstrate a sufficient number of customers willing to subscribe to the provider's service and agree to some cost sharing on the extension of the cable plant to the neighborhood. This practice is similar to the "fiber-hoods" in Kansas where enough citizens in a neighborhood commit to pay for Google to extend fiber into their neighborhood.

Frederick County's current cable franchise was effective on April 1, 2009 with a term of ten years. The agreement stipulates it is not an exclusive agreement and the county reserves the right to grant other franchises for similar uses or for other uses of the public rights-of-way. The agreement stipulates the cable provider must build service (cable plant) to any homes where there are at least 30 homes per linear mile, which is quite a large number of

homes especially for rural areas. The cable provider must also extend the system if at least 15 potential subscribers are in the aggregate per mile and are willing to enter into a one-year contract. Finally, there is a stipulation the provider must extend the cable plant to anyone within 200 feet of their cable plant or provide the citizen with an option to cover the cost of the build beyond 200 feet. The last two points are significant clauses that should be leveraged by neighborhoods that are within a reasonable distance from the cable plant and/or have at least 15 households willing to commit to a service contract.

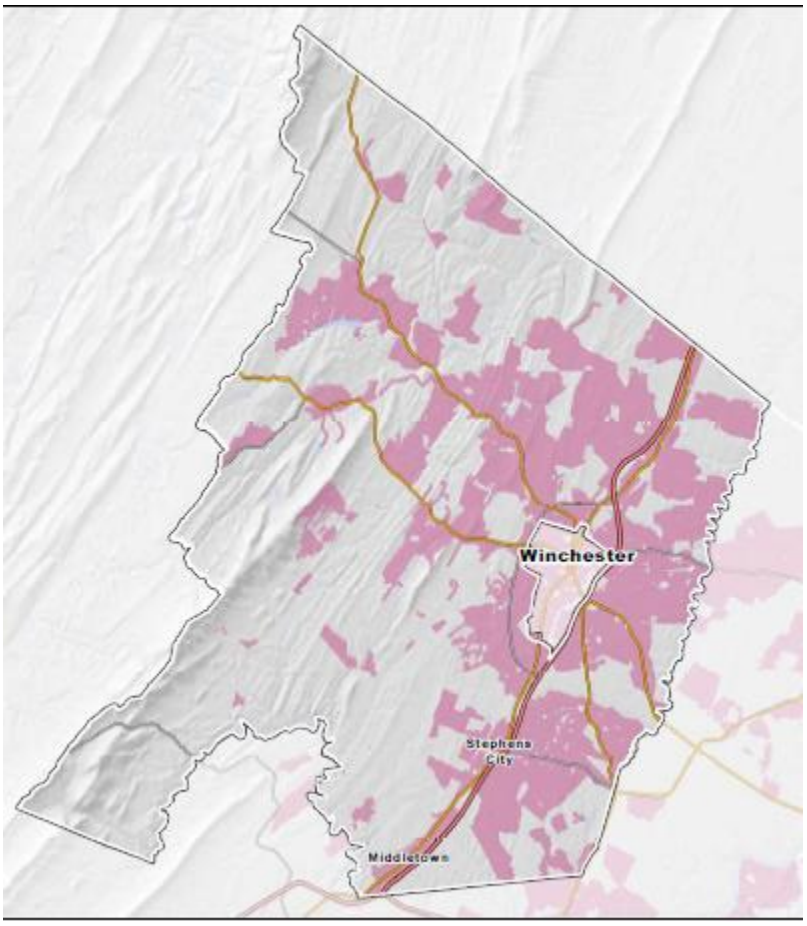


Figure 12 Cable Coverage Area

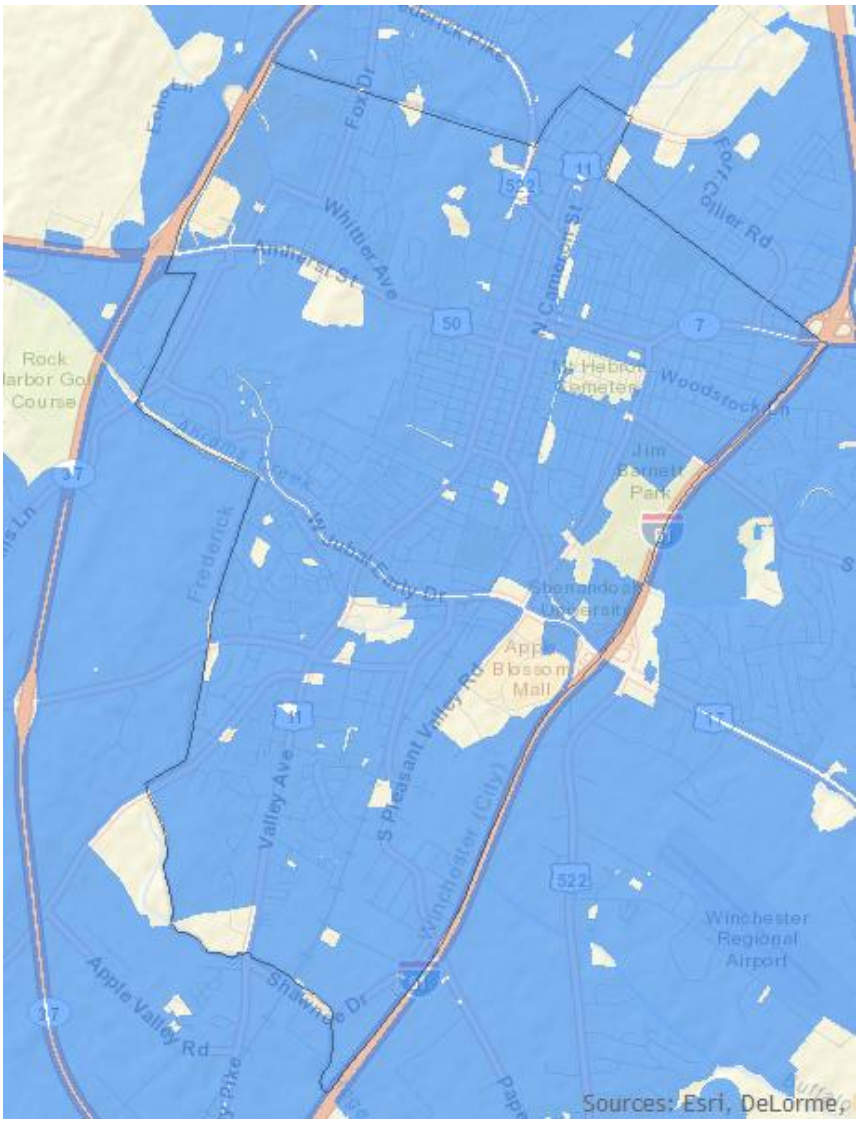


Figure 13 Winchester Cable Coverage (Blue indicates cable coverage)

Digital Subscriber Line (DSL) Coverage

DSL is delivered over traditional copper telephone lines and is typically limited to facilities within 3 miles of a telephone company Central Office (CO).

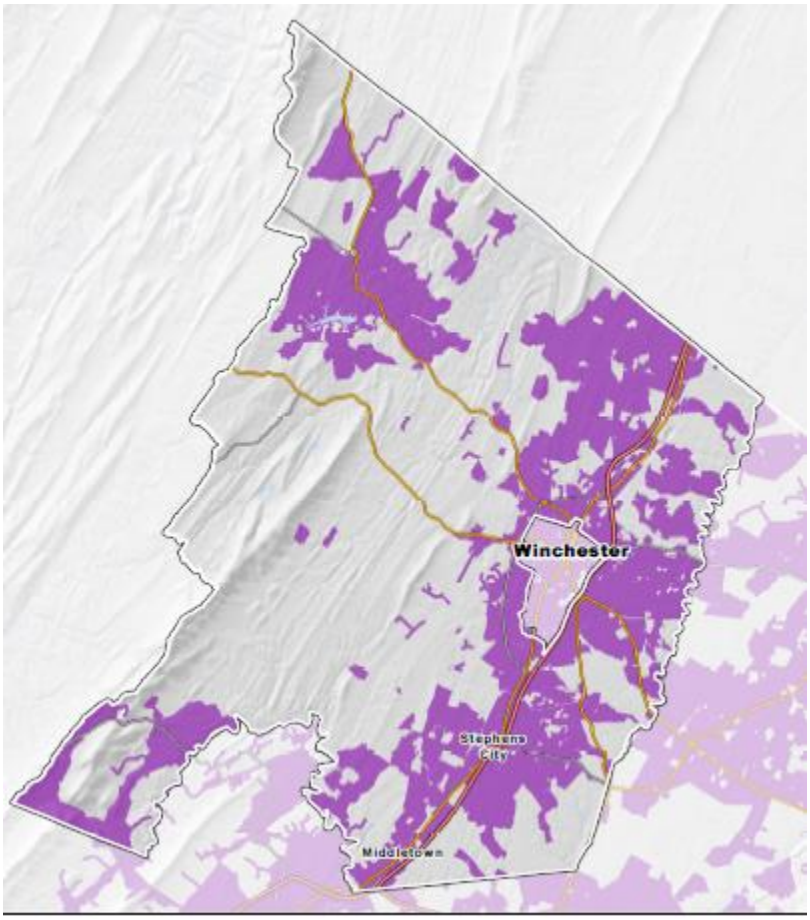


Figure 14 Frederick County DSL Coverage

Figure 15 Winchester DSL Coverage (Green indicates DSL coverage area)

Fiber Optic Coverage

Frederick County and the City of Winchester have two fiber providers serving limited areas – Verizon and Level 3. This is very good for the area as these providers can provide diverse routes and redundancy to the last mile providers.

It is important to note that the broadband map does not include any 'dark' fiber or fiber not currently serving end subscribers. Providers only need to report service areas and type of service. Therefore, if any organization has dark fiber or fiber used only for transport, it is not reported for mapping purposes.

The fiber in the area includes --

- Level 3 -- at speeds over 1000Mbps
    - just north of Winchester city limits – the south end of White Hall area.
    - in the Shawnee area just southeast of the city limits.
    - In the northeast area of Back Creek in Kernstown just east of route 37
    - in the northeast area of the city of Winchester.
- Verizon -- at speeds of 50-100Mbps
    - in the Neff's Town area just south of Stephenson
    - in Opequon area just east of Stephens City and also near Canterburg

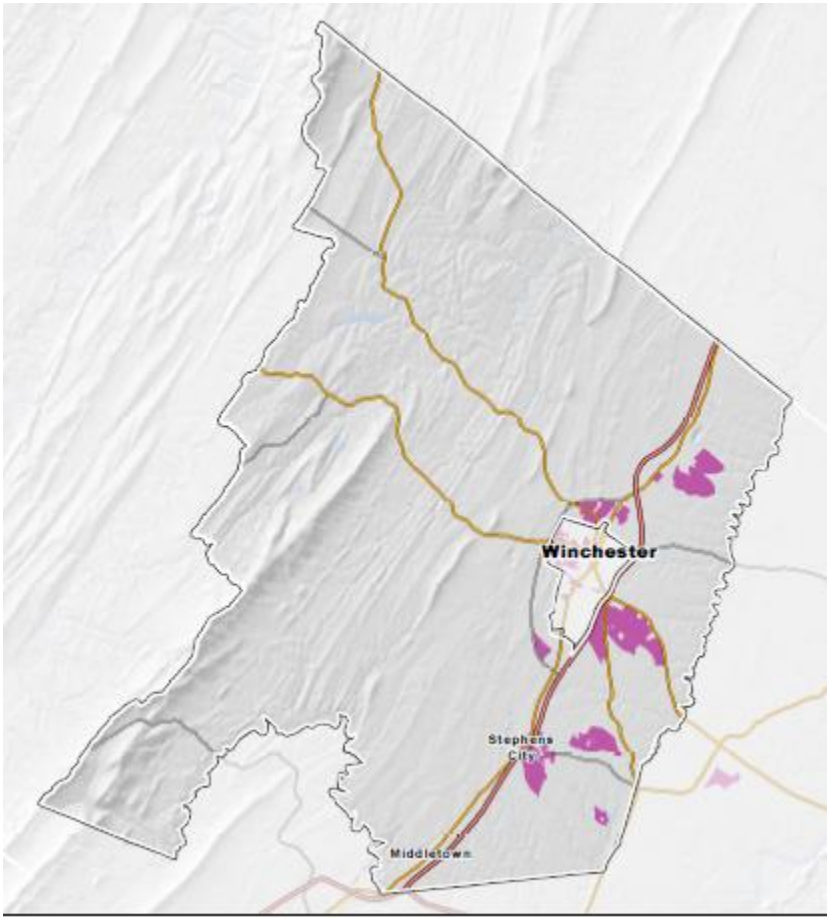


Figure 16 Frederick County Fiber

There is existing fiber that is not reported as providing service to the citizens or businesses. This fiber can be for transport or 'dark' (meaning unused currently) fiber. The following fiber routes were mapped based on data provided by Frederick County GIS. The Point of Presence (POP) location data was provided by Stone Net Services.

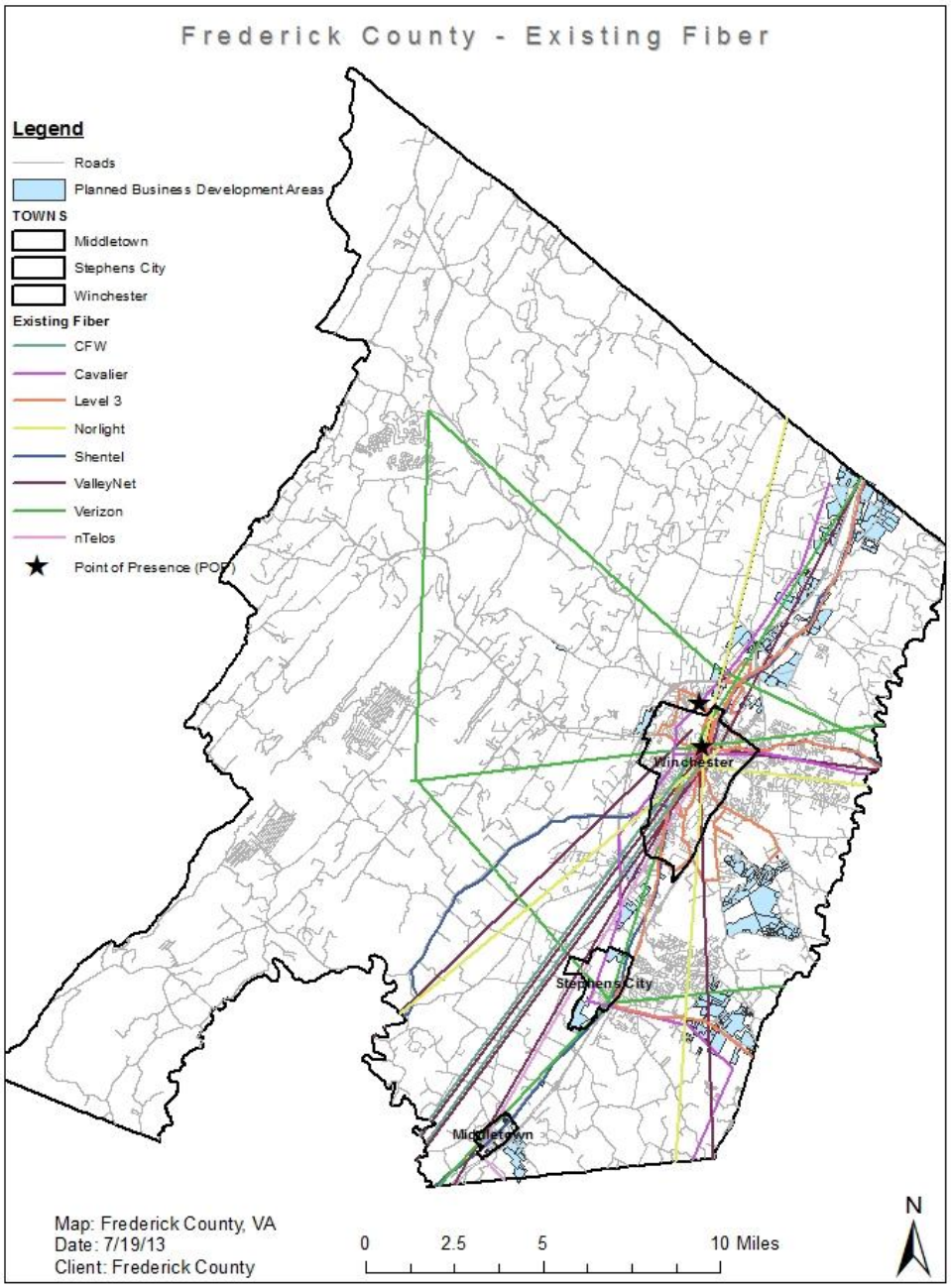


Figure 17 Frederick County Existing Fiber

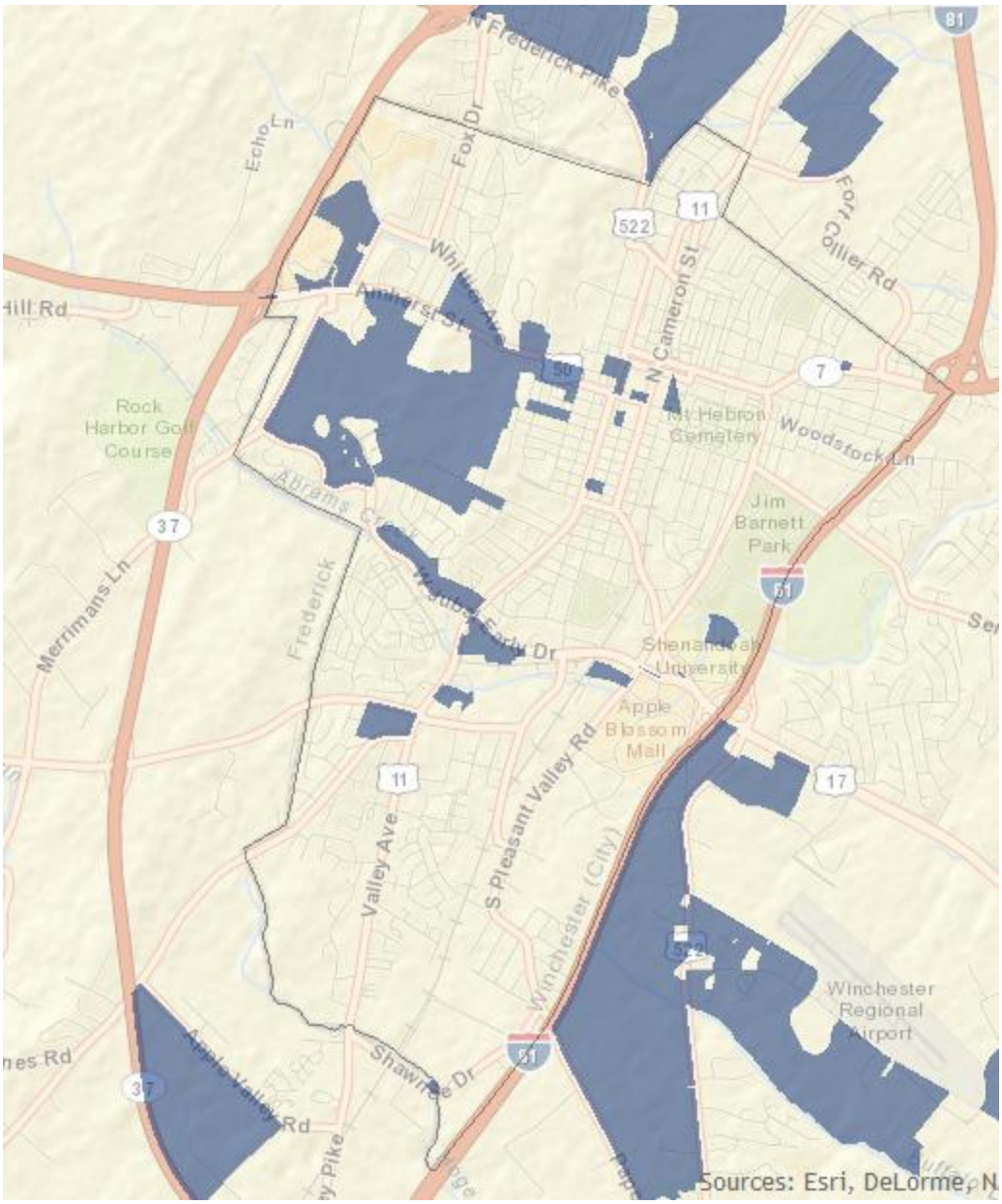


Figure 18 Winchester Fiber Coverage (Blue indicates fiber coverage area)

Fixed Wireless Broadband Technology

Fiber is the ideal technology for delivering broadband services. However, the cost to deploy that technology is very high and may not be feasible for years and may have to be deployed in phases over many years. Fixed wireless technology is the most economical and easily deployed last mile solution and is well suited for rural, challenging terrain and where there is little to no funding available for fiber deployment.

This technology leverages radio frequencies – licensed or unlicensed – to transmit signals between towers and to businesses and residences. These networks are referred to as point-to-multipoint as one transmitter can deliver service to many customer sites. Fixed wireless

technology can deliver high throughput over reliable and scalable networks. Providers have a "head end" location that supplies their wireless network with multiple fiber Internet services providers for redundancy. This fiber-fed Internet service is then distributed across the wireless technology and can span 25-30 miles for backhaul and up to 15-20 miles for customer sites.

This technology is not affected by weather but does depend on line-of-sight (LOS) or near-line-of-sight (nLOS) to a transmitter. Tree canopy and hills can disrupt signal, however, new WiMax technology now has the ability to shoot through and around the more frequent challenge of tree canopy. Equipment manufacturers are waiting for new standards that will utilize the television "white space" recently made available with the move to all digital television broadcasting. This new "white space" frequency has the ability to push through obstacles currently impeding technologies and frequencies. Some wireless Internet services providers (WISPs) are now using utility poles to mount equipment and 'hop' into neighborhoods that do not have LOS to existing towers. The equipment does require some electric power but there are successful implementations utilizing solar in some of the more remote tower locations. Recent technology advances have moved to software upgrades which allow providers to push out new features without having to physically touch the equipment.

Fixed wireless technology is delivering broadband service to millions of customers around the world in many different environments. The technology has exceptionally low outage rates and has advanced quickly over the last several years. The fixed wireless equipment can be co-located on towers with other types of equipment without interference which allows communities to leverage existing vertical assets. This technology can provide tiered service models allowing customers to choose the bandwidth speeds they need between 1Mbps to 55Mbps and possibly beyond. It has very low latency that is consistently 5-7 milliseconds which is lower and more predictable than some other technologies.

There are no trenches to dig or copper or fiber to deploy making deployment easy and affordable. The technology has been proven for over 10 years all over the world and the latest technology easily supports triple-play (voice, video and data).

There are three fixed wireless providers in the area but unfortunately citizens have a very poor perception of this technology. This perception has been affected by less than optimum implementation of the technology and less than adequate customer service. Only one of these providers agreed to share their information to support mapping of their coverage. Winchester Wireless provided their tower locations and equipment specifications so the Virginia mapping team could model their wireless signal. Currently this process is based on bare earth (no trees, terrain, etc) which overstates coverage. The following map of fixed wireless coverage indicates almost the entire county is covered. In reality some areas with dense forest or hills between the tower and end customers may not have an adequate signal to support broadband service delivery.

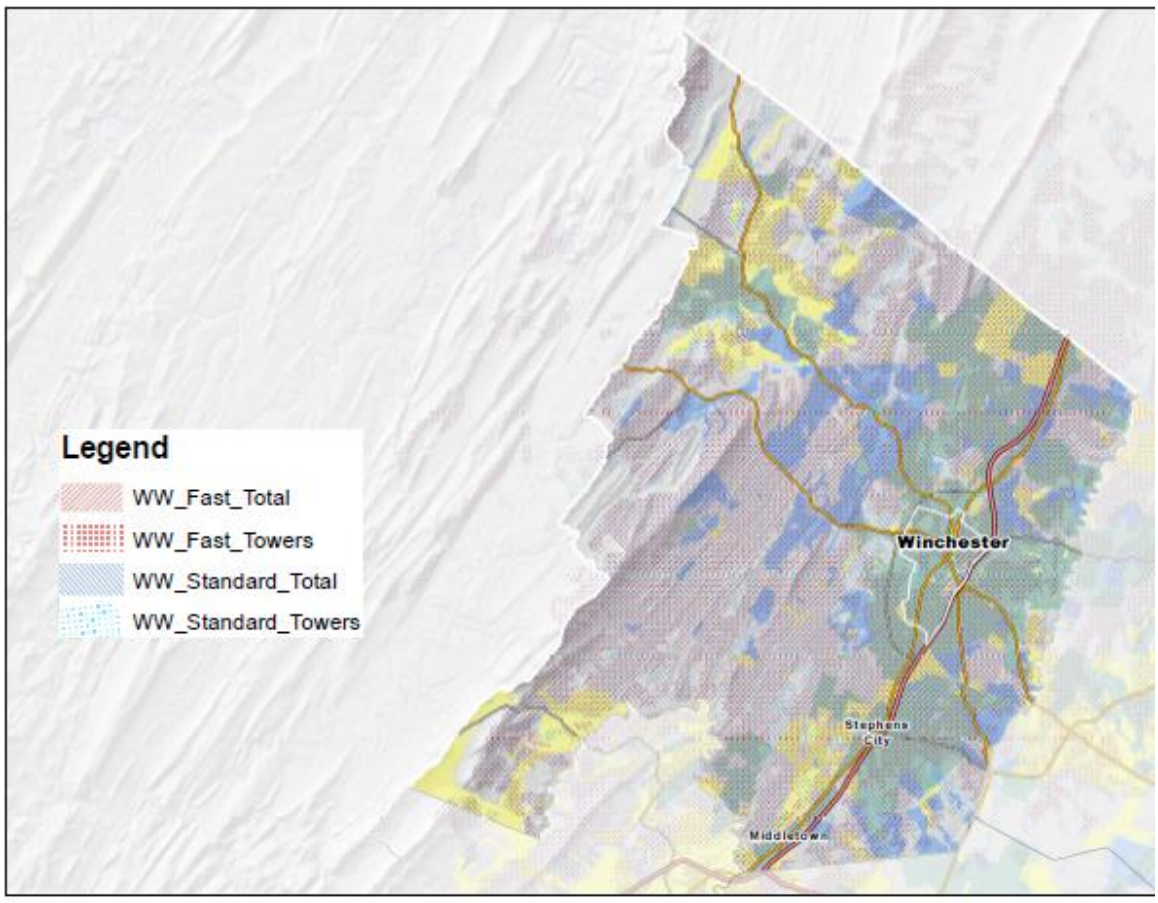


Figure 19 Fixed Wireless Coverage

Citizen Survey Results

Frederick County conducted a county-hosted citizen survey in June 2012. The number of responses to that initial survey was only 148. This survey was re-advertised for a second time at the end of March 2013. The survey ran until early May and included 2,237 responses. The responses were grouped by zip code and based on population the data provided statistically significant sample sizes for the City of Winchester, Frederick County, the 22602 (Back Creek) and the 22603 (Gainsboro) areas. The number of responses gathered provides data that is 95% accurate with a 10 point variance for the city residents and 99% accurate with a 2.75 point variance for the county. The Back Creek area (22602) and Gainsboro (22603) residents contributed the largest number of responses and provide data that is 99% accurate with a 4 point variance for Back Creek and 95% accurate with a 4 point variance for Gainsboro. The survey questions were grouped based on connectivity, adoption and utilization prior to analysis.

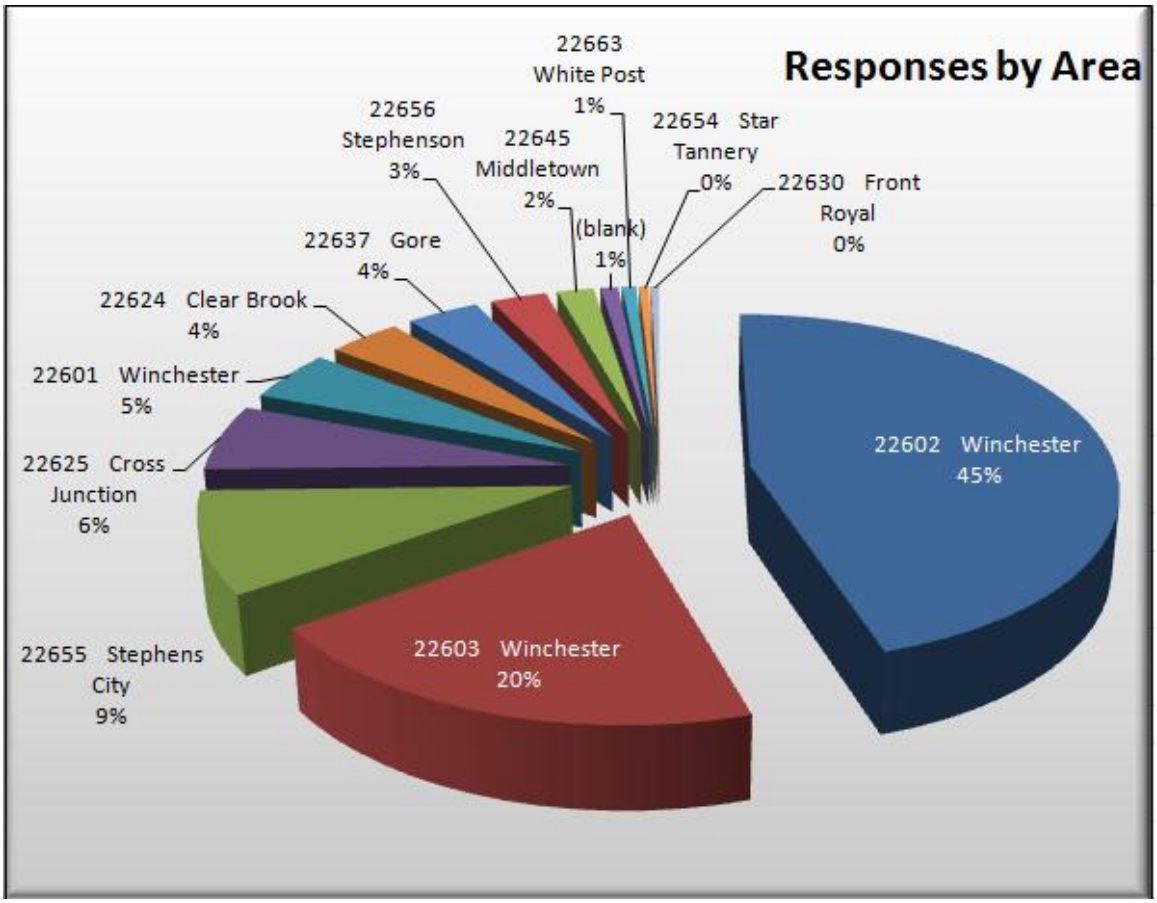


Figure 20 Citizen Survey Responses by Area

CONNECTIVITY FINDINGS

As expected, Winchester has the highest percentage of wired connections (36%) and Gainsboro has the lowest at 22% with the county and Back Creek having 25%. The number of citizens relying on dial-up or cellular service is 8% in Back Creek to 11% in Gainsboro with the city at 10% of respondents. An average of 9% of respondents reported no service available at their residence.

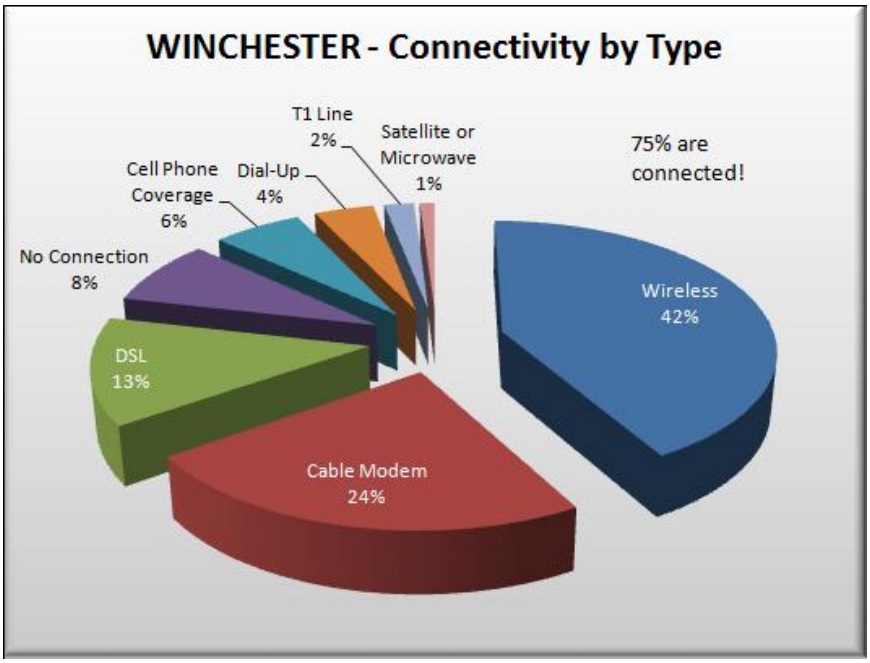


Figure 21 Citizen Survey - Winchester Connectivity by Type

The primary provider in all areas is Comcast with 51-59% of the connected citizens except in Gainsboro where only 39% rely on Comcast. The "Other" provider which includes Winchester Wireless, represents the second provider at 13-21% of respondents in all areas except the city where the second provider is VerizonWireless at 14%. VerizonWireless is the third most reported provider in the county and "Other" is the third one for the city.

Approximately one third of the respondents pay between $30 and $50 dollars per month for service. Over fifty-percent of Back Creek and Gainsboro (54% and 56% respectively) respondents pay more than $50 per month for their service.

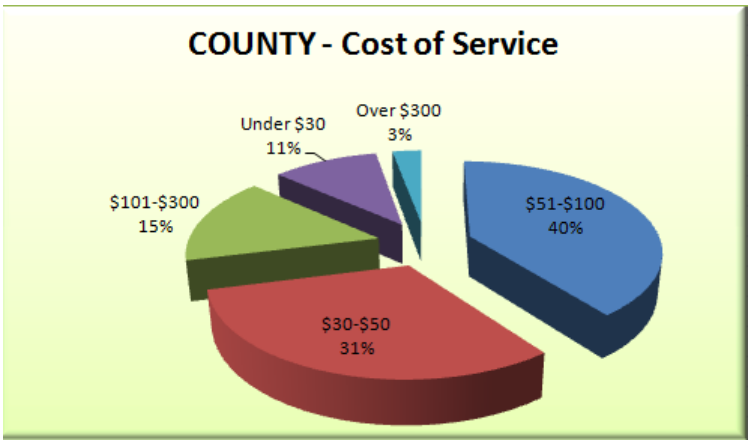


Figure 22 Citizen Survey – County Costs of Service

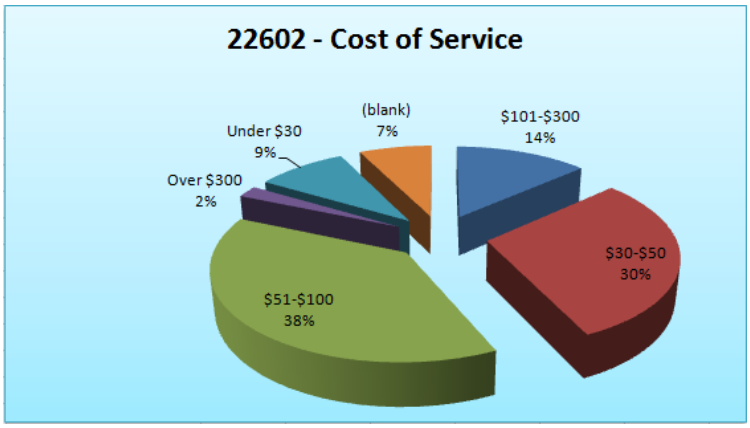


Figure 23 Citizen Survey - Back Creek area Costs

Many respondents report satisfaction with their current service (72-80%) and over half (55-64%) are satisfied with their current connection speed. The respondents that are not satisfied with their current service report a slow connection speed being the largest complaint (36-39%) followed by the cost of the service (27-29%) being too expensive.

ADOPTION

Broadband adoption means citizens utilize computers and the Internet and are "digitally literate". The National Telecommunications & Information Administration recently released a Broadband Adoption Kit[1] to assist agencies and organizations throughout the country to accelerate efforts to assist the nearly one-third of Americans who are not online and have not adopted technology to improve their education, employment and healthcare. The survey data was analyzed in terms of adoption of use based on reported number of home devices (computers) and reported barriers to adoption. More than half of all respondents (66-70%) report having school children in the home which typically requires some computer being available to support homework and research. Just under half (34-50%) of the respondents report having three or more devices in the home with the largest reporting percentage from the Back Creek area and the city having the lowest reported percentage. A little less than 10% of the respondents (7-11%) report having no computers in the home with the largest percentage reported from the city.

Approximately one third of the respondents reported cost as one of the barriers to adoption and another third reported no interest in the Internet. Just under one quarter of the respondents report there is no service available for them to connect with the largest percentage reporting (28%) from Gainsboro followed by the county (23%).

[1] http://www2.ntia.doc.gov/files/toolkit_042913.pdf

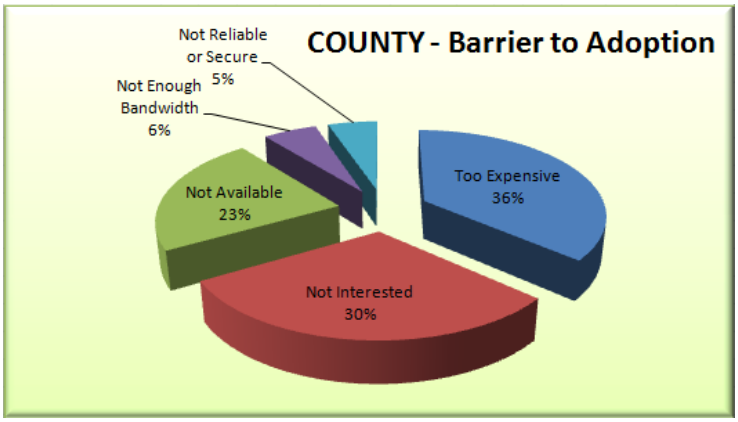


Figure 24 Citizen Survey - County Barriers to Adoption

UTILIZATION

The last area analyzed in the survey findings is the utilization of the Internet and specifically why citizens with service are leveraging the connectivity. The largest reported use of the Internet is for educational purposes with 74%. Over half of the respondents (63%) use the Internet to work from home with the largest percentage reported (66%) from the Back Creek area. A small percentage (11%) reported using the connectivity for a home-based business, with the county reporting the largest use (13%). Less than half (42%) of all respondents report regularly visiting their local government's website with Gainsboro reporting the largest percentage (48%).

Across all areas the responses for current uses of the Internet and future (planned) uses are the same. The citizens of the city and the county currently use the Internet for: communication, social media, online banking and financials and purchasing goods. The applications that all respondents plan to use in the future include online training and distance learning.

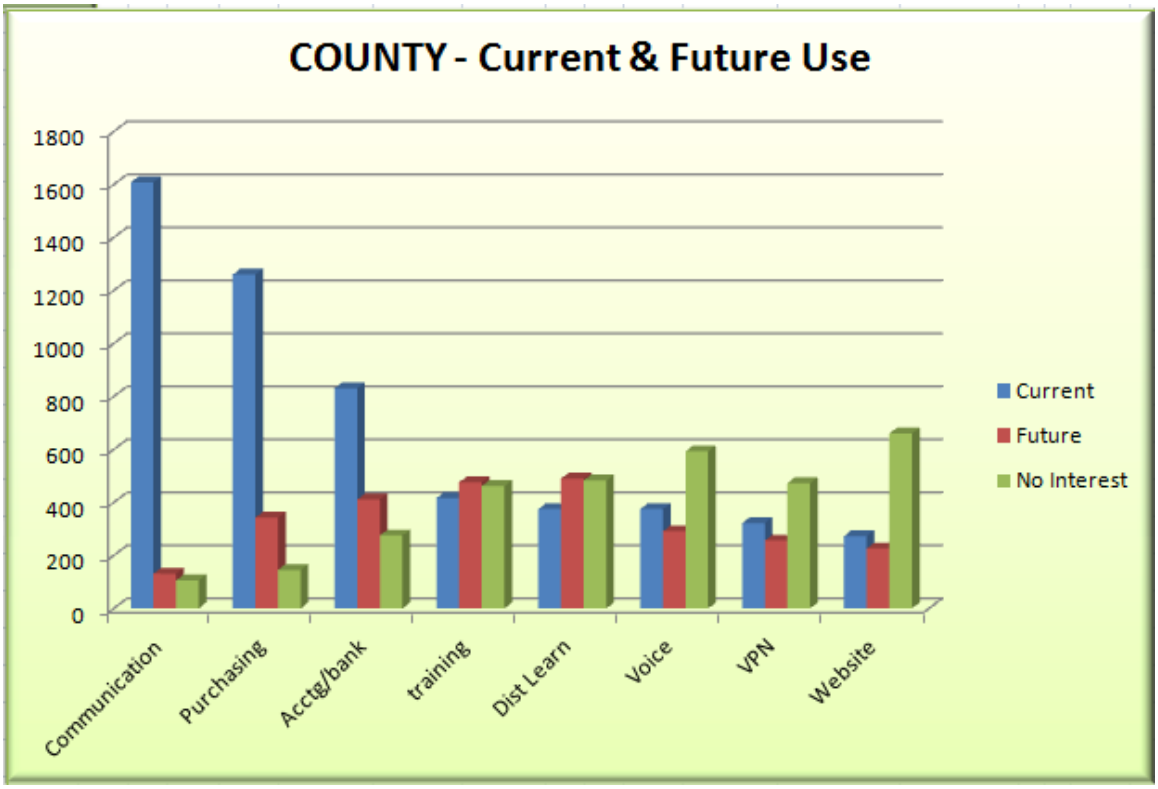


Figure 25 Citizen Survey - County Current & Future Utilization

Provider Interview Findings

CIT conducted interviews with Internet service providers in the county and the city to determine their perspective on challenges to expansion and what options the county and city may have in working with the provider to expand their service. There were a few providers that would not respond to our requests for an interview – VisualLink and Lumos. Additionally CIT interviewed the local electric coops to discuss pole attachment fees and required processes. All contacts are listed in the References section in the Appendices.

Level 3

Level 3 is an upstream provider – providing Internet service to last mile providers – and they maintain a three percent market share within the region. They are considered the largest IP provider globally. Multiple industry authorities list Level 3 as having the most connected, lowest latency network in the world. Sources indicate that the company holds over fifty percent of the world's traffic.

Level 3 provides fiber, Internet service, Voice-over-IP, security services, Ethernet, IPVPN (Layer 2 and 3), private line services (TDN/Ethernet), wavelength services, cloud services,

collaboration and unified communications. They continue to expand their network and fiber miles within the county based on specific customer and government projects. They currently have multiple projects in progress that will expand their assets significantly in the area.

Level 3 reports their largest barrier to expansion is locating local demand that aligns with their global portfolio. They are absolutely open to considering cost share to provide connectivity to unserved areas within the county. In fact, Level 3 has multiple programs that support these types of partnerships. They are currently doing this in other counties within Virginia and Maryland.

Finally, Level 3 is interested in meeting with the county and city to align strategic initiatives and growth plans.

Comcast

As noted in the citizen survey, Comcast is the largest provider in the area. Comcast has 140,000 miles of fiber that stretches across the country that includes an advanced platform powered by a common architecture, open standards and IP protocols. Comcast stated they do not have any build-out plans set for the county at this time. However, they are offering a new fiber service for business customers (Metro E). The expansion of fiber could provide more opportunities for cable connections to residents. Comcast also pointed out if they had an opportunity to provide services to the schools that could also allow opportunities for nearby residents. Considering this statement it may be beneficial for the schools to do a price comparison between their current provider and Comcast.

Comcast states the largest barrier to their expansion is population density. They need to have a significant number of homes per mile to make expansion feasible. The second largest barrier is Shenandoah Electric Coop's pole attachment rates are too high forcing Comcast to go underground which makes build-outs even more expensive. Shenandoah Electric is charging thirty-three dollars ($33) per pole per year whereas Dominion Power charges just under eight dollars.

> *Pole attachment rates are always higher with electric coops than for profit companies due to their need to cover the costs of the poles. There have been some legislative attempts in Virginia in recent years to regulate the electric coop pole attachment rates as they are not bound to the federal regulation like the for-profit power companies. Those attempts have failed and in 2012 legislation was passed to authorize the State Corporation Commission to determine reasonable rates when the parties cannot reach agreement. There is a current case pending with the SCC between NOVEC and Comcast with a target of November 2013 for the hearing. The outcome could greatly impact broadband deployment in electric coop areas.*

Comcast is amenable to cost sharing to lower costs of expansion. They have already completed some cost sharing projects in Goochland and Caroline counties. Each area must be evaluated on a case by case basis; some factors to be considered are the number of

residents committed to taking service, the types of construction required, and the willingness of residents to contribute to the costs of construction.

Comcast tracks several metrics including proactively monitoring its network and product performance around the clock. All Comcast employees are held to several metrics to ensure quality of service and care.

Comcast would not divulge their take rate (rate of potential subscribers actually subscribing to their service) but did highlight that how much they pay as Communications Sales Tax is a general indicator of their business in the county. In regards to adoption, Comcast has established a program available to low-income families with children who receive either a free or reduced price lunch under the National School Lunch Program. The goal of the "Internet Essentials" program is to help close the digital divide and ensure more Americans benefit from all the Internet has to offer.

Comcast offered the following items as additional ways the county or the city could assist their services expansion in the area:

- Consider how the schools and local government are connecting and consider a deal with a local provider;
- The county could require new housing developments to have a broadband plan and could roll the cost of build-outs into the cost of the house;
- The local governments could work with HOAs to get residents to commit to subscribe to service – still need critical mass in these situations;
- Work within communities to assess actual needs;
- Streamline and modernize policies impacting broadband deployment, including those related to rights-of-way management and zoning ordinances;
- Tap into local social infrastructure to raise awareness of the benefits of broadband connectivity in under-adopting communities (e.g., seniors, low-income households).

SHENTEL

Shentel provides mobile wireless, 44 DSL lines in the southern most part of the county and fiber mostly to businesses and most if not all cell towers in the county. They have full redundancy with six diverse routes out of Frederick County with their upstream service from Ashburn, Atlanta and Pittsburgh. Shentel is the Sprint Wireless affiliate in the county offering mobile wireless service and twenty-two percent of wireless customers in Winchester are Sprint customers. Sprint customers are required to sign a two-year contract in exchange for subsidized phone; however, month-to-month service is also available. As for fiber customers, Shentel typically requires some sort of contract term so the customer can pay for the build over time. Shentel is currently replacing wireless equipment to upgrade to 4G LTE and building 80-100 new towers in the area.

Shentel reports the largest barriers to expansion in the county are zoning ordinances and regulations. These ordinances and regulations prohibit them from placing towers where they need them most. Shentel recommends that Frederick County reassess policies to be more broadband friendly. Shentel did not offer any specifics on the particular policies they are referring in the above statement.

Shentel is very agreeable to cost sharing to extend their service to any customer in the county or the city. Shentel offered there are two wireless Internet service providers that are interested in moving into the county (Roadstar and Loudoun Wireless). Additionally Shentel is open to sharing their existing fiber in exchange for partnering on expansion builds throughout the county to expand their 4G LTE service.

NOVECNet

NOVECNet provides satellite broadband technology through ViaSat-1 and based on the new Exede technology. ViaSat will be releasing a newer and more powerful version in 2016. The end customer connects directly from their home satellite dish to the ViaSat-1 satellite and via the satellite to an earth station or gateway located in Lovelock, NV. There are multiple gateways across the United States; however the Lovelock gateway provides service to the ViaSat-1 beams covering Frederick County and most of Virginia. The earth station provides the terrestrial connection to the internet. From the earth station the data is retuned via the gateway to the satellite and back to the customer's satellite dish. The round trip takes approximately 600 milliseconds. The gateway has redundant fiber paths to ensure high availability and the satellite connection from the gateway to the satellite and the satellite to the customer's location is robust and able to handle most weather conditions by automatically adjusting power levels to maintain connections.

NOVECNet has a base package price of $49.99 plus a $9.99 modem rental cost. Installation is free but they do require a two-year contract. ViaSat has 512,000 satellite broadband customers. Penetration data is challenging due to defining the Exede service area, which is every home not served by wireline. Marketing and promotion activities are a more limited set of this audience and CIT does not have access to that information for either ViaSat or NRTC members.

NOVECNet reports the only barrier they have is trees interrupting line-of-sight to the satellite. NOVECNet suggests that the county and city could inform the public that this is a viable option for high speed broadband internet service – especially for those that are frustrated waiting for fixed wireless providers or other terrestrial service providers such as Comcast or Verizon to come into their areas. As a not-for-profit electric cooperative, NOVECnet's focus is to deliver products and services that provide value to the communities they serve. They believe in the importance and transformative value of broadband, which is why they partnered with NRTC to deliver the Exede satellite product. They believe it is a great solution for many homes and businesses in Frederick County. However, if a better technology with a better broadband offering becomes available, NOVECnet will work to ensure their Exede subscribers have the freedom to select the product that's best for them. They do not intend to lock a person into anything that's not of value; they just want to offer them the best broadband service available to them today.

Verizon

Verizon provides DSL, fiber-to-the-home (limited), fixed and mobile wireless broadband services and they do not require term contracts. Additionally, Verizon offers a whole array of higher capacity broad band services over copper and fiber for business in Frederick County

(T1, DS3, OC-3, OC-12, OC-48, etc.). Verizon views all service options in regards to return on their investment and no specifics were provided in regards to barriers to expansion.

DSL

DSL has been deployed in the Winchester, Stephens City, and Gainsboro central offices, and in three remote terminals off of the Winchester CO for a total of six sites. Verizon has no plans to build out the DSL service any further.

FiOS

Verizon has deployed a small amount of FiOS in Frederick County, all in "greenfield" (new construction) neighborhoods. In the limited areas where it is available, customers can purchase FiOS Internet and FiOS voice services only, not FiOS TV as they do not have a video franchise in the county and are not pursuing one. There are no proactive expansion plans, but Verizon may consider additional deployment in a new construction situation only if the business case works from an investment/return perspective.

Mobile Wireless (3G and 4G LTE)

Verizon Wireless 3G coverage is extensive in Frederick County, and 4G LTE coverage is becoming extensive. 4G LTE is now widely available in the greater Winchester area and the I-81 corridor. Verizon intends to overbuild its entire 3G network with 4G LTE service by the end of 2013, so this coverage should continues to improve. Both 3G and 4G coverage enables mobile broadband, and in 4G areas Verizon offers HomeFusion, a fixed wireless broadband service. It is this HomeFusion service that will help them reach the more rural customers with a most cost-effective broadband solution. HomeFusion uses a professionally installed, cylinder-shaped antenna attached to a customer's home. The antenna's innovative design includes multiple internal antennae, allowing the device to pick up the best Verizon 4G LTE signal available and transmit it to a broadband router inside the home. The router can connect up to four wired and at least 20 wireless devices inside the home using Wi-Fi. Mobile wireless customers should experience average data rates of 5 to 12 Mbps on the download and 2 to 5 Mbps on the uplink.

WAVE2NET

Wave2Net provides only fixed wireless service which has typically been WiFi technology. Over the past two years the company has been building out fourth generation wireless technology (WiMax) which includes high bandwidth equipment and services. They are moving to licensed spectrum to provide better quality service and to be able to compete in other areas.

Wave2Net stated barriers to expansion are the cost to build towers and the associated permitting process. The fourth generation platform will allow them to expand in an area where they are currently serving approximately thirty customers. Their business case requires a minimum of fifty customers willing to subscribe before deploying this equipment and they will not expand into areas where wireline service exists.

Wave2Net does not have a customer service plan to ensure consistency in customer service delivery. However, they have increased their customer service hours and are educating rural

customers on their service in an effort to set proper expectations. The company does track metrics in regards to up-time per location, overall bandwidth usage times, latency, service delivery, and interference levels. They do not track "take rate" or the percentage of potential customers that actually subscribe.

Since Wave2Net is a WISP, CIT asked about documented network contingency plans and if their network is modular allowing in-place upgrades. Wave2Net responded that these questions were not applicable. They responded the same way to the question regarding their interest in cost sharing for extending their service.

Wave2Net has multiple upstream providers and they believe their current head end facility is adequate. The company suggested that the county could grant access to vertical assets and allow utilization of any spectrum owned by the county. Wave2Net's main question was "what is it that the county wants to do?" Wave2Net is very interested in working with the county but believes they need some insight as to what Frederick County wants to achieve.

Winchester Wireless

Winchester Wireless provides fixed wireless service using Motorola Canopy (Cambium Networks) and Ubquiti Networks for select point-to-point services. The company is the newest wireless Internet service provider in the area and currently provides service to approximately 700 businesses and residences in the northern Shenandoah Valley area. The company operates in spectrums ranging from 900Mhz to 5.8Ghz for point to multipoint networks. Winchester Wireless does not require any contract term for service; it is pay as you go month-to-month. The company currently has plans to add approximately eight additional broadcast points during the remainder of this calendar year. Additionally, they are adding higher speed non-line-of-sight equipment over the remainder of this year; including 2.4Ghz in OFDM modulation and 3.65Ghz WiMax once the licensing process is completed.

Winchester Wireless stated the primary barriers to expansion is locating and procuring suitable rebroadcast locations and public awareness that their services are available in an area. They stated some areas that the county believes are underserved or unserved are already served by their company but citizens do not know their service is available.

The company constantly upgrades the backhauls between tower sites and is always looking at new technologies to add to increase last mile bandwidth capabilities to the residence. They will be adding some new equipment in the 2.4Ghz range to the network later this summer. This new equipment is being released by Cambium sometime in July and they are also in the process of licensing 3.65Ghz spectrum in the area which will include all five required quiet zone exclusions (areas where radio transmissions but operate at reduced power and with highly directional antennas) for this area. Once this new equipment is deployed Winchester Wireless will begin offering WiMax service. Currently there are no other providers in Frederick County have 3.65Ghz licensing approvals and Winchester Wireless hopes to be the first provider to offer this product with a target date of fourth quarter this calendar year.

Winchester Wireless has fully documented their network and is in the process of building out a redundant ring for all their tower sites. Their network is mostly modular and capable of supporting in-place upgrades on ninety percent of their sites.

In regards to their customer service plan, Winchester Wireless provides customers with a one-year warranty and after the first year the customers are automatically entered into an equipment protection plan. There is a set thirty-five dollar deductible for repairs and then the company covers the remainder of the costs for repair. Winchester Wireless does not currently have a customer service plan to ensure customer service delivery consistency. The company tracks metrics such as up-time on every device on the network and they track customer data usage as well as usage flowing through each of the tower sites.

Winchester Wireless has a 1Gbps fiber optic line feeding their head end in the city. They are currently investigating adding a second peering point so they can ensure redundancy and do load balancing for their network.

The company would welcome the county's assistance with locating areas that need service and then subsequently assisting with securing rebroadcast sites in those areas. Winchester Wireless stated if they knew where the unmet demand was they would focus on those areas. Finally, they stated financial subsidy can accelerate the timeline to reach some of the unserved areas.

Rappahannock Electric Cooperative

The cooperative allows other entities to attach to their poles provided they can meet code compliance. The costs for provisions to meet the proper code restrictions are payable in advance. REC has a Joint Use Contract which states the fee per attachment annually which is $18.44 per pole. This annual fee is not negotiable due to the amount that has been filed with the SCC.

Shenandoah Valley Electric Cooperative

The cooperative works closely with each firm that requests permission to attach to one of their poles. First, a pole attachment agreement must be established with the requesting firm. Once the agreement is in place, cooperative engineers will work with the requesting firm to understand the proposed route. Engineering is completed to identify any construction or rearrangement (i.e., make-ready work) of existing attachments required to facilitate attachment in accordance with the National Electric Safety Code. The cost of this work is paid by the requesting firm and make-ready work is completed by the cooperative. The requesting firm is then given the approval to attach to cooperative poles.

Fees are based on the actual (embedded installed) pole cost, and the actual number of cooperative-owned poles for the time period. It is important to note that the cooperative is not-for-profit distribution electric cooperative (i.e., member-owned). Recovering actual pole cost is imperative to keeping cooperative member-owners whole during the pole attachment process. There is no mark-up for these attachments. As a not-for-profit entity, SVEC seeks to ensure that cross-subsidies do not exist between those with whom SVEC does business.

Such cross-subsidization by member would not be fair to member-owners not receiving benefit from the project.

Library Interviews

Libraries in the area were interviewed to determine how many public access computers are available to the citizens and what types of digital literacy training is available. These findings will be considered in the final recommendations in regards to potentials for expanding digital literacy training options for the citizens.

Handley Regional Library

Handley Regional provides 40 public access computers across all three facilities. They do have staff dedicated to assisting patrons with computer needs. Additionally, the library offers approximately six free computer classes per month. They are currently in the process of upgrading the public computers to Windows 7 operating system and Microsoft Office 2010 to support future classes beginning in the late fall.

The library reported that the typical support questions they receive from the patrons are related to printing, accessing files from a flash drive, how to create a resume, how to attach their resume to a online job application and how to apply for jobs online.

Educational Programs Offered

- Getting to Know the Computer
  Class will cover the basics about the computer. Attendees will learn parts of the computer, use of the mouse, and various keyboard functions. 90 minutes. *Attendees must have a Handley Regional Library card and be able to use a mouse.*

- Online Database Searching
  Class will cover Find It Virginia and other subscription databases, including business, medical, scholarly, and general informational databases. Attendees will learn to access and search these databases. 90 minutes. *Attendees must have a Handley Regional Library card and completed MS Word and Internet classes.*

- Basic E-Mail – Handley Library and Bowman Library
  Class will cover setting up e-mail accounts, sending e-mail, and tips on spotting viruses. 90 minutes. *Attendees must have a Handley Regional Library card and be able to use a mouse.*

- Introduction to the Internet – Handley Library and Bowman Library
  Class will cover the basics of Internet searching and search engines. 90 minutes. *Attendees must have a Handley Regional Library card and have basic computer skills, i.e. mousing.*

- Beginning MS Word – Bowman Library and Handley Library
  Class will cover the basics of Microsoft Word. Attendees will learn how to set up, save, and print documents. 90 minutes. *Attendees must have a Handley Regional*

Library card and be able to use a mouse.

- Basic MS Excel – Handley Library and Bowman Library
  Class will cover the basics of Microsoft Excel. Attendees will learn a practical application for Excel, such as basic spreadsheet setup. 2 hours. *Attendees must have a Handley Regional Library card and be proficient in MS Word.*

- Basic MS PowerPoint – Bowman Library only
  Class will cover the basics of the Microsoft PowerPoint program. Attendees will learn how to create a simple PowerPoint presentation. 90 minutes. *Attendees must have a Handley Regional Library card and be familiar with Microsoft Office.*

- Basic MS Publisher – Bowman Library only
  Class will cover the basics of the Microsoft Publisher program. Attendees will learn how to create publications including simple flyers, calendars, and greeting cards. 90 minutes. *Attendees must have a Handley Regional Library card and be proficient in MS Word.*

- Basic MS Access - Bowman Library only
  Class will cover the basics of Microsoft Access. Attendees will learn to create relational databases using tables. A brief introduction of forms, reports, and queries will follow. Class time: 90 minutes. *Attendees must have a Handley Regional Library card and be proficient in MS Word. Familiarity with MS Excel is recommended.*

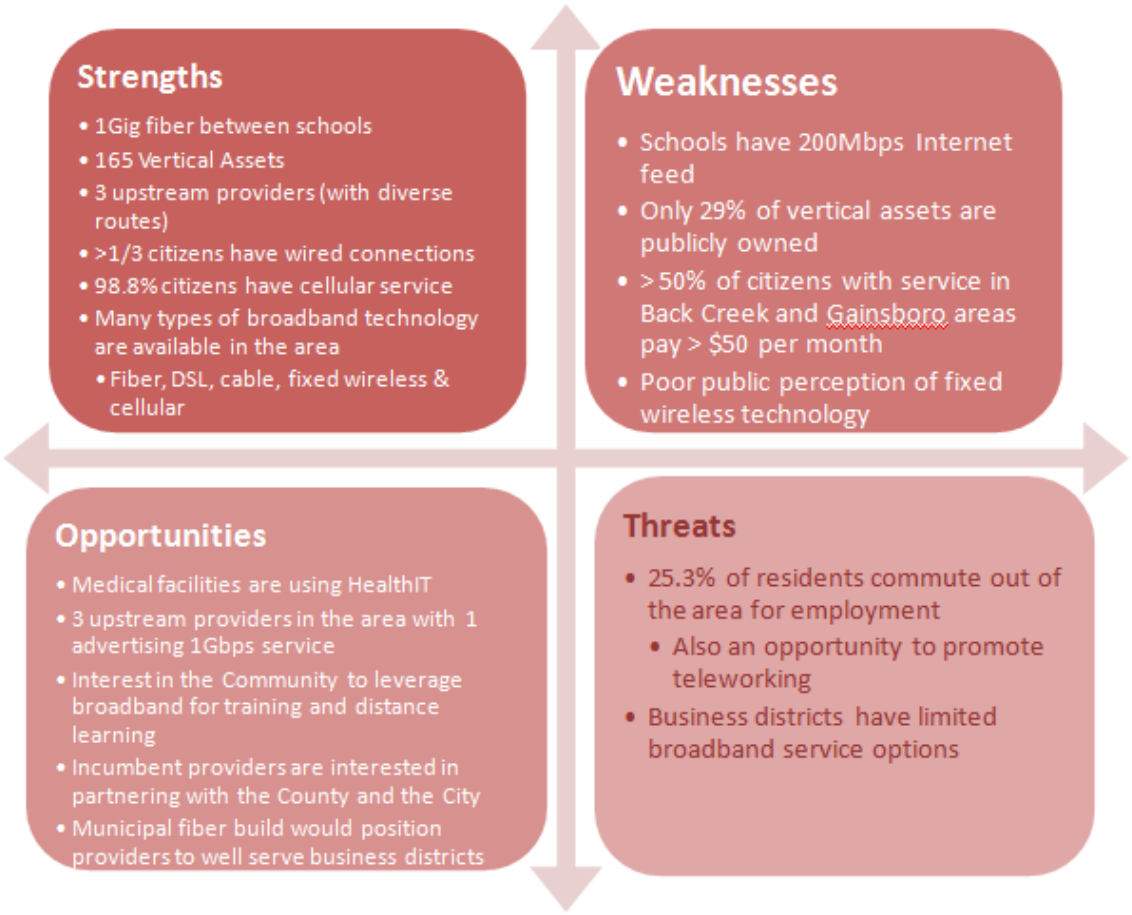
Lord Fairfax Community College – Paul Wolk Library (Middletown campus)

The Wolk Library is open to the public and they provide thirty-five desktops and twenty laptops for public use. They do not have staff dedicated to assisting patrons with technical support or applications questions. They do have patrons ask for assistance; primarily for help printing and with Microsoft Office. The Wolk Library does not offer any public computer classes. However, the college offers tutoring and workshops specific to technology for students only through the Academic Center for Excellence.

Shenandoah University Library

The university library is open to the public; however, they offer only limited access to four computers as they are primarily for the students. If there are computers available they will a citizen user have access for up to sixty minutes per day. They often direct residents of Winchester and Frederick County to the Handley Regional Library for more extensive availability and support. They have a few people who come in regularly to use a computer, but mostly they see travelers who are passing through. They do not provide wireless access for community users as their campus network is restricted to current students, faculty and staff. The library does not offer any classes for the general public.

Community Strengths, Weaknesses, Opportunities and Threats



Business Case Analysis

The greatest challenge to any broadband deployment initiative is funding – grants, private investment, local general fund tax dollars or other sources. This section is all about thinking creatively on how to leverage the assets, reduce costs, reallocate current spend and make deployments easier.

Frederick County Coverage Assessment

In comparing the combination of DSL and cable coverage areas and census population density it is clear there are gaps, the larger ones noted in the map below by red circles. Some of these gaps are on the edge of existing cable and/or DSL service areas and should be addressed with the existing providers to determine what is needed to extend service. In some instances – such as with Stoneymeade there are clearly gaps in cable coverage within that development. The coverage in our maps is based on data reported by the providers and there is a disclaimer as errors do occur. One such error is the indication that some cable and DSL exists in Shawneeland which CIT has reported to our data collection team as an error. Other similar areas that are suspect as data errors are noted in the table below as "reported coverage data error?" and the associated gaps may be larger than denoted. Shawneeland is a densely populated development and is quite a challenge from a fixed wireless perspective due to having dense tree canopy. Fixed wireless providers can provide coverage but it will require a number of data poles and the poles may not appeal to the residents. The new TV Whitespace technology which is being piloted by West Virginia University has demonstrated the ability to transmit through tree canopy. However, the whitespace technology is new, somewhat expensive and performs at the cellular 3G speeds (max 1.4Mbps download). The best solution for Shawneeland is wireline service and considering the number of potential subscribers the business case should be made for cable or DSL providers (preferably cable). Shawneeland should be particularly attractive to broadband providers as it contains 871 homes in four square miles and it is only thirty-percent developed.

Following is a map identifying the more major gaps in coverage in consideration to population density. Below the map is a table referring to the gaps (referenced by number – numbers 11 and 13 deleted after determining few homes involved) providing the estimated number of homes impacted and if there may be a potential to encourage existing wireline providers to extend their coverage if the gap is on the edge of current service areas.

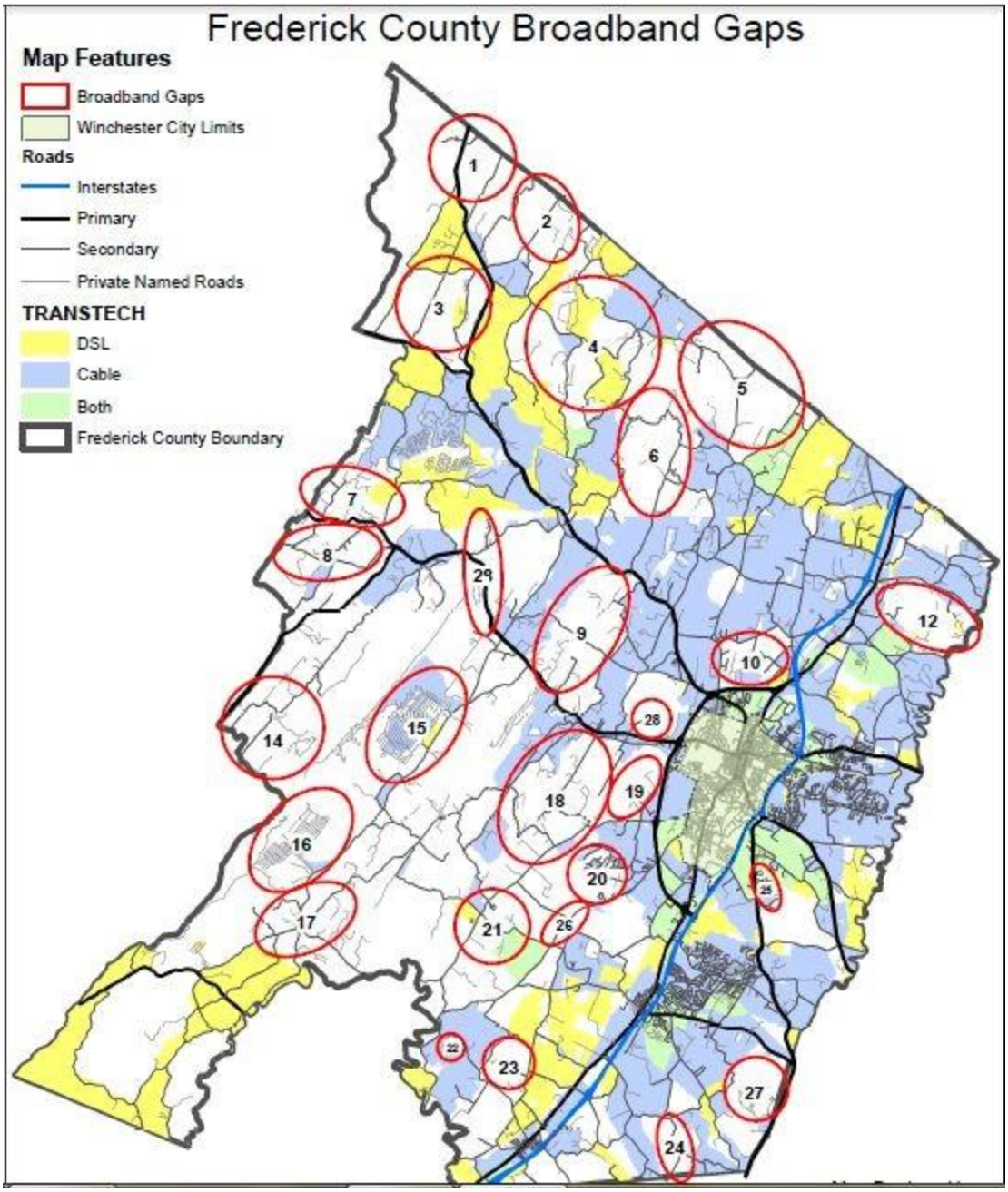


Figure 26 Frederick County Coverage Gaps

Gap Ref #	Census Tract	Est. # Unserved Homes	Location Description	Comments
1	503	71	Gainsborough - N. 522 at state line	DSL extension?
2	503	60	Gainsborough - Reynolds Rd to state line	DSL extension?
3	503	82	Gainsborough - Timber Ridge (Whitacre Park)	

Gap Ref #	Census Tract	Est. # Unserved Homes	Location Description	Comments
4	503	138	Gainesborough – Winding Ridge	May be larger – possible coverage reported data error
5	503	119	Albin – Green Spring Rd	
6	503	127	Albin – Hunting Ridge Rd	Cable extension?
7	504	133	Redland – Fairview Rd	Cable / DSL extension
8	504	144	Redland – Parishville Rd	Cable extension? Possible coverage reported data error
9	505	173	Nain – Indian Hollow Rd	Cable extension? Up
10	502	174	White Hall – Greenfield Dr/McGhee Rd	Cable Extension?
12	501	73	Clear Brook – Slate Ln	Cable/DSL Extension?
14	504	90	Redland & Gore – Back Creek Rd	
15	504	902	Gore – Shawneeland	Wireline preferred
16	504	537	Gore – Wilde Acres	Wireline preferred
17	504	135	Gore & Russells – Star Tannery Rd	
18	505	352	Russells – Singhass Rd	Cable?
19	505	54	Russells – Woodchuck Ln	Cable? Some DSL
20	506	208	Kernstown – Stoneymeade	Cable issue
21	506	131	Kernstown – Cedar Creek Dr	
22	507	25	Cedar Creek – Chimney Circle	Cable? Possible coverage reported data error
23	506	45	Cedar Creek – Buffalo Marsh Rd	
24	507	42	Newtown – Refuge Church Rd	Cable Extension?
25	509	228	Shenandoah – Longcroft Rd & Travis Court	Cable / DSL Extension?
26	506	53	Kernstown – Middle Rd & Barley Ln	Cable Extension?
27	508.01	132	Canterburg – Lake Frederick	Cable Extension?
28	505	84	Nain – National Lutheran Blvd	Cable Extension?
29	503 & 504	118	Gore & Redland – Rt 50 (Hayfield Ridge)	Cable Extension?

Table 5 Frederick County Broadband Coverage Gaps

Leveraging Assets To Reduce Costs

Existing Vertical Assets

Wireless broadband technologies can leverage many types of structures to mount transmitters including towers, water tanks, silos and building roof tops. It is most cost effective to consider all existing structures when designing a broadband network. The following table identifies the existing structures by owner type.

Owner / Owner Type	Existing Vertical Assets
Private Business	109
Institutional / NonProfit	8
Public: Local	35
Public: State	13

Table 6 Vertical Asset Count by Owner Type

The map below depicts the locations of existing vertical assets using symbology to indicate the height of each:

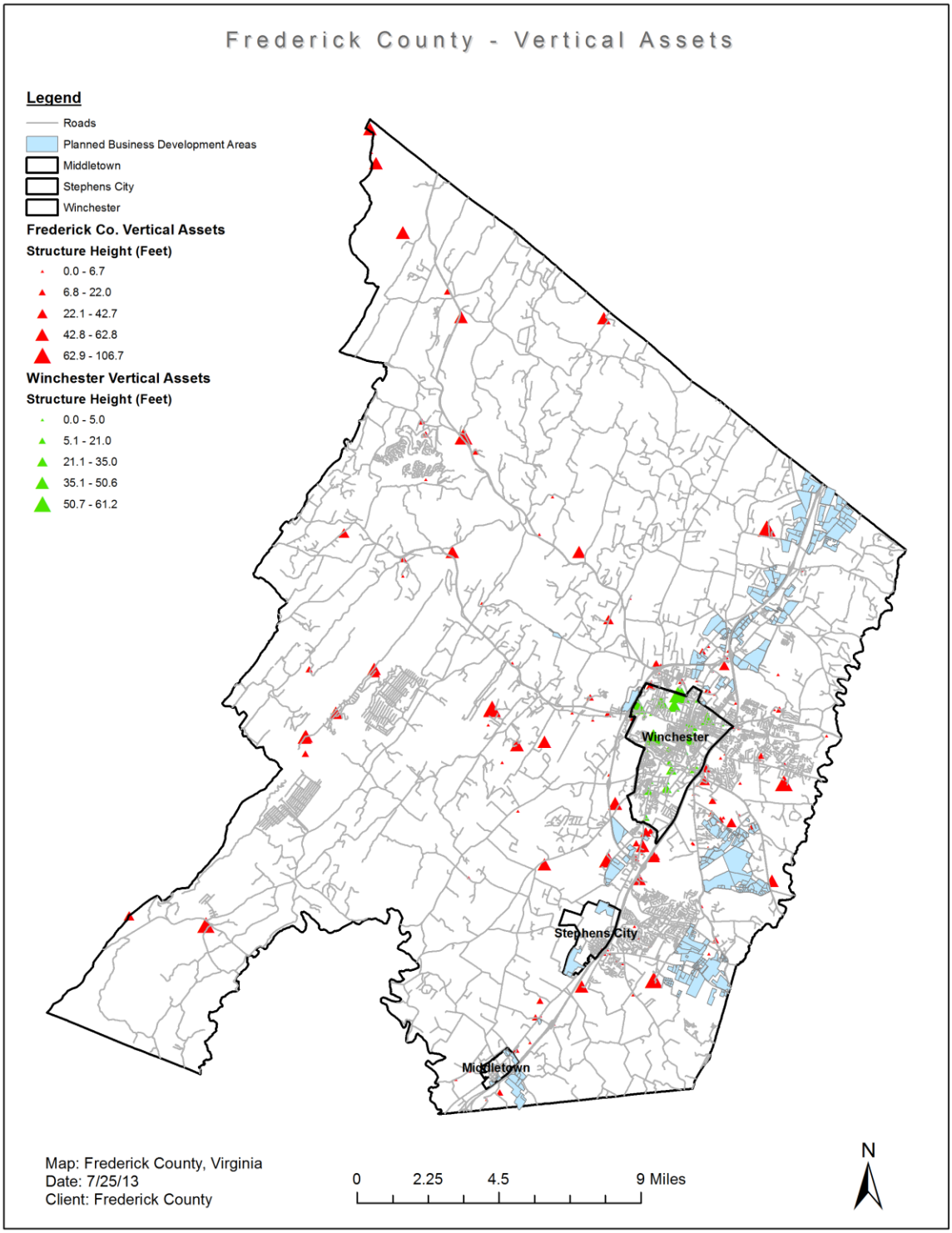


Figure 27 Frederick County Vertical Asset symbology indicating height

Local Government Owned Land

Local government owned land can easily be leveraged for future infrastructure build-outs including towers, poles, huts, etc. The following unimproved acreage has been identified and may be considered for any new towers:

- **Frederick County School Board** – has approximately 214 acres across 11 parcels.

MAP #	ACREAGE	COMMENTS	DESCRIPTION
29 A 33A	1.40		GAINESBORO ELEMENTARY
30 A 45F	38.03		
42 A 186	1.00	DUMPSTER SITE	BRYARLY ELEMENTARY
42 A 230	6.02	2 MOBIL OFFICES 6/1/06 B	
42 5 D	68.86	DUGOUTS ADDED 1/1/2011	JAMES WOOD HIGH SCHOOL
42 6 A	10.00	APPLE PIE ELEM SCHOOL	APPLE PIE RIDGE ELEM
42 6 B	4.19		
75 A 54	23.90		R E AYLOR MIDDLE
75 A 63	18.29		BASS HOOVER ELEM
86 A 80A	2.28		
86 A 117	40.00	MOD CLASSROOMS COMP 5/1/09 N	SHERANDO HIGH SCHOOL

- **Frederick County-** has almost 60 acres available across eighteen parcels.

MAP #	ACREAGE	COMMENTS	DESCRIPTION
42 5 D2	0.23	WATER TANK	.23 ACRE
48 A 48M	0.06	2 TOWERS & BLDG ASSESSED 1/1/01 &	.06 ACRE
49A01 1 6 2	0	DITCH	SHAWNEE LAND L2 P1 S6
49A05 1 F 61	0		SHAWNEELAND L61 SF
49A07 111 16	0		SHAWNEELAND L16 P1 S11
49A07 111 125	0		SHAWNEELAND L125 P11 S11
49B03 124 12	0		SHAWNEELAND L12 P4 S24
50 A 33B	0.13		.13 ACRE
54 A 124A	10.65	PARK IN FREDERICK HEIGHTS	10.65 ACRES
54C 1 5 25A	0		GREEN ACRES L.25A S5
55 A 127C	0.05		.05 ACRE

64 A 40D	6.9		6.90 ACRES
64 A 154	5.46	PLANE CRAZY IS BESIDE THIS PARCEL	5.46 ACRES
65 A 156F	16.8	Kenny Lane S/D	16.80 ACRES
65 A 167	9.5		9.50 ACRES
75 A 63F	9.84	BASS HOOVER ELEM	9.84 ACRES
90 A 12A1	0.1		.10 ACRE
90 A 12B1	0.1		.10 ACRE

- **Frederick County Sanitation** – has approximately 52 acres across 14 parcels:

MAP #	ACREAGE	COMMENTS	DESCRIPTION
42 A 193A	1.68		1.68 ACRES
43 A 56A	0.03	NOT MAPPED	.03 ACRES
44 A 294B	0.16	PUMP STATION BLDG 10/1/08 B	.16 PUMP LOT
53 A 68D	0.15	PUMP STATION	PUMP LOT .15 ACRES
54 A 36W	0.08		.08 PUMP STATION LOT
55B 3 2 65	0		SHENANDOAH HILLS L65 S2
64 A 45Q	0.17		PUMP STATION LOT
74 A 22A	0.26	PUMP HOUSE COMPLETE 1/1/2001 R	.26 ACRE PUMP LOT
74A01 1 A1	23.01	WATER TREATMENT PLANT	23.01 ACRES
74A01 1 A1	23.01	WATER TREATMENT PLANT	23.01 ACRES
75 A 1G	0.037		FCSA OUTLOT .037 ACRE
75 1 A1	2.09	LEVEL GOOD COMMERCIAL POSSIBILTY	2.09 ACRES
76 A 53O	0.07		PUMP STATION
87B 2 1 228C	0.09	Pump Lot	SHENANDOAH .09 ACRE

- **Shawneeland Sanitary District** – has more than 10 acres (not all parcels show acreage) across 49 parcels:

MAP #	ACREAGE	COMMENTS	DESCRIPTION
49A01 1 2 1A	0	WOODED	SHAWNEELAND L.1A S2
49A01 1 2 23	0	WOODED	SHAWNEELAND L23 S2
49A01 1 3 24A	0		SHAWNEELAND L.24A S3
49A01 1 3 83	0		SHAWNEELAND L83 S3
49A01 1 6 16	0	OPEN DITCH	SHAWNEELAND L16 P1 S6
49A01 1 7 22	0	LARRICK CEMETERY ON THIS LOT	SHAWNEELAND L22 P1 S7
49A01 1 7 23	0	WOODED	SHAWNEELAND L23 P1 S7
49A01 1 7 24	0	WOODED	SHAWNEELAND L24 P1 S7
49A01 1 8 9	0	WOODED	SHAWNEELAND L9 P1 S8
49A01 1 8 17	0	WOODED CORNER LOT	SHAWNEELAND L17 P2 S8
49A01 1 8 40	0		SHAWNEELAND L40 P2 S8

MAP #	ACREAGE	COMMENTS	DESCRIPTION
49A02 115 20	0		SHAWNEELAND L20 P1 S15
49A02 119 21	0		SHAWNEELAND L21 P1 S19
49A03 1 D 61	0	WOODED	SHAWNEELAND L61 SD
49A03 1 H 15	0	WOODED	SHAWNEELAND L15 SH
49A03 1 H 16	0	WOODED	SHAWNEELAND L16 SH
49A03 1AA F1	6.84		SHAWNEELAND L.F1S.AA
49A03 1BB N	0	WOODED	SHAWNEELAND LN S.BB
49A05 1 R 3	0		SHAWNEELAND L3 SR
49A05 1 R 4	0		SHAWNEELAND L4 SR
49A05 1 R 23	0	STEEP	SHAWNEELAND L23 SR
49A05 1 R 24	0	STEEP	SHAWNEELAND L24 SR
49A06 1 5 244	0		SHAWNEELAND L244 P12 S5
49A06 110 53	0		SHAWNEELAND L53 P5 S10
49A06 110 54	0		SHAWNEELAND L54 P5 S10
49A07 111 39	0		SHAWNEELAND L39 P3 S11
49A07 111 45	0		SHAWNEELAND L45 P3 S11
49A08 111 71	0		SHAWNEELAND L71 P7 S11
49A08 111 165	0		SHAWNEELAND L165 P12 S11
49B02 125 63	0	STEEP & ROUGH	SHAWNEELAND
49B02 125 64	0	STEEP & ROUGH	SHAWNEELAND L64 P3 S25
49B02 125 65	0	STEEP & ROUGH	SHAWNEELAND L65 P3 S25
49B02 125 105	0	STEEP & ROUGH	SHAWNEELAND L105 P2 S25
49B02 125 106	0	STEEP & ROUGH	SHAWNEELAND L106 P2 S25
49B03 123 246	0		SHAWNEELAND L246 P19 S23
49B03 123 265	0		SHAWNEELAND L265 P21 S23
49B03 123 266	0		SHAWNEELAND L266 P21 S23
49B03 123 267	0		SHAWNEELAND L267 P21 S23
49B03 123 268	0		SHAWNEELAND L268 P19 S23
49B03 123 269	0		SHAWNEELAND L269 P19 S23
49B03 123 270	3.67		SHAWNEELAND L270 P19 S23
49B03 123 280	0		SHAWNEELAND L280 P18 S23
49B03 123 281	0		SHAWNEELAND L281 P18 S23
49B03 123 282	0		SHAWNEELAND L282 P22 S23
49B03 123 283	0		SHAWNEELAND L283 P22 S23
49B03 123 284	0		SHAWNEELAND L284 P22 S23
49B03 125 6	0		SHAWNEELAND L6 P6 S25
49B03 125 14	0		SHAWNEELAND L14 P6 S25
49B03 125 21	0		SHAWNEELAND L21 P6 S25

- **City of Winchester** – has almost eight acres across two parcels:

MAP #	ACREAGE	COMMENTS	DESCRIPTION
55 A 182C	0.15	NOT MAPPED, LOOKS LIKE NEAR 182A&	.15 ACRE
55 4 1	7.39		7.39 ACRES

RIGHTS-OF-WAY

The "Frederick County – Rights-of-Way" map below displays the best available information regarding county-owned parcels. Additionally, Rappahannock Electric Cooperative is the only utility company that provided rights-of-way information for this study and those are included in this map.

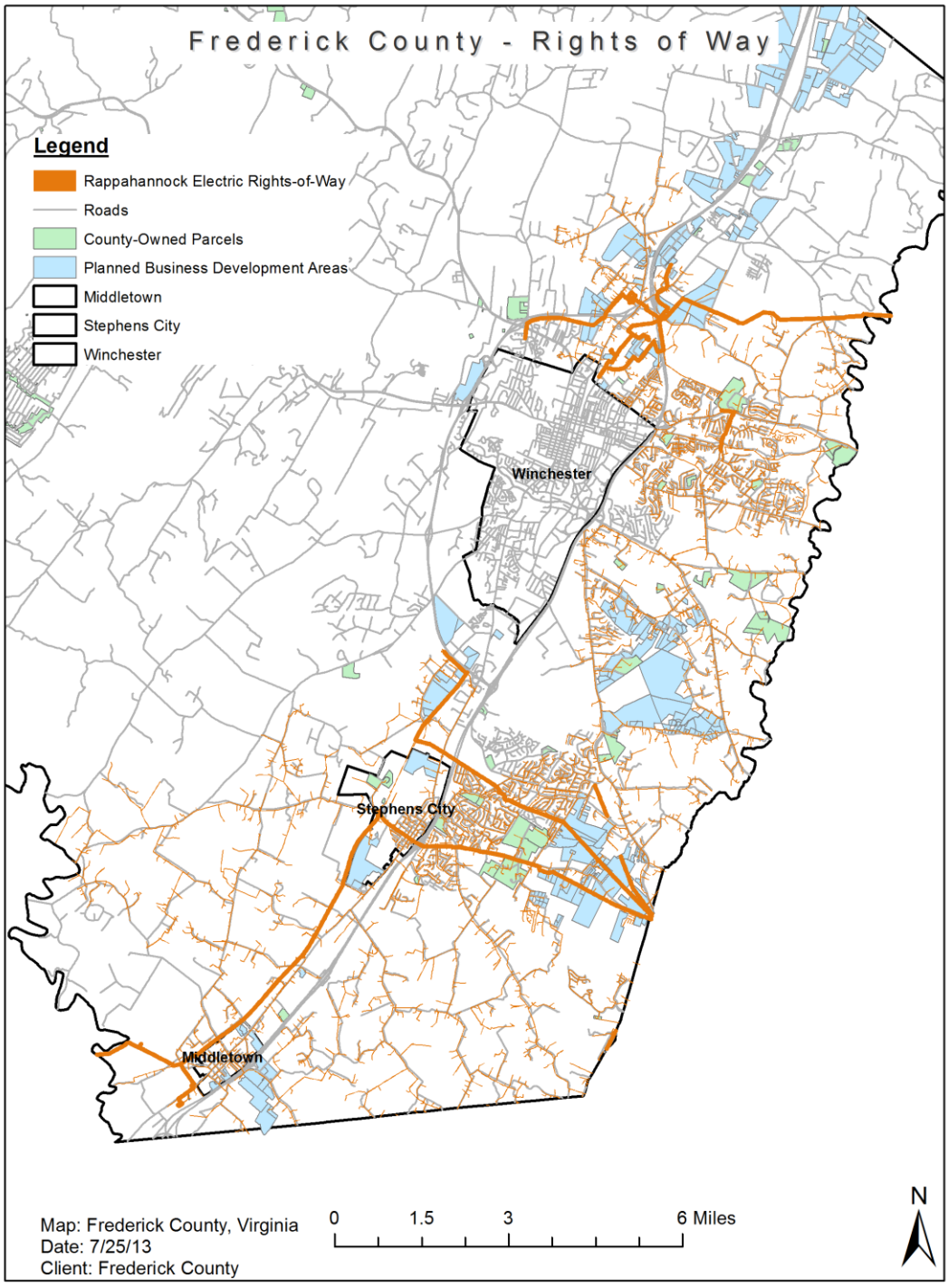


Figure 28 Frederick County Rights-of-way

How to Fund Broadband Expansion

This section includes all available federal and state grants as of August 2013. The Tobacco Commission, Appalachian Regional Commission and USDA Community Connect grants have been excluded as the county and city are not eligible for these. The most applicable grants for the infrastructure builds recommended in this study would be the VDHCD Telecommunications Projects grant and possibly the EDA grant. The County has the significant gaps in broadband coverage and the City is fairly well-served. However, jointly applying for grants provides a better chance for the award and the recommended infrastructure in this report will certainly serve both localities.

How to Buy-Down The Cost

Public Safety Communications Projects

At the time of this study there were no reported public safety upgrade projects planned or underway. However, the following recommendations are offered for consideration in any future projects.

Consider broadband infrastructure needs whenever planning public safety radio upgrades. Include space to accommodate at least 4 providers in addition to the locality's equipment when planning any new towers. Electronic or network equipment cabinets at tower sites should be large enough to accommodate providers' equipment in addition to the locality's radio equipment. Plan the tower site security to allow for providers to have access to maintain their equipment.

Leverage Federal Funds

Federal Economic Development Administration

- The EDA, will partially fund public works projects used for economic development purposes.
- Broadband projects are theoretically eligible for this funding, and it is ideally suited to funding lateral extensions to under and unserved commercial and industrial areas.
- The last funding deadline in 2013 is for the first cycle of funding in 2014 and is September 13, 2013.

- More specifics about this grant opportunity can be found at the Grants.gov website (http://www.grants.gov/search/search.do;jsessionid=knDpQzXGJ6gWnzy1h6Tn3D1fjKBNK9Fw40vlTDxWx3xrJGpLpCN4!-861966415?oppId=208353&mode=VIEW)

Federal and State Agencies for Telemedicine

- Federal and State agencies provide funding for broadband resources that support telemedicine programs.
- Typically, telemedicine programs buy services from existing providers rather than constructing facilities, and can potentially be anchor tenants of new broadband projects.
- The possibility of tapping into these funds should be considered whenever a health care provider can be served by proposed lateral or other network extensions.
- The Telemedicine.com site keeps current all related grant information (http://www.telemedicine.com/grants.html).

Evaluate Grant Opportunities

Virginia Department of Housing and Community Development (VDHCD)

http://www.dhcd.virginia.gov/index.php/business-va-assistance/telecommunications.html

VDHCD Telecommunications Projects

This grant is the best option for Frederick County & the City of Winchester's deployment of fiber and construction of tower(s)

- Telecommunications efforts, which may include
  - implementation (e.g., installation of a fiber network) or
  - system development and support (e.g., community business training and education), may be eligible for assistance.
- All projects must demonstrate activities that are outcome-focused and demonstrate a direct relationship between intended project efforts and measurable, tangible improvements to the health of the community being served.
- All projects must demonstrate that they meet a National Objective and demonstrate a direct relationship between intended project efforts and measurable, tangible improvements to the health of the community being served.
  - National objectives include
    - benefiting low- and moderate-income persons,
    - preventing or eliminating blight, or

        - Meeting other community development needs having a particular urgency because existing conditions pose a serious and immediate threat to the health or welfare of the community, and other financial resources are not available to meet such needs.
- Please note that CDBG funds can only be used for open-access networks that allow for competition among different service providers.
- All projects funded must first submit a community telecommunications plan for approval by DHCD.
- Only implementation projects which target "last mile" installation of broadband applications will be considered for funding. (e.g., no long-haul backbone systems will be installed)
- Eligibility:
    - applicant eligibility depends on the scope and location of the proposed project. Only units of local government in non-entitlement localities are the only eligible recipients of VCDBG funding. Virginia ARC eligible applicants include localities, planning district commissions, educational institutions, health organization, nonprofit organizations and others.
- Funding Amount:
    - up to $200,000 per project is available for telecommunications
    - applicants for telecommunications implementation projects under the Local Innovation Fund must provide match with local funds in an amount equal to 50% of the CDBG request up to a maximum of $100,000.

Community Development Block Grant (CDBG) – Planning Grant

Frederick County is eligible but the City of Winchester is not currently.

- Support to localities for developing strategies for identifying and addressing their greatest community development needs.
- Can be leveraged to assist with development of telecommunications.
- Eligibility:
    - Units of local government in non-entitlement localities (list available http://www.dhcd.virginia.gov/CommunityDevelopmentRevitalization/PDFs/CDBG_EligibleLocalities.pdf)
    - Localities may partner with planning district commissions.
- Funding Amount:
    - $500,000 is available on an open basis from January 1 through September 30, 2013 or until all funding is committed.

Innovative Funding Models

http://www.cjspeaks.com/msp/snapshot-5-21.pdf

Promissory Notes

- Twenty-three Vermont towns created ECFiber, an LLC nonprofit corporation. ECFiber offers tax-exempt 15-year $2,500 promissory notes that effectively earn 6 percent interest. Fifty thousand people in these towns raised over $900,000 in 2011 to begin an initial build out covering 26 miles. Several additional fundraising efforts generated hundreds of thousands of dollars to continue the build out.

Investments (pre-paid)

- The Utah Telecommunication Open Infrastructure Agency (UTOPIA) is a consortium of 16 Utah cities. Community residents became "investors" in the network by paying upfront for its build out. UTOPIA CEO Todd Marriott said that "if residents were interested we'd bill them one fee of $3,000/home to connect to the network. We offered financing if they agreed to have a lien put on their houses. Over 31 percent of residents subscribed, with 25 percent of these households paying the $3,000 up front."

Donations

- The Steuben County [IN] Community Foundation created a supporting organization called iMAN that raised $2.7 million through mostly local donations to build a dark fiber network infrastructure. iMAN sells the dark fiber to businesses that in turn contract with ISPs to turn on the fiber and sell Internet services. Sixty-five percent of activation fees go to the Foundation whose Board of Directors fund local economic development projects.

Crowd-funding

- Crowd-funding has been used in the private sector to gather people with a common interest to pool their resources – typically money – to fund an event or service and typically leverage social media (Facebook, etc.) to build the momentum.
- A technology company in Kansas City – Neighbor.ly – is working with some local governments to use crowd-funding to solicit support (money) from residents to fund and promote services they want. Kansas City is using this service to expand the number of neighborhoods eligible for the Google fiber network and another effort to raise money (over $400,000) to establish a downtown bicycle-sharing program.
- Most recently the CEO of TechPad startup community in Blacksburg, Virginia started a crowd-funding initiative to bring Gigabit Internet and free Wi-fi to one area of the town. The funding initiative began late in May with a goal to raise $85,000 by June 9th. This amount will cover the cost of leasing the fiber for one year. The goal was exceeded as 181 contributors took the total to $92,400.

Loan Opportunities

USDA Rural Utilities Service (RUS)

http://www.rurdev.usda.gov/RD_Loans.html

Farm Bill Broadband Loan Program

http://www.rurdev.usda.gov/utp_farmbill.html

- The program funds the costs of construction, improvement, and acquisition of facilities and equipment to provide broadband service to eligible rural areas on a technology-neutral basis.
- Direct loans are in the form of a cost-of-money loan, a 4-percent loan, or a combination of the two.
- Broadband loans provide funding for:
    - the construction, improvement, and acquisition of all facilities required to provide service at the broadband lending speed to rural areas, including facilities required for providing other services over the same facilities;
    - the cost of leasing facilities required to provide service at the broadband lending speed if such lease qualifies as a capital lease under GAAP (Generally Accepted Accounting Principles);
    - an acquisition, under certain circumstances and with restrictions (see the interim rule for more details).
- Eligibility:
    - rural area means any area, as confirmed by the latest decennial census by the U.S. Census Bureau, which is not located within: (a) A city, town, or incorporated area that has a population of more than 20,000 people; or (b) An urbanized area contiguous and adjacent to a city or town with a population of more than 50,000 people. An urbanized area means a densely populated territory as defined in the latest decennial census.
    - to be eligible for a broadband loan, an applicant may be either a nonprofit or for-profit organization, and must take one of the following forms: (1) Corporation; (2) Limited liability company (LLC); (3) Cooperative or mutual organization; (4) Federally recognized Indian tribe or tribal organization; or (5) State or local government, including any agency, subdivision, or one of their units.
    - a service area may be eligible for a broadband loan if all of the following are true: (1) The service area is completely contained within a rural area; (2) At least 25 percent of the households in the service area are underserved households; (3) No part of the service area has three or more incumbent service providers; (4) No part of the funded service area overlaps with the service area of current RUS borrowers and grantees; (5) No part of the funded service area is included in a pending application before RUS seeking funding to provide broadband service.

Virginia Resources Authority

http://www.vra.state.va.us/projectfinancing.shtml

Loan Programs

- The Virginia Resources Authority provides innovative, cost-effective and sustainable financial solutions to build vibrant and healthy Virginia communities. Created by the General Assembly in 1984.
- Will finance broadband infrastructure and equipment (wired and wireless).
- VRA makes loans to counties, cities, towns, and authorities in several loan programs with the advantage of below market rates or credit enhancement.
- VRA conducts a thorough credit review of each project and borrower in its loan programs and provides post closing monitoring of every loan.

Recommendations

Facilitate Citizens Locating Providers

Many localities that are working to bring broadband to their constituents are finding that many times citizens just do not know the providers that are available. There is no one place for citizens to go to find what providers are serving the area – except for our Virginia Broadband Map. It is recommended the county and city each provide a web page and possibly a flyer of the various providers by technology type and include some information about the solution – potentially sourced from this document (Table 4 on page 28). This list of providers should include contact information for each provider. This resource will make it easier for citizens or businesses moving to the area to contact existing providers and evaluate broadband options. It is also recommended that each website include a link to the Virginia broadband map as it supports the ability to search for providers based on an address (http://mapping.vita.virginia.gov/broadband/).

Ensure a Broadband "Friendly" Zone

The following recommendations were formulated based on feedback from broadband deployment experiences throughout the Commonwealth. The scope of this project did not allow a deep analysis of Frederick County and the City of Winchester's policies and permitting fees and relied upon the information available online and provided to CIT for review. Due to the limited depth of information available for this study, it is recommended that the local planning and building staff consider these recommendations for applicability to their ordinances and permitting processes.

It is beneficial for community broadband availability that all local building and zoning ordinances facilitate broadband deployment. The county and city are encouraged to expedite the permitting process for telecommunications deployment and reduce costs of that deployment wherever possible. Providers consider all costs associated with infrastructure builds when planning deployments and expansions – the county and the city need to help make these builds cost effective to encourage service expansions. The county and the city should include broadband infrastructure in all of their plan reviews just as they do for other utilities.

Permitting Policies

All permitting policies should be reviewed and modified to facilitate broadband deployment and expansion. The county and the city should ensure the permitting process as it relates to telecommunications construction such as towers, huts, etc. is as simple as possible as well as control fees where possible.

Utility Zoning for Telecommunications

Very few Virginia localities have setup utility zoning. Normally, the lots that telecommunications huts (pre-fabricated concrete buildings protecting electronics from the environment and weather) or co-location buildings (small data center buildings providing power, cooling and physical security for servers, networking equipment and storage) are built on do not need to be as large as a residential or commercial lot. The facilities need enough land to have a grounding field, for earth grounding electronic equipment, and room for backup power such as a generator which may require fuel storage tank when natural gas is not available at the site. Excessive zoning requirements like setbacks and green spaces can inhibit a provider's ability to purchase or use a site; it should be possible for these sites to have small footprints. Frederick County code enables the Zoning Administrator to determine lot sizes for public utilities but the policy should be modified to include broadband as a utility.

"Dig Once" Policy

Considered by many to be the easiest and most effective policy change to help expedite and reduce the cost of future broadband deployment. "Dig once" policies are designed to reduce the number and scale of repeated excavations for the installation and maintenance of broadband facilities in rights of way.

The largest expense of building out broadband infrastructure is the construction phase. "Greenfield utility deployments" (development of utilities like telecommunications, water, electric, etc., before buildings, roads and sidewalks are paved) are always less expensive than deploying to an area that is already developed.

The following are a few ways the county and the city can facilitate broadband deployment though "dig once" policies:

- Require developers to have large utility easements that allow for placement of all utilities, including telecommunications infrastructure or conduit, underground before roads or paved and sidewalks are poured.
    - this can be taken a step further by defining standards for where each type of utility is placed in the utility easement in order to minimize utilities crossing each other and the need for "pot holing" to locate other utilities.
- The county and the city can partner with developers to plan the installation of open-access conduit systems (including service access pedestals and/or hand holds) throughout any new development at the time other underground utilities are installed, ensuring the conduit system is brought to the main development entrance where telecommunication providers can access the conduit for service delivery.
- When the city plans to renovate, repair or build new sidewalks, parking lots etc., open access conduit could be installed when the ground is open. During the planning stage, all service providers should be notified of the opportunity to utilize the conduit or to coordinate with the locality for new infrastructure installation. If open access

conduit is installed, it could be leased to service providers thus paying for itself over a period of time. It can also be used to manage tight right-of-way areas.

- The open access conduit system would need to strategically place adequate hand holds and/or pedestals for service providers to use and to house splice cases.

Pole Attachments

Frederick County and the City of Winchester are served by rural electric cooperatives (Rappahannock and Shenandoah Electric). Often local providers will highlight the high costs of pole attachments as a barrier to expanding services. There has been substantial discussion across various groups about this issue and the FCC has passed legislation to try and improve the situation. Although legislation has been passed at the federal level and in some states, rural electric cooperatives are exempt from that legislation. The complexity of this issue was well documented by an attorney in an article written for Broadband Communities magazine's January/February 2013 issue and a link to this article is included in the reference section of this document. CIT is unable to provide an average rate for electric coops as the SCC has not determined a pricing methodology. CIT did forward the 2011 SCC report on electric coop pole attachment rates to Frederick County in an email in early August as that report contains ranges charged by the various Virginia coops for reference. Currently there is an SCC case (PUE-2013-00055) between NOVEC (Northern Virginia Electric Cooperative) and Comcast with a hearing scheduled for November (2013). The ruling on this case may have a substantial impact on Virginia electric cooperative pole attachment rates.

Partner With Incumbent Providers

CIT recommends government leaders and the wireline providers – fiber, cable, DSL and telephone companies – consider meeting to discuss the identified gaps (Table 5 on page 55) and discover ways they can partner to expand broadband service options throughout the area. The county and/or city may learn of challenges to broadband deployment in their discussions with the providers that they can help alleviate.

The County may share the identification of the broadband service coverage gaps identified in this report with the providers – especially those gaps on the fringes of current service areas. During CIT's interviews with the providers, Level 3, Comcast and Shentel indicated a willingness to have these discussions and all three provided insight into some partnering that could benefit both the provider and the localities. These meetings would be an opportunity to align growth strategies and discuss plans to support economic development and expansion of broadband options.

The county government leaders and Comcast should consider meeting to discuss the gaps on the edges of their existing service areas and determine if there is an opportunity for cost-sharing expansion or community campaigns to determine the number of citizens ready to subscribe if extensions are built. One thing that has been learned from the Google fiber build in Kansas and some other creative projects across the nation is the willingness of

citizens and businesses to expend their own money and commit to a subscription contract to obtain service.

The table of gaps (Table 5 on page 55) with estimated number of unserved homes includes a note of "cable extension?" to indicate gaps that should be discussed with Comcast. These gaps are on the fringes of existing reported cable coverage areas and service may be extended to provide service.

CIT recommends the county and city discuss the location of fiber near the business districts with Comcast, Shentel and Level 3 to determine if any of the existing fiber is accessible.

A Public-Private Partnership

A public-private partnership with an fixed wireless Internet service provider can limit the region's financial exposure while expanding broadband options and potentially increasing job growth (by employing county residents as technicians and ideally expanding the size the wireless provider's company as the network grows). This recommendation is to pursue a fixed wireless provider partner that can deliver broadband service to community anchor institutions, businesses and citizens in the identified and more rural service gap areas (refer to Page 54 for a map and page 55 for Table 5 for description of areas). Certainly some community anchor institutions may require connectivity greater than can be provided by fixed wireless but the majority can easily be served by this technology. Fixed wireless technology is easily deployed and portable so it can be re-deployed to other unserved areas as wireline providers expand their service areas. This is a solution for today and tomorrow as it can augment wired and cellular networks and future fiber deployments. As outlined in the models documented in Appendix A (Page 96), Franklin County has proven to be a very sustainable fixed wireless partnership model and that network realized growth during an extremely tough economy. Franklin County local government benefited in many ways from this partnership over the past eight years including improved communications and lowered telecommunications costs.

There are different models implemented to guide Frederick County on how to construct the public-private partnership. Franklin County's model was based on providing the partner with access to all county-owned vertical assets at no monetary cost to the provider but an exchange of services to the county. This greatly limited the financial risk to the county while lowering the deployment costs for the provider. There was the potential risk to county services and the broadband network if the private partner failed at business management or decided to close the business. However, since the county primarily invested in infrastructure such as towers, those investments would continue to be beneficial for years to come. Other similar partnerships are founded on the county covering the costs of the equipment and upstream Internet service while the private partner invests time and resources to design, build, operate and maintain the network. This latter model could potentially put the county at risk should something happen in the partnership and the private partner ends the relationship. The county would then own all the equipment but potentially not have the expertise to maintain the operations, but could pursue finding another operator. As

mentioned earlier, fixed wireless technology is advancing rapidly and hence can become obsolete and outdated in three to five years.

In Franklin County the local government contributed some general fund investment early in the partnership – funding equipment and infrastructure such as towers. As the network grew and the private partner's business expanded, the county had little need to invest more money. The Virginia legislation that supports the formation of a wireless broadband authority positions local authorities to be able to assist a private partner with obtaining a low cost loan. A low cost loan could assist the private partner during the initial network build as most wireless providers have a one to two year return on investment and that initial capital outlay can be difficult. However, it is advised that this should only be considered if the private partner qualifies for a loan on their own.

It is critical to the partnership no matter which model is formed, to have a detailed agreement for the operation and maintenance of the service and supporting infrastructure. The partnership plan must lay out any ongoing responsibilities for all members within the partnership. There needs to be a responsibility to keep the network equipment up to date and regularly upgrade and expand the network.

Development of a marketing and communication plan can help generate both public support for the partnership and increased subscriptions – "take rates". Higher take rates play an important role in generating initial cash flow for the private provider and ensuring financially sustainable broadband service.

As the nation has observed the Google fiber project in Kansas all of us have learned that equipment subsidies coupled with term contracts offer benefits to the consumers. Frederick County could apply for the DHCD CDBG grant to fund the customer premise equipment costs for low-income eligible citizens to offset the full cost of deployment. The county could then establish an assistance program for qualified (low-income, unemployed, etc.) residents to help mitigate the one time install fee, underwrite some amount of the monthly pricing package or offer discounts. This assistance improves community life and speeds broadband adoption. The assistance program could be done as a pilot program and should require the recipients to commit to a minimum contracted period of service with penalties assessed for early termination to recover the costs.

Issue an RFI/RFP for a private Partner

It is recommended that the county issue a Request for Information (RFI) followed by a Request for Proposals (RFP) to locate a private fixed wireless Internet provider partner. The RFI should be issued first to determine the interest and capabilities of the incumbent fixed wireless providers. The county can then decide how wide to advertise their RFP based on the responses to the RFI – if incumbent providers' responses to the RFI do not demonstrate adequate interest or capability, then market the RFP to a broader area to attract other providers. The RFP should include many of the details in this report including key vertical assets, aggregated demand, indentified service area gaps and prioritization of census tracts.

Additionally the request should stipulate the following terms to be met by the provider:

- Customer Service
    - The company should not use a phone tree – there should be a person to answer the phone.
    - The company should not have voice mail on the main line except for nights, weekends or holidays and only then if they have no other option – there should be a person to leave a message with.
    - The company should implement measurements of customer service and business metrics -- tracking results through reporting to the Authority at least twice per year – such as number of calls for tech support, total customers, and average wait time.
    - The private partner should have a customer service strategy – steps or staff to go through so everyone is consistent in delivery of customer service.
- Network Build Best Practices
    - build a modular network as this will allow for upgrades without rebuilding the entire network
    - network should not be based on wi-fi technology as there are too many problems with that technology
    - document the network strengths, weaknesses, opportunities and threats (SWOT) and document contingency plans
    - ensure full redundancy, as much as possible considering the limitations on upstream fiber providers in the area.

Broadband Authority

An Authority may or may not be desired for a public-private partnership with a fixed wireless solution – depending on the model preferred by the county. There are models in Virginia that have leveraged an Authority for these partnerships when the locality is funding the infrastructure (towers and/or wireless equipment as well as the cost of the upstream Internet feed) and the private partner is designing, building, maintaining and operating the network and both parties share the revenue. If the County chooses to only share existing infrastructure (towers) with the partner and fund the build of additional towers the county would own, then an Authority may not be necessary for the wireless partnership. It depends on the role the County wishes to have in the partnership.

Leverage Existing Vertical Assets

In the recommended public-private partnership with a fixed wireless provider, the county owned towers will be important assets in expediting the deployment of a network to serve the rural areas. CIT has made every attempt to evaluate all existing vertical assets in relation to the identified gaps in service (Table 5 Page 55) to identify those assets that may be integral to providing service to those areas. These key vertical assets are listed below and include location census tract for geographic reference. The following table prioritizes these census tracts – and therefore prioritizes the existing towers -- based on the identified

broadband coverage gaps, estimated number of homes in each gap and location of community anchor institutions.

	Census Tract	
Phase I	501	(business + ~76 homes)
	502	(business + ~174 homes)
	504	(~ 2000+ homes)
Phase II	505	(~ 663 homes)
	506	(business + ~ 437 homes)
	503	(~ 656+ homes)
Phase III	507	(~ 67 homes)
	509	(business + ~ 228 homes)
	508.01	(~ 132 homes)

Table 7 Census Tract Prioritization

In reviewing the existing vertical asset inventory, there are 21 vertical assets that are located in areas adjacent to or in close proximity to the unserved areas of the region. The following table lists these key assets that should be included in any broadband deployment plan. These towers will need to be evaluated as to available space and/or loading. It is recommended the county ensure each of these towers have a recent load analysis and inspection to determine available space and potential use in a fixed wireless network. Based on the inspection, some of these may be removed from the list if there is no available space or they may be scheduled for upgrading to support additional equipment. The goal is to work from this list and inspection data to confirm available towers for use by a fixed wireless partner.

Latitude	Longitude	Structure Type	Base Elevation	Structure Height	Structure Address (Census Tract)	Structure City	Structure Owner Name
39.0681	-78.1855	TOWER	224.1815	82	221 SPOTSWOOD CT (508.01)	STEPHENS CITY	Virginia 10 RSA Limited Partnership
39.1239	-78.2119	TOWER	247.0997	79.7	121 SOLDIERS REST LN (509)	WINCHESTER	FREDERICK COUNTY FIRE AND RESCUE DEPARTMENT
39.1786	-78.2483	TOWER	282.8017	59.4	3100 BERRYVILLE PIKE (511.01)	WINCHESTER	FREDERICK COUNTY OF VIRGINIA SHERIFFS DEPARTMENT
39.1931	-78.3714	TOWER	697.2657	58.5	GREAT NORTH MOUNTAIN NEAR PINACLE RIDGE (504)	WINCHESTER	FREDERICK COUNTY OF VIRGINIA SHERIFFS DEPARTMENT
39.1939	-78.2792	TOWER	286.7252	106.7	361 TURTLE MEADOW DRIVE (505)	WINCHESTER	Virginia 10 RSA Limited Partnership
39.1941	-78.2792		288.2539	105.2	361 TURTLE MEADOW DRIVE	WINCHESTER	Shenandoah Mobile, LLC
39.2133	-78.1817		278.9933	0	(505)	FREDERICK	JAMES WOOD HIGH SCHOOL
39.2428	-78.2844		233.7383	0	(503)	Winchester	Frederick County Public Schools
39.2558	-78.3308		244.1943	0	M SODE RTE 50 W 1200 E FO INT RTE 704 & 50 (504)	GORE	GORE VOLUNTEER FIRE COMPANY
39.2657	-78.2263		281.1972	59.4	329 Hunting Ridge Road (503)	Winchester	SBA Infrastructures, LLC
39.2666	-78.3012		275.6354	59.4	226 STONY HILL ROAD (503)	GORE	Shenandoah Mobile, LLC

Latitude	Longitude	Structure Type	Base Elevation	Structure Height	Structure Address (Census Tract)	Structure City	Structure Owner Name
39.2742	-78.2497		200.8903	0	(503)	Middletown	Frederick County Public Schools
39.2751	-78.1153	TOWER	246.2133	84.4	205 BROWN LN (501)	CLEAR BROOK	FREDERICK COUNTY
39.2758	-78.3653	UPOLE	389.1	26.8	235 PARISHVILLE ROAD (504)	GORE	Virginia 10 RSA Limited Partnership
39.2758	-78.3652		389.0256	30.4	235 PARISHVILLE ROAD	GORE	Shenandoah Mobile, LLC
39.3125	-78.2864	UPOLE	259.7028	12	US 522 .4 KM S OF SR 693 (503)	CROSS JUNCTION	VIRGINIA, COMMONWEALTH OF
39.3731	-78.2097		281.5885	51.8	575 Glengary Road (503)	Winchester	New Cingular Wireless PCS, LLC
39.3746	-78.2944		344.6364	59.4	8926 N. Frederick Pike (503)	Cross Junction	SBA Infrastructures, LLC
39.3864	-78.3022	TOWER	350.5485	17	9381 NORTH FREDERICK PIKE (503)	CROSS JUNCTION	FREDERICK COUNTY FIRE AND RESCUE DEPARTMENT
39.4136	-78.3281	TOWER	412.8432	59.4	2453 SLEEPY CREEK ROAD (503)	CATLETT GAP	Virginia 10 RSA Limited Partnership

Table 8 Key Vertical Assets

New Communications Towers

The following new tower sites are recommended to support fixed wireless service and potentially cellular broadband service. The recommended sites were chosen based on the identified coverage gaps and analysis that indicate existing publicly owned towers will not reach all unserved areas. Should the county pursue a public-private partnership with a fixed wireless provider, these sites should be reviewed to determine their value in comparison with the provider's technology of choice and existing network, if any.

The recommended locations are general in nature of location as the county would have to investigate available land in the general vicinity to acquire or lease. Ideally tower locations are located on ridge tops to maximize the potential coverage from wireless signals. Choosing tower sites include not only high elevation but limited trees or obstructions to the signal. The sites require accessible electric power and physical access which may require easements from other land owners depending on the accessibility of the tower site from existing roads. Obtaining easements to access the property can be a laborious task especially if multiple parcels are involved. The information provided below on tower specifications and considerations when siting a tower is to assist the county in new tower siting and construction.

Typically the cost of constructing a tower to accommodate several providers will cost approximately $230,000 and this cost will cover the structure, a telecommunications cabinet, concrete pad, etc. In addition to this cost there will be the additional monies required to acquire the land (purchase or lease), provide power to the site and general maintenance of the site.

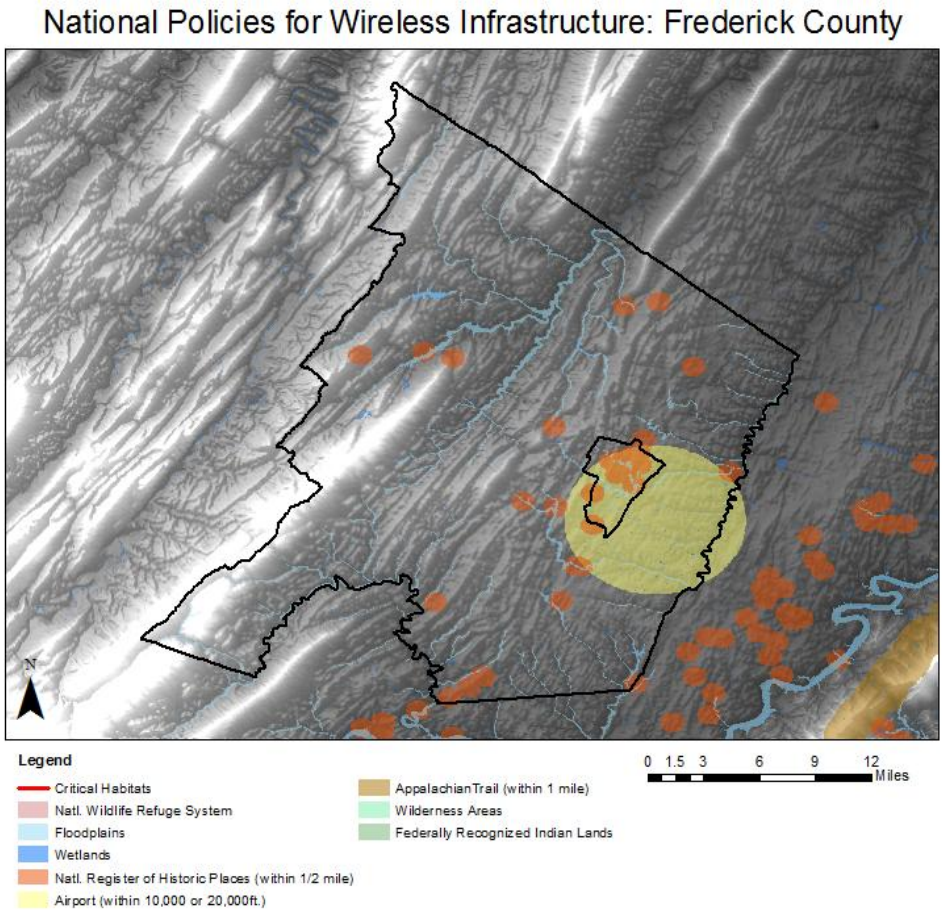
Tower Specifications

The Rev G TIA Standard contains new parameters that significantly affect the magnitude of wind, ice and earthquake loading. In addition to specifying the location of a structure for determining the basic wind speed, design ice thickness and earthquake accelerations, it is important to consider these new parameters for the design of proposed structures and for the modification of existing structures. Additionally, all tower sites should be constructed to accommodate at least four providers to ensure that every tower site is leveraged to improve communications in the county or city.

The Virginia Tech infrastructure report provided in a separate document includes a summary and explanation which are intended to assist users of the Standard with these new parameters. Reference should also be made to the Rev G Standard, which contains more detailed information and an annex that provides additional procurement and user guidelines.

National Policies Related to Siting a Tower

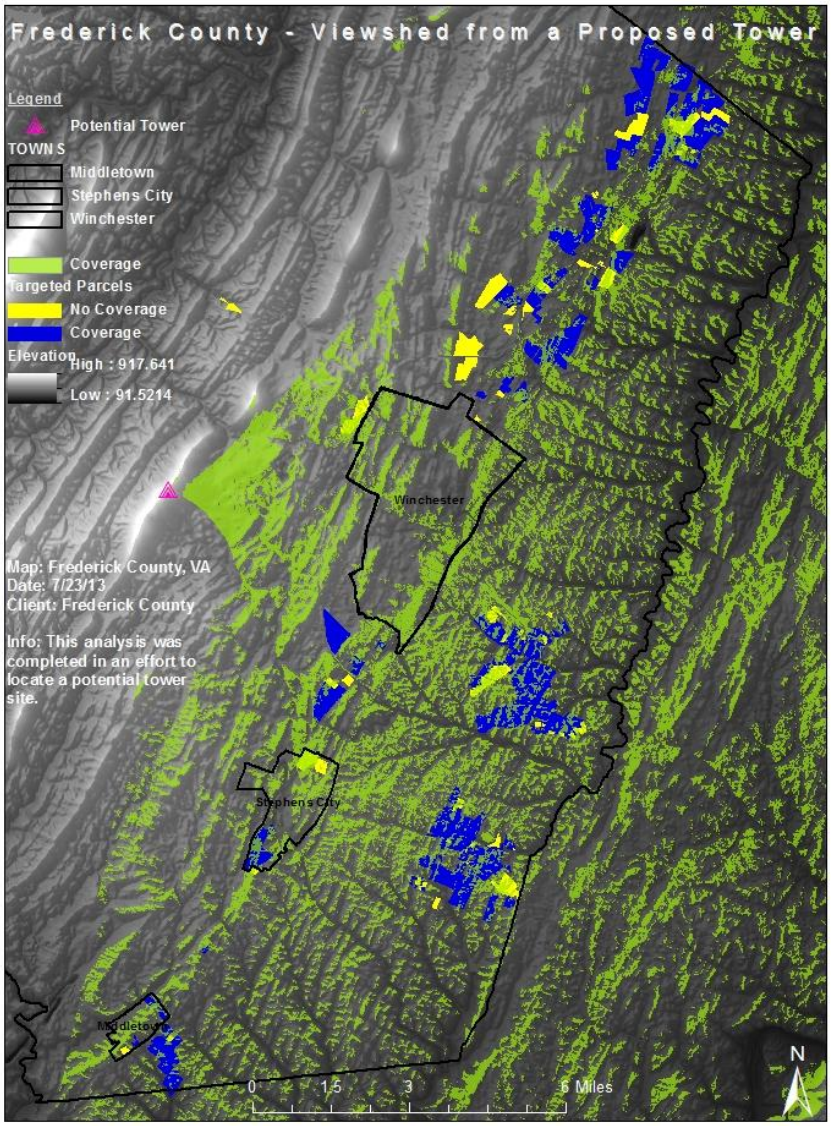
There are several national policies that require special permitting for siting new towers within certain types of lands. The map below displays the areas by type that would be affected by these policies in Frederick County and thus, siting a new tower in these locations would require special permitting through the appropriate government agency. Further details are available in the full report provided as a separate document.



Recommended Tower to Serve Business Areas

Frederick County's plan to grow targeted business development areas will require good wireless coverage (cellular as well as fixed wireless) in order to attract new business. In an effort to determine and recommend a suitable location for wireless tower or antenna placement that would provide adequate coverage to target business development areas in Frederick County, a reverse viewshed analysis was completed using GIS tools and processes. This analysis resulted in isolating a small site on the east side of Little North Mountain that contained a significant portion of each of the target business development areas in it's viewshed. This output site would be an ideal place to site a tower. Frederick County policy requires a conditional use permit for any new tower; however, placing a new antenna on an

existing structure has fewer limitations. A viewshed analysis from that asset revealed that comparable coverage could be obtained for the targeted business development areas by leveraging that asset. Also, this location is not located in an area affected by the national policies explained in the previous section. See the map below for results.



Recommended Towers to Serve Rural Areas

The following viewshed analysis maps indicate the locations of the proposed new towers to support a fixed wireless network reaching unserved areas. These maps show the line-of-

sight from the proposed tower location. These views do not take into consideration radio frequency or distance, so the actual wireless coverage would more than likely not extend as far as indicated by the visible areas (in blue).

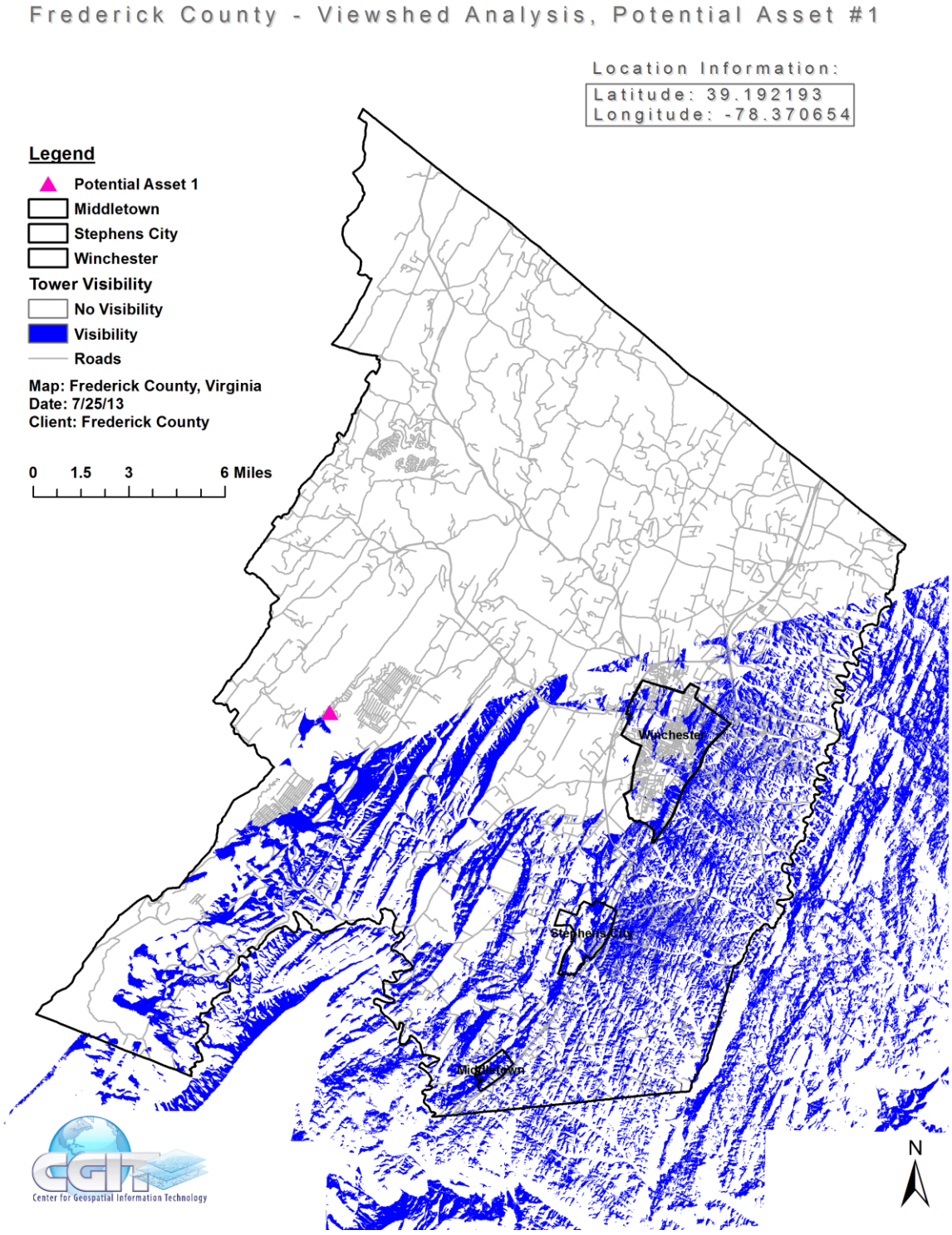


Figure 29 Proposed Tower Site – Back Creek Area

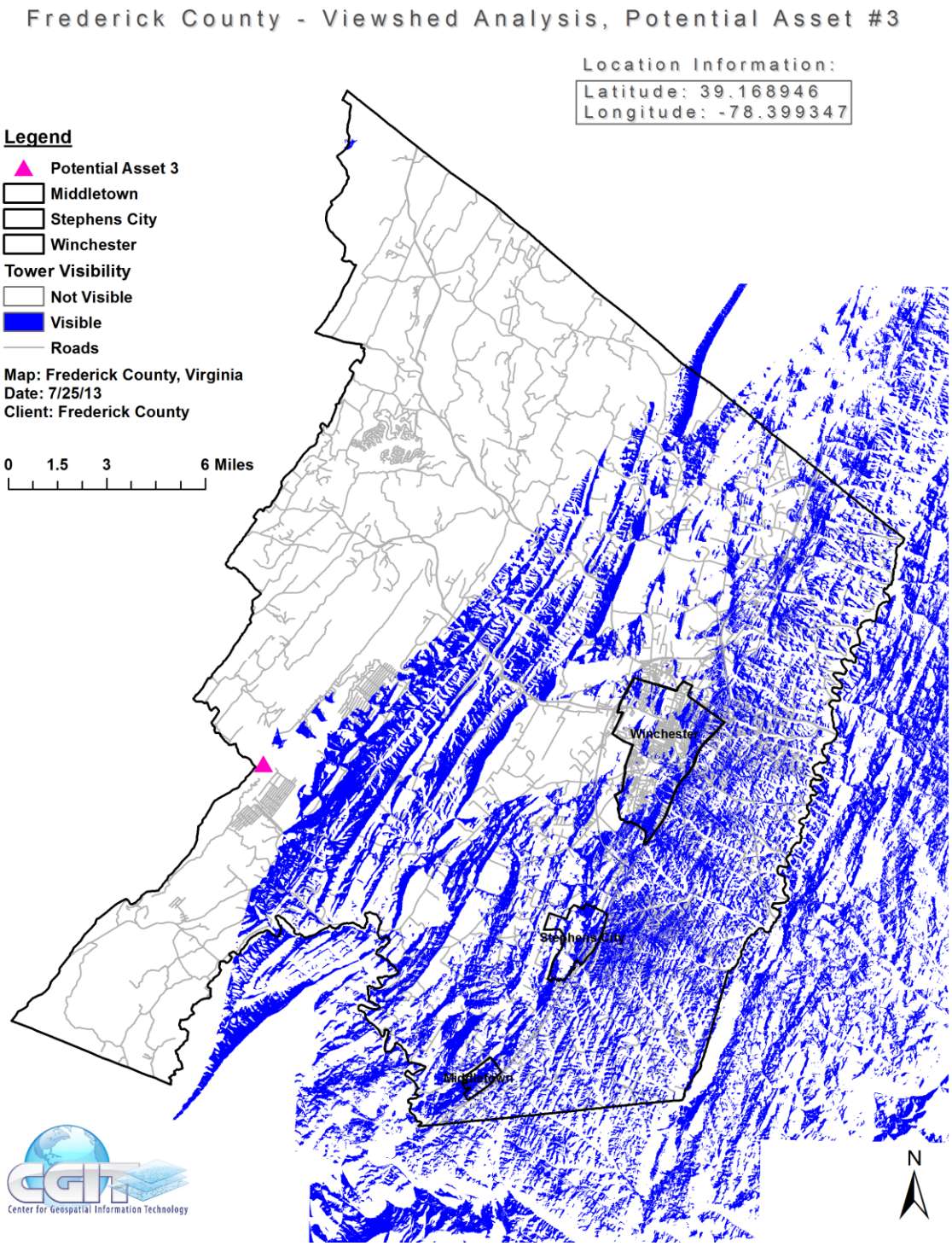


Figure 30 Proposed Tower Site – Back Creek Area

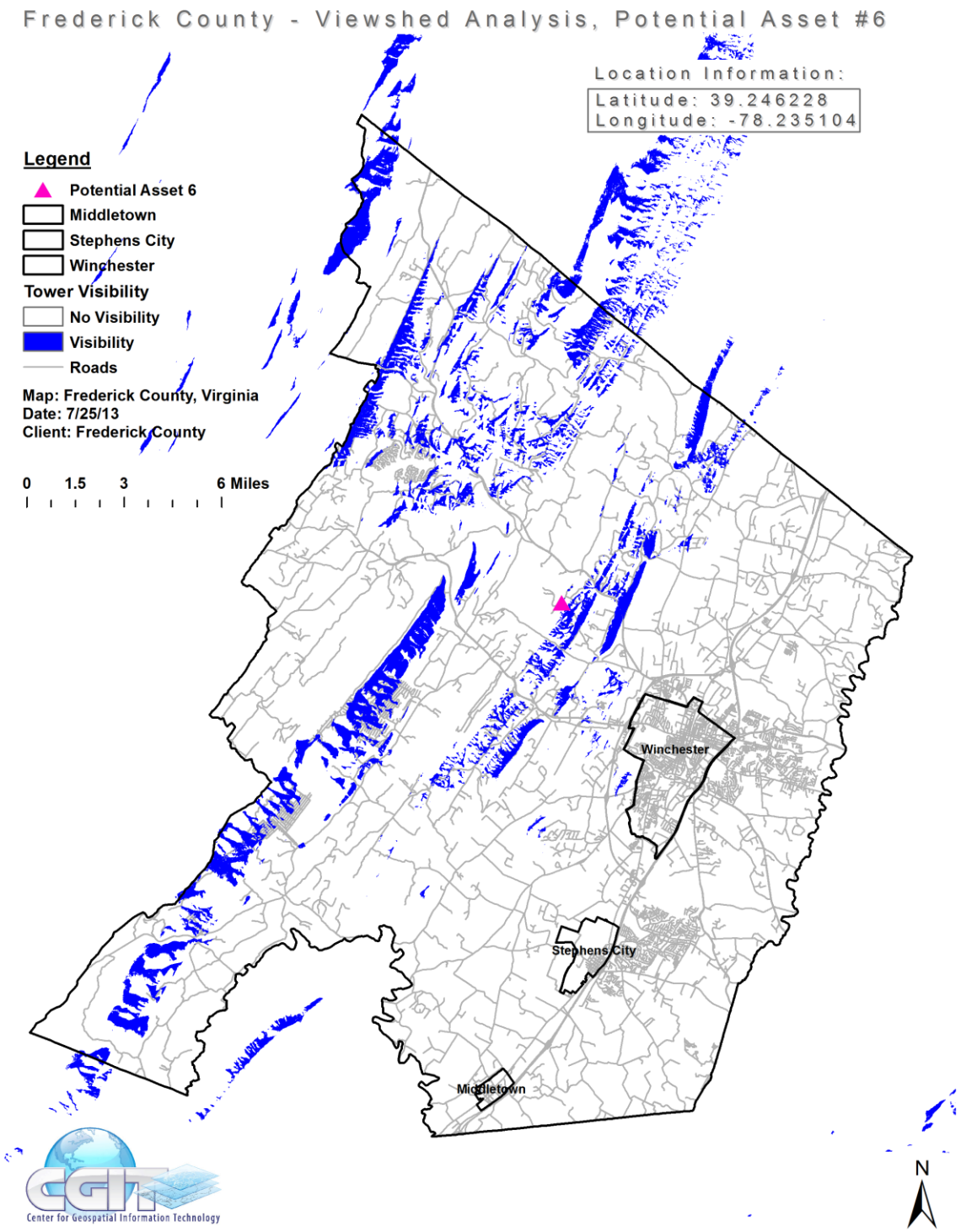


Figure 31 Proposed Tower Site - Gainsboro area

Broadband Adoption and Awareness

Providing all citizens and business with affordable broadband is a necessity and the goal of many communities and governments. In addition to providing broadband options, all communities must also ensure that citizens and businesses are aware of and prepared to leverage the many benefits that having broadband affords them. Extensive research shows low adoption rates are due to lack of interest in the Internet, minimal digital literacy and cost. More Americans subscribe to cable TV and cell phone services than the Internet. All communities are encouraged to use outreach, provide educational programs and computer ownership programs to improve subscription rates and ensure citizens leverage the Internet to improve their personal and community economy. The many benefits of getting online include the following:

- Financial savings
    - Lower costs by telecommuting, engage in commerce and online savings, and manage personal and business finances through online applications and services.
- Increased Productivity
    - Businesses expanding their use of broadband can increase their competitiveness in their market – increasing economic growth.
- Educational benefits
    - Distance education opens doors to many that cannot afford to move to a university or have needs to stay at home to assist family members.
- Voice communication
    - Broadband provides the opportunity to leverage the Internet for voice communications and reduce telecom expenditures for both citizens and businesses. Online meetings provide ability to share documents and applications and eliminate costly travel for many meetings.
- Community Participation
    - Broadband provides social avenues that allow citizens to be more active in their society through engaging government services and community organizations to name just a few. Citizens can be more engaged and informed in government affairs.
- Improved Healthcare Access
    - Broadband supports telehealth which is important to providing improved healthcare in rural areas. The Veterans Administration has expanded home monitoring systems and has documented the improved health and savings from these systems. Electronic health records and health information exchange between doctors and health systems offers improved diagnosis and healthcare and are dependent on broadband connectivity.
- Improved Public Safety
    - Law enforcement and public safety first responders are better positioned to protect and serve communities when they have fast and reliable access to information and communications through broadband connections.

Digital Literacy Education

Communities must provide educational resources to citizens and businesses to ensure they realize all the benefits of broadband and not just deliver broadband options. There are several online options providing digital literacy training in addition to the Handley Regional Library. These resources (online and at the local library) should be advertised to citizens and businesses.

Consider that average "take rates" – the percentage of citizens that actually purchase broadband services when they are available – are about 60-70%. This indicates there are many citizens and businesses that have an option for broadband but may not see the need for that connectivity. This is where community outreach for awareness and education could impact citizens that do have broadband options. Once they are aware of the benefits, they could leverage the service to improve quality of life through expanded education, job opportunities and healthcare.

It is important for the area to especially target the small businesses to ensure they are leveraging broadband to improve and grow their business. CIT's E-commerce Assessment results show that small businesses are impacted the greatest by leveraging the Internet and this can directly result in job growth in the area. It is recommended the county and city share the following resources and any local programs with the local Chamber of Commerce and any other organizations that support small businesses.

Following is a list of current online resources to provide training for citizens and businesses:

- Start-Up Savings
  - Created by the Internet Innovation Alliance (IIA) and the Small Business and Entrepreneurship Council (SBE Council) to show businesses how broadband can lower costs and barriers to business startup.
  - http://internetinnovation.org/small-biz/
- Microsoft's Online Digital Literacy training
  - Microsoft has created an extensive curriculum for all skill levels for free. This online training is focused on Microsoft products but does include the very PC and online basics. It does not require that you own the Microsoft products but there is a requirement that it is accessed by a Windows PC using Microsoft's Internet Explorer browser. The curriculum includes assessments to ensure participants are mastering the lessons.
  - http://www.microsoft.com/about/corporatecitizenship/citizenship/giving/programs/up/digitalliteracy/default.mspx
- DigitalLiteracy.Gov
  - a portal created by the Obama Administration to provide a plethora of online resources delivering digital literacy training and services.
  - http://www.digitalliteracy.gov/
- Digital Literacy Portal
  - a web portal created through a collaborative project run by Link Americas Foundation (LAF) and Kempster Group promoting Information and Communication Technologies and Digital Literacy training. The portal provides many resources available for training including materials.

- http://www.ictliteracy.info/ICT-Training.htm

The area's libraries do offer some digital literacy training. The community leaders, the county and the city should assist in promoting these classes. Additionally, the county and the city should provide the links to the above resources on their websites. It is recommended that the county and the city consider running periodic awareness campaigns, sharing the online course information links and advertising the local library workshops.

Computer Refurbishment Program

As national research and the citizen survey conducted in Frederick and Winchester identified, cost is often a barrier to adoption. A way to address this barrier is to initiate a community computer refurbish program. The community can solicit students and local computer repair companies to refurbish older computers and donate them to the lower-income families in the community. Students that perform this work gain valuable technical skills and can earn credits for school or college while helping their community.

There are several recycling programs that can be included in this initiative to dispose of old parts or when there are more machines to donate than there are recipients - programs like the one Goodwill Industries has or Dell's Reconnect Program.

Additional Infrastructure and GIS Data Model Recommendations

The Center for Geospatial Information Technology (CGIT) at Virginia Tech partnered with CIT to provide a broadband infrastructure planning document for use by Frederick County and the City of Winchester.

This full infrastructure report (provided as a separate document) includes recommendations for Geographic Information Systems (GIS) data models, maps of existing infrastructure and fiber as well as the results of a GIS-based planning analysis. Additionally, the document shows populations maps and tables, potential tower siting analyses, policies, best practice recommendations, and implementation process guidelines.

The general recommendations are that Frederick County and the City of Winchester consider options for the development of additional broadband infrastructure. One option is to develop additional middle mile fiber in order to create a fiber ring in Frederick County. This would provide planned redundancy for critical communications for example for emergency response and dispatch where no one single point of failure would result in network outages. A county owned fiber backbone would carry significant costs to the county and/or city, but also has a large number of benefits for future development options and economic viability.

Commercial ISPs provide another option for the development of additional fiber in the county, and would follow the historical trend for commercial fiber build-out in Frederick County and the City of Winchester. Finally, there are hybrid options where county or city government and commercial ISPs form partnerships. For example, if the county or city owned the fiber, it could offer dark fiber to wireline providers to encourage extending services to rural and underserved areas.

This recommendation is a planning study based on best available data and information. Further engineering studies and data gathering would provide additional information to serve as the basis for planning and implementation of broadband infrastructure in Frederick County and the City of Winchester.

Recommendations Action List

The following table lists the recommendations in a suggested order based on prerequisites, weighted effort, costs and potential risks. The first few actions will cost the county and/or city very little but could provide immediate benefits and can be accomplished relatively quickly. The weighted effort (staff time and commitment) are subjectively set based on our experience with similar projects.

Recommendation	Staff Time	Commitment	Cost	Risk	Risk Mitigation Strategy
Facilitate citizens locating broadband providers	3	1	1	None.	
Broadband Adoption and Awareness: Digital literacy education	2	1	1	None.	
Ensure a broadband "friendly" environment	3	2	1	Authority to affect policies is limited by state code or law.	Review local policies and procedures for opportunities to ease and/or expedite broadband infrastructure construction and deployment.
Partner with incumbent providers	2 [2]	2	1	Provider(s) may not be amenable to negotiations	Focus on stipulations in cable franchise agreement – home per mile; 15 contract commitments; cost sharing for

[2] This may increase if the county must pursue citizens' commitment to contractual commitments for Internet service.

Recommendation	Staff Time	Commitment	Cost	Risk	Risk Mitigation Strategy
					extension, etc.
Leverage existing vertical assets	2	3	2	Existing vertical assets have no available space requiring investment to upgrade towers.	Perform tower inspections including load analysis prior to pursuing a partnership. Pursue grant money to fund tower upgrades for towers are determined to be key to partner's fixed wireless network.
Issue an RFI/RFP to locate a fixed wireless partner	4	4	1	No adequate partner found in responses;	Issue an RFI first advertising in region to determine quality of potential responses. If RFI responses are not satisfactory, broaden advertising area for RFP to state-wide.
Form a public-private partnership with a fixed wireless provider	3	4	2	Private partner performs poorly affecting customer satisfaction and limiting citizens' options for service	Stipulate the customer service and network build requirements as stated in this document. Include stipulations for service level agreement. Include failure to adhere to agreement performance stipulations as reason to dissolve partnership.

Recommendation	Staff Time	Commitment	Cost	Risk	Risk Mitigation Strategy
Computer refurbishment program	3	3	2	No or too few computers are donated to the program.	Heavily market the program to the region to solicit support in the form of donations. Conduct an annual "Community Electronics Donation Day" to avoid potential hardware being discarded improperly and to increase donations.
New communication towers	5	4	3	No available funding for new tower construction.	Pursue infrastructure grants as provided in this document and only begin construction when funding is available.
Additional Infrastructure and GIS Data Model Recommendations	5	5	4	Infrastructure overbuild; No available funding	Consult with incumbent providers first to determine available infrastructure, their ability to serve the business areas and potential fiber sharing options. Pursue infrastructure grants as outlined in this document and only pursue construction of required fiber once funding is available.

Table 9 Prioritization of Recommendations

APPENDICES

A. VIRGINIA MODELS DETAILS

UTILITY OWNED FIBER

Bristol Virginia Utilities (BVU)

Bristol Virginia Utilities is a national model and the first city in the nation to build a fiber-to-the-home (FTTH) network. BVU began planning their fiber network in the late 1990s followed by deployment of fiber-to-the-premise (FTTP) in 2001 reaching 6,000 customers in just the first two years. The initial customers were municipal buildings, their own electrical substations and schools. BVU was the first municipal utility in the nation to build a fiber network delivering 'triple-play' – phone, Internet and cable TV. BVU transitioned over the years from being owned by the city to being owned by an authority (2010) and are continuing expansion including smart-grid technology through some BTOP and Tobacco Commission funding. It is important to note that BVU's initial goals were -- as with most municipal fiber networks – to lower telecommunications services prices.

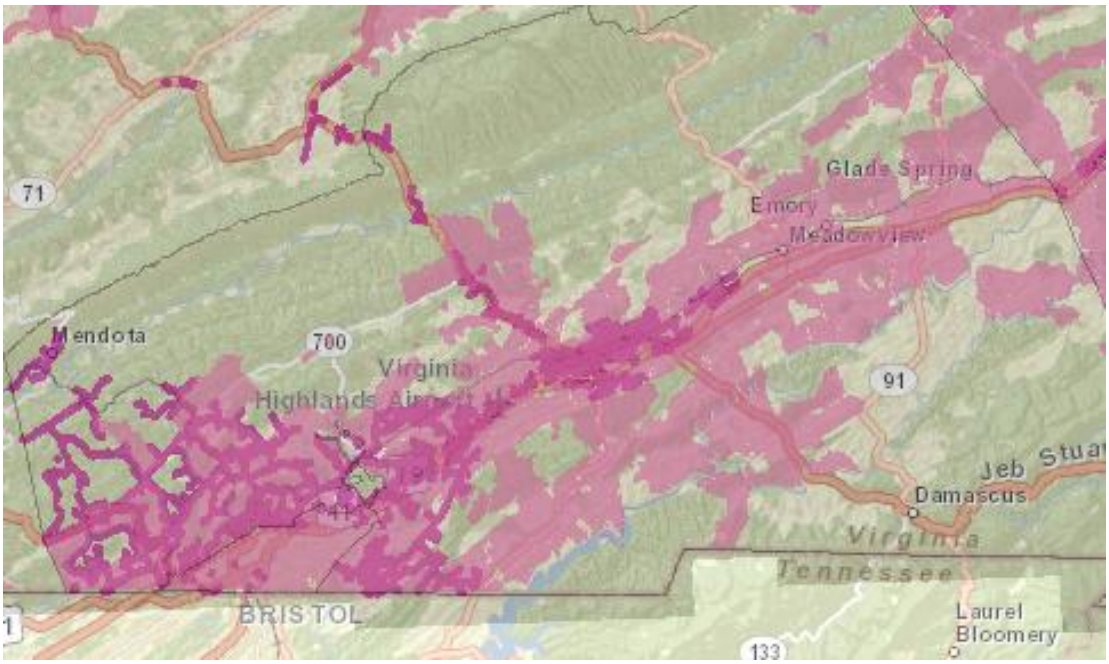


Figure 32 Bristol VA Fiber and Cable Coverage

Danville's nDanville Network

In 2004 Danville Utilities began building fiber to connect approximately 120 local government and the public school system buildings. Since inception they have expanded to connect approximately 100 businesses and then in 2011 began a residential connection pilot. This network is an open-access network allowing private sector providers to sell services to the connected businesses and citizens – the city does not sell services except to providers to use the network. For comparison, below are maps of the nDanville fiber network and cable and DSL coverage from the Virginia Broadband map. As expected, Danville has very good cable coverage.

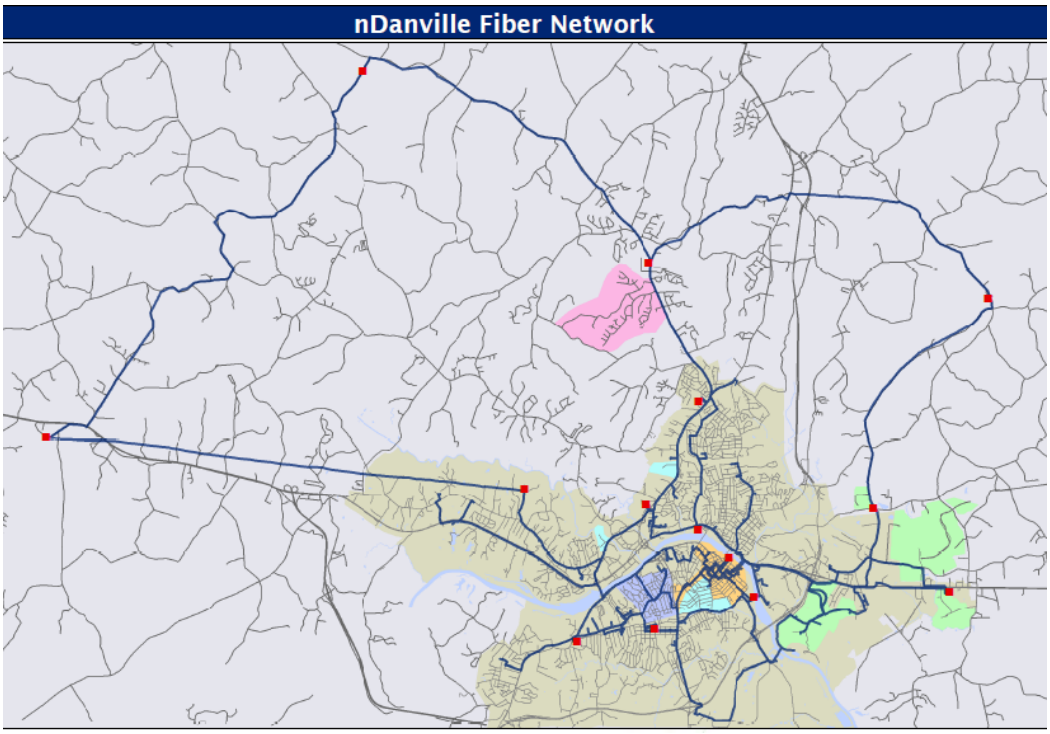


Figure 33 nDanville Fiber Network Map

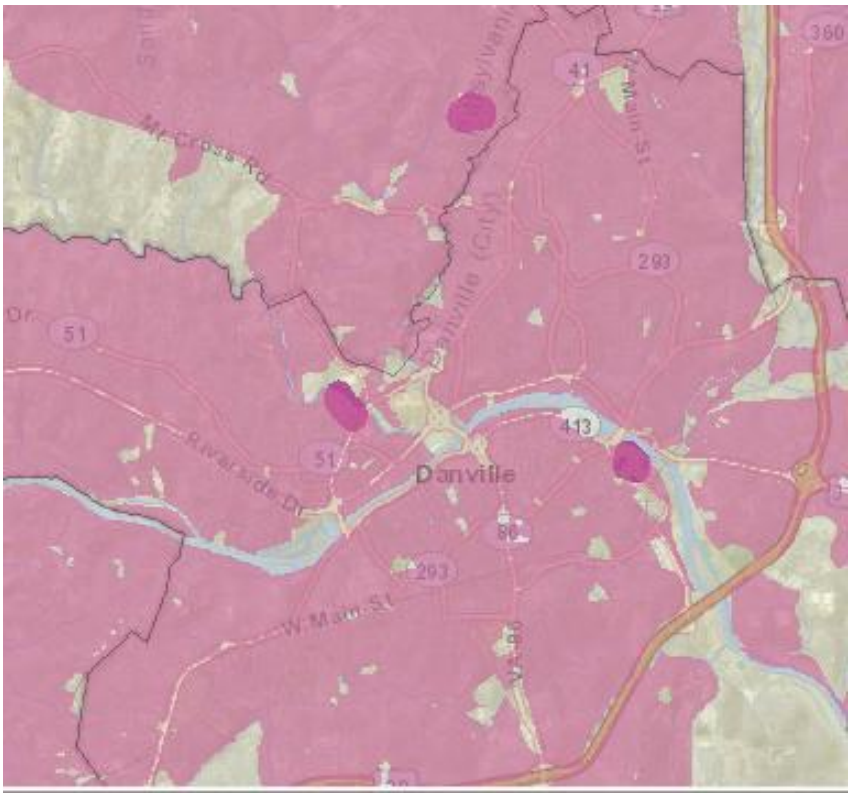


Figure 34 Danville City DSL and Cable Coverage

Rural Telecom Digital Subscriber Line (DSL)

Citizens Telephone Cooperative

Citizens is based in Floyd and began in the early 1940s as a telephone coop. They have continued to expand through the years offering, in addition to telephone service, VoIP, IPTV video, DSL and FTTP serving 7 counties in southwest Virginia. Additionally, Citizens operates a 248 mile regional open access fiber network in 6 counties – serving 8 industrial parks. In 2010 Citizens received a BTOP award to extend the open access fiber network an additional 186 miles through 7 counties connecting industrial parks and community anchor institutions (CAIs). Notice in the map below that Floyd is very well covered with DSL service which is very rare for a rural county.

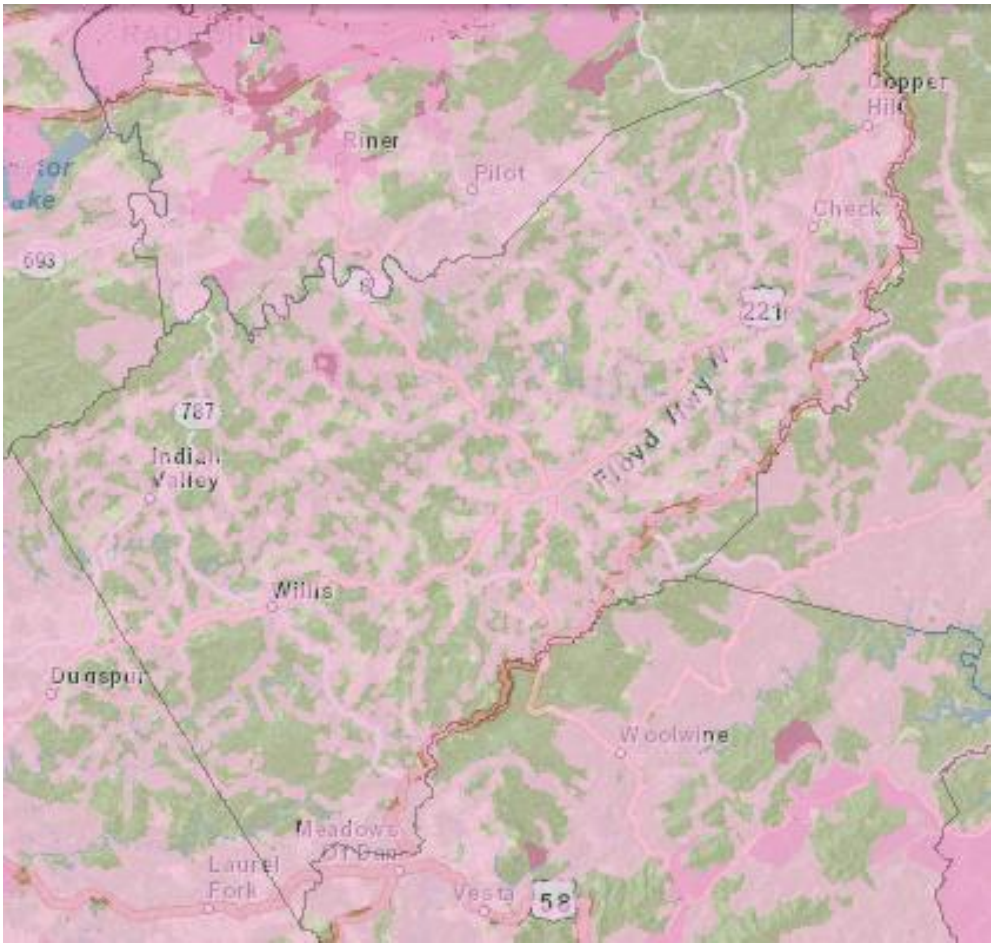


Figure 35 Floyd County DSL Coverage

Highland County

Highland Telephone Cooperative began in 1905 as a mutual telephone company and then became a cooperative corporation incorporated in 1980. This project was preceded and ultimately helped by leverage from Distance Learning Labs that were installed in Highland and Bath Counties through funding from Regional Competitive and RUS grants. Highland county is a beautiful and very mountainous terrain area which provides many challenges to deployment.

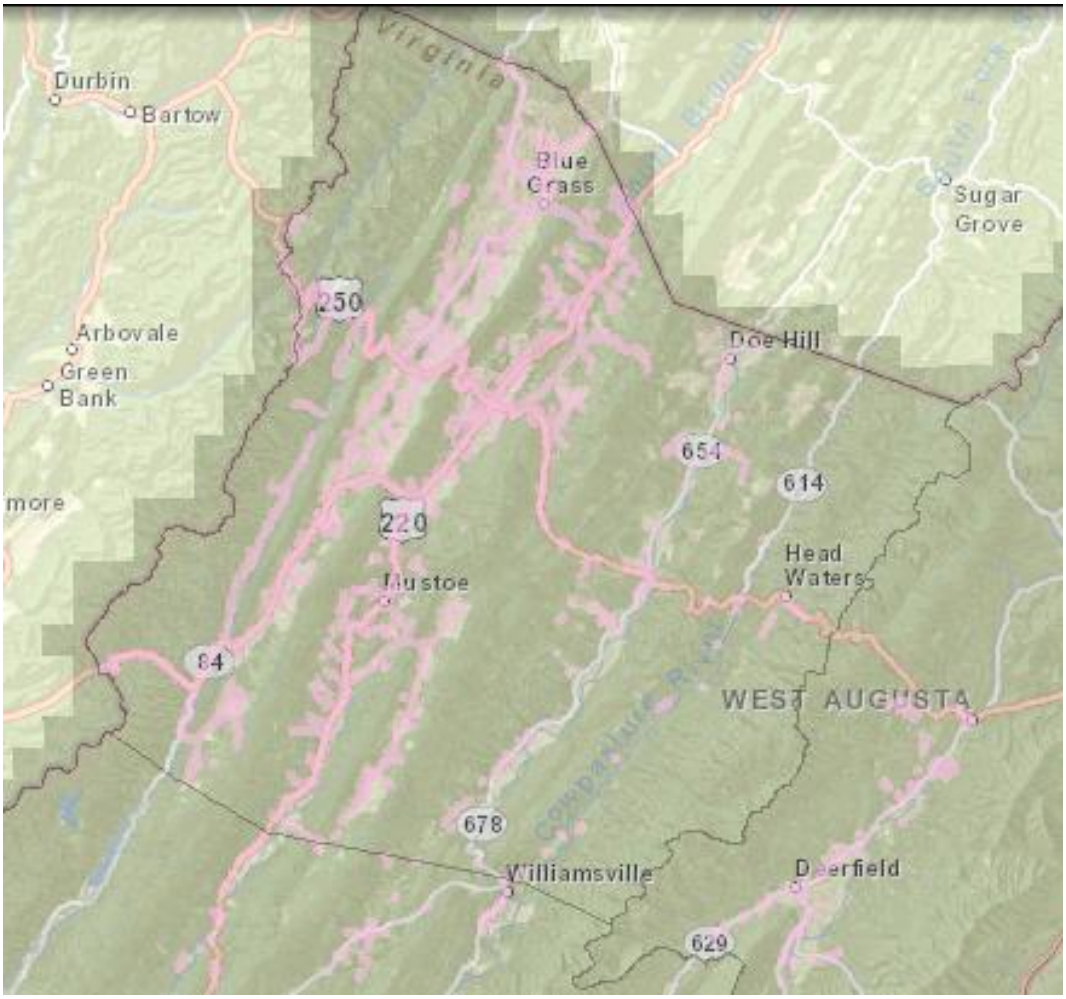


Figure 36 Highland County DSL Coverage

Public-Private Partnerships

Franklin County

Franklin County is 721 square miles in the foothills of the Blue Ridge mountains – too large and challenging terrain to attempt fiber builds to serve the entire county. The size and terrain challenges make it difficult for private providers – local telco and cable – to make the business case to extend their fiber builds.

Franklin County formed a public-private partnership with a wireless Internet service provider (WISP) in 2005. That partnership was based on the county providing access to all county-owned vertical assets (towers, water tanks, building rooftops, etc.) in exchange for Internet service. The county invested very little from general county funds (approximately $36000 initially) in addition to $50,000 of a Homeland Security Grant to connect all 16 fire and rescue stations. The invested money was used to cover new tower infrastructure upgrades, some receiver equipment and pre-pay for services from one commercial tower. This partnership arrangement allowed the WISP low-cost entry to build a fully redundant and robust wireless network throughout the county serving the local government, citizens

and businesses. The WISP has continued expanding the network over the years and upgrading equipment as wireless technology advanced – serving hundreds of businesses and thousands of residences. The local government built a wide-area-network (WAN) through this wireless broadband network easing support and management of technology through all government agencies. The government was able to reduce telecom expenditures 36% over two years by deploying a voice-over-IP solution to all government facilities through this wireless network.

The following coverage map was recently produced by the WISP providing the Virginia State Broadband Initiative team with tower locations and equipment specifications which were used to model the wireless signals. This current process does not include tree canopy or building obstacles but our state broadband initiative is working to include this data in future models to continually improve the accuracy of mapping wireless coverage. The map below is somewhat overstated in coverage but only in regards to those type of obstacles in particular locations.

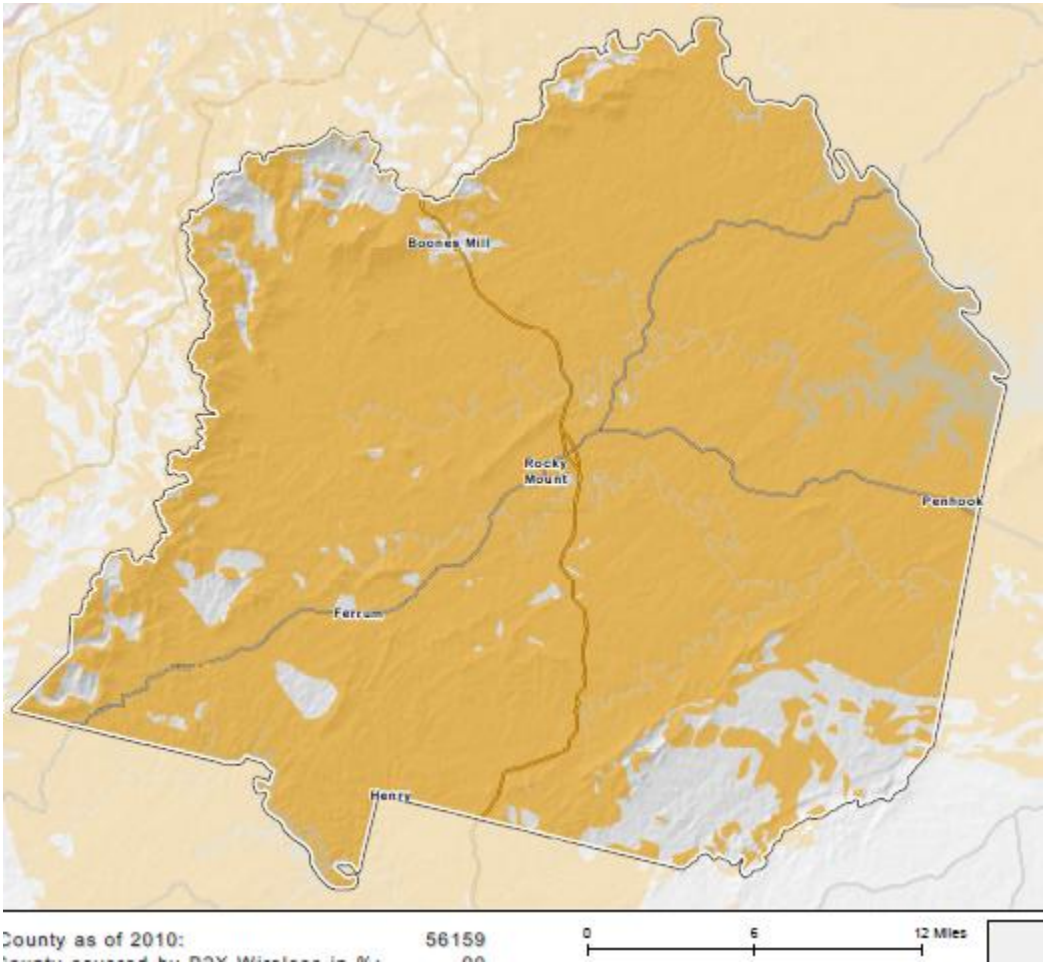


Figure 37 Franklin County Fixed Wireless coverage map

AUTHORITY OR CO-OP OWNED OPEN ACCESS FIBER NETWORK

Eastern Shore Broadband Authority

Northhampton and Accomack counties formed the authority in 2008 and began construction of an open-access fiber backbone connecting community anchor institutions. Funding was through DHCD, EDA and congressional earmark in addition to county contributions. Few details will be repeated here since this authority is a close neighbor of the Middle Peninsula. The Virginia broadband map shows provider service coverage areas and as such, does not map open access fiber backbone. The Virginia broadband map view does show the eastern shore having good DSL coverage and a bit of cable coverage on Chincoteague.

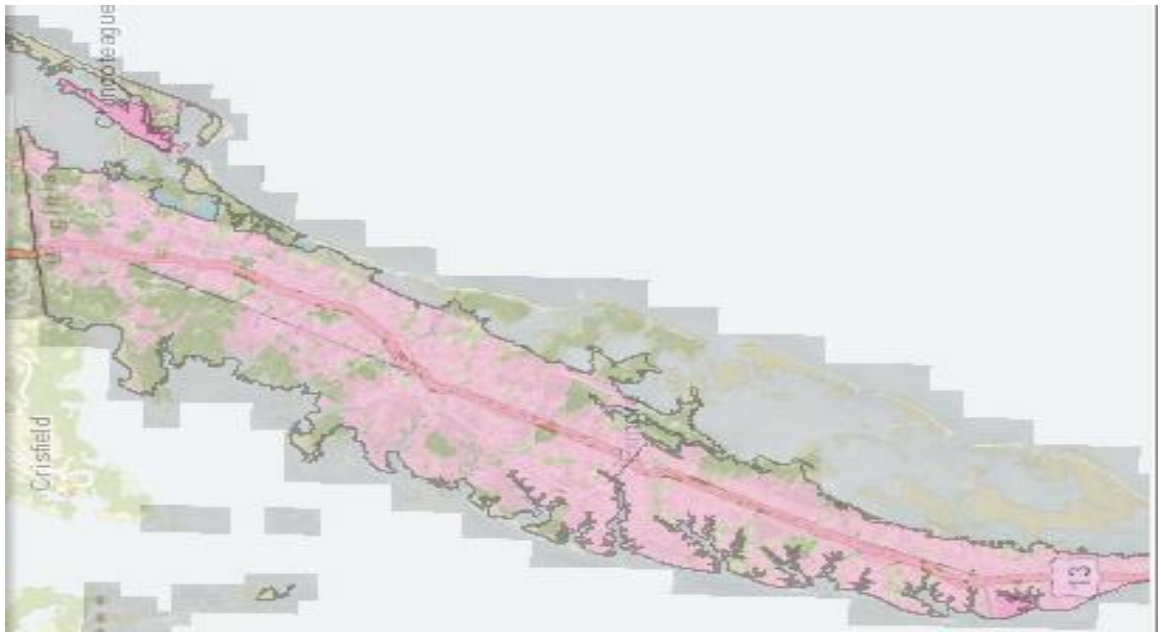


Figure 38 Eastern Shore DSL Coverage

Lenowisco

The LENOWISCO Planning District Commission partnered with private firm Sunset Digital in 2001 to deploy a fiber network throughout the counties of Lee, Scott and Wise and including the city of Norton. Funding was received primarily from the Tobacco Commission and by the end of 2009 they had deployed over 350 miles of fiber connecting over 800 FTTP subscribers. The planning district commission owns the network while Sunset Digital designed, built and operates the open access network in addition to providing Internet service.

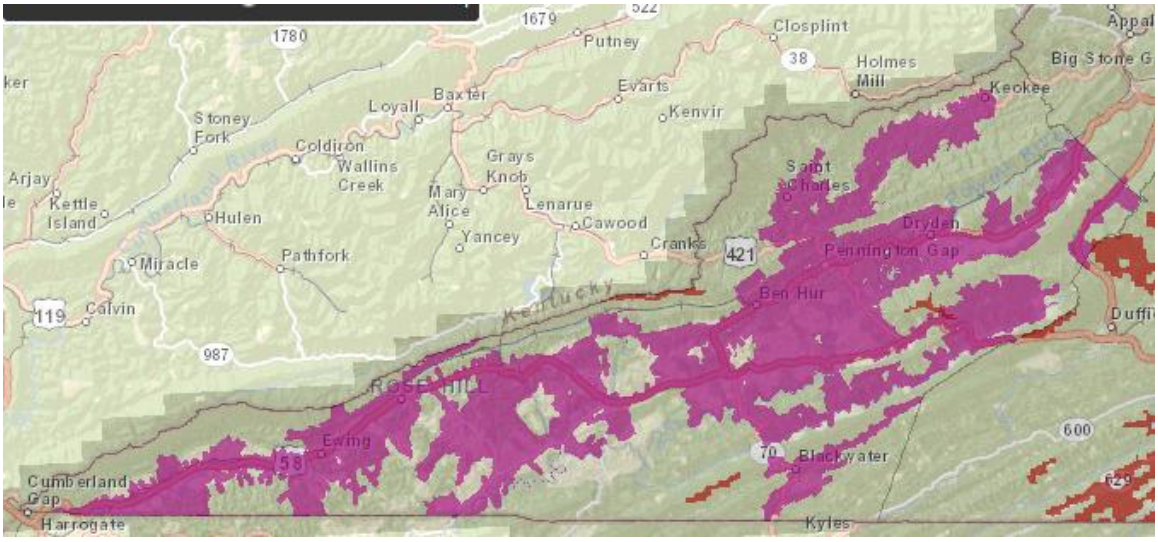


Figure 39 LENOWISCO Fiber Coverage

AUTHORITY OWNED AND OPERATED WIRELESS

Dickenson County Wireless Integrated Network (DCWIN)

In 2001 Dickenson County's IT Department was evaluating options to connect the 911 facility and the courthouse. They found wireless to be the most cost effective solution and then began a discussion with the county Board of Supervisors about providing broadband via wireless technology. In 2002 they began serving the county agencies, 911 and the schools and then in 2004 the citizens and businesses. They constructed several towers to support the wireless network and formed a Wireless Authority to manage and operate the network. They are currently serving 300 customers in addition to the 911 center, schools and local government facilities. Unfortunately DCWIN has not yet contributed service data to the Virginia broadband mapping initiative and hence, their fixed wireless coverage area is not depicted on our broadband map.

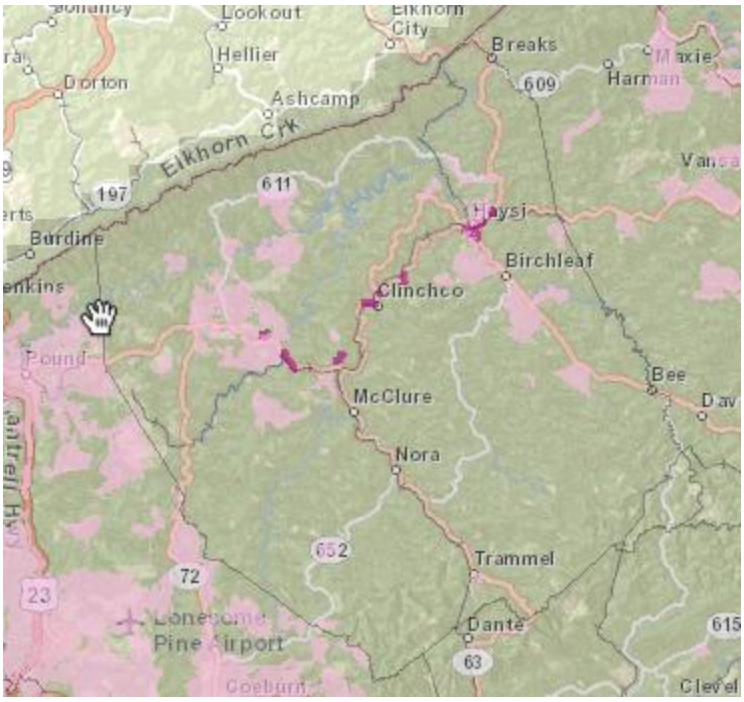


Figure 40 Dickenson County DSL and Fiber coverage

B. Existing Vertical Asset Inventory

Lat	Long	Structure Address	City	Base Elevation	Height	Type	Owner Type	Owner Name
39.0175	-78.2775	12 MILES SSW WINCHESTER	MIDDLETOWN	205.837615	13	POLE	Public: Local	WINCHESTER, CITY OF
39.0239	-78.3033	MEADOWS MILL RD @ SR624 XING CSX TRACKS	MIDDLETOWN	188.041305	4.6	B	Private: Business	CSX Transportation Inc
39.0278	-78.2808	CENTER OF TOWN	MIDDLETOWN	217.110961	0		Private: Business	MIDDLETOWN VOL FIRE & RESCUE CO INC
39.0372	-78.2675	173 SKIRMISHER LANE	MIDDLETOWN	218.832336	20	BMAST	Public: State	VIRGINIA, COMMONWEALTH OF
39.0403	-78.2594		Middletown	225.721359	0		Public: Local	Frederick County Public Schools
39.0486	-78.245	I81 4 KM S OF RT 277	WINCHESTER	221.158111	6	B	Public: State	VIRGINIA, COMMONWEALTH OF
39.0519	-78.2558	ST RT 633 CROSSING OF B & O RAILROAD	VAUCLUSE	224.579223	14	POLE	Private: Business	CSX TRANSPORTATION INC.
39.0525	-78.2528	RT 11 2 MI S	MIDDLETOWN	231.38507	5		Public: State	VIRGINIA, COMMONWEALTH OF
39.0594	-78.2529	245 Vaucluse Road	Stephens City	236.420944	18	POLE	Private: Business	FELHC, Inc.
39.0617	-78.1981	FARVIEW CHURCH 5.5 MI NNE	FRONT ROYAL	223.945159	0		Public: Local	WARREN, COUNTY OF
39.0681	-78.1858	824 PEACE & PLENTY LANE	STEPHENS CITY	222.984252	82	TOWER	Private: Business	NEXTEL WIP LICENSE CORP.
39.0681	-78.1855	221 SPOTSWOOD CT	STEPHENS CITY	224.181488	82	TOWER	Private: Business	Virginia 10 RSA Limited Partnership
39.0683	-78.1858	221 SPOTSWOOD CT	STEPHENS CITY	224.226303	77.1		Private: Business	Shenandoah Mobile, LLC
39.0761	-78.2042	5346 MULBERRY ST	STEPHENS CITY	230.229827	0		Private: Business	STEPHENS CITY FIRE CO INC

Lat	Long	Structure Address	City	Base Elevation	Height	Type	Owner Type	Owner Name
39.0775	-78.2072	SR 1018 .3 KM N OF SR 277	STEPHENS CITY	231.377227	6	UPOLE	Public: State	VIRGINIA, COMMONWEALTH OF
39.08	-78.153	280 MORANTO MANOR DR	WINCHESTER	211.967361	0		Private: Business	THE HOME DEPOT, INC. DBA HOME DEPOT IDC 5362
39.0806	-78.2144	113 TOWNRUN LANE	STEPHENS CITY	229.179779	0		Private: Business	BURGER BUSTERS, INC.
39.0808	-78.2111	191 FAIRFAX PIKE	STEPHENS CITY	225.319259	0		Private: Business	KV ENTERPRISES, INC.
39.0825	-78.2128		STEPHENS CITY	230.261688	0		Private: Business	NRV II, LLC
39.0833	-78.2167		STEPHENS CITY	229.002471	0		Public: Local	FREDERICK COUNTY FIRE AND RESCUE DEPARTMENT
39.0842	-78.1875		STEPHENS CITY	221.476013	0		Private: Institutional/NonProfit	SHERANDO HIGH SCHOOL
39.0862	-78.1489	RT.522 S. OLD ARMEL SCHOOL	WINCHESTER	216.379699	12.5		Private: Business	TIMBER RIDGE MINISTRIES, INC.
39.0878	-78.1944	118 ELIZABETH DRIVE	STEPHENS CITY	228.405807	0		Private: Business	DAILY GRIND STEPHENS CITY, LLC
39.0931	-78.1967		Stephen City	229.413024	0		Public: Local	Frederick County Public Schools
39.0961	-78.4497	200 Brill Road	Star Tannery	381.536987	79.2		Private: Business	Global Tower, LLC
39.1019	-78.1567		Winchester	216.180816	0		Public: Local	Frederick County Public Schools
39.1131	-78.1151	Millwood Pike	Winchester	205.598266	49.1		Private: Business	CROWN COMMUNICATION LLC
39.1131	-78.115	Izaak Walton Park Site Millwood Pike	Winchester	205.609878	50.9	TOWER	Private: Business	Virginia 10 RSA Limited Partnership
39.1149	-78.1936	315 TASHER ROAD	WINCHESTER	232.124847	61	TANK	Public: Local	FREDERICK COUNTY
39.115	-78.1936	315 TASKER ROAD	KERNSTOWN	232.124847	58.1	TANK	Public: Local	FREDERICK COUNTY OF VIRGINIA SHERIFFS DEPARTMENT

Lat	Long	Structure Address	City	Base Elevation	Height	Type	Owner Type	Owner Name
39.1167	-78.2942			268.041198	0		Private: Business	SHENANDOAH GAS COMPANY
39.1223	-78.2492	3.0 MI NW OF	STEPHENS CITY	275.516479	55.8		Private: Business	MCI Communications Services, Inc
39.1239	-78.2119	121 SOLDIERS REST LN	WINCHESTER	247.099731	78.2		Private: Business	Shenandoah Mobile, LLC
39.1239	-78.2119	121 SOLDIERS REST LN	WINCHESTER	247.099731	79.7	TOWER	Public: Local	FREDERICK COUNTY FIRE AND RESCUE DEPARTMENT
39.1245	-78.1953	US RT 11 3 MILES S OF	WINCHESTER	229.062438	15.2		Public: State	VIRGINIA DEPARTMENT OF STATE POLICE
39.125	-78.183	E SIDE RT 81 N OF I79	KERNSTOWN	220.042938	0		Private: Business	SHENANDOAH GAS COMPANY
39.125	-78.183	300 M E & .8 KM N OF KERNSTOWN INTERCHANGE	KERNSTOWN	220.042938	12	TOWER	Private: Business	WASHINGTON GAS LIGHT COMPANY
39.1253	-78.185	350 HILLANDALE LANE	WINCHESTER	227.767181	54.9	TOWER	Private: Business	WASHINGTON GAS LIGHT COMPANY
39.1255	-78.185	350 HILLANDALE LANE	WINCHESTER	227.734359	23	POLE	Private: Business	WASHINGTON GAS LIGHT COMPANY
39.13	-78.1911	.6 MI N US 11 AND SR 37	WINCHESTER	227.953521	61		Private: Business	FELHC, Inc.
39.1301	-78.1911	1 km N of US Hwy 11 & SR 37	WINCHESTER	227.953521	61	TOWER	Private: Institutional/NonProfit	Shenandoah Valley Electric Cooperative
39.1301	-78.1911	RD 3 .6 MI N US 11 & SR 37	WINCHESTER	227.953521	61		Private: Business	FELHC, Inc.
39.1306	-78.1914		WINCHESTER	228.210586	0		Private: Business	FELHC, Inc.
39.1306	-78.1611		Winchester	222.642868	0		Public: Local	Frederick County Public Schools
39.1311	-78.1617		Winchester	224.433746	0		Public: Local	Frederick County Public Schools
39.1314	-78.195	WINCHESTER LAMP PLANT 3447 RT 3 BOX 310	WINCHESTER	235.636627	18	BANT	Private: Business	GENERAL ELECTRIC COMPANY
39.1369	-78.1864	3229 SHAWNEE DR	WINCHESTER	225.909515	14	BANT	Private: Business	TREX COMPANY
39.1403	-78.1389	WINCHESTER REGIONAL	WINCHESTER	214.074127	3.7	MAST	Public: Local	WINCHESTER REGIONAL

Lat	Long	Structure Address	City	Base Elevation	Height	Type	Owner Type	Owner Name
		AIRPORT						AIRPORT AUTHORITY
39.1403	-78.1386	220 Park Center Dr	Wichester	213.925445	27	BANT	Private: Business	Kraft Foods Global, Inc.
39.1417	-78.145	511 AIRPORT RD	WINCHESTER	217.15274	13	BANT	Private: Business	AIREVAC INC. C/O PHI AIR MEDICAL GROUP
39.1425	-78.1433	491 AIRPORT ROAD	WINSCHESTER	217.465881	6.7	BANT	Public: Local	WINCHESTER REGIONAL AIRPORT AUTHORITY
39.1425	-78.1431	WINCHESTER REGIONAL AIRPORT	WINCHESTER	217.35884	6.7	BANT	Public: Local	WINCHESTER REGIONAL AIRPORT AUTHORITY
39.1436	-78.1339		Winchester	214.949813	0		Private: Business	Blue Ridge Industries Inc
39.1446	-78.15	510 PEGASUS COURT	WINCHESTER	222.512527	10.7	BTWR	Private: Business	AMFM RADIO LICENSES, L.L.C.
39.1497	-78.2069	3074 MIDDLE ROAD	WINCHESTER	255.53096	59.4	TOWER	Private: Business	NEXTEL WIP LICENSE CORP.
39.1499	-78.2069	3074 MIDDLE RD	WINCHESTER	255.341598	60		Private: Business	CROWN COMMUNICATION LLC
39.1503	-78.1496	1080 COVERSTONE DRIVE	WINCHESTER	218.324218	13.7	BANT	Public: Local	Frederick County
39.1503	-78.1492	1080 COVERSTONE DRIVE	WINCHESTER	219.624954	14.9	BANT	Public: Local	FREDERICK COUNTY FIRE AND RESCUE DEPARTMENT
39.1536	-78.1608	388 FRONT ROYAL PIKE	WINCHESTER	224.442855	1	POLE	Private: Business	FEDEX FREIGHT EAST
39.1578	-78.1581		Winchester	220.551086	0		Private: Business	Costco Wholesale Corporation
39.1578	-78.1073	500 W STATE R 831	WINCHESTER	194.519577	81.1		Private: Business	SBC TOWER HOLDINGS LLC
39.1578	-78.1073	500 Ft West of State Route 831	WINCHESTER	194.519577	82.3	MAST	Private: Business	New Cingular Wireless PCS, LLC
39.1578	-78.1072	325 BROAD AVE	WINCHESTER	194.519577	81.4	MAST	Private: Business	NEXTEL WIP LICENSE CORP.
39.1583	-78.1331			214.540512	0		Private: Business	HENKEL HARRIS COMPANY INC
39.1597	-78.1539	1026 Millwood Avenue	Winchester	219.52362	36.6		Private: Business	Holtzman Oil Corp.
39.1597	-78.1539	1026 MILLWOOD PIKE (AMOCO STATION)	WINCHESTER	219.52362	36.6	SIGN	Private: Business	NEXTEL WIP LICENSE CORP.
39.1656	-78.1536	1460 University Drive	Winchester	207.726364	38.4		Private: Business	New Cingular Wireless PCS, LLC
39.1672	-78.1067		Winchester	193.490783	0		Public: Local	Frederick County Public Schools

Lat	Long	Structure Address	City	Base Elevation	Height	Type	Owner Type	Owner Name
39.1693	-78.2736			437.574584	0		Private: Business	Wireless Properties of Virginia, Inc.
39.17	-78.1444		WINCHESTER	201.765884	0		Private: Business	WINCHESTER COUNTRY CLUB
39.1708	-78.1205	809 GREENWOOD ROAD	WINCHESTER	207.133041	16	BANT	Private: Business	GREENWOOD VOL. FIRE AND RESCUE CO. INC.
39.1719	-78.1417		WINCHESTER	193.405029	0		Private: Business	WINCHESTER COUNTRY CLUB
39.1745	-78.3897	PINNACLE RIDGE	GORE	644.756774	11	TOWER	Public: State	VIRGINIA DEPARTMENT OF STATE POLICE
39.1745	-78.3897	PINNACLE RIDGE	GORE	644.756774	11	TOWER	Public: State	VIRGINIA DEPARTMENT OF STATE POLICE
39.1745	-78.3897	PINNACLE RIDGE	GORE	644.756774	11	TOWER	Public: State	VIRGINIA, COMMONWEALTH OF
39.1745	-78.3897	Pinnacle Ridge	Gore	644.756774	15.2	MAST	Public: State	Virginia Department of State Police
39.1772	-78.2644	LITTLE NORTH MOUNTAIN	WINCHESTER	428.935241	46	TOWER	Private: Business	USA Mobility Wireless, Inc.
39.1772	-78.2644	LITTLE NORTH MOUNTAIN, 5 MILES W. OF	WINCHESTER	428.935241	0		Private: Business	USA Mobility Wireless, Inc.
39.1772	-78.2644	LITTLE NORTH MOUNTAIN	WINCHESTER	428.935241	54.9		Private: Business	USA Mobility Wireless, Inc.
39.1772	-78.2644	LITTLE NORTH MOUNTAIN, RTE 608	WINCHESTER	428.935241	55		Private: Business	USA Mobility Wireless, Inc.
39.1773	-78.2644	0.5 Mi. West of Singhass Rd and Masterpiece Lane	WINCHESTER	426.534484	59.4		Private: Business	Capstar Radio Operating Company
39.1773	-78.2644	LITTLE MTN 8.05 KM W OF	WINCHESTER	426.534484	61		Private: Business	CAPSTAR TX LLC
39.1786	-78.2483	3100 BERRYVILLE PIKE	WINCHESTER	282.801727	59.4	TOWER	Public: Local	FREDERICK COUNTY OF VIRGINIA SHERIFFS DEPARTMENT
39.182	-78.39		WINCHESTER	781.852844	0		Private: Business	VALLEY TWO WAY, INC
39.182	-78.39	GREAT NORTH MTN NEAR PINNACLE RIDGE	WINCHESTER	781.852844	58	TOWER	Private: Business	VALLEY TWO WAY, INC

Lat	Long	Structure Address	City	Base Elevation	Height	Type	Owner Type	Owner Name
39.182	-78.39	1840 AMHERST ST	WINCHESTER	781.852844	46	B	Private: Institutional/NonProfit	WINCHESTER MEDICAL CENTER
39.182	-78.39	GREAT NORTH MOUNTAIN NEAR PINNACLE RIDGE	WINCHESTER	781.852844	58		Private: Business	Virginia Two Way
39.182	-78.39	GREAT NORTH MOUNTAIN NEAR PINACLE RIDGE	WINCHESTER	781.852844	58		Private: Business	PERRY ENGINEERING INC
39.182	-78.39	GRT NORTH MTN NEAR PINNACLE RIDGE	WINCHESTER	781.852844	58	TOWER	Public: Local	FREDERICK COUNTY PUBLIC SCHOOLS
39.182	-78.39	GREAT NORTH MOUNTAIN NEAR PINICAL RIDGE	WINCHESTER	781.852844	59	TOWER	Private: Institutional/NonProfit	WINCHESTER MEDICAL CENTER
39.182	-78.39	NEAR PINNACLE RIDGE NEAR NORTH MOUNTAIN	WINCHESTER	781.852844	58	TOWER	Private: Business	WINCHESTER MEDICAL CENTER INC
39.182	-78.39	GREAT NORTH MOUNTAIN NEAR PINICAL RIDGE	WINCHESTER	781.852844	59	TOWER	Private: Institutional/NonProfit	WINCHESTER MEDICAL CENTER
39.182	-78.39	W SIDE RT 522 1/4 MI N RT 694 & RT 522	CROSS JUNCTION	781.852844	0		Private: Business	REYNOLDS STORE VOLUNTEER FIRE CO
39.182	-78.39	GREAT NORTH MOUNTAIN NEAR PINACLE RIDGE	WINCHESTER	781.852844	0		Private: Business	Virginia Two Way
39.182	-78.39	GREAT NORTH MOUNTAIN NEAR PINNACLE	WINCHESTER	781.852844	18	TOWER	Private: Business	NEXTEL COMMUNICATIONS OF THE MID-ATLANTIC, INC.
39.1825	-78.3892	PINNACLE KNOB, SHAWNEELAND, FREDERICK COUNTY, VA	WINCHESTER	780.735534	60.3	TOWER	Public: State	VIRGINIA DEPARTMENT OF STATE POLICE
39.1826	-78.3894	Pinnacle Knob, Shawneeland, Frederick County, Virginia	Winchester	781.63623	60.3	TOWER	Public: State	COMMONWEALTH OF VIRGINIA, DEPARTMENT OF STATE POLICE
39.1828	-78.3898	BIG NORTH MOUNTAIN WOLF SPRINGS RD (006520)	WINCHESTER	782.741821	27.7		Private: Business	American Towers, LLC.

Lat	Long	Structure Address	City	Base Elevation	Height	Type	Owner Type	Owner Name
39.1828	-78.3897	450 VALLEY VIEW TRAIL	WINCHESTER	782.658203	30.8	TOWER	Private: Business	New Cingular Wireless PCS, LLC
39.1828	-78.3897	450 VALLEY VIEW TRAIL	WINCHESTER	782.658203	30.8	MAST	Private: Business	New Cingular Wireless PCS, LLC
39.1836	-78.1333		Winchester	204.307189	0		Public: Local	Frederick County Public Schools
39.1867	-78.2814		WINCHESTER	291.383239	0		Private: Business	FELHC, Inc.
39.1892	-78.1964	1870 AMHERST ST. MOB-1, STE. 1E	WINCHESTER	243.279174	15	BANT	Private: Institutional/NonProfit	WINCHESTER MEDICAL CENTER
39.1911	-78.2108	2275 NORTHWESTERN PIKE US 50 1.0 KM	WINCHESTER	262.384338	9	POLE	Public: State	VIRGINIA, COMMONWEALTH OF
39.1917	-78.2319	INT RTS 803 & 654	WINCHESTER	273.357299	0		Private: Business	ROUND HILL COMMUNITY FIRE COMPANY
39.1919	-78.1122		Winchester	199.904357	0		Public: Local	Frederick County Public Schools
39.1919	-78.1092	251 First Woods Dr	Winchester	198.154693	14	BANT	Public: Local	Frederick County Public Schools
39.1931	-78.3714	TIMBER RIDGE TRAIL GREAT NORTH MOUNTAIN	WINCHESTER	697.265686	58.5	TOWER	Public: Local	FREDERICK COUNTY PUBLIC SAFETY COMMUNICATIONS DEPT
39.1931	-78.3714	GREAT NORTH MOUNTAIN NEAR PINACLE RIDGE	WINCHESTER	697.265686	58.5	TOWER	Public: Local	FREDERICK COUNTY OF VIRGINIA SHERIFFS DEPARTMENT
39.1931	-78.3714	NEAR GREAT NORTH MOUNTAIN NEAR PINACLE RIDGE	WINCHESTER	697.265686	58.5	TOWER	Public: Local	FREDERICK COUNTY FIRE AND RESCUE DEPARTMENT
39.1932	-78.3715	805 TIMBER RIDGE ROAD	WINCHESTER	695.894042	30.5	MAST	Public: Local	FREDERICK COUNTY
39.1939	-78.2792	361 TURTLE MEADOW DRIVE	WINCHESTER	286.725219	106.7	TOWER	Private: Business	Virginia 10 RSA Limited Partnership
39.1941	-78.2792	361 TURTLE MEADOW DRIVE	WINCHESTER	288.253875	105.2		Private: Business	Shenandoah Mobile, LLC
39.1987	-78.2211	381 SPINNING WHEEL LN	WINCHESTER	268.848754	12.2		Private: Business	CAPSTAR TX LLC

Lat	Long	Structure Address	City	Base Elevation	Height	Type	Owner Type	Owner Name
39.1988	-78.2208	510 PEGASUS COURT	WINCHESTER	267.583007	12.2	B	Private: Business	AMFM RADIO LICENSES, L.L.C.
39.1994	-78.1475	480 BROOKE ROAD	WINCHESTER	212.639511	0		Private: Business	HOME DEPOT U.S.A., INC.
39.2014	-78.1514	141 FT COLLIER RD	WINCHESTER	217.007339	22	BTWR	Public: Local	FREDERICK, COUNTY OF
39.2069	-78.1422	480 PARK CENTER DR	WINCHESTER	206.191375	0		Private: Business	HOME DEPOT U.S.A., INC.
39.2081	-78.1097		Winchester	198.411376	0		Private: Business	Grey Wolfe Inc
39.2092	-78.18	140 FOXRIDGE LANE	WINCHESTER	253.319671	0		Private: Business	ALLEN FOOD SERVICE LLC
39.21	-78.1486		Winchester	212.7294	0		Private: Business	Kraft Foods Global, Inc.
39.2125	-78.1414	172 PACTIV WAY	WINCHESTER	209.674041	23	SILO	Private: Business	PACTIV CORP
39.2131	-78.3486		Hayfield	652.764343	42.7	TOWER	Private: Business	World Class Wireless, LLC
39.2131	-78.3483	3.3 MI SW OF	HAYFIELD	656.020019	45.1		Private: Business	MCI Communications Services, Inc
39.2133	-78.1817	161 Apple Pie Ridge Rd	Frederick	278.993255	32.3	BANT	Private: Institutional/NonProfit	JAMES WOOD HIGH SCHOOL
39.2133	-78.1817		FREDERICK	278.993255	0		Private: Institutional/NonProfit	JAMES WOOD HIGH SCHOOL
39.2133	-78.1789		Winchester	252.040054	0		Public: Local	Frederick County Public Schools
39.2161	-78.1411	US RT 11 .2 MI SW OF US RT 81 & RT 11 INT	WINCHESTER	213.737457	0		Private: Business	A E JOHNSON INC
39.2161	-78.1397	1594 MARTINSBURG PIKE	WINCHESTER	214.712692	0		Private: Business	NERANGIS ENTERPRISES, INC.
39.2172	-78.1414	125 WELTON ROAD	WINCHESTER	214.708709	0		Private: Business	BURGER BUSTERS, INC.
39.2344	-78.2094	550 FAIRMONT AVE	WINCHESTER	260.601257	30.4	B	Private: Business	NATIONAL FRUIT PRODUCT CO INC
39.2428	-78.2844		Winchester	233.738281	0		Public: Local	Frederick County Public Schools
39.2558	-78.3308	M SODE RTE 50 W 1200 E FO INT RTE 704 & 50	GORE	244.194305	0		Private: Business	GORE VOLUNTEER FIRE COMPANY

Lat	Long	Structure Address	City	Base Elevation	Height	Type	Owner Type	Owner Name
39.2657	-78.2263	329 Hunting Ridge Road	Winchester	281.197204	59.4		Private: Business	SBA Infrastructures, LLC
39.2666	-78.3012	226 STONY HILL ROAD	GORE	275.635375	59.4		Private: Business	Shenandoah Mobile, LLC
39.2742	-78.2497		Middletown	200.890304	0		Public: Local	Frederick County Public Schools
39.2751	-78.1153	205 BROWN LN	CLEAR BROOK	246.213348	84.4	TOWER	Public: Local	FREDERICK COUNTY
39.2753	-78.115	205 BROWN LN	CLEAR BROOK	243.857849	82.9		Private: Business	Shenandoah Mobile, LLC
39.2753	-78.115	205 BROWN LN	CLEAR BROOK	243.857849	84.4	TOWER	Public: Local	FREDERICK COUNTY FIRE AND RESCUE DEPARTMENT
39.2753	-78.115	205 BROWN LN	CLEAR BROOK	243.857849	84.4	TOWER	Private: Business	NEXTEL WIP LICENSE CORP.
39.2753	-78.115	205 Brown Lane	CLEAR BROOK	243.857849	84.4	MAST	Private: Business	NEW CINGULAR WIRELESS PCS, LLC
39.2753	-78.115	205 BROWN LANE	CLEARBROOK	243.857849	84.4	TOWER	Private: Business	Virginia 10 RSA Limited Partnership
39.2758	-78.3653	235 PARISHVILLE ROAD	GORE	389.099975	26.8	UPOLE	Private: Business	Virginia 10 RSA Limited Partnership
39.2758	-78.3652	235 PARISHVILLE ROAD	GORE	389.025573	30.4		Private: Business	Shenandoah Mobile, LLC
39.2914	-78.2417	480 CHALYBEATE SPRINGS RD	WINCHESTER	197.934829	0		Private: Business	NORTH-SOUTH SKIRMISH ASSOCIATION
39.3125	-78.2864	US 522 .4 KM S OF SR 693	CROSS JUNCTION	259.702758	12	UPOLE	Public: State	VIRGINIA, COMMONWEALTH OF
39.3178	-78.2914	.5 MI N INT RT 6679 & RT 522N OUT OF WINCHESTER	CROSS JUNCTION	279.419616	0		Private: Business	SHAWNEE CANNING CO
39.3194	-78.2936	311 CROSS JUNCTION ROAD	CROSS JUNCTION	293.71936	81.1	TOWER	Public: Local	FREDERICK COUNTY FIRE AND RESCUE DEPARTMENT
39.3195	-78.2938	311 Cross Junction Road	Cross Junction	296.437866	79.3		Private: Business	SBA Infrastructures, LLC
39.3208	-78.3161	231 Redland Rd	Cross Junction	286.909942	10.7	BANT	Private: Business	LAKE HOLIDAY COUNTRY CLUB INC
39.3267	-78.3183	MASTERS DR 1/2 MI W 231 REDLAND RD	CROSS JUNCTION	311.326629	9	TANK	Private: Business	LAKE HOLIDAY COUNTRY CLUB INC

Lat	Long	Structure Address	City	Base Elevation	Height	Type	Owner Type	Owner Name
39.3731	-78.2097	575 Glengary Road	Winchester	281.5885	51.8		Private: Business	New Cingular Wireless PCS, LLC
39.3746	-78.2944	8926 N. Frederick Pike	Cross Junction	344.636444	59.4		Private: Business	SBA Infrastructures, LLC
39.3864	-78.3022	9381 NORTH FREDERICK PIKE	CROSS JUNCTION	350.548522	17	TOWER	Public: Local	FREDERICK COUNTY FIRE AND RESCUE DEPARTMENT
39.4136	-78.3281	2453 Sleepy Creek Road	Cross Junction	412.843231	57.9	MAST	Private: Business	NEW CINGULAR WIRELESS PCS, LLC
39.4136	-78.3281	2453 SLEEPY CREEK ROAD	CATLETT GAP	412.843231	59.4	TOWER	Private: Business	Virginia 10 RSA Limited Partnership
39.4138	-78.3282	2453 N SLEEPY CREEK	WHITACRE	416.568115	57.9	MAST	Private: Business	New Cingular Wireless PCS, LLC
39.4458	-78.3436	CACAPON MOUNTAIN 1 MI S OF CACAPON STATE PARK	WHITACRE	769.947021	46	TOWER	Private: Business	TWO WAY RADIO SERVICE INC
39.4458	-78.3436	CACAPON MOUNTAIN 1 MI S OF CACAPON ST PK	WHITACRE	769.947021	49		Public: Local	MORGAN, COUNTY OF
39.4458	-78.3436	CACAPON MOUNTAIN 1 MI S OF CACAPON ST PK	WHITACRE	769.947021	49		Private: Business	NEXTEL WIP LICENSE CORP.
39.4458	-78.3436	CACAPON MT 1 MI S CACAPON STATE PARK	WHITACRE	769.947021	0		Private: Business	TWO WAY RADIO SERVICE INC
39.4458	-78.3436	CACAPON MOUNTAIN 1 MI S OF CACAPON STATE PK	WHITACRE	769.947021	0		Private: Business	TWO WAY RADIO SERVICE INC
39.4509	-78.3464	2.0 MILES WEST OF CITY CACAPAN STATE PARK	Gainesboro	765.158142	6.1	B	Private: Business	Atlantic Broadband (Penn) LLC
39.4615	-78.3469	4 MILES NORTH OF	WHITACRE	707.408325	59.4		Private: Business	AT&T Communications of Virginia, LLC
39.4615	-78.3469	9 MI N OF	WHITACRE	707.408325	59.4		Private: Business	AT&T CORP.

Table 10 Existing Vertical Assets

C. Community Anchor Institutions

ANCHORNAME	ADDRESS	CITY	TYPE
FREDERICK COUNTY OFFICE	107 NORTH KENT STREET	WINCHESTER	government
Parks & Recreation	1001 east cork st	WINCHESTER	government
Public Works	301 East Cork St	WINCHESTER	government
Rouss City Hall	15 North Cameron St	WINCHESTER	government
FREDERICK COUNTY SHERIFFS OFFICE	1080 COVERSTONE DRIVE	WINCHESTER	law enforcement
MIDDLETOWN POLICE DEPARTMENT	7875 CHURCH STREET	MIDDLETOWN	law enforcement
NORTHWESTERN REGIONAL JUVENILE DETENTION CENTER	145 FT. COLLIER RD	WINCHESTER	law enforcement
STEPHENS CITY POLICE DEPARTMENT	1033 LOCUST STREET	STEPHENS CITY	law enforcement
VIRGINIA STATE POLICE DIVISION 2 AREA 13 - WINCHESTER	3680 VALLEY PIKE	WINCHESTER	law enforcement
WINCHESTER CITY SHERIFFS OFFICE	5 NORTH KENT STREET	WINCHESTER	law enforcement
WINCHESTER POLICE DEPARTMENT	231 EAST PICCADILLY STREET	WINCHESTER	law enforcement
HANDLEY LIBRARY	100 W. PICCADILLY ST.	WINCHESTER	library
MARY JANE AND JAMES L. BOWMAN LIBRARY	871 TASKER ROAD	STEPHENS CITY	library
Amherst Family Practice	1867 Amherst st	WINCHESTER	medical
SURGI-CENTER OF WINCHESTER, INC.	1860 AMHERST STREET	WINCHESTER	medical
Valley Health Urgent Care	607 East Jubal Early Drive	WINCHESTER	medical
Winchester Internal Medicine	190 Campus Blvd	WINCHESTER	medical
WINCHESTER MEDICAL CENTER	1840 AMHERST STREET	WINCHESTER	medical
Winchester Neurological Consultants	125 Medical Center Dr	WINCHESTER	medical
Timbrook Public Safety Center	231 EAST PICCADILLY STREET	WINCHESTER	public safety
Clearbrook Fire & Resuce	1256 First Town Road	CLEAR BROOK	public safety
Friendship Fire Company - Stn 1	627 North Pleasant Valley Rd	WINCHESTER	public safety
Gore Volunteer Fire & Rescue	7184 Northwestern Pike	GORE	public safety
Greenwood Volunteer Fire & Rescue	809 Greenwood Rd	WINCHESTER	public safety
Middletown Volunteer Fire & Rescue	7855 Main St	MIDDLETOWN	public safety
Millwood Station Fire & Rescue	250 Costello Dr	WINCHESTER	public safety
North Mountain Volunteer Fire & Rescue	186 Rosenberger Lane	WINCHESTER	public safety
Rouss Fire Company - Stn 2	2 south braddock street	WINCHESTER	public safety
Shawnee Fire Company - Stn 4	2210 valor drive	WINCHESTER	public safety
South End Fire Company - Stn 5	17 west monmouth st	WINCHESTER	public safety
Stephens City Volunteer Fire & Rescue	5346 Mulberry St	STEPHENS CITY	public safety
ADMIRAL RICHARD E. BYRD MIDDLE	134 ROSA LN	WINCHESTER	school
ALSON H SMITH JR AGRICULTURAL RESEARCH &	595 LAUREL GROVE ROAD	WINCHESTER	school

ANCHORNAME	ADDRESS	CITY	TYPE
EDUC CTR			
APPLE PIE RIDGE ELEMENTARY	349 APPLE PIE RIDGE RD	WINCHESTER	school
ARMEL ELEMENTARY	2239 FRONT ROYAL PIKE	WINCHESTER	school
BASS-HOOVER ELEMENTARY	471 AYLOR RD	STEPHENS CITY	school
DANIEL MORGAN MIDDLE	48 S PURCELL AVE	WINCHESTER	school
DOUGLASS COMMUNITY LRNG. CTR.	598 KENT ST	WINCHESTER	school
EVENDALE ELEMENTARY	220 ROSA LN	WINCHESTER	school
FREDERICK COUNTY MIDDLE	441 LINDEN DR	WINCHESTER	school
FREDERICK DOUGLASS ELEMENTARY	100 CEDARMEADE AVE	WINCHESTER	school
GAINESBORO ELEMENTARY	4651 N FREDERICK PIKE	WINCHESTER	school
GARLAND R. QUARLES ELEMENTARY	1310 S LOUDOUN ST	WINCHESTER	school
GREENWOOD MILL ELEMENTARY	281 CHANNING DR	WINCHESTER	school
INDIAN HOLLOW ELEMENTARY	1548 NORTH HAYFIELD RD	WINCHESTER	school
INTERNATIONAL BEAUTY SCHOOL	808 BERRYVILLE AVE	WINCHESTER	school
JAMES WOOD HIGH	161 APPLE PIE RIDGE RD	WINCHESTER	school
JAMES WOOD MIDDLE	1313 AMHERST ST	WINCHESTER	school
JOHN HANDLEY HIGH	425 HANDLEY BLVD	WINCHESTER	school
JOHN KERR ELEMENTARY	536 JEFFERSON ST	WINCHESTER	school
LORD FAIRFAX CC MIDDLETOWN	173 SKIRMISHER LN	MIDDLETOWN	school
MIDDLE SCHOOL ALTERNATIVE PRGM.	156 DOWELL J CIR	WINCHESTER	school
MIDDLETOWN ELEMENTARY	190 MUSTANG LN	MIDDLETOWN	school
MILLBROOK HIGH	251 FIRST WOODS DR	WINCHESTER	school
MOUNTAIN VIEW CHRISTIAN ACAD	153 NARROW LANE	WINCHESTER	school
NORTHWESTERN REG ED PGM	860 SMITHFIELD AVE	WINCHESTER	school
ORCHARD VIEW ELEMENTARY	4275 MIDDLE RD	WINCHESTER	school
REDBUD RUN ELEMENTARY	250 FIRST WOODS DR	WINCHESTER	school
ROBERT E. AYLOR MIDDLE	901 AYLOR RD	STEPHENS CITY	school
SACRED HEART ACADEMY	110 KEATING DRIVE	WINCHESTER	school
SHARONS CENTRE LLC	1855 SENSENY RD	WINCHESTER	school
SHENANDOAH UNIVERSITY	1460 UNIVERSITY DR	WINCHESTER	school
SHENANDOAH VALLEY CHRISTIAN AC	4701 VALLEY PIKE	STEPHENS CITY	school
SHERANDO HIGH	185 SOUTH WARRIOR DR	STEPHENS CITY	school
STONEWALL ELEMENTARY	3165 MARTINSBURG PIKE	CLEAR BROOK	school
TIMBER RIDGE SCHOOL	1463 NEW HOPE RD	CROSS JUNCTION	school
VIRGINIA AVENUE CHARLOTTE DEHART ELEMENTARY	550 VIRGINIA AVE	WINCHESTER	school
WINCHESTER MONTESSORI SCHOOL	1090 W PARKINS MILL ROAD	WINCHESTER	school
Roundhill Fire / Rescue			public safety
Gainesboro Fire/Rescue			public safety
Star Tannery Fire/Rescue			public safety

ANCHORNAME	ADDRESS	CITY	TYPE
Reynolds Store			public safety
Winchester Voter Registrar	107-A N East Lane	Winchester	government
Frederick Douglas Learning Center	598 N Kent St	Winchester	school
VA Ave Charlotte Dehart Elem School	550 VIRGINIA AVE	Winchester	school
Daniel Morgan Middle Scholl	48 S PURCELL AVE	Winchester	school
Quarles Elementary School	1310 S LOUDOUN ST	Winchester	school
Frederick Douglass Elementary School	100 CEDARMEADE AVE	Winchester	school
John Handley High School	PO BOX 910	Winchester	school
John Kerr Elementary School	536 JEFFERSON ST	Winchester	school
City Schools Administrative Office	12 N WASHINGTON ST	Winchester	school
Indian Hollow Elementary School	1548 N HAYFIELD RD		school
Old Gainesboro Elementary School	5629 N FREDERICK PIKE		school
Stonewall Elementary School	3165 MARTINSBURG PIKE		school
Apple Pie Ridge Elementary School	349 APPLE PIE RIDGE RD		school
James Wood High School	161 APPLE PIE RIDGE RD		school
Frederick County Middle School	441 LINDEN DR		school
James Wood Middle School	1313 AMHERST ST		school
Millbrook High School	251 FIRST WOODS DR		school
Red Bud Elementary School	250 FIRST WOODS DR		school
Dowell J. Howard Vocational School	156 DOWELL J CIR		school
Senseny Road Elementary School	1481 SENSENY RD		school
Admiral Byrd Middle School	134 ROSA LN		school
Evandale Elementary School	220 ROSA LN		school
Orchard View Elementary School	4275 MIDDLE RD		school
Armel Elementary School	2239 FRONT ROYAL PIKE		school
Bass-Hoover Elementary School	471 AYLOR RD		school
R. E. Aylor Middle School	901 AYLOR RD		school
Sherando High School	185 S WARRIOR DR		school
Middletown Elementary School	190 MUSTANG LN		school
School Board Administration Office	1415 AMHERST ST		school
School Board Old Bus Garage	178 INDIAN HOLLOW RD		school
New Gainesboro Elementary	4651 N FREDERICK PIKE		school
Handley Regional Library	100 W. PICCADILLY ST.		library
LORD FAIRFAX CC MIDDLETOWN	173 SKIRMISHER LN		Comm College
SHENANDOAH UNIVERSITY	1460 UNIVERSITY DR, WINCHESTER, VIRGINIA 22601-5195		University
Winchester Medical Center	1840 AMHERST STREET	Winchester	medical
MARY JANE AND JAMES L. BOWMAN LIBRARY	871 TASKER ROAD	Stephens City	library
Valley Health System	220 Campus Blvd	Winchester	medical
Valley Health System	1840 Amherst Street	Winchester	medical

ANCHORNAME	ADDRESS	CITY	TYPE
Virginia Brain and Spine Center	1818 Amherst street	Winchester	medical
Winchester Orthopaedic Associates, Ltd.	128 Medical Circle	Winchester	medical
Advanced Pain Relief Centers Inc	190 Campus Blvd Ste 420	Winchester	medical
Asthma & Allergy Center of the Northern Shenandoah	1828 W. Plaza Drive	Winchester	medical
Winchester Womens Specialists	1870 Amherst	Winchester	medical
Blue Ridge Hospice	333 W. Cork St. Suite 405	Winchester	medical
Valley Health	220 Campus Blvd #400	Winchester	medical
Blue Ridge Women's Care, P.C.	130 W. Picadilly Stl	Winchester VA	medical
Winchester Medical Center/Valley Health	347 Westside Station Drive	Winchester VA	medical
Commonwealth assisted living	156 Granville Ct	Winchester	medical
Shenandoah Valley Westminster Canterbury	300 Westminster Canterbury Dr.	Winchester	medical
Stephens City Family Medicine	160 Warrior Drive	Stephens City	medical
Selma Medical Association	104 Selma Drive	Winchester	medical

Table 11 Community Anchor Institutions

D. GLOSSARY

BROADBAND	**Technical definition**: a high-capacity transmission technique using a wide range of frequencies, which enables a large number of messages to be communicated simultaneously. **FCC Definition**: Broadband or high-speed Internet access allows users to access the Internet and Internet-related services at significantly higher speeds than those available through "dial-up" Internet access services
DIGITAL LITERACY	The ability to effectively and critically navigate, evaluate and create information using a range of digital technologies.
BANDWIDTH	The rate of data flow in digital networks typically measured in bits per second
TELEWORK	Remote work – telecommute (to work from home using a computer to connected to employer's network typically via the Internet).
TELEHEALTH	Healthcare facilitated by telecommunication technology.
FTTX	**Fiber to the *x* (FTTX)** is a generic term for any broadband network architecture using optical fiber to provide all or part of the local loop used for last mile telecommunications. The term is a generalization for several configurations of fiber deployment, ranging from FTTN (fiber to the neighborhood) to FTTD (fiber to the desktop).
DSL	**Digital subscriber line** (**DSL**, originally **digital subscriber loop**) is a family of technologies that provide Internet access by transmitting digital data over the wires of a local telephone network.
HEALTHIT	Health information technology (HIT) is the area of IT involving the design, development, creation, use and maintenance of information systems for the healthcare industry.

E. References

The following references were used in preparation of this report:

1. Virginia's Broadband Toolkit (http://www.wired.virginia.gov/broadband_toolkit.shtml).
2. Top Consumer benefits of Broadband (http://www.fiercetelecom.com/story/top-consumer-benefits-broadband/2012-10-29)
3. Broadband Case Studies or Models (http://www.wired.virginia.gov/pdf/broadband%20deployment%20models%20-%20matrix%209-2-08.xls)
4. Broadband Resources (including sample Agreements and RFPs) (http://www.wired.virginia.gov/broadband_Virginia%20Resources.shtml)
5. Modeling Cost of Rural Fiber Deployment http://bbpmag.com/2011mags/marchapril11/BBP_MarApr_CostOfFiber.pdf
6. Telecommunications Wiring in buildings and homes additional references:
    a. http://en.wikipedia.org/wiki/Category_5_cable
    b. http://en.wikipedia.org/wiki/Category_6_cable
    c. http://en.wikipedia.org/wiki/Daisy_chain_%28electrical_engineering%29
    d. http://en.wikipedia.org/wiki/110_block
7. Grounding for buildings reference:
    a. http://www.jacobsonengineering.ca/documents/ power_infl_UofA_2005_1.pdf
8. Fixed wireless technology information:
    a. Governments Engaging Citizens (http://www.cambiumnetworks.com/downlink.php?id=718af87f1e3b1b349d051fb4bdf9af54&tag=resources&loc=page)
    b. Wireless Residential Broadband Networks (at http://www.cambiumnetworks.com/downlink.php?id=d2c22992e94b8427b76c697da6e3597e&tag=resources&loc=page)
    c. Case Studies from around the world (http://www.cambiumnetworks.com/resources.php)
9. Internet Innovation Alliance's 2013 Broadband Guide http://internetinnovation.org/files/2013-Broadband-Guide.pdf
10. An article published in Broadband Communities magazine in January/February 2013 explaining the pole attachment issues http://www.kandutsch.com/articles/access-to-utility-poles-for-ftth-providers
11. Contact information for provider interviews:
    a. Level 3; William Ganey, William.Ganey@Level3.com
    b. Comcast; Rob Omberg, robert_omberg@cable.comcast.com
    c. Shentel; Willy Pirtle, willy.pirtle@emp.shentel.com
    d. Verizon; Jeff Merriman, jeffrey.t.merriman@verizon.com
    e. Wave2Net; Rudy Worrell, vendors@wave2net.com
    f. Winchester Wireless; David Williamson dwilliamson@CustomComputersVA.com
    g. Rappahannock Electric Coop; Roger Key, rkey@myrec.coop
    h. Shenandoah Valley Electric Cooperative; Mike Aulgur, maulgur@svec.coop

12. Contact information for library interviews:
    a. Handley Regional; Trish Ridgeway, tridgeway@handleyregional.org
    b. Lord FairFax Community College; Kerry Kilpatrick, KKilpatrick@lfcc.edu
    c. Shenandoah University Library; Chris Bean, cbean@su.edu

ADDRESS	Business Type
3205 APPLE PIE RIDGE RD	CONVENIENCE STORES WO/ GAS
2721 APPLE PIE RIDGE RD	APPRAISER OF REAL ESTATE
3094 APPLE PIE RIDGE RD	HOME IMPROVEMENT CONTRACTING
244 ASHLAND DR	CONSULTING
150 CHARMING CT	SENIOR CARE
269 COTTONWOOD DR	PRACTITIONERS OF HEALING ARTS
280 ENCHANTING DR	LANDSCAPING / LAWN CARE
221 GREEN SPRING RD	RETAIL BUSINESS
141 GREEN SPRING RD	APPRAISER OF REAL ESTATE
444 GREEN SPRING RD	SPECIALTY CONTRACTOR
138 HANNAH CT	ELECTRICAL CONTRACTOR
408 MISTY MEADOW DR	GRAPHIC / ANIMATED DESIGN
186 OLD BALTIMORE RD	ACCOUNTING / BOOK KEEPING
224 OLD BALTIMORE RD	CHILDCARE
117 PANARAMA DR	ENTERTAINMENT - BAND
270 PANARAMA DR	COMMERCIAL & RESIDENTIAL BUILD
186 SONGBIRD LN	CONSULTING
343 WARM SPRINGS RD	CONSULTING
157 WARM SPRINGS RD	ONLINE RETAIL
748 WARM SPRINGS RD	MAIL DELIVERY / CARRIER
661 WARM SPRINGS RD	ALL OTHER MISCELLANEOUS STORE
850 WARM SPRINGS RD	HEAVY / LIGHT EQ RETAIL
841 WARM SPRINGS RD	SPECIALTY CONTRACTOR
815 WARM SPRINGS RD	ANIMAL SERVICE - HORSES
191 WARM SPRINGS RD	ENGINEERS
648 WARM SPRINGS RD	ELECTRICAL CONTRACTOR
440 WHITE HALL RD	BUILDING CONTRACTOR
432 WHITE HALL RD	ANIMAL SERVICE - DOG WALKER

WINCHESTER

BUNDLED PACKAGES[1,2]

QUAD PLAY PACKAGES

QUAD PLAY PACKAGE PRICING BELOW IS ADDITIONAL TO TRIPLE PLAY PACKAGE PRICING

with Xfinity Home Security add[40]	$39.95
with Xfinity Home Security Plus add[41]	$49.95

TRIPLE PLAY PACKAGES[39]

Standard Triple Play Includes Limited Basic, Kids & Family, Entertainment, Sports & News and HD programming for primary outlet, 10 Hour DVR Service, Performance Pro Internet and Voice Unlimited	$129.99
- with Blast! Internet upgrade add	$20.00
- with Extreme Pro Internet upgrade add	$25.00
- with Gig Internet upgrade add	$30.00
- with Gig Pro Internet upgrade add[23]	$238.00
Select Triple Play Includes Limited Basic, Kids & Family, Entertainment, Sports & News, Digital Preferred Tier, DVR Service and HD programming for primary outlet, Blast! Internet, and Voice Unlimited	$149.99
- with Extreme Pro Internet upgrade add	$25.00
- with Gig Internet upgrade add	$30.00
- with Gig Pro Internet upgrade add[23]	$238.00
Signature Triple Play[36] Includes Limited Basic, Kids & Family, Entertainment, Sports & News, Digital Preferred Tier, Showtime, Starz, Streampix, DVR Service and HD programming for primary outlet, Extreme Pro Internet, Voice Unlimited and Netflix Standard HD Plan	$169.99
- with Netflix Premium UHD Plan upgrade add	$3.00
- with Gig Internet upgrade add	$30.00
- with Gig Pro Internet upgrade add[23]	$238.00
Super Triple Play[36] Includes Limited Basic, Kids & Family, Entertainment, Sports & News, Digital Premier Tier, Sports Entertainment Package, Streampix, DVR Service and HD programming for primary outlet, Gigabit Internet. Voice Unlimited, Netflix Standard HD Plan	$199.99
- with Netflix Premium UHD Plan upgrade add	$3.00
- with Gig Pro Internet upgrade add[23]	$238.00
- with Xfinity Mobile deduct	-$12.00

DOUBLE PLAY PACKAGES[39]

Choice Double Play[37] Includes Choice TV, 10 Hour DVR Service and Performance Plus Internet	$89.99
- with Performance Pro Internet upgrade add	$15.00
- with Blast! Internet upgrade add	$20.00
- with Extreme Pro Internet upgrade add	$25.00
- with Gig Internet upgrade add	$30.00
- with Gig Pro Internet upgrade add[23]	$238.00
Standard Double Play Includes Limited Basic, Kids & Family, Entertainment, Sports & News, 10 Hour DVR Service, and HD programming for primary outlet and Performance Pro Internet	$109.99
- with Blast! Internet upgrade add	$20.00
- with Extreme Pro Internet upgrade add	$25.00
- with Gig Internet upgrade add	$30.00
- with Gig Pro Internet upgrade add[23]	$238.00
Select Double Play Includes Limited Basic, Kids & Family, Entertainment, Sports & News, Digital Preferred Tier, HD programming for primary outlet, 10 Hour DVR Service and Performance Pro Internet	$119.99
- with Blast! Internet upgrade add	$20.00
- with Extreme Pro Internet upgrade add	$25.00
- with Gig Internet upgrade add	$30.00
- with Gig Pro Internet upgrade add[23]	$238.00
Signature Double Play[36] Includes Limited Basic, Kids & Family, Entertainment, Sports & News, Digital Preferred Tier, HD programming, Showtime, Starz and Streampix for primary outlet, 10 Hour DVR Service, Performance Pro Internet and Netflix Standard HD Plan	$139.99
- with Netflix Premium UHD Plan upgrade add	$3.00
- with Blast! Internet upgrade add	$20.00
- with Extreme Pro Internet upgrade add	$25.00
- with Gig Internet upgrade add	$30.00
- with Gig Pro Internet upgrade add[23]	$238.00
Super Double Play[36] Includes Limited Basic, Kids & Family, Entertainment, Sports & News, Digital Premier Tier, HD programming and Streampix for primary outlet, 10 Hour DVR Service, Blast! Internet and Netflix Standard HD Plan	$169.99
- with Netflix Premium UHD Plan upgrade add	$3.00
- with Extreme Pro Internet upgrade add	$25.00
- with Gig Internet upgrade add	$30.00
- with Gig Pro Internet upgrade add[23]	$238.00

XFINITY TV[1]

BASIC SERVICES

Limited Basic[9]	$24.95
Broadcast TV Fee[27]	$10.00
Expanded Basic[17]	$42.32

XFINITY TV SERVICES

Choice TV[33] Includes Limited Basic, Streampix and HD programming	$30.00
Genre Packs[34] Choose up to 2 packs	
Kids & Family Includes kid and family-friendly channels including Cartoon Network, Disney Channel, Nickelodeon and Universal Kids	$10.00
Entertainment Includes entertainment channels including A&E, AMC, Bravo, Food Network, FX, TNT and VH1	$15.00
Sports & News Includes sports and news channels including CNBC, CNN, ESPN, Golf, MSNBC and NBC Sports	$28.25
Digital Starter Includes Limited Basic, Expanded Basic for primary outlet, additional digital channels, MoviePlex, access to Pay-Per-View and On Demand programming and Music Choice	$67.27
Digital Preferred Tier[4] Includes over 65 channels including CBS College Sports, Destination America, Disney XD, Encore and Science Channel	$17.95
Digital Preferred Tier plus One Premium Includes Digital Preferred Tier and choice of Showtime®, Starz®, Cinemax®, or The Movie Channel®	$29.95
Digital Preferred Tier with HBO® Includes Digital Preferred Tier and HBO®	$32.95
Digital Premier Tier Includes Digital Preferred Tier, HBO®, Showtime®, Starz®, Hitz, and The Movie Channel®	$64.95
Sports Entertainment Package[4] Includes over 15 channels including NFL Red Zone and CBS Sports Network	$9.95

Refer to the last page for additional information. For information about Xfinity policies and terms of service, go to xfinity.com/policies.

Deportes[17] Includes over 6 deportes channels including ESPN Deportes, FOX Deportes and NBC Universo	$7.00
With Choice Double Play or Standard, Select, Signature, Super Double or Triple Play Packages	$5.00
Xfinity TV Latino[17] Includes over 50 channels of Spanish language programming	$17.95
With Choice Double Play or Standard, Select, Signature, Super Double or Triple Play Packages	$10.00
HBO®[17]	$15.00
Showtime®[17]	$12.00
Starz®[17]	$12.00
Cinemax®[17]	$12.00
The Movie Channel®[17]	$12.00
Epix[32]	$5.99
Playboy®[17]	$15.00
HD Technology Fee[13]	$9.95
DVR Service[3,16]	$10.00
AnyRoom® DVR Service[4,15]	$10.00
Service to Additional TV[14]	$9.95
with HD[19]	$9.95
with DVR Service	$19.95
with AnyRoom DVR Service[20]	$19.95
with AnyRoom DVR Service (client)	$9.95
with CableCARD[35]	$7.27
Service to Additional TV with TV Adapter[12]	$6.99

INTERNATIONAL SELECTIONS

WKTV (Korean)	$14.99
ART: Arabic[38]	$9.99
TV Globo: Brazilian[38]	$19.99
Brazilian 2 Pack[38] Includes TV Globo and PFC	$24.99
Brazilian 4 Pack[38] Includes TV Globo, PFC, Band Internacional and Record TV	$34.99
TVB Jade: Catonese[38] Includes TVB Jade	$10.99
Mandarin 2 Pack[38] Includes Phoenix Info News and Phoenix North America	$6.99
Mandarin 4 Pack[38] Includes CTI Zhong Tian, CCTV4, Phoenix Info News and Phoenix North America	$19.99
Filipino 2 Pack[38] Includes GMA Pinoy w/ GMA Video On Demand and GMA Life	$14.99
Filipino 3 Pack[38] Includes GMA Pinoy w/ GMA Video On Demand, GMA Life and TFC	$22.99
TV5MONDE: French[38] With Cinema On Demand	$9.99
DW Deutsche +: German[38]	$9.99
Antenna: Greek[38]	$14.99
The Israeli Network[38]	$19.99
Rai Italia: Italian[38]	$9.99
Italian 2 Pack[38] Includes Rai Italia and Mediaset	$14.99
TV JAPAN[38] Includes TV JAPAN On Demand	$24.99
TV Polonia: Polish[38]	$19.99
SIC: Portuguese[38]	$9.99
Portuguese 2 Pack[38] Includes RTPi and SIC	$14.99
Impact TV: Russian Add-on[38] With any International package	$6.99
Russian 2 Pack[38] Includes Channel One Russia and NTV America	$14.99
Russian 4 Pack[38] Includes Channel One Russia, RTN, TV1000 Kino and NTV America	$26.99
Russian 5 Pack[38] Includes Channel One Russia, RTVi, NTV America, RTR-Planeta and Rossiya 24	$26.99
Russian 8 Pack[38] Includes Channel One Russia, RTN, RTVi, TV1000 Russian Kino, NTV America, RTR-Planeta, Rossiya 24 and CTC	$34.99
Willow: Cricket Add-on[38] With any International package	$6.99
Willow: Cricket[38]	$14.99
Zee TV: Hindi[38]	$14.99
SET: Hindi[38]	$14.99
Hindi 2 Pack[38] Includes Zee TV & SET	$24.99
Hindi Pack[38] Includes Zee TV, SET, TV Asia, NDTV 24x7 and NDTV Good Times	$29.99
Hindi Plus Pack[38] Includes Zee TV, SET, TV Asia, NDTV 24x7, NDTV Good Times, Eros Now and Willow	$39.99
SBTN: Vietnamese[38]	$14.99
TVB Jade: Cantonese[38]	$10.99
Record TV: Brazilian[38]	$14.99
ABP News: Hindi[38]	$7.99
TFC: Filipino[38]	$11.99

PAY-PER-VIEW AND ON DEMAND SUBSCRIPTION SERVICES[5]

Eros Now On Demand	$12.99
Eros Now On Demand w/a South Asian international selection	$9.99
here! TV On Demand	$7.99
Filipino On Demand	$7.99
Filipino On Demand w/a Filipino international selection	$5.99
The Jewish Channel On Demand	$6.99
Disney Family Movies On Demand	$5.99
Kidstream On Demand	$4.99
History Vault On Demand	$4.99
Gaiam TV Fit & Yoga On Demand	$6.99
Grokker Yoga Fitness On Demand	$6.99
UP Faith and Family On Demand	$4.99
Lifetime Movie Club On Demand	$3.99
Anime Network On Demand	$6.99
Stingray Karaoke On Demand	$6.99
DOGTV On Demand	$4.99
Gaia On Demand	$9.99
AMC Premiere On Demand	$4.99
Stingray Classica On Demand	$6.99
TumbleBooksTV On Demand	$4.99
FitFusion On Demand	$6.99
CuriosityStream On Demand	$5.99
PlayKids On Demand[31]	$6.99
MagellanTV History On Demand[31]	$5.99
Disney Story Central On Demand	$4.99
Acorn TV On Demand	$5.99
Daily Burn On Demand[31]	$14.99
Xive TV On Demand[31]	$4.99
Quark On Demand[31]	$4.99
Stephens Drum Shed On Demand[31]	$4.99
Pro Guitar Lessons On Demand[31]	$4.99
Touchfit TV On Demand[31]	$4.99
Lion Mountain TV On Demand[31]	$3.99
Bluprint TV On Demand	$7.99
Urban Movie Channel On Demand	$4.99
The Great Courses Signature On Demand[31]	$7.99
Pantaya On Demand	$5.99
DJAZZ On Demand[31]	$6.99
Ride TV On Demand[31]	$4.99
Outside TV Features On Demand[31]	$4.99
The Reading Corner On Demand[31]	$3.99
Hopster On Demand[31]	$6.99
Stingray Qello On Demand[31]	$7.99
Brown Sugar On Demand[31]	$3.99
Echoboom Sports On Demand[31]	$5.99
Revolution Golf+ On Demand[31]	$6.99

Hallmark Movies Now On Demand[31]	$5.99
Dove Channel On Demand[31]	$4.99
Kocowa On Demand[31]	$6.99
WHAM On Demand[31]	$2.99
Gravitas Movies On Demand[31]	$4.99
MHz Choice On Demand[31]	$7.99
Hi-YAH! On Demand[31]	$2.99
True Royalty On Demand[31]	$5.99
Real Vision On Demand[31]	$14.99
Docurama On Demand[31]	$2.99
Con TV On Demand[31]	$4.99
Walter Presents On Demand[31]	$6.99
Dekkoo On Demand[31]	$9.99
ZooMoo On Demand[31]	$2.99
Miniteve On Demand[31]	$1.99
Kids Room On Demand[31]	$5.99
Cinemoi On Demand[31]	$2.99
Hitz[42]	$12.00
Streampix[7]	$4.99
Pay-Per-View and On Demand Movies and Events[6] (per title or event)	Prices Vary
Revry On Demand[31]	$6.99
Too Much for TV On Demand	$14.99
Brazzers On Demand[18]	$19.99
Vivid On Demand Subscription[18]	$19.99
Hustler On Demand Subscription[18]	$19.99
TEN On Demand Subscription[18]	$19.99
Urban Fantasy On Demand[18]	$19.99
Falcon On Demand[18]	$19.99
Homegrown Amateur On Demand[18]	$19.99
Evil Angel On Demand[18]	$19.99
Mature Lust On Demand[18]	$19.99
Penthouse On Demand[18]	$19.99
Girlfriends Films On Demand[18]	$19.99
Wicked On Demand[18]	$19.99
XTSY On Demand[18]	$19.99
Reality Kings On Demand[18]	$19.99
Arouse On Demand[18]	$19.99

SPORTS PACKAGES[5]

MLB Extra Innings®	Call 1-800-XFINITY for pricing
MLS Direct Kick	Call 1-800-XFINITY for pricing
NHL® Center Ice®	Call 1-800-XFINITY for pricing
NBA League Pass	Call 1-800-XFINITY for pricing

XFINITY TV EQUIPMENT

TV Box Limited Basic	$2.50
TV Box	$2.50
Remote	$0.18
HD TV Box Limited Basic	$2.50
TV Adapter (Limited Basic — Primary TV)	$0.00
TV Adapter (Limited Basic — 1st and 2nd Additional TVs)	$0.00
TV Adapter (Limited Basic — 3rd Additional TV)	$0.50
CableCARD (first card in device)	$0.00
CableCARD (second card in same device)	$0.00

INSTALLATION (PER OCCURRENCE UNLESS NOTED)	**Initial Installation of Service**	**After Initial Installation of Service**
Professional Installation[24,25]	$79.99	N/A
In-Home Service Visit[22]	N/A	$40.00
Hourly Service Charge[25] (Custom Installation)	$50.00	$50.00
Xfinity Internet Gigabit Pro Professional Installation (per occurrence)		$500.00
Wireless Networking On-Site Professional Set-Up (Separate trip, per occurrence)		$99.95
Wireless Networking On-Site Professional Set-Up (each additional device over 4 devices per occurrence)		$29.95

REACTIVATION
(NO IN-HOME VISIT REQUIRED—PER OCCURRENCE UNLESS NOTED)

Reactivation - TV	$6.00
Reactivation - Internet	$6.00
Reactivation - Voice	$6.00

MISCELLANEOUS (PER OCCURRENCE UNLESS NOTED)

Customer-Owned Video Equipment Credit See www.xfinity.com/equipmentpolicy for additional information	$2.50
Regional Sports Fee[29] (per month)	$6.40
Field Collection Charge Visit to customer's residence required to collect past due balance or unreturned equipment	$30.00
Returned Payment Item (each)	$25.00
Late Fee	5%
Agent Assisted Payment For payment made by phone with a Customer Care Representative	$5.99
Unreturned or Damaged Equipment Fees[8] (per piece)	Replacement Cost
Self Install Kit Shipping and Handling	$15.00
Self Install Kit Shipping and Handling (Priority Shipping)	$29.95

XFINITY INSTANT TV[1,28]

BASIC SERVICE

Xfinity Instant TV Includes Limited Basic for simultaneous streaming on two devices, and 20 hours of Cloud DVR service	$10.00

XFINITY INSTANT TV ADDITIONAL SERVICES[30]

Kids & Family Includes 13 kid and family-friendly channels including Cartoon Network, Disney Channel, Nickelodeon and Universal Kids	$10.00
Entertainment Includes 22 entertainment channels including A&E, AMC, Bravo, Food Network, FX, TNT and VH1	$15.00
Sports & News Includes 14 sports and news channels including CNBC, CNN, ESPN, Golf, MSNBC and NBC Sports	$28.25
Deportes Includes over 6 deportes channels including ESPN Deportes, FOX Deportes and NBC Universo	$7.00
Latino Includes 13 latino channels including Cine Latino, Discovery en Espanol, Galavision, Viendo Movies and VME Kids	$5.00
HBO®	$15.00
Starz®	$12.00
Streampix	$4.99

XFINITY VOICE[1,10]

Xfinity Voice—Unlimited	$44.95
With TV and Internet Service	$39.95

Xfinity Voice—Local with More	$34.95
With TV or Internet Service	$24.95

XFINITY INTERNET[1,11]

	Xfinity Internet Service Only	with Xfinity TV or Voice Service[26]
Performance Starter	$49.95	$49.95
Performance	$74.95	$61.95
Performance Plus	$84.95	N/A
Performance Pro	$89.95	$76.95
Blast!	$94.95	$81.95
Extreme Pro[21]	$99.95	$86.95
Gigabit[21]	$104.95	$91.95
Gigabit Pro[21,23]	$299.95	$299.95

Modem Rental	$13.00
Wireless Adapter (each, one-time charge)	$30.00
Gigabit Pro Activation Fee (per occurrence)	$500.00
Unreturned or Damaged Equipment Fees[8] (per piece, per occurrence)	Replacement Cost

1 Certain services available separately or as a part of other levels of service. Xfinity services are subject to Comcast's standard terms and conditions of service. Unless otherwise specified, prices shown are the monthly charge for the corresponding service, equipment or package. Prices shown do not include applicable taxes, franchise fees, FCC fees, Regulatory Recovery Fee, Public Access fees, other state or local fees or other applicable charges (e.g., per-call toll or international charges). Prices, services and features are subject to change. If you are an Xfinity TV customer and you own a compatible TV Box or CableCARD device, please call 1-800-XFINITY for pricing information or visit www.xfinity.com/equipmentpolicy. © 2019 Comcast. All rights reserved.

2 Requires a Modem and TV Box with remote, CableCARD or compatible customer owned device.

3 Requires HD Technology Fee. Service to Additional TV with TV Box required for DVR Service on additional TVs.

4 Requires Digital Starter.

5 Requires Limited Basic, TV Box with remote or compatible customer owned device. Sports Package subscriptions can be billed at once or in 4 total payments. Restrictions may apply.

6 Price of Pay-Per-View and On Demand Movie or Event is displayed prior to the completion of the Pay-Per-View or On Demand ordering process.

7 Requires Limited Basic and TV Box and remote or compatible customer owned device. Requires HD Technology Fee to receive HD programming. Streaming to device requires Xfinity TV app, Internet service with bandwidth of at least 600 Kbps and to Limited Basic. Streaming to laptop/computer requires equipment meeting minimum requirements posted at https://www.xfinity.com/support/internet/requirements-to-run-xfinity-internet-service/, Internet service with bandwidth of at least 600Kbps and to Limited Basic.

8 Contact 1-800-XFINITY for questions regarding equipment replacement charges.

9 Requires TV Box, TV Adapter, CableCARD or compatible customer owned device.

10 Requires a Modem. Unlimited Local and Long Distance package pricing applies only to direct dialed calls from home to locations included in the plan. Plans do not include other international calls. For more information regarding Xfinity Voice pricing go to https://www.xfinity.com/Corporate/About/PhoneTermsOfService/ComcastDigitalVoice/cdvresidential.

11 A Modem is required. For more information regarding Xfinity Internet go to http://www.xfinity.com/internet-service.html.

12 Includes TV Adapter and remote. Digital service tier on additional TV corresponds to digital service tier on primary outlet. Does not include access to On Demand content, premium channels or channel numbers above 1000 unless otherwise noted on the channel lineup. Not available to customers with Limited Basic only.

13 Not available to customers with Limited Basic only. Must subscribe to HD Technology Fee to receive HD programming.

14 Not available to Limited Basic only customers. Digital service tier on additional TV corresponds to digital service tier on primary outlet.

15 Sold only with Service to Additional TV with TV Box for up to 3 TVs, maximum 3 clients per household. Requires HD Technology Fee and professional installation. Not available to customers with Limited Basic only.

16 Subject to availability.

17 Requires Limited Basic, TV Box, CableCARD or compatible customer owned device.

18 One month minimum purchase required. Not available in all areas.

19 Requires HD Technology Fee.

20 Non-client includes Service to Additional TV charge.

21 Not available in all areas. May require installation and non-refundable installation charge.

22 Applies to installation, relocation and activation of additional outlets as well as upgrade downgrades of service after initial installation of service and in-home visits. Does not cover installation or in-home visits for Xfinity Home.

23 Requires 2 year contract. Monthly rental of Gigabit Pro compatible cable modem/router additional. Activation and professional installation fees additional. Gigabit Pro does not qualify for Comcast 30-day money back guarantee.

24 Includes standard installation of Xfinity TV, Xfinity Internet and/or Xfinity Voice and installation of additional outlets and wireless networking set-up if requested at time order is placed. Does not include installations of Xfinity TV only, Xfinity Home or Xfinity Gigabit Pro Internet.

25 Standard installations include installations up to 125 feet from existing Comcast plant, primary outlet only. Custom installations include installations which require in-wall wiring or installations in extensive drop ceilings, basements, or crawl spaces.

26 Xfinity Internet discount does not apply to Xfinity Instant TV.

27 Applies to Limited Basic and Xfinity Instant TV.

28 Requires Xfinity Internet.

29 Applies to Digital Starter and above, and Xfinity Instant TV Sports & News.

30 Requires Xfinity Instant TV.

31 Requires Limited Basic with X1 TV Box and Xfinity Internet service.

32 Requires Limited Basic, HD Technology Fee and TV Box, CableCARD or compatible customer owned device.

33 Requires TV Box, CableCARD or compatible customer owned device with Xfinity Internet service. Up to 10 hours of cloud DVR service available with either X1 TV Box (eligible with minimum subscription to one Genre Pack) with Xfinity Internet service or compatible customer owned device with Xfinity Internet service.

34 Requires Choice TV. Cannot be combined with Limited Basic or Digital Starter.

35 Not available to customers with Limited Basic only. Includes a customer-owned video equipment credit. An additional charge will apply for additional CableCARDs in the same device.

36 Netflix activation of subscription requires X1 equipment.

37 Cannot be combined with the Sports & News genre pack.

38 Requires Limited Basic with X1 TV Box or compatible customer owned device and Xfinity Internet service.

39 10 Hour DVR Service requires Xfinity Internet Service and either an X1 TV Box or a compatible customer owned device.

40 Equipment required at an additional cost. For additional information go to http://www.xfinity.com/homesecurity.

41 Includes Xfinity Home Security and 24/7 Video Recording for up to 4 cameras. Equipment required at an additional cost. For more information on 24/7 Video Recording go to http://www.xfinity.com/videorecording.

42 Requires Limited Basic TV service and a compatible Xfinity TV Box or customer owned device.

Xfinity Home License Numbers:
AL: *001484, 001504;* **AR:** *12-030;* **AZ:** *ROC 280515,* **BTR** *18287-0;* **CA:** *CSLB 974291, ACO 7118;* **CT:** *ELC 0189754-C5;* **DE:** *FAL-0299, FAC-0293, SSPS 11-123;* **FL:** *EF0000921, EF20001002, EF0001095;* **GA:** *LVU406303, LVU406264, LVU406190, LVU406354;* **IL:** *PACA 127-001503;* **LA:** *F1691;* **MA:** *SS-001968;* **MD:** *107-1776;* **ME:** *LM50017039;* **MI:** *3601206217;* **MN:** *TS674412;* **NC:** *2335-CSA, 29443-SP-FA/LV;* **NJ: Burglar and Fire Alarm Business Lic. #** *34BF00047700;* **NM:** *373379;* **NY: licensed by the N.Y.S. Department of State** *12000305421;* **OH: LIC#** *53-89-1732;* **OR:** *CCB 192945;* **SC:** *BAC-13497, FAC-13440;* **TN:** *ACL 1597, ACL 1604;* **TX:** *ACR-1672104,-1818, B16922, B02571;* **UT:** *8226921-6501;* **VA:** *2705145289, DCJS 11-7361;* **VT:** *ES-02366;* **WA:** *COMCABS892DS;* **WASHINGTON, DC:** *ECS 902687, BBL 602512000005;* **WV:** *WV049211.*

MS: 15018010

Valid 1/1/19. See www.xfinity.com/home-security for current list.

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