



ARLINGTON COUNTY, VIRGINIA

Broadband Resource Evaluation and Needs Assessment Report

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TELEVATE



strategic
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advancing economies in a digital world

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1

EXECUTIVE SUMMARY

Broadband Internet service is an indispensable utility. Arlingtonians have come to rely heavily on broadband and the COVID-19 pandemic highlighted the critical nature of broadband communication and information. Broadband is critical for commerce, education, and entertainment in today's society, and this study further reinforces the need.

This report addresses the current state of broadband and digital inclusion in Arlington County and assesses the federal, state, and local tactics and tools currently available and their ability to eliminate any gaps. This report was designed for decision makers who will lead broadband advancement in the County, including the County Board, County Manager, and the departments that will contribute to advancing broadband and digital equity programs. This *Resource Evaluation and Needs Assessment Report* addresses the first element of the County's overall Broadband Study: to better understand the community's Internet use and broadband access. The information in this report will inform the next two components of this Broadband Study, including an evaluation of broadband implementation models to select appropriate solutions to address the County's needs and proposed actions and policies to ensure adequate and affordable broadband access.

To gain insights into the existing broadband market conditions, as well as gaps, barriers and opportunities in the use of online practices, residents and businesses in Arlington County were asked to complete an assessment (eCheckup) of how they are connected, using, and benefitting from the Internet. Arlington

County’s project team worked with local stakeholders on targeted outreach and engagement to maximize participation rates by businesses and households to identify gaps, barriers, and opportunities. A coordinated effort was conducted to reach all segments of the County, especially in areas that are typically under-represented in terms of income, language, and race.

The study found gaps with households with low incomes showing that they generally had less self-reported expertise with computers and the use of online practices, and they reported lower satisfaction with various aspects of their Internet service. Household income levels were a greater determinant of Internet use and satisfaction as compared to race or ethnic factors. Key findings included:

- Internet satisfaction increases with income levels
- Computer expertise increases with income levels
- People of color, renters, and low-income groups spend less per month for Internet service

Analysis and findings showed that households with lower incomes are more likely to lack the critical skills (e.g., digital literacy and basic technical skills needed to operate a computer) needed to gain access to the Internet and to be capable of utilizing the resources once they do gain access. They are less likely to have the means to pay for Internet service and to afford the devices needed to access it. And, while there are programs now available to help with affordability of devices and Internet service, only 18% of eligible County households take advantage of the federal Affordable Connectivity Program (ACP) to receive these benefits. It is paradoxical that those who have the most to gain from getting online are the least able to take advantage of the Internet because of their lack of access and skills.

Although findings regarding the telecommunications infrastructure highlight that Arlington County is extremely well served with broadband, 80% of household respondents were “very likely” or “somewhat likely” to change service providers. Furthermore, 28.7% “Want something better now” as part of the nearly three-fourths of respondents who reported they would consider other options for better broadband. According to the U. S. census, over 6% of Arlington households do not have an Internet subscription. 93.4% of households have a broadband subscription of any type. 85.3% of households are connected with a broadband subscription such as cable, fiber, or DSL. 6.7% of households have a cellular data plan with no other type of internet subscription. Additionally, over 3% of households do not own a computer (including desktops, laptops, smartphones, tablets or other portable wireless devices) and another 3% of households use a smartphone or tablet with no other computing device,¹ which may not be optimal for telework or other video streaming functions.

Households with fiber broadband reported the largest percentage of “Happy with what I have” with their Internet connection. Over half of the household broadband download speeds and one fourth of upload speeds were reported by respondents to be in excess of current federal benchmarks for new infrastructure. Approximately half (48%) of respondents reported that their current Internet provider’s customer service was “Excellent” or “Acceptable,” while DSL users reported the highest levels of “Not Acceptable” customer satisfaction. This is consistent with other jurisdictions of the project team’s research where DSL service was reported as not acceptable.

There are several groups and organizations that are actively working to address the challenges experienced by low-income households in Arlington. Focusing efforts on low-income and other groups more susceptible to barriers presented by the digital divide will increase the share of the population involved in using online services. These ongoing efforts are presented in greater detail as a part of this

¹ U.S. Census Bureau ACS 5-year estimate: [S2801](#)

study and are further analyzed to determine the level of impact, utilization of resources and needs, and potential gaps in the community related to Internet access and utilization.

This study focuses on retail fixed² broadband Internet service in homes and businesses in Arlington County. Fortunately, Arlington has a very strong broadband marketplace. According to data reported to the Federal Communications Commission (FCC) by the Internet Service Providers (ISP),³ more than 99% of Arlington County addresses achieve the federal definition of broadband ($\geq 100/20$ Mbps⁴). Four service providers, Comcast (using the Xfinity brand), Starry, T-Mobile, and Verizon (using the Fios brand) each individually offer fixed broadband service to thousands of the nearly 36,000 locations reflected in the FCC data—in aggregate, their offerings cover most of the County. More than 95% have two or more providers offering high-speed Internet service – supplying the vast majority of Arlington households and businesses with multiple competitive options. There are fewer than 50 locations that do not have access to these speeds, and most of those are commercial locations. The study also found that the ISPs in Arlington County are well positioned to continue to meet the speeds anticipated for most households and businesses for years to come due to planned upgrades from its primary ISPs.

Efforts over the past two decades show Arlington County has taken a leadership role in addressing digital inclusion and equity with pilot projects, as well as policy and governance initiatives. However, dedicated focus and budgets are needed across the enterprise to move from pilot projects to programs that are comprehensive in scope and reach, as well as integrated with existing local stakeholder organizations already working with targeted populations. Digital inclusion is a process that requires the necessary resources and time to achieve digital equity goals. A fundamental step in that process is this broadband assessment to identify and assess broadband and digital equity gaps. Therefore, a key finding from this study is that focused pilot initiatives are needed to explore the opportunity, and that they should be integrated with existing programs and stakeholder groups to be sustainable and available to all of the targeted populations.

The section on Broadband Policies presents an overview of available Federal and Commonwealth of Virginia broadband infrastructure and digital equity grant programs and explores opportunities for the County to pursue these programs. It additionally assesses a variety of County strategic plans, agreements, and policies to examine if, in context with the broadband funding programs, they foster or impede broadband access, investment, and digital equity. An important finding associated with the assessment of digital equity focused efforts across multiple County government and community organizations is that while there are several efforts across these diverse entities to collaborate and share human and financial resources, these well-intentioned efforts are not architected under a common digital equity policy

² Retail Internet fixed service is a service delivered to individual homes or businesses that connects customers to the Internet. This is in contrast to mobile broadband internet service delivered to mobile devices such as smartphones. And it is in contrast to other broadband services, such as point-to-point connections a wireless service provider might need to connect a cell site to its core network. The providers covered in this study provide these other services, but these other broadband services are not a focus of this study. Starry and T-Mobile are examples of wireless fixed broadband.

³ See *Appendix B: FCC Broadband Data* for more details of this data. While far more detailed than ever before, this data is the first iteration of its kind. Errors in the data were found. But through public engagement, the FCC expects to continually improve the data. As a result, all findings in this report should be thought of as directionally reflecting the current state of service in Arlington County, but specific details will evolve over time.

⁴ Megabits per second (Mbps) refers to a measurement of data transfer speeds over a network. It is a measure of data transfer speeds, expressing how many megabits can travel over a network connection per second.



framework. A common digital equity policy framework would more optimally facilitate the County’s decision-making and priority-setting efforts regarding broadband and digital equity.

Arlington County should strive for universally available, high-speed, affordable Internet service. The County should also strive for digital equity among its residents – ensuring that all Arlingtonians have the knowledge, skills, access, and devices needed to fully participate in today’s digital economy.



2

INTRODUCTION

In an increasingly digital world, the COVID-19 pandemic highlighted not only the importance of Internet access, but the urgency of making access available to all members of the community. From an infrastructure perspective, Arlington County is well served by its multiple Internet providers. Arlington also owns and operates its own fiber optic network, ConnectArlington, that serves government and educational facilities, and a portion of which was leased to JBG Smith in 2021 to support Internet access in the burgeoning National Landing community.

Digital inclusion—encompassing affordability, Internet accessible devices, and digital literacy—is fundamental to achieving digital equity. Despite being among the wealthiest counties in the United States, almost 8% of Arlington’s population (over 4% of households) live in poverty, and over 6% of households do not have an Internet subscription. 93.4% of households have a broadband subscription of any type. 85.3% of households are connected with a broadband subscription such as cable, fiber, or DSL. 6.7% of households have a cellular data plan with no other type of internet subscription. Additionally, over 3% of households do not own a computer (including desktops, laptops, smartphones, tablets or other portable wireless devices) and another 3% of households use a smartphone or tablet with no other computing device,⁵ which may not be optimal for telework or other video streaming functions. Characteristics for

⁵ U.S. Census Bureau ACS 5-year estimate: [S2801](#)

Arlington to consider in broadband planning include employment opportunities that necessitate access to the Internet and the recent increase in working from home (16%), which is an 11% increase from 2015 (5%).⁶ Foremost among Arlington’s unique characteristics that could impact and inform future strategies is its ethnic diversity. Twenty percent (20%) of Arlington students receive English Language services, coming from homes that speak 88 different native languages. Beyond students, the economic prospects of more than 10% of Arlington County residents are constrained by limited proficiency in the English language. Included in these statistics are 10.3% of Black residents, 11.1% of Asians, and 15.6% of Hispanic and Latino residents. Virtual language programs have been shown to be highly effective tools for improving language skills whether delivered virtually or in a hybrid instructional model.



Digital Equity is an enterprise initiative between the Department of Community Planning, Housing, and Development, Department of Technology Services, and Arlington Public Libraries. Our vision is for all Arlington residents to have affordable, reliable access to high-speed broadband internet and the necessary devices and technology skills to fully participate in the community and economy. Our work is currently guided by the following four principles:

Connectivity: *The County will invest in infrastructure to support lower cost connectivity for affordable housing residents.*

Access: *All residents can access the internet and cost is not a barrier.*

Education & Training: *Residents have the appropriate skills necessary to be successful on the internet.*

Program Sustainability & Community Capacity: *Ensure strategies are sustainable and the community is engaged on the issue.*

*Source: Arlington County Digital Equity, Vision and Principles
<https://www.arlingtonva.us/Government/Departments/Community-Planning-Housing-Development/Digital-Equity>*

Since 2010, Arlington has consistently made strides toward achieving the Digital Equity objectives stated above, including building and expanding its ConnectArlington network, funding and subsidizing Internet access through housing and schools, providing access to outdoor Wi-Fi hotspots, a Digital Equity working group, and multiple studies focusing on broadband access for low-income residents. Building on this previous work, Arlington County contracted Televate, LLC, in partnership with the Strategic Networks Group (SNG), to assess the current landscape of broadband services, and to document broadband needs throughout the County. The information learned from this resource evaluation and needs assessment will inform future elements of the County’s Broadband Study, including an evaluation of broadband implementation models to select appropriate solutions to address the County’s needs and strategic recommendations and proposed actions and policies to ensure adequate and affordable broadband access. This *Resource Evaluation and Needs Assessment Report* addresses the first element of the County’s overall Broadband Study report: to better understand the community’s Internet use and broadband access.

⁶U.S. Census Bureau ACS 5-year estimates (2021 and 2015): [B99087](#)

Under this first element of the Broadband Study, the Televate-SNG team conducted market discovery that included key stakeholder interviews, Internet service provider (ISP) interviews and data collection, and an online broadband services assessment for County residents and businesses (eCheckup Assessment). Interviews with the ISPs and a review of the Federal Communication Commissions (FCC) Fixed Broadband Deployment database⁷ supported the assessment of countywide broadband infrastructure and service offerings. Together, these data elements provided a thorough representation of both the community's and the Internet providers' requirements, gaps, and barriers to increased broadband utilization.

This portion of the project was performed over a five-month period, between August 2022 and December 2022. Approximately 70 stakeholders representing government agencies, building landlords and developers, broadband industry practitioners, business organizations, Arlington Public School, safety net organizations and other non-profit organizations, and community advocates were interviewed regarding their broadband experiences and requirements. The eCheckup broadband assessment obtained responses from 840 households and 36 businesses in Arlington County. All primary ISPs were interviewed and relevant information regarding their respective broadband networks and service offerings were collected and analyzed. Additionally, Televate explored the details regarding Arlington's ConnectArlington network and assets as part of the study. The County's broadband infrastructure is available for third-party service providers to assist them in providing retail broadband Internet service.

This study will delve into a broadband market analysis, analysis of digital inclusion and racial equity, and close with a discussion of broadband policies. This report was designed for decision makers in Arlington County who will lead broadband advancement in the County, including the County Board, County Manager, and the departments that will contribute to advancing broadband and digital equity programs.

⁷ See [Home | Fixed Broadband Deployment Data | Federal Communications Commission \(fcc.gov\)](#) for additional details.



3

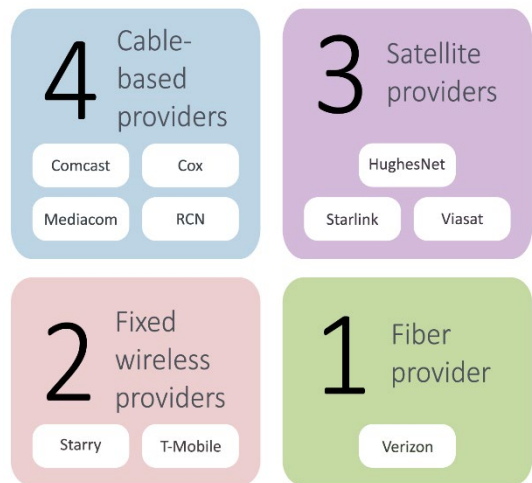
BROADBAND MARKET ANALYSIS

There are two primary determinants of whether and to what extent an individual or household participates in the digital ecosystem: (1) if Internet service is available and at what speeds; and (2) if an individual, household, or business subscribes to and has the requisite skills to utilize available Internet service. These situations are discussed separately below.

3.1 Broadband Provider Overview

According to the most recent FCC broadband data,⁸ ten commercial companies provide residential Internet service

Ten commercial companies provide residential Internet service to at least 10 locations in Arlington.



⁸ See Appendix B: FCC Broadband Data regarding details on the FCC data.

to at least 10 locations⁹ within Arlington County using a variety of technologies, which include legacy telephone and coaxial cable wiring to transmit data to and from homes and businesses to the Internet. Most providers deliver service to both businesses and residences but some, such as Starry, target residential locations, while other providers target businesses.¹⁰

The *Internet Technologies* section (See *Appendix A*) provides a high-level view of the technologies and the physical media they use to provide service. It also provides highlights on the Internet service provider's network topology, including the middle mile and last mile portions of the network.

3.1.1 Introduction

This report addresses an assessment of the fixed broadband Internet service in Arlington. It does not address the mobile broadband Internet service marketplace that delivers wireless services intended for non-fixed locations such as smartphones and tablets. There are a variety of other specialty broadband services that private businesses may also purchase from the broadband marketplace, but this document focuses on the retail Internet marketplace where a service provider connects a home or business to the Internet.

It is important to understand the responsibilities of an Internet Service Provider. The ISPs are not responsible for the Internet content itself; they provide homes and businesses with access to the desired content available over the Internet. Issues can occur before the data reaches the ISP's network, such as outages for a content provider, or the content provider network congestion that will cause a quality-of-service issue for the end-user, but they are not the responsibility of the ISP. Additionally, this report focuses on delivery of service to, and not within, homes and businesses. Each customer has a demarcation point where the service provider delivers fixed Internet service into the home or business. The ISP is responsible for the connection between the Internet backbone, and the end-user's home or business network demarcation.

Many residents and businesses may associate their Wi-Fi service to be synonymous with their Internet service. And, likewise, may attribute their Wi-Fi coverage and performance with the Internet Service Provider's network or service. However, beyond the ISP's modem or Customer Premises Equipment, the customer is generally responsible for maintaining the data network inside their home or business. Many ISPs will bundle a rented modem that has Wi-Fi routing capabilities with their service, but this device is under the control and responsibility of the customer. If the equipment itself fails, the ISP will replace or repair it, but the configuration and placement of the device is the responsibility of the customer. The customer can add wired data connections or more Wi-Fi access points to their home or business network to enhance their coverage. *Internet Technologies* (See *Appendix A*) provides more details regarding Wi-Fi and how the different pieces of Internet technology work together to connect people and devices to the Internet.

Confusing the matter, some ISPs use wireless to deliver broadband Internet service to homes and businesses. There are a variety of methods to use wireless service, including using the same network that

⁹ The term "location" as used in this context refers to any physical residential or business address, the "location," where an ISP delivers broadband service. The FCC does not define a location; however, a location is intended to represent a structure, and therefore, a single apartment building representing 10 units, would constitute one location, not 10 locations.

¹⁰ These providers include Atlantech Online, Inc., Cogent Communication, FiberLight, Fusion, and Fusion Cloud Services, Inc. as well as others that offer other data services such as Crown Castle that are not represented in the FCC's Internet service database.

delivers mobile Internet service. For example, T-Mobile delivers fixed wireless access service using the same network as is used for its mobile service in Arlington. And while AT&T does not offer fixed wireless access service in Arlington, it does offer this service in rural areas. As this report will show, mobile cellular service offered by these providers is important, but it becomes relevant to this study when the provider offers a specific fixed device intended to be permanently located within their home or business (as opposed to a smartphone).

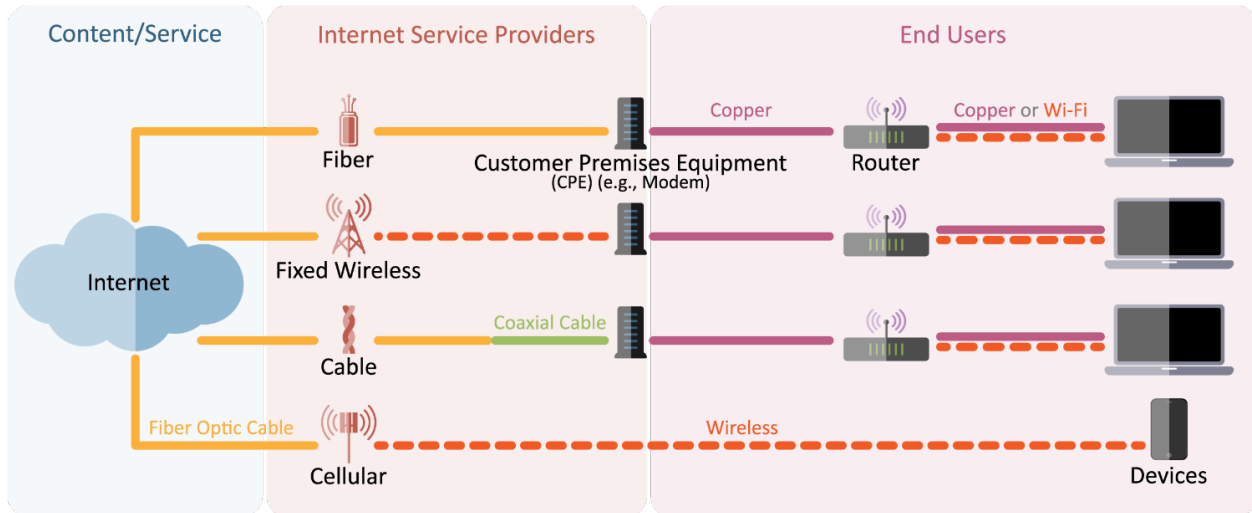


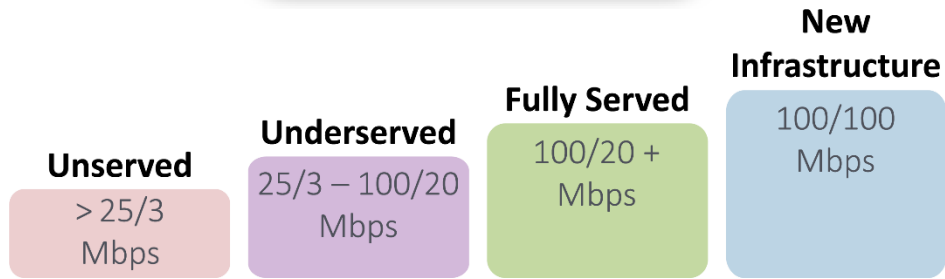
Figure 1: Internet Delivery Methods

3.1.2 Broadband Speed

Broadband data speed is an important element of the quality of service for Internet access. Without sufficient speeds, web pages will be slow to load, video will freeze or pixelate, and files will take much longer to upload or download. The speed of the network in both directions must accommodate the demands of the user in order to deliver a high-quality user experience. Today, the FCC threshold to define a connection as broadband is 25 megabits per second (Mbps) download (from the Internet to the customer) and 3 Mbps upload (from the customer to the Internet), noted as 25/3 service.¹¹ However, this threshold was established in 2015 and recent federal legislation funding broadband infrastructure has increased the federal standard for broadband to 100/20 service.¹² This represents a 57% per year average increase in download speeds. This study will treat locations that meet or exceed 100/20 speeds as meeting the definition of broadband, and as fully served. Speeds below 100/20 will be considered underserved. This study also evaluates the level at which Arlington County achieves 100/100 service. This threshold is the current requirement for federal grant funded new construction. In other words, 100/100 are the speeds new infrastructure must achieve to receive federal funding.

¹¹ This standard for notation will be used throughout this document. The first number prior to the slash represents the download speed, and the number after the slash represents the upload speed. Unless otherwise indicated, the values represent megabits per second (Mbps).

¹² The federal government has established 100/20 as the definition of served as part of the American Rescue Plan Act (ARPA) and the Infrastructure Investment and Jobs Act (IIJA). This download and upload threshold was designated by Congress and Televate knows of no publicly documented explanation for the values. The current FCC definition of “Broadband” is 25/3.



3.1.2.1 Target Broadband Speeds

Google, Federated Wireless, and Imagine Wireless were asked during interviews what the future broadband data speeds are for businesses and residents. While these visionary organizations had opinions regarding the kinds of applications that could generate substantial demand, there were no conclusive opinions offered about the specific data speeds needed. The stakeholders identified an expectation, as has occurred over the past several decades, of continued growth for minimum data speeds. Stakeholders from the County’s Information Technology Advisory Committee (ITAC) provided very positive comments regarding the overall quality of broadband service offerings including cost, data speeds, and the competitive marketplace within the County highlighting that broadband service in Arlington was one of the best in the country. Arlington County DTS personnel identified a need for higher speeds in the short term for video uploads indicating that 20 megabits per second (Mbps) is sufficient for only one to two people. They also shared the visionary organizations’ belief that that broadband demand, and bandwidth will continue to increase, though pinpointing a specific target data speed is a challenge.

Ultimately, the target broadband speed within Arlington County will vary based on whether the location is a business or resident, the number of persons and devices accessing the Internet at that location, the types of applications used, and what applications are used at the same time. Many of the applications that businesses and households use require high burst speeds. For example, upon launching a video streaming application, the usage is initially very high (perhaps 50 Mbps), but the usage drops down to more modest levels (perhaps less than 5 Mbps). In addition, many applications are specifically made to accommodate network issues. As an example, video streaming applications will create a buffer of content such that if the network speed degrades temporarily, the content in the buffer can be used to ensure a constant video playback. Often, households are told they need more data speed, but in reality, the issues could be their own Wi-Fi network, or other points in their Internet connection with the service (for example, there could be network congestion between the streaming platform and the customer’s Internet Service Provider.)¹³

FCC Speed Guide application speed requirements in Mbps:

- HD Video: 5-8**
- Ultra HD 4K Video: 25**
- HD Video Conference: 6**
- Online Gaming: 4**
- File Sharing: 10**
- General Browsing & Email: 1**
- Online Multiplayer Gaming: 4**

The broadband speed any business or household requires is a function of the applications that may be in use at the same time. For example, two adults in a family are remote workers during the day and use 5 – 25 Mbps each while working during the day. The same family may also use the Internet in the evening

¹³ The Wall Street Journal conducted a study on usage among its reporters. It found that the reporters rarely used their full bandwidth, and even when they did, they did not report quality issues. See [The Truth About Faster Internet: It’s Not Worth It \(wsj.com\)](http://www.wsj.com/articles/the-truth-about-faster-internet-it-s-not-worth-it-1452222222)

watching one Ultra High Definition (4K) movie,¹⁴ with two kids playing video games. But because these work and entertainment uses do not occur at the same time, their network connection does not have to be sized to handle all these uses – only the aggregate use at the peak usage period is needed to determine the required data speed.

In addition, both the download and upload speeds must accommodate the demand. Streaming video is largely uni-directional, from the streaming provider to your device – in the download direction. Applications like file sharing will consume both download (downloading the files to your device) and upload (uploading files to the Internet) data. If the above hypothetical family's two adults were both engaging in file sharing and HD video conferencing at the same time, they may consume 16 Mbps each on both the upload and download (see FCC Speed Guide call out box above). In aggregate, the adults would require 32 Mbps down and up. Therefore, this family's service would ideally¹⁵ support at least 32 Mbps in both directions, but would need to factor in any other usage, including evening entertainment needs. If the family routinely separately watches four Ultra High Definition streaming programs, that would consume 100 Mbps download speed per the FCC Speed Guide and result in a need of 100 Mbps down and 32 Mbps up.

Ultimately, there are thousands of factors that can affect the broadband speeds needed by an individual business or household. Each business and household should individually assess how they use the Internet to make a decision. A larger family will generally, but not always, require higher data speeds depending on how they use the Internet. Likewise, a larger business will generally, but not always, require higher data speeds as well. Televate knows of no definitive source of information regarding what businesses and households need.

In most households today, Televate believes 100/20 is adequate for day-to-day use.¹⁶ But as identified above, some households may require higher speeds depending on their specific Internet demand. Likewise, businesses may require more capacity. Offices that use cloud-based email and file sharing, and that regularly conduct video meetings with customers and vendors, will tend to consume more bandwidth. Employees are more likely to need to transmit and receive large amounts of data at the same time as other employees within a common office environment, such that their aggregate needs grow linearly based on the number of employees in an office. For example, an office of 10 might require 100/100 service, and if that office were to grow to 20 individuals using the same applications at the same time, their usage would double to 200/200, and to experience high quality connectivity, their subscribed rates would need to increase accordingly. However, due to a lack of information that definitively suggests that households and businesses always or even typically require more than the current federal target speed of 100/20, we choose to set an initial target broadband speed as based on the Federal definition – 100/20 – and we recognize that some households and perhaps many businesses will require more speed.

¹⁴ 4K video has much higher resolution than a standard High-Definition video. As a result, it requires much higher data speeds to deliver the content.

¹⁵ Another factor regarding the speeds needed is whether the application can accommodate situations where there may be some network congestion. In this example, the adults may not mind that it takes an extra 30 seconds to send or receive a large file if their connection is at its full capacity. The HD video conferencing, on the other hand, requires that the network consistently deliver adequate bandwidth or else the video will freeze or the video quality will suffer.

¹⁶ For example, see the Wall Street Journal article referenced previously where most of the participants had used, on average, less than 25% of their available speed, including those who subscribe to services of less than 100 Mbps.

The FCC definitions of broadband can be considered as the baseline for broadband requirements. While individual households and businesses may need more data speed than the FCC definition, the FCC targets are likely to address the current needs of most households and most small businesses. As mentioned above, the federal broadband speed targets grew by 57% per year between 2015 and 2022. This figure mimics Nielsen’s Law of user data connection speed growth of 50% per year.¹⁷ Although some analysts have suggested that data speed growth will slow over the next five years,¹⁸ our conservative growth rate estimate is to retain the 50% per year average growth beyond 2022. The following table depicts this growth in the minimum required broadband speeds using an average annual 50% increase.¹⁹

Table 1: Minimum Broadband Current and Future Speed Requirements

	Current (2023)	5 Year (2028)	10 Year (2033)
Minimum Speed in Mbps (download/upload)	100/20	250/50	500/100

3.1.2.2 Speed Sufficiency

Current Broadband Bandwidth Needs

All four primary service providers, T-Mobile, Starry, Verizon, and Xfinity, meet the current federal definition for broadband service, 100/20 Mbps, at all or some of their service locations in Arlington. Furthermore, two providers, Verizon and Starry, today achieve the 100/100 threshold of new infrastructure designated by the National Telecommunications and Information Administration’s (NTIA) grant programs. And, while Comcast’s Xfinity service does not meet the upload speed requirement of 100 Mbps as of March 2023, by the end of 2023 Comcast stated that they will upgrade its Arlington infrastructure to achieve data speeds of more than 100/100.²⁰ It is important to note that the broadband data speeds delivered by the ISP cannot be directly influenced by the County. Delivered data speeds are driven by the competitive marketplace and are not regulated by the federal government.

Future Broadband Bandwidth Needs

Once Verizon implements their planned upgrade (see Section 3.2.2), they will be able to offer 10 Gbps symmetric service, providing ample capacity for the next 10 years for all but a few businesses (e.g., cell towers will likely need more than 10 Gbps). With Comcast’s upgrade to their new services, expected around 2026, 1 gig symmetrical service is expected and potentially moving to 2 Gbps downloads. This will meet the needs of most businesses for the next 10 years and likely all households. Large businesses will likely require fiber as they do today. Televate does not have any specific information on T-Mobile or Starry upgrade paths that would achieve the target speeds of 500/100 in 2032.

¹⁷ See [Nielsen's Law of Internet Bandwidth \(nngroup.com\)](https://www.nngroup.com/articles/law-of-internet-bandwidth/).

¹⁸ See [Strategy Analytics: Fixed Broadband Traffic Growth Slowing | Business Wire](#)

¹⁹ We also note that The FCC Chairwoman has proposed setting a new goal of 1 Gbps / 500 Mbps, but it is unclear what the goal represents or the time period it targets. See [Chairwoman Rosenworcel Proposes to Increase Minimum Broadband Speeds and Set Gigabit Future Goal](#).

²⁰ See Section 3.2 for more information.

3.1.3 ConnectArlington: Arlington’s Fiber Network

Arlington County owns and operates an extensive broadband infrastructure in ConnectArlington. According to Arlington’s Department of Technology Services, the building of the ConnectArlington reduced costs paid to other providers for Internet connectivity of County-managed facilities. When ConnectArlington was implemented, it was estimated that the County would benefit by not paying providers an estimated \$3.2 Million for the connectivity. Today, it is estimated that the cost savings would be even greater.

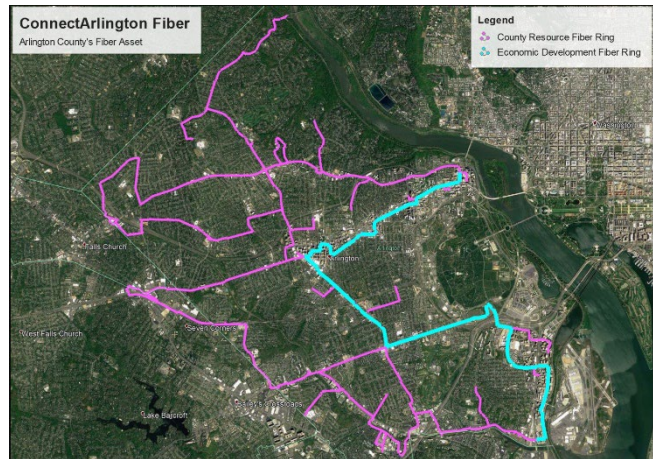


Figure 2: The ConnectArlington Fiber Routes

The County advertises ConnectArlington as a “fiber-optic, high-speed, dedicated network that links County and Schools buildings, ensuring that government, the schools and the community will benefit as demand for digital services continually increases over the long term.”²¹ The ConnectArlington asset also includes conduit²² that houses the County’s fiber infrastructure. The assets span the main commercial corridors of Arlington County.²³ The County makes the broadband assets of ConnectArlington available to telecommunications providers, and the County’s Broadband Advisory Committee (BAC) Recommendation Document believes that ConnectArlington “is a strategic asset that will improve the lives of Arlingtonians as it becomes available and evolves into a vital utility for the future.”

ConnectArlington is not an Internet Service Provider. The Department of Technology Services) identifies ConnectArlington as a middle mile element of an Internet service network that would require a broadband service provider partner to provide retail Internet service throughout Arlington. It is primarily a resource that serves and connects government facilities in Arlington County. It additionally provides connectivity between the Virginia Tech Research Center located in the County to the main Virginia Tech campus in Blacksburg, VA, expanding connectivity to the Mid-Atlantic Research Infrastructure Alliance (MARIA) of Virginia university institutions. As further discussed below, its role has expanded via agreements with private entities that will extend its reach. Arlington County has marketed ConnectArlington as a resource available to private telecom businesses; however, it is important to understand that the existing telecom providers also have extensive broadband resources in the County. One ISP reported that there was no benefit to use ConnectArlington due to its own fiber assets in Arlington.

However, a new entrant that lacks a substantial footprint may opt to leverage the ConnectArlington assets. ConnectArlington’s focus on connecting government facilities that are generally well distributed

²¹ Captured from [ConnectArlington – Official Website of Arlington County Virginia Government \(arlingtonva.us\)](https://www.arlingtonva.us/files/sharedassets/public/departments/images/arlington-fiber-asset.jpg) on 2/23/2023.

²² Tubing that protects telecommunication cabling and simplifies the installation of cabling over long distances.

²³ See <https://www.arlingtonva.us/files/sharedassets/public/departments/images/arlington-fiber-asset.jpg> to view the current layout of the ConnectArlington fiber routes.

throughout the County has resulted in 40 of an estimated 460²⁴ miles of Arlington roads that would require fiber. ConnectArlington has another 40 miles of conduit that would facilitate the deployment of fiber. These assets could play a strong middle-mile foundation for a broadband service provider’s network. This could also include the backhaul component of a wireless network connecting cell sites to the carrier’s backbone network. All traffic signals are on the network, representing a possible opportunity for wireless providers to leverage both the connectivity and vertical assets from Arlington County.²⁵

3.2 Service in Arlington

3.2.1 Service Overview

The following table depicts the number of locations with zero (no service providers) to three or more providers achieving at least 100/100 or 100/20 data speed of the 35,934 total serviceable locations in Arlington County.

Table 2: Arlington County Overall Service Statistics

Number of Providers at Location	100/20+ Locations/Percent Total	100/100+ Locations/Percent Total
0	46 / 0.1%	1,068 / 3.0%
1	1,576 / 4.4%	28,008 / 78.0%
2	18,427 / 51.3%	6,843 / 19.0%
3+	15,885 / 44.2%	15 / 0.0%
Total	35,934	35,934

The above table illustrates that there are a total of 1,068 locations in Arlington that do not meet the 100/100 requirement (just under 3%) and only 46 of 35,934 locations (0.1%) that do not meet the 100/20 federal threshold for minimum broadband service. And, while there is competition (more than one ISP) at only 19% of locations at 100/100, over 95% of locations have competitors at 100/20. As is further discussed below in *Section 3.2.5.2*, Comcast plans to upgrade its Xfinity service in 2023 to achieve more than 100/100 service, and at that time, Arlington will achieve competition at the target broadband speeds of 100/100 at more than 97% of its locations. The ISPs serve Arlington County very well and most locations in Arlington County experience competition.

²⁴ Based on the Arlington Street Network database, there are a total of 585 road miles. Fiber would not be needed for 100% of these roads (e.g., at Arlington National Cemetery, interstates). Excluding these controlled access and Federal roads, there are 462 miles of roads. While fiber is not necessarily required on the entirety of all roads, most of the road miles will require fiber to serve all homes and businesses. ConnectArlington staff provided the 40-mile figure. We note that portions of ConnectArlington’s fiber and conduit are outside of Arlington County (connecting Falls Church and Alexandria to Arlington). ConnectArlington’s fiber and conduit would then represent roughly 10 and 20 % respectively of the total road miles of a countywide broadband network.

²⁵ See *Section 6.1.3* for additional information about the County’s pole regulation program.

The following maps depict the broadband service geography of Arlington County.²⁶ On the left-hand side, the image shows the percentage of locations in each grid served at or above 100/100 service. The image on the right shows the percentage of locations served at the 100/20 or higher data speed levels.

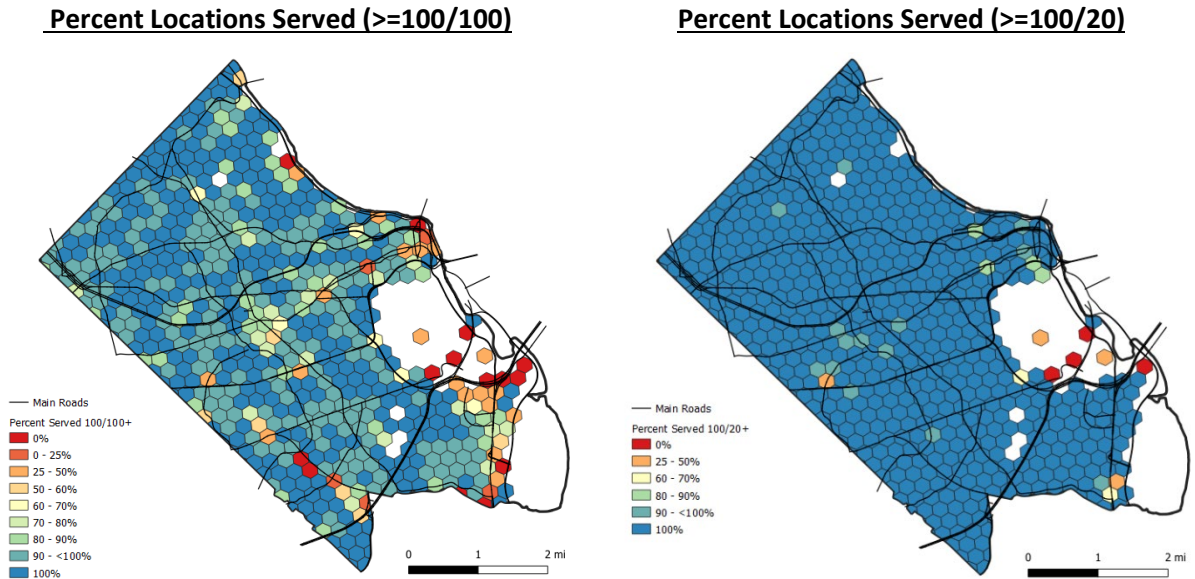


Figure 3: Overall Percent Service Maps 100/100 (left) and 100/20 (right)

In total, more than 97% of the serviceable addresses are served with 100/100 or better service, with 1,071 of the 35,934 addresses lacking 100/100 service. These are predominantly locations where Verizon is not offering fiber service. In many cases, this may be only a handful of locations in a grid that causes the percentage of locations to be less than complete (note that the dark blue color is limited to 100% of locations served). Because Xfinity provides service at 1200/35, it does not currently achieve the 100/100 Mbps threshold.

The 100/20 service map on the right depicts a different picture that includes Xfinity’s comprehensive footprint with far fewer gaps in service. Only 46 of 35,934 locations do not achieve 100/20 service that make up the image above on the right. These locations are in areas with low address density. Fourteen of the grids depicted in Figure 3 have less than 90% serviced locations at 100/20. These grids have a total of 91 serviceable locations which is nearly eight times less than the average density countywide.²⁷ In addition, some of the FCC data is suspect. For example, some of the problem areas such as the areas in and around the Pentagon and at Ft. Myers, are likely not serviceable.²⁸ The map shows that broadband service is universally available in almost all of Arlington County, and that only a handful of areas lack widespread high speed broadband service. Over 95% of serviceable grids (576 of 604) have 100/20 service

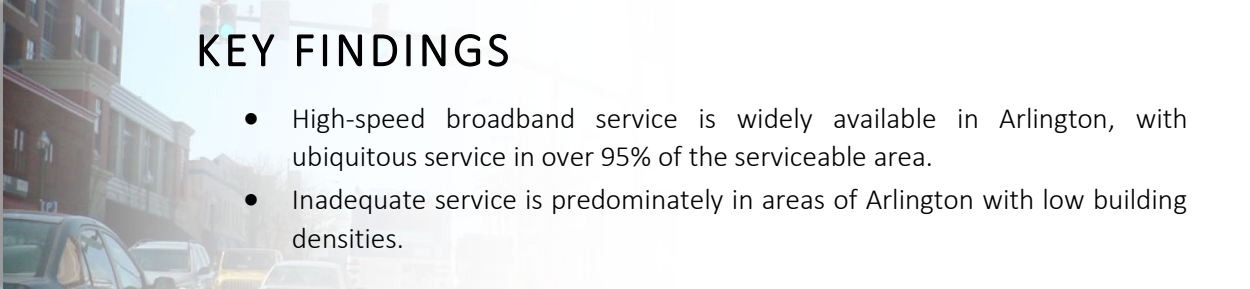
²⁶ Actual address locations were not used to protect sensitive information in the County’s license agreement for the FCC location fabric. The map depicts the percent of serviceable locations in each grid that achieve a particular level of service.

²⁷ Areas that are less dense cost ISPs more per location to serve. As a result, these less dense areas are served at a lower frequency.

²⁸ See *Appendix B: FCC Broadband Data* regarding this area around the Pentagon for more information about inaccuracies in the FCC data in this area.

at all addresses. Nearly 98% of the grids (590 of 604) have 90% or more of the addresses served at 100/20. Major broadband service gaps are therefore isolated to a small portion of Arlington County.

This report will delve into more detail regarding unserved and underserved locations as well as the level of competition in Arlington County (see *Section 3.2.4*) in more detail below. In addition, *Appendix D: Supplementary Maps* includes maps that depict the peak download and upload speed of all locations in each grid. These maps display high speeds that meet and exceed the federal broadband threshold.



KEY FINDINGS

- High-speed broadband service is widely available in Arlington, with ubiquitous service in over 95% of the serviceable area.
- Inadequate service is predominately in areas of Arlington with low building densities.





3.2.2 Provider Details

Arlington County’s primary business and residential Internet Service Providers (ISPs) include a diverse set of providers offering DSL (digital subscriber line), cable, fiber, fixed wireless, and satellite service. A total of 15 unique service providers have submitted information about their Internet service offerings to the FCC broadband database as of June 30, 2022. Five of these providers offer service to fewer than 10 business addresses in Arlington County. Three of the providers offer satellite-based service at speeds that are below 100/20 service. Another three providers serve fewer than 700 locations in Arlington. The remaining four providers Comcast, Verizon, T-Mobile, and Starry each provide both residential and business service to more than 7,000 of nearly 36,000 locations in Arlington. This study will focus on these four primary service providers. Specific utilization rates among Arlington residents are not publicly available and ISPs were unable to share this information. However, location-based service areas are provided.

The following table of the four primary Internet Service Providers in Arlington County includes the number of locations served with service that meets or exceeds 100/20, the advertised data speed for that service,²⁹ the type of technology employed for each provider, and the services each provider offers, in the order of percent locations served.


²⁹ Providers may offer several different service packages or technologies. The table provides the maximum advertised speed advertised the most and that meets or exceeds the 100/20 speed threshold.

Table 3: Arlington County Primary Internet Service Providers

Company (Service Name)	Percent Locations Served 100/20+	Advertised Speed (DL/UL) Mbps	Primary Technology	Services Offered
Comcast (Xfinity)	97%	1200/35	Cable	
Verizon (Fios)	95%	940/880	Fiber	
T-Mobile	32%	120/20	Fixed Wireless	
Starry	22%	200/100	Fixed Wireless	

The percentage of locations served above represents the provider reported locations as of June 30, 2022 that achieve 100/20 or better service of all serviceable addresses. The database contains a total of 35,934 serviceable locations in Arlington County and the FCC designates an additional 497 as non-serviceable that the Commission deems to not be candidates for mass market Internet service.³⁰

The table highlights that Comcast’s Xfinity service and Verizon’s Fios service serve most addresses in Arlington. These two providers also offer a full suite of services including Internet, television, and telephone. T-Mobile reports service to most Arlington addresses (28,000 overall), however, over half of those are at the 25/3 speed tier, and only 11,000 addresses meet the 100/20 threshold. T-Mobile offers Internet service bundled with phone and television service. Starry targets multi-tenant residential buildings and while the company promotes third party phone service, it does not offer phone or television service directly. Detailed information about the number of locations served by providers serving more than 10 locations can be found in *Appendix E: Detailed ISP Service Information*.



KEY FINDINGS

- Over 99% of Arlington County’s serviceable locations have high speed broadband access of 100/20 or more.
- Over 95% of Arlington County's serviceable locations have competition (more than one ISP) at the 100/20 Mbps service level today, and at 100/100 Mbps by mid-2023 when Comcast upgrades its infrastructure.

3.2.2.1 Comcast

Comcast provides wireless, phone, Internet, and television services in Arlington County. The company’s network is hybrid fiber-coax (HFC) for customer connections. The company employs a workforce of over 1,600 people in Virginia and offers retail and technical support locations in Arlington County. The company

³⁰ Of these 497 non-serviceable FCC designated locations, 81 are “Community Anchor Institutions” (generally government buildings) and 416 are “Enterprise” locations (generally properties used by large corporations).

has invested over \$700 million in the past three years in the region. The company offers 68,000 public Wi-Fi hotspots in Virginia that are free to its Xfinity Mobile and Xfinity Internet customers.^{31,32}

Comcast primarily uses coaxial cable as the last-mile portion of their broadband network³³ in Arlington County and can deliver fiber-based 2-gig symmetric service upon request (but indicated it is rarely requested).³⁴ Comcast notes that because their fiber is deep into their network (i.e., in close proximity to the customer's location), it is not difficult to run fiber to the premises. Comcast offers fiber upgrades to businesses and residents who require higher speeds. The Company reports 28 locations in Arlington that are currently offering fiber service. Comcast indicated they can scale to 100 gigabit services for businesses.

A key area of concern for this project was the Columbia Pike corridor. Comcast indicated that they served the entirety of Columbia Pike. In addition, the company did not believe there were any single-family homes they did not serve in the County.

Service Map

Xfinity's largest service gaps represented in the FCC data are along North Carlin Springs Road and surrounding communities between US Route 50 and North George Mason Drive – a predominately residential area. Due to Comcast's previous statements regarding the extent of their service locations in the County, Televate reached out to Comcast regarding this area believing it to be an error in the FCC data. Comcast confirmed that this area is served indicating the data in the FCC database is in error.³⁵ This error represents approximately 950 homes. Xfinity also has service gaps in Rosslyn, Crystal City, and Pentagon City.

³¹ See [Xfinity Wi-Fi – Connect on the Go with Millions of Hotspots Nationwide](#) for a map of Xfinity's public Wi-Fi locations.

³² This does not apply to customers with a prepaid Internet plan.

³³ See Internet Technologies for details on the different types of technologies used to provide internet service.

³⁴ In some situations, ISPs may charge a one-time fee for construction of new services or may charge for higher speeds associated with an upgrade of services. Internet Service Providers may require one-time charges to deliver certain services if their cost to deliver service is excessive.

³⁵ See *Section 10.3* for more information about this area and its impacts on this report.

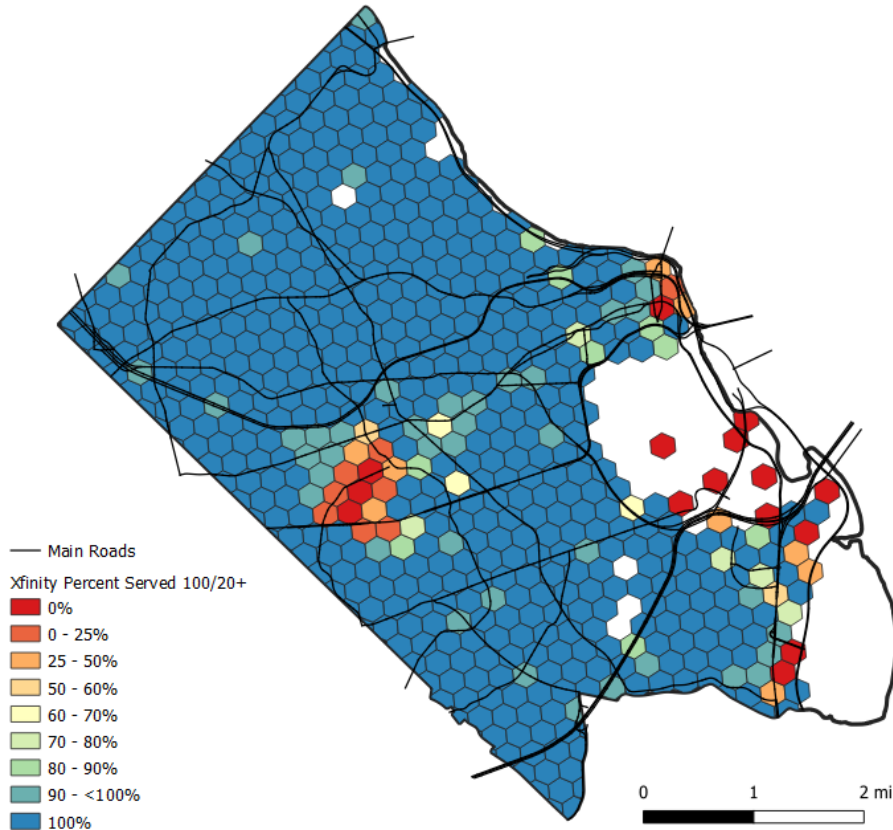


Figure 4: Xfinity Percent of Addresses Served at $\geq 100/20$

3.2.2.2 Starry

Starry specifically targets multi-dwelling buildings and has developed specialized programs for low-income households. Starry offers fixed wireless access (FWA) service using millimeter wave³⁶ wireless technology connecting individual buildings or residences to Starry's network (generally on or near the roof). Inside the building, Starry uses fiber to connect individual tenant locations. Starry requires access by the property owner to install wireless equipment and inside wiring. Starry only offers broadband Internet service and does not offer television or phone service.

The company was active in the FCC rulemaking process regarding agreements between ISPs and property managers that prevent competition in buildings and sees this as a major impediment to providing service to more locations.

Starry has a specialized program where an entire building can qualify for their Starry Connect service. The service delivers 30 Mbps symmetrical speeds for \$15 per month.³⁷ More than 77,000 households living in public and affordable housing units across the country have been qualified for Starry Connect. Starry qualifies an entire property making the sign-up and qualification process far simpler for residents of each building. There is no requirement to participate in other assistance programs (e.g., SNAP) to qualify for Starry Connect.

³⁶ See Internet Technologies for more information about millimeter wave wireless.

³⁷ See [Starry Connect: Better Internet for More People](#) With the availability of the ACP program, the service is free and is raised to 100 Mbps.

Service Map

The Starry service map depicts service primarily focused on the area South of the I-66 corridor. Starry targets multi-tenant locations, serving 95.0% of all serviceable locations with more than 200 units countywide and nearly 88.6% of all location types (i.e., including business, residential, mixed location types) with more than 25 units. Starry serves all eight locations in Arlington with more than 500 units. Starry’s expansion plans are unknown, and as noted have paused expansion. It is unknown if Starry will be able to raise the funds to expand services in Arlington.

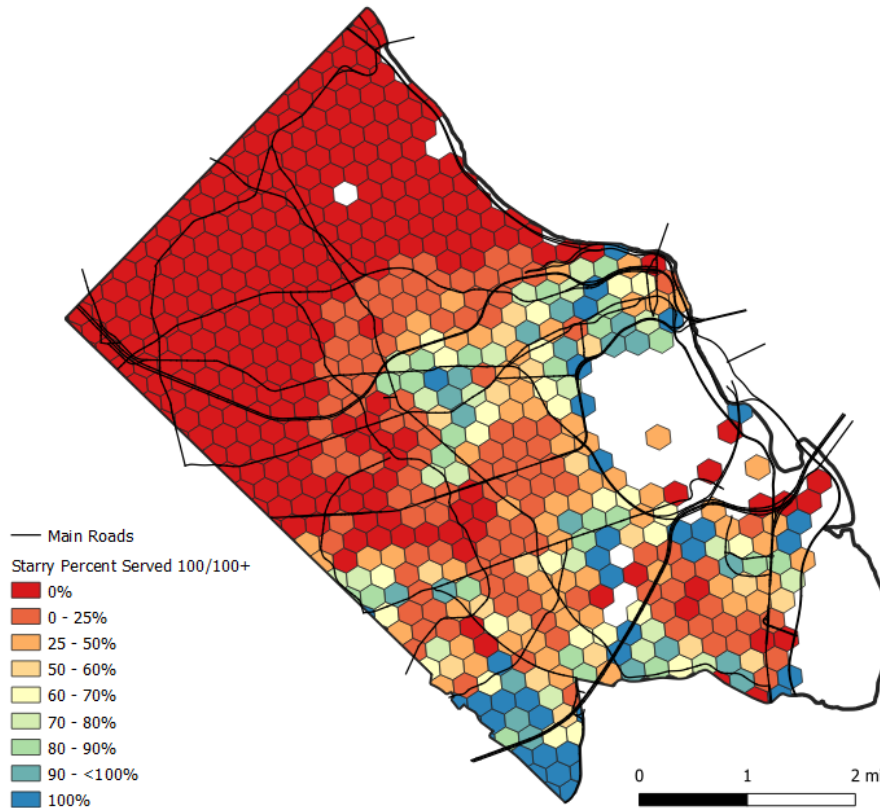


Figure 5: Starry Percent of Addresses Served at $\geq 100/100$

3.2.2.3 T-Mobile

Televate interviewed T-Mobile in August 2022 about its fixed wireless service offering, called Home Internet. Home Internet uses a gateway modem and router to be placed in a customer’s home or business. The service can be moved, but the customer must notify T-Mobile to confirm their new address is eligible for service. The service has no data caps. T-Mobile advertises higher speed (100/20) Home Internet service in portions of Arlington using their mid-band spectrum.³⁸ The company offers 25/3 service to a large portion of Arlington as well in areas that lack mid-band coverage. T-Mobile offers YouTubeTV television service with Home Internet through a partnership with Google. T-Mobile also offers phone service packages. The company has roughly 90 employees in Arlington County and has made a substantial investment in its network over the past 10 years.

³⁸ See Internet Technologies for more information in this spectrum allocation.

Service Map

The following map identifies the locations for T-Mobile’s 100/20 service. Their pockets of service are in Crystal City, Shirlington, Arlington Heights, and in several clusters in North Arlington neighborhoods.

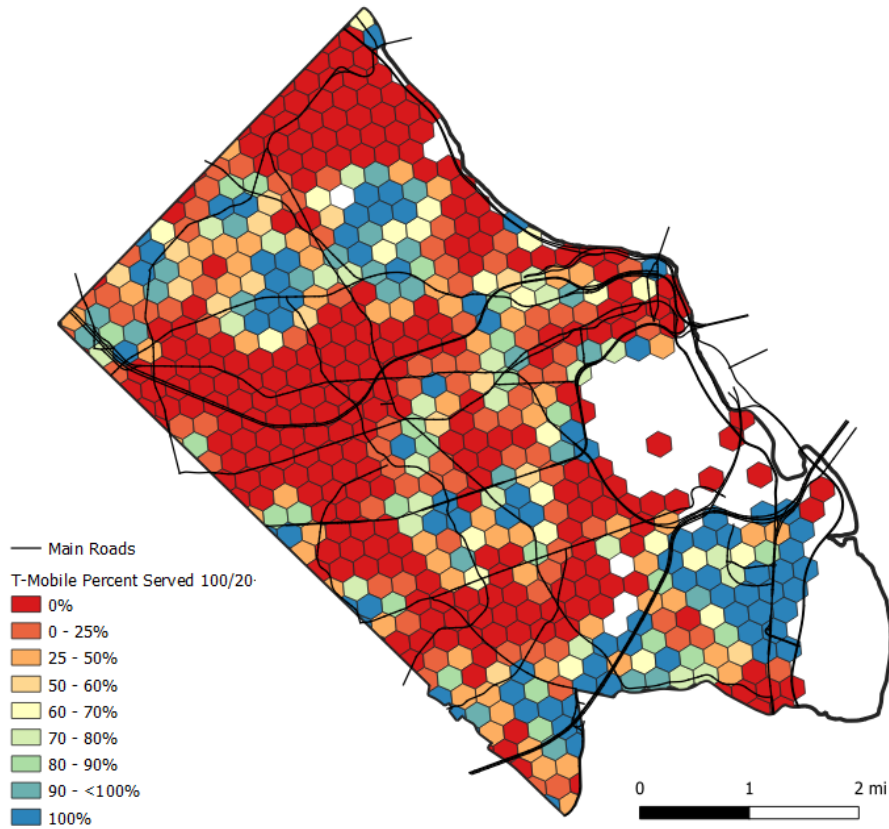


Figure 6: T-Mobile Percent of Addresses Served at \geq 100/20

3.2.2.4 Verizon

Verizon is the incumbent telephone service provider for Arlington County. In the early 2000s, the company began to deploy fiber. Over time, the fiber network has retired the copper telephone network in most areas of Arlington. There are a few areas where Verizon has not deployed fiber and continues to offer copper-based Digital Subscriber Line (DSL) service using their legacy telephone cabling.³⁹

The company is working with municipalities to host digital equity outreach events by assisting customers to sign up for the Affordable Connectivity Program (ACP) subsidized broadband service. Verizon also supported the Arlington Alliance for Aging by providing volunteers for the Affordable Connectivity Program Fair in Arlington in September 2022.

Verizon stated that access to buildings to deploy fiber was an issue and preventing the company from offering their high speed Fios service. Verizon mentioned that some buildings may have had agreements years ago that prevented access, but they may not have attempted to revisit those sites later.

³⁹ Ibid.

Service Map

Verizon lacks comprehensive service in a few areas, including Rosslyn, Ballston, Clarendon, Parkglenn, Four Mile Run, Shirlington, Crystal City, and Pentagon City. The map also highlights Verizon's service gaps in business corridors and with multi-tenant residences. In total, Verizon provides, as of June 2022, fiber service to slightly under 52% of the locations designated as businesses by the FCC. Additionally, Verizon serves a lower percentage of multi-tenant residential locations. Verizon serves 97.5% of single unit residential properties in Arlington but only 83.1% multi-tenant residential locations. Verizon serves only 61.0% of FCC designated mixed-use locations (business and residential), all of which are multi-tenant locations.

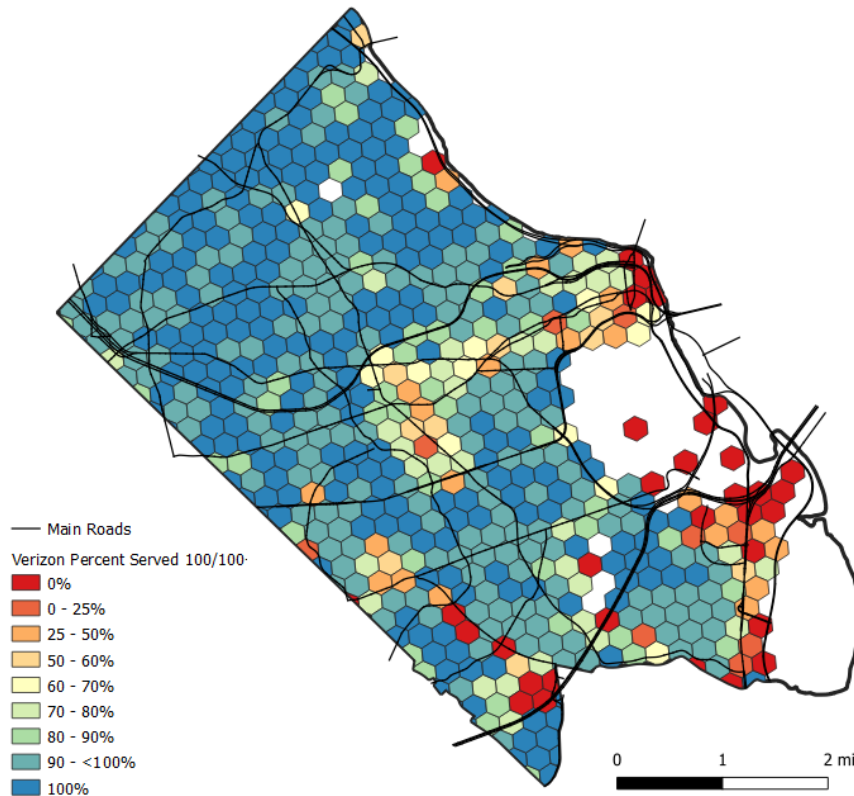


Figure 7: Verizon Percent of Addresses Served at $\geq 100/100$

3.2.2.5 Other Prospective Providers

The Televate and the Arlington County Government team met with another fiber-based Internet service provider to assess their interest in entering the Arlington broadband market. This provider has other operations in the region, and therefore, has operational assets nearby. The provider indicated that they would likely not enter the Arlington County market due to the current saturation of ISPs affecting the competitive landscape. Specifically, the presence of Verizon and their expansive fiber network was a major deterrent. Due to the already competitive environment, this ISP indicated their concern in gaining sufficient market share to be viable. However, the ISP was open to targeted areas that lack service. This suggests that Arlington would likely have a difficult time attracting additional ISPs to the area given the current level of competition in the market. And, because this challenge is largely one of gaining sufficient market share to generate returns on an investment, it also suggests that a government led initiative would likely face the same headwinds.

3.2.3 Gaps in Service

The term “unserved location” means a broadband-serviceable location that achieves a speed of less than 25 megabits per second (Mbps) for downloads and 3 Mbps for uploads (<25/3). The term “underserved location,” means a broadband-serviceable location that achieves less than 100 Mbps for downloads and 20 Mbps (<100/20) for uploads. In addition, this report also provides information regarding the federal government’s defined requirements for new infrastructure, download and upload speeds of 100 Mbps. *Section 3.2.2* addressed a high-level view of the locations that meet this requirement. The following section addresses additional analysis regarding the gaps in service. In total, only 0.1% and 3% of locations in Arlington County lack 100/20 and 100/100 service respectively. This section will investigate the gaps in service in more detail.

Televate evaluated the new FCC data⁴⁰ that illustrates that all 35,934 serviceable locations have geostationary satellite services from Hughes and ViaSat that meets the definition of underserved. As a result, if we include satellite services, no location in Arlington is categorized as “unserved” at less than 25/3. Therefore, all locations are in the fully served or underserved categories. As a result, what follows is an analysis of the underserved locations (below 100/20) and at the federal threshold for new infrastructure (below 100/100).

A total of 46 locations in the FCC data are in the category of underserved between 25/3 and 100/20.⁴¹

Another 1,025 locations fall into the category of served (100/20), but less than 100/100 service. Of these 1,025 locations, the following table indicates the number of locations served by providers that achieve at least 100/20 service:

Table 4: Providers at < 100/100 and >100/20 Locations

Provider	Total Locations Served	Service Speeds (Mbps)
Xfinity	988	1200/35 ⁴²
T-Mobile	392	100/20
RCN	43	1000/20
Cox	10	1000/35

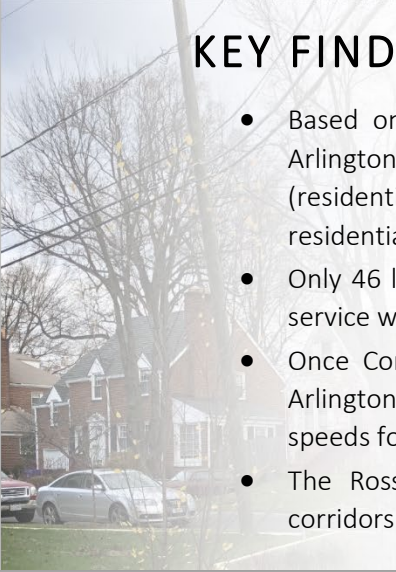
The table clearly indicates that Xfinity is the largest provider serving this category of locations among all locations between 100/20 and 100/100. As discussed in *Section 3.2.5.2*, Comcast’s upgrade plans for 2023 will bring these 988 locations over 100/100 service leaving only 37 locations in the service tier between

⁴⁰ Released on November 18, 2022 that reflects address broadband service as of June 30, 2022. The data was downloaded on November 21, 2022 and reflects data as of November 17, 2022.

⁴¹ The breakout of underserved locations by provider is located in *Appendix F*. All 46 locations have satellite service of 25/3 or higher. Starlink provides the fastest service at 30 of those locations with 100/10 service. T-Mobile is another provider that helps avoid no-service at these locations, and due to the cost of satellite service, will offer an affordable solution that meets the federal government’s current definition of broadband at 25/3.

⁴² We note that Comcast plans to upgrade its Arlington County network no later than 2025 to achieve speeds in excess of 100 Mbps uploads. As a result, these locations will be considered “served” at that point but are currently underserved by Arlington’s definition.

100/20 and 100/100. Once Comcast upgrades its network in Arlington, RCN, T-Mobile, and Cox serve 28, 23, and 2 of the remaining locations respectively.



KEY FINDINGS

- Based on the information available from the FCC, the vast majority of Arlington locations have high speed broadband service. Only 0.1% of all (residential and business) Arlington locations and less than 0.03% of residential locations are underserved.
- Only 46 locations in Arlington are underserved and do not have access to service with federally designated speed levels out of 35,934 locations.
- Once Comcast upgrades its Xfinity service in 2023, only 83 locations in Arlington County will not have broadband speeds designated as the target speeds for new infrastructure in the NTIA grant program (100/100).
- The Rosslyn-Ballston, Richmond Highway, and Columbia Pike planning corridors were all well served at similar rates as the rest of the County.

3.2.3.1 Residential Buildings Analysis

Televate analyzed the FCC service availability information against the Arlington County Master Housing Unit Database (MHUD) that contains information regarding property parcels including affordable housing, structure types (e.g., garden apartment and single-family residence), planning corridor, and age of the structure. Details of the results can be found in *Appendix C: Detailed Residential Service Availability Analysis* and are summarized below.

- **Affordable Housing:**
 - The analysis showed no pattern of gaps in broadband service in affordable housing. The providers serve affordable housing locations at roughly the same frequency as other housing types.
 - Comcast provides service to all committed affordable housing properties and over 95% of mixed market rate and affordable housing locations.
- **Building Type:**
 - There are no substantial service gaps for any residential building structure class. All the structure classes had more than 95% of their locations served with 100/100 service or better, and less than two-tenths of one percent of single family detached and garden have less than 100/20 service.
- **Planning Corridors:**
 - The Rosslyn-Ballston, Richmond Highway, and Columbia Pike planning corridors were all well served at similar rates as the rest of the County. There was no significant difference in the gaps in service in any corridor.

- **Age of Structure:**

- There is no substantial difference in service gaps for any residential building age. All decades of building age had more than 90% of its structures served with 100/100 or better service.

3.2.3.2 Structure Use Analysis

The FCC’s location fabric⁴³ classifies locations as business, residential, mixed,⁴⁴ group quarters, community anchor institutions (CAI), enterprise, and other. Of the locations in Arlington, only business, residential, mixed, and group quarters are identified as serviceable. The following graph depicts the percentage of each type of structure that falls in each category of service class.

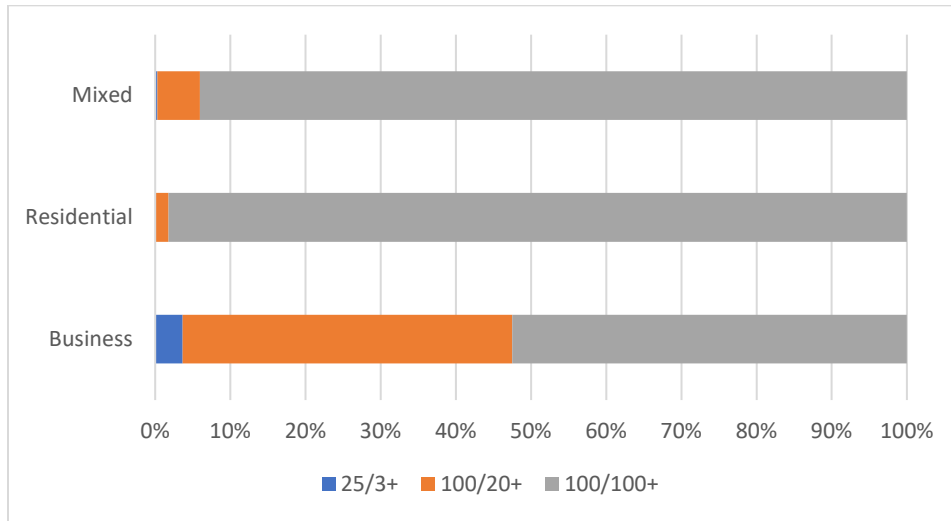


Figure 8: Service Level Distribution by Location Use Type

Figure 8 highlights a substantial difference in the service availability by the usage type of the structures.⁴⁵ Service at more than 3.5% of the business locations (32 total locations) achieve only 25/3+ speeds. As discussed above, business locations represent the majority of underserved locations in Arlington County. All other use classes have less than half of one percent of their locations served at the 25/3+ service level. In addition, only 53% of business locations are served at 100/100 or more compared to over 98% of residential locations.

⁴³ The FCC’s location fabric positions a serviceable or non-serviceable facility or “location” (residential, business, government building, multi-dwelling unit, parking garage, parking lot, bus/train stop, etc.) where internet service is provided, or where it could be delivered.

⁴⁴ The FCC does not define the categories, but we interpret mixed to imply mixed residential and business use.

⁴⁵ Group quarters results were removed from the analysis due to the limited number of locations (10 locations), and of those locations several are likely not serviceable including the Pentagon, and Ft. Myers.



KEY FINDINGS

- Commercial buildings made up the largest quantity of underserved locations, have a much greater frequency of service below 100/20 (3.6%), and only 53% had 100/100+ service.
- Residential locations have far better service with more than 98% 100/100+ service and only 0.03% are underserved (below 100/20). There are no significant service gaps associated with any class of residential structures.
- Four providers achieve 100/20 speed levels specified by federal agencies as the current target broadband speed, and three will meet the 100/100 speed threshold identified by federal agencies for new grant funded infrastructure.
- Two providers, Comcast and Verizon, are expected to meet the needs of most households and businesses in Arlington with their current infrastructure 10 years from now.
- Affordable housing locations are served at equivalent rates as non-affordable housing and Comcast Xfinity serves nearly all affordable housing locations.
- The Rosslyn-Ballston, Richmond Highway, and Columbia Pike planning corridors were all well served at similar rates as the rest of the County.

3.2.4 Broadband Choice

Arlington County has a very competitive broadband market. Four providers, Comcast, Verizon, T-Mobile, and Starry, offer service at the 100/20 service level or higher. Comcast and Verizon each serve more than 95% of all serviceable locations. More than 95% of all serviceable locations (over 34,000) have at least two providers, and over 44% have more than three providers that currently achieve the 100/20 service level or higher. Only 4%, 1,576 total locations, have a single provider that offers service at 100/20 or higher. The following map shows percentage of locations that are served by two or more providers at the 100/20 service level or higher.

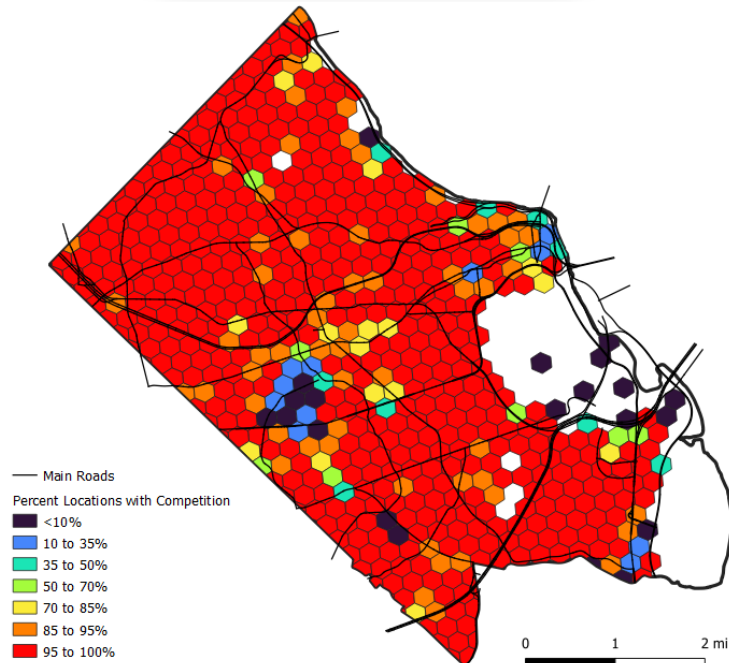


Figure 9: Percent of Locations with Competition at 100/20 or Higher by Grid

More than three-quarters (79%) of the serviceable grids have competition at 95% of the locations in the grid. Most grids with a low percentage of competitive locations have very few serviceable addresses. The major exception is the area around N. Carlin Springs Road. That area, as addressed above, is not served by Comcast in the March 2023 iteration of the FCC broadband map, however, Comcast clarified that they have Xfinity service in the entire area, impacting approximately 950 exclusive locations (see *Appendix B: FCC Broadband Data* for more details).

3.2.4.1 Scale of Provider Exclusivity

Televate analyzed where only one service provider that required access rights from property managers/owners is providing broadband service at the location. The analysis considered services that required access rights to the common areas of a property to determine where property managers may be restricting access.⁴⁶ A total of 1,942 (5.4% of serviceable locations) include service providers that require access rights to buildings to provide service.⁴⁷

⁴⁶ Atlantech, Cogent, Cox, Fusion, RCN, Starry, Verizon, and Xfinity were included. Importantly, T-Mobile is excluded from the analysis as tenants do not need landlord permission to use T-Mobile's service. On the other hand, while Starry is also a fixed wireless solution, it is excluded due to its requirement to run fiber into a building and secure rooftop rights to provide service. Additionally, it is important to note that this analysis excludes Verizon's DSL service as it did not achieve 100/20 speeds.

⁴⁷ Note that these numbers are higher than the overall exclusivity figures (1,576 locations or 4% of the serviceable locations) because these numbers exclude T-Mobile service as T-Mobile does not require access rights to buildings.

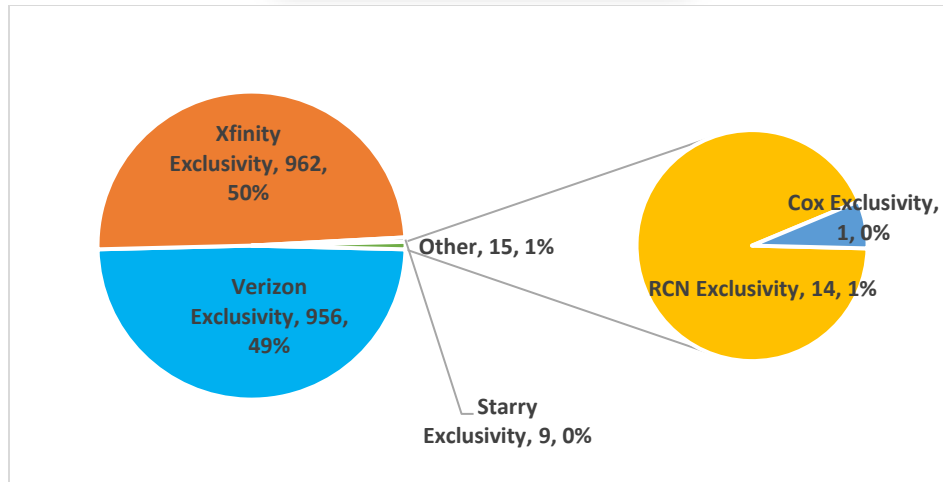


Figure 10: Exclusivity of Service at Locations Requiring Property Access (>=100/20)

Figure 10 highlights that the vast majority of the 1,942 exclusive locations belong, roughly equally, to Verizon (49%) and Xfinity (50%). However, the gap in served Xfinity locations in the Carlin Springs Rd area (see *Appendix B: FCC Broadband Data*) affects roughly 950 of the Verizon exclusivity locations.⁴⁸ Based on Comcast’s clarification about their service in the area, and that only Verizon and Comcast provide service in the area (Starry does not), this would then eliminate nearly all of the exclusive Verizon locations. As a result, there are likely only 1,000 exclusive locations in Arlington, and the vast majority are exclusive to Xfinity.

During an interview with Comcast in September 2022, the company indicated that they lacked access to roughly 3 – 4% of multi-dwelling units (MDU) and were currently negotiating access with another 10 – 15%. The company indicated that it lacked access exclusivity, but not marketing exclusivity in buildings (which is still permitted by the FCC). The company also added that it would prefer to provide and own the inside infrastructure in buildings but would evaluate building owner provided infrastructure on a case-by-case basis.⁴⁹

Additionally, while this analysis does establish the population of locations where there is exclusivity among service providers that require property access, it does not necessarily mean that all 1,000 locations are caused by an agreement between a property owner and a service provider. Single provider locations could instead be caused by financial reasons, such as a high cost to construct service (new providers are not offering service because there is not enough return on investment) or property owners could simply prevent new providers from accessing the space (in other words, there is no agreement preventing access, but the property owner is blocking access nonetheless for reasons we do not know). What percentage of the 1,000 exclusive locations are caused by exclusive agreements between ISPs and property owners is unknown, but it is likely a combination of each of these factors (economics, agreements, and property owners) that make up the reasons for exclusivity.

⁴⁸ While it is difficult to estimate in total, there are roughly 950 addresses in the area. And, in this area, Verizon has roughly 950 addresses where it is exclusive. Therefore, it is possible that all of Verizon’s exclusivity would be eliminated if this area was entirely served by Comcast. If indeed if all of Verizon’s 956 exclusive locations would be eliminated from this gap in the data, the number of exclusive locations would drop by roughly 2.7%, and only 2.7% would remain exclusive. Of which, almost all of these locations would be exclusive to Comcast.

⁴⁹ September 2022 interview with Comcast.

Finally, the purpose of this analysis is to uncover property manager caused exclusivity—not the existence of exclusivity itself. In other words, the difference between the 1,942 exclusive locations requiring property access and the 1,576 locations with overall exclusivity is T-Mobile’s service that does not require access rights. In other words, while property rights may influence the 1,942 locations, at roughly 350 of these “access exclusive” locations, T-Mobile provides 100/20 service, and the residents of those properties have broadband choice, meaning the choice to select a preferred ISP when more than one provider serves a given location.

Looking at the locations where there is exclusivity (i.e., only one provider) among service providers offering 100/20 or higher service and requiring landlord rights of entry (i.e., excluding T-Mobile and satellite services), the figure below highlights that affordable housing locations are equally as likely to have broadband choice compared to market rate, mixed, and other locations.

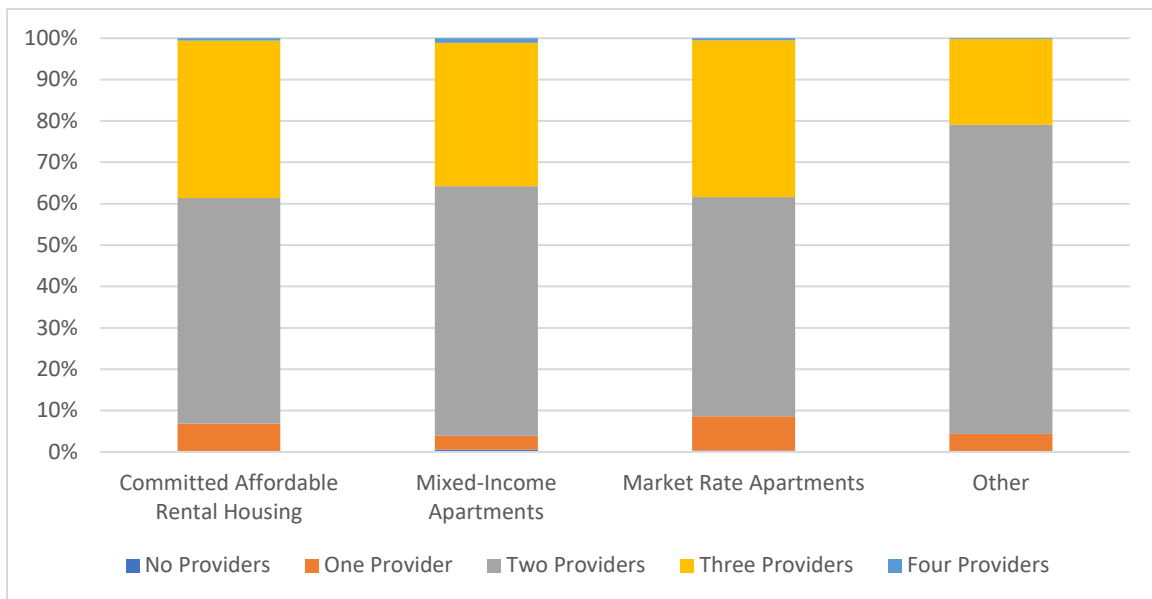


Figure 11: Number of Providers by Affordability Type

A total of 6.8% of committed affordable rental housing locations had only one provider.⁵⁰ The single provider rate for market rate and mixed-income apartments is 8.3% and 3.4% respectively. The other category (non-rental, predominantly) is comparable to the affordable housing locations at 4.3% of other location types (residential and commercial). Given the higher frequency of monopolies in market rate properties, affordable housing apartments are no more likely to have a single provider than non-affordable housing apartments among providers that require property access.

⁵⁰ Based on information collected from affordable housing property owners by County staff, this is grossly different than the FCC data. The County assessed 48 CAF properties among 5 different affordable housing property owners and indicated that 37 (77 %) of the properties offer only Comcast service. There could be a variety of reasons for the discrepancy and should likely be investigated further to confirm.

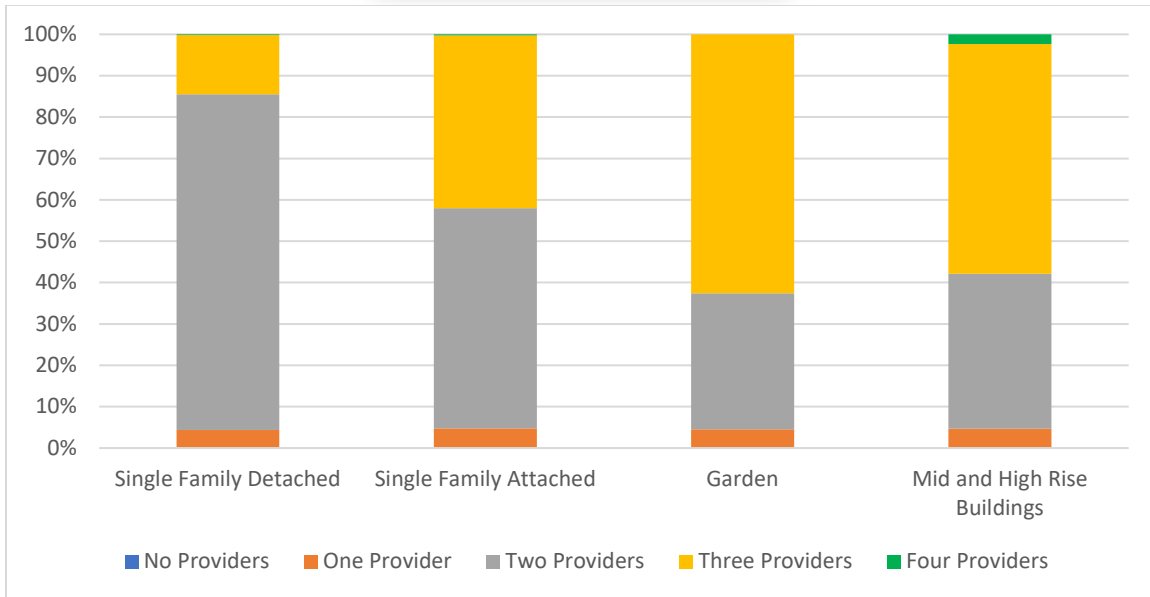


Figure 12: Number of Providers by Structure Type

An evaluation by the type of structure provides some stark contrast in the level of competition in Figure 12 above. The different structure classes have roughly equivalent occurrence of single provider scenarios (between 4.3 and 4.8% of the locations are single provider). However, for garden and mid- and high-rise buildings, there is a much greater frequency of three or more providers compared to single family detached locations (over 60% garden locations have three or more competitors, 58% mid- and high-rise buildings, compared to only 14% of single family detached locations have three or more providers).



KEY FINDINGS

- Affordable housing locations are equally as likely to have broadband choice (i.e., more than one provider) compared to market rate, mixed, and other locations.
- Garden and mid- and high-rise buildings have a higher frequency of competition among Internet service providers. Over 60% garden locations have three or more competitors, 58% mid- and high-rise buildings, compared to only 14% of single family detached locations have three or more providers.

3.2.4.2 Association and Building Owner Perspective on Competition and Bulk Agreements

Televate and Arlington representatives met with three regional property management associations and individual property managers to better understand the nature and extent of property manager and ISP arrangements that reduce competition. In addition to these interviews, fifteen property owners and managers participated in a survey that sought to better understand Arlington's broadband landscape and

the nature and extent of arrangements that limit provider choice.⁵¹ We learned the following insights from the conversations and survey responses:

- Nine of fifteen survey respondents indicated that they did not have issues or challenges with broadband services at their properties, and seven respondents indicated that they had more than one broadband provider at their facility.
- Among the six who experienced barriers identified the following reasons: recent FCC rules regarding exclusive agreements with providers, lack of affordable options with faster data speeds, connectivity issues that vary based upon asset class infrastructure, the cost to retrofit older properties and to offer free Wi-Fi to residents and having only one authorized service provider available for residents.
- Eight respondents only have one provider at their property(ies). Of these, most (5) responded that they did have an agreement with a provider. The rest provided other responses, including that other providers were not interested or that they are able to offer residents lower high-speed services (\$40 per month for gigabit speeds).
- Some defended the choice to limit the number of providers at their location (contrary to the FCC’s order). One respondent recommended allowing bulk or managed Wi-Fi for apartment buildings claiming a win-win for owners and residents. These bulk agreements, if not exclusive, are allowed by the FCC. Assistance from Arlington County negotiating bulk agreements with Internet service providers was identified as an opportunity to provide better pricing to affordable housing communities. Interview participants also expressed the belief that bulk programming benefits both the owner and the residents, as building owners can leverage economies of scale across their entire portfolio, and residents can therefore receive large discounts. However, one property owner noted difficulties including Affordable Connectivity Program⁵² participants in bulk agreements. It is also worth noting that the distribution of any financial discounts is not known and would likely be challenging information to collect (i.e., what percentage of financial benefit is really passed on to residents?).
- Others asked for more County involvement, including assistance requiring a minimum quality of service and managing prices, providing financial support, and facilitating relationships with service providers. One respondent suggested oversight from local jurisdictions of ISPs.

3.2.4.3 Importance of Competition

Marketplace competition typically results in greater consumer ISP choices, delivering competitive pricing, and multiple broadband service plans and data speeds. Due to ISP investment in areas that already have quality technology and higher competition for services, low-income communities often do not provide incentives for ISP competitive investments.⁵³ The eCheckup Assessment provides Arlington a view of the impacts on the lack of competition. The eCheckup data for Arlington County revealed that Internet service

⁵¹ The survey was prepared in partnership with leadership of the Northern Virginia Apartment Association (NVAA), Apartment and Office Building Association of Metropolitan Washington (AOBA), and the Northern Virginia chapter of the National Association for Industrial and Office Parks (NAIOP). The survey was shared among NAIOP and AOBA members as well as membership from the Housing Association for NonProfit Developers.

⁵² The Affordable Connectivity Program is a federally funded program that provides a subsidy to qualified low-income individuals and households to obtain broadband service. See *Section 5* for additional information.

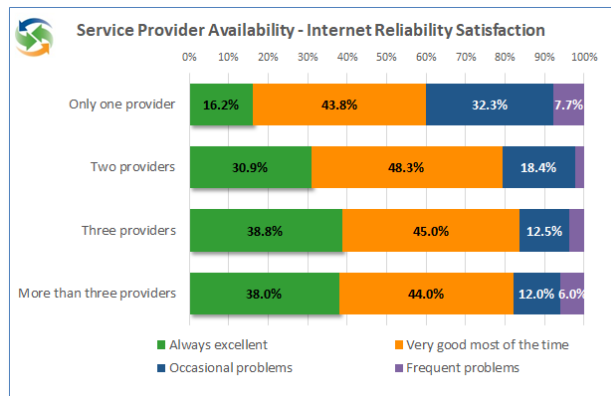
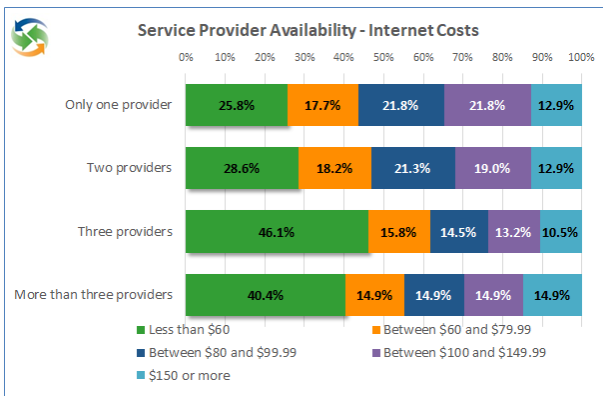
⁵³https://www.sahfnet.org/sites/default/files/uploads/digital_access_playbook_publish_w_bookmarks_2_0.pdf

cost, satisfaction, and value varied consistently depending on the number of providers. In total, 20% of all household respondents reported having only one provider available, compared to 60% of household respondents saying there are two providers available in their area for Internet service.

Households that reported having only one available provider reported (see *Appendix C: Detailed Residential Service Availability Analysis*):

- **Higher Internet service costs** – 34% are paying more than \$100 per month. While Internet subscription costs are similar for one and two service provider responses, eCheckup analysis shows that Internet costs drop significantly when three or more providers are available.
- **Lowest reliability satisfaction** – 16% of households reporting “Always excellent” for one provider versus 31% for two providers, and 38% for three or more providers.
- **The greatest instances of “Occasional or Frequent problems” regarding service reliability** at 40% for one provider compared to 21% for two providers and 16% for three providers or more.
- **The lowest speed satisfaction** – 15% of households reporting “Very fast” versus 25% for two providers, and 38% for three or more providers. These satisfaction ratings are further confirmed by average download speeds based on provider availability. The average download speed of one provider available was 152 Mbps compared to 213 Mbps from households reporting two providers available.
- **The lowest value** at 8% reporting “Worth every penny” (compared to 22-28% for three providers or more) and highest reporting of “Below expectations” 35% compared to 23% for two providers and 16% for three providers or more.
- **Lowest customer service satisfaction ratings** – 28% of households with one provider said customer service was “Not Acceptable” compared to 11% of respondents with two providers.

The eCheckup data showed that the more competition the lower the costs and higher the perceived reliability and value.



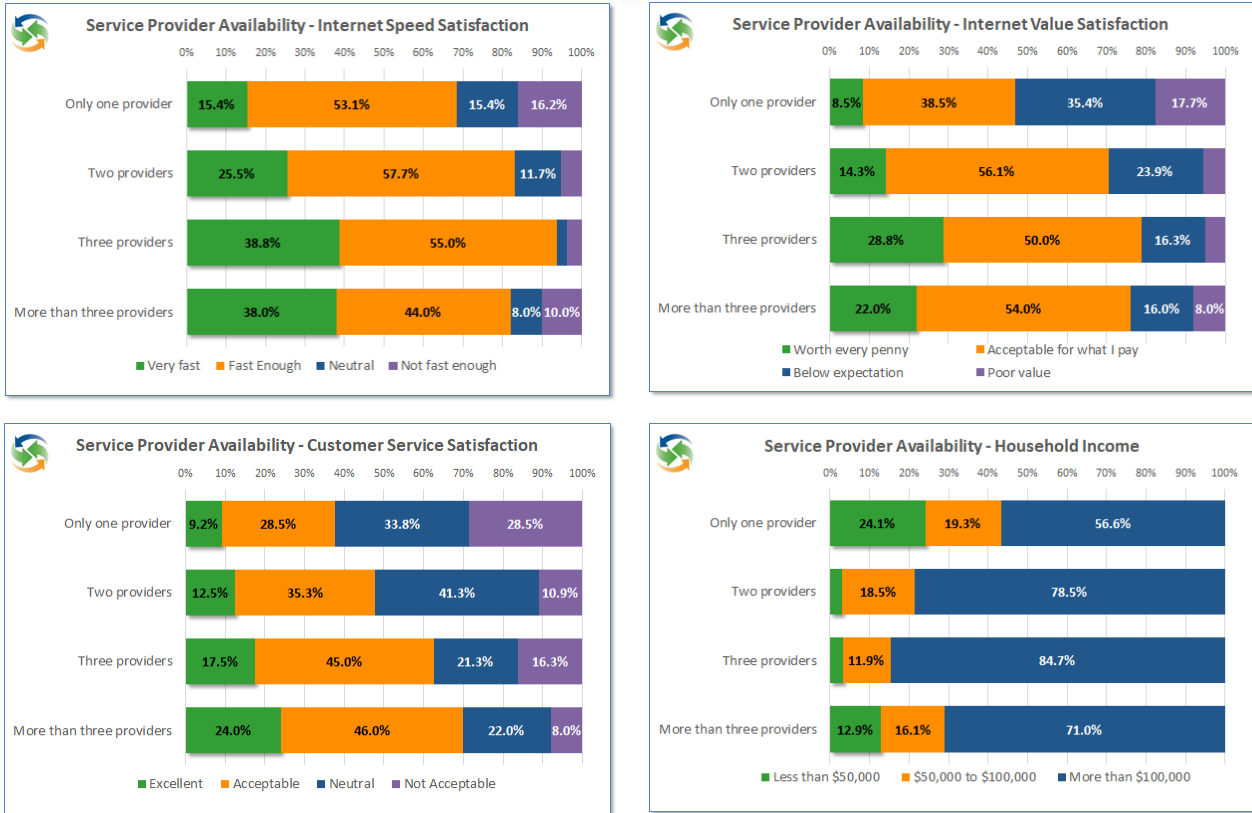


Figure 13: Service Satisfaction vs. Level of Competition

The data shows that as reported availability changes from one to three providers, the frequency of respondents who have a positive satisfaction level increases and the cost of Internet subscription decreases. The only inconclusive level is the “more than three providers” category that is generally on par with three providers. Those who earn less than \$50,000 per year make up 24.1% of respondents who reported only one provider, but only 3% of respondents with two or three providers.

It should be noted that these findings based on the eCheckup track the respondent's awareness or perception of providers within the area of their household. In locations that have extensive availability of broadband services, it may be the case that residents are not aware of the offerings and choice of service that may exist. Increasing the awareness within the community of available Internet service providers will ensure that households have the information available to make the best choice to meet their needs.

The impacts of competition uncovered by the eCheckup are clear and consistent across all attributes of broadband service. These statistics can be used to help property managers make the right decisions about why they should offer multiple providers in their buildings. Their tenants will be far more likely to be pleased with the costs, reliability, speed, value, and customer service.

KEY FINDINGS

- More competition and service availability leads to higher customer satisfaction and better customer service.

3.2.4.4 Exclusivity Analysis

When only one provider serves a location, it provides exclusive access to that location. When only one service provider offers service at a location, that service provider might become complacent and provide lower quality of service and higher pricing due to the lack of competition. While we have shown that there are always multiple broadband providers at all locations due to satellite service, that service is not high-speed and is expensive.

Since 2008, the FCC has restricted cable and telecommunication carriers from entering into exclusive agreements with multi-tenant property owners. However, the rules did not prohibit agreements that circumvented these rules. Then, in February 2022, the Commission released a Report and Order that further prohibited these ISPs from entering into exclusive or graduated revenue sharing agreements. It required disclosure of exclusive marketing agreements. The Report and Order also prohibits the sale and leaseback of inside wiring that have been used to impede use by an alternative service. The rule and its prohibitions went into full effect (including existing exclusive and graduated revenue sharing agreements) on October 24, 2022.⁵⁴ These new rules then became effective after the June 30, 2022 FCC service data analyzed in this report. It will take perhaps another year to determine the effectiveness of the new rules.

The reasons why there may be only one high-speed, low-cost broadband service option are complex. The cost to serve a location may be excessive, and perhaps only one service provider can justify service. The landlord can also prevent access to other service providers. While it is illegal for service providers to enter into agreements with property owners/managers that are exclusive and for service providers to have exclusive revenue sharing agreements, there may be other reasons why property managers may allow only one provider in their building. Property owners can still favor one provider and prevent other providers from gaining access as the FCC policy only regulates the ISPs. Bulk sale agreements that are not exclusive are still allowed and property owners can block access to alternative ISPs. Non-exclusive bulk sale agreements tend to be more expensive to offset costs to include additional providers. This can be cost prohibitive, particularly for smaller property owners and affordable housing developers. Some jurisdictions have regulated the property owners to address the issue by mandating fair and reasonable access to their properties. For example, in December 2016, the City of San Francisco established the Occupant's Right to Choose Communications Service Provider ordinance. It mandates that property owners cannot interfere, discriminate, or otherwise prevent access to a certified service provider that expresses intent to provide service to a multiple occupancy building.⁵⁵

⁵⁴ The rules prohibit enforcement of existing contracts 180 days after publication in the Federal Register, April 27, 2022. Other elements went in place 30 days after publication. See Federal Register [Federal Register :: Improving Competitive Broadband Access to Multiple Tenant Environments](#)

⁵⁵ See [ARTICLE 52: OCCUPANT'S RIGHT TO CHOOSE A COMMUNICATIONS SERVICES PROVIDER \(amlegal.com\)](#).

It is noteworthy that ISPs frequently work with building developers during construction to gain access to new buildings, which is often easier than retrofitting an existing structure. We were not informed by the ISP’s interviewed about any building access issues associated with the construction of “new structures.”

3.2.5 Recent Investments and Future Infrastructure Options

3.2.5.1 JBG Smith in National Landing

JBG Smith is the largest landlord in National Landing and describes itself as committed to high-quality broadband connectivity. JBG Smith acquired radio spectrum from the FCC for mobile/wireless service to augment its connectivity plans⁵⁶ and intends to stimulate innovation with its FCC license in National Landing. The company has a partnership with AT&T on outdoor wireless and reported that AT&T is using JBG Smith’s fiber. The company is also planning on ubiquitous Wi-Fi across National Landing including managed Wi-Fi at all residential properties. The service will not be free but will be included in the rent.

The company secured conduit and fiber from Arlington County’s ConnectArlington system via a 99-year Indefeasible Rights of Use (IRU) agreement. In addition, the company is making a major investment regarding connectivity in National Landing by deploying fiber comprehensively throughout the neighborhood/ region/ district. The company will require ISPs to utilize JBG Smith’s fiber to provide retail broadband service using an “open access” model. The company also plans to build data centers in National Landing to augment their connectivity. In theory, this would increase competitors to the area due to the nearly zero capital cost to offer service. Some providers, however, may not be willing to participate without owning the infrastructure or may not participate if the market is overly saturated. However, it is too early to evaluate this model’s impact to National Landing, and it is worth the County investigating in the coming years.

3.2.5.2 Future ISP Upgrades and Investments

The primary service providers offered details regarding the known expansion and upgrade plans. The providers did not offer any details regarding their planned investments. While Televate expects that the service providers will continue to make investments in Arlington County and have already made announcements about upgrades in Arlington specifically, and nationally in general, Televate does not know what future investments the service providers will make. However, upgrades of some sort are almost always the preferred pathway to increase speeds. It is generally, though not always, far cheaper than a wholesale replacement of all infrastructure.

Comcast

During interviews with Comcast, the company stated that the only locations where they did not provide service was where the property owner/manager would not provide rights of access to the private property. Comcast indicated that wherever they can obtain rights of access, they will expand service. In addition, Comcast shared deployment plans for upgrades. These upgrades are critical in meeting the County’s requirement for 100 Mbps symmetric service. Comcast reported that the company will implement upgrades that deliver 1.2 gigabits per second (Gbps)⁵⁷ down and 200 Mbps up for consumers and businesses before the end of 2023.⁵⁸ Comcast has also announced its intention for further upgrades

⁵⁶ The spectrum is in the Citizens Broadband Radio Service (CBRS) band. See *Internet Technologies* for details regarding wireless technologies.

⁵⁷ One Gbps is one billion bits per second and is the equivalent of 1000 Mbps.

⁵⁸ Email from Comcast to Televate on 10/31/2022 and 3/7/2023.

which it expects will deliver symmetric (both download and upload) gigabit speeds to end users. Comcast publicly shared their plans regarding higher speed tiers for their existing plans in the Washington, DC region in October 2022.⁵⁹ Symmetric gigabit speeds are expected to be available for commercial deployments in the 2026 timeframe. And, as noted above, Comcast will extend fiber to the premises for customers who request it.

T-Mobile

T-Mobile indicated they are continuously adding to their network and were looking to upgrade their cell sites to support more mid-band spectrum⁶⁰ that increases both the total capacity and the peak speeds enabling 100/20 service.

Starry

Starry's initial public offering in March 2022 did not raise as much money as expected and the company needs more cash to break even. Starry was delisted by New York Stock Exchange on December 14, 2022 due to its share price. At the time of Starry's interview in August 2022, the company had approximately 100 employees in Arlington County. Starry recently eliminated 50% of its workforce nationwide, paused expansion, and withdrew from its funding from the FCC Rural Digital Opportunity Fund (RDOF).⁶¹ On February 21, 2023, Starry announced a voluntary Chapter 11 restructuring. Starry indicated it is not going out of business, will continue to operate as normal, and will be working with its lenders to reduce the company's debt.⁶²

Verizon

As mentioned above, Verizon stated that locations where they did not serve with Fios service were due to lack of access. And, that wherever access was provided, they would expand their service. Verizon did not directly share their upgrade plans; however, as a company Verizon has articulated their plans regarding their upgrades and their upgrade technologies. Verizon has announced fiber to the premises technology upgrades for their service footprint. Their chosen technology allows the operator to use multiple wavelengths on the fiber optics to deliver 40 Gbps aggregate speeds and enables 10 Gbps service or more to individual households or businesses. Verizon anticipates that their chosen technology will be able to scale to 100 Gbps.⁶³

3.2.5.3 Consideration of Technology Advances

This report discusses the technological advances in cable, fiber, and wireless that are currently feasible, and Arlington's service providers have already announced plans to deploy them. However, there are more advances on the horizon. All technologies are likely to see further enhancements in data speeds over the coming decade. The primary 5G wireless technology benefit for most consumers is access to more spectrum (mid-band and millimeter wave⁶⁴) to deliver faster speeds to individual devices. These bands

⁵⁹ See [Comcast Boosting Speeds for Our Most Popular Xfinity Internet Tiers Across the Beltway Region](#)

⁶⁰ See Internet Technologies for details regarding various technologies used for internet service.

⁶¹ See [Starry seeks buyer as cash runs low | Fierce Wireless](#).

⁶² See [PR Starry Announces Voluntary Chapter 11 Bankruptcy Filing](#)

⁶³ See [Verizon VP: NG-PON2 will make future fiber upgrades easier | Fierce Telecom](#)

⁶⁴ Mid-band (e.g., 3.45-3.55 GHz band 3.5 GHz and 3.7 GHz) and millimeter wave (70-80-90 GHz) wireless frequencies are at much higher radio frequency (RF) bands and provide significantly less coverage than other band employed to deliver wireless broadband. In fact, millimeter wave band requires line-of-sight and are not conducive to point-to-multipoint broadband communications.

have larger channel sizes that can deliver speeds of more than 100 Mbps and beyond 1 Gbps. While millimeter wave solutions can deliver gigabit speeds, the range is so short that wireless providers deploy millimeter wave technology on a very limited basis. The deployments tend to be at arenas, stadiums, and in other very dense locations.

It is quite challenging to predict what the advances in technology will deliver in the long term, but if the history of broadband technology offers a potential roadmap, the future is likely to be promising. Certainly, there will be advances, but the advances themselves could disrupt the broadband market in ways that we cannot fathom today. Ultimately, the utilization of these advances is up to the Internet service providers. For example, there are 21,000 locations in the FCC database that are within 500 feet of all Arlington County light poles (500 feet is the best possible range for mmWave in some testing⁶⁵). Figure 14 below depicts the hypothetical footprint from the 7,200 Arlington County streetlights, which are only the poles that the County owns out of all of the utility poles located in the county. It is important to note that providers that use an Arlington County pole are required to build a conduit to the ConnectArlington fiber if they are within 150 feet of the County's fiber run. This requirement could provide the County opportunities to expand the footprint of their fiber network depending on the location of the leased pole.



Figure 14: Hypothetical Service Footprint for Millimeter Wave Fixed Wireless Using Arlington Streetlights

While it may be possible for a fixed wireless provider to use its millimeter wave spectrum (or use the even shorter-range unlicensed millimeter wave spectrum at 60 GHz), these providers will likely weigh such investments against other options on whether they can win business. For example, if the wireless providers feel that they will not be able to deliver substantially more than 1 Gbps reliably, and they feel the market will require 10 Gbps, they may opt to not invest in expanding their network in that way.

⁶⁵ See [Verizon's 5G mmWave Network Has a Tree Problem - SDxCentral](#)

Another challenge might be about physical obstructions. Unless some technology or technique is invented that navigates around the laws of physics above 20 GHz, the connections will be required to be line-of-sight (no physical obstructions). Even if a transmitter is placed on every pole in Arlington County, there will likely be homes or businesses that cannot see a pole. There may be no poles on certain streets, or the street or properties may be lined with trees. Ultimately the decision to deploy 5G millimeter wave wireless to compete with cable and fiber broadband service will depend on financial considerations and the projected return on investment (ROI).

Aesthetics and convenience could also play a role in the uptake of fixed wireless access (FWA) service using mmWave. For example, if the customer is forced to install an antenna on the outside of their house, perhaps their roof, or to install the equipment in a window where it is inconvenient for the customer, many may decline. This would then make it more challenging to capture customers and secure a solid return on investment in competition with cable and fiber.

We do not know what technological advances will occur in the next 10 years, but we know of no technological advances that are expected to dramatically alter the economics of broadband service delivery. The fundamental physics associated with broadband signal propagation and communications suggests that more bandwidth results in more throughput. Fiber has an overwhelming advantage with regards to bandwidth, it has a far greater range than cable and wireless, and once installed, it is very inexpensive to operate. We do not see anything changing to make it the technology of choice in urban and suburban areas.

3.3 Broadband Service Pricing and Affordability

3.3.1 Pricing Plans

The following table includes primary service provider offerings and pricing,⁶⁶ as listed on their websites, which were largely captured in December 2022 and January 2023 and are subject to change. The prices in the table are intended to reflect the standard pricing, excluding discounts (which also applies to auto payment discounts), promotions and limited time offers; however, where noted, the standard price could not be identified. In many cases, because we excluded discounts, the prices in the table below are higher than what a new subscriber to one of these plans would receive. Subscribers benefit from these discounted promotional rates, but it is important to note that the rates often expire after 12 to 24 months, which can result in a large price increase. For subscribers who are unaware of or may forget about the promotional period, the price increase may come as a surprise.

The table highlights the variability of service prices by provider and based on the data speeds. It should be noted that providers offering slower DSL based service charge the same as higher speed fiber service. The providers also offered special service pricing for Affordable Connectivity Program (ACP) packages. When paired with the federal subsidy, consumers have no net cost. Overall, prices varied from as low as \$9.95 per month for 50 Mbps service from Comcast, to \$117 per month service also from Comcast for 1200 Mbps service.

⁶⁶ The cost of broadband services in Arlington County are within the average cost nationally, perhaps slightly higher based on various added fees. See [Monthly Internet Cost: Price Breakdown – Forbes Home](#) and [Average Cost of Internet | Balancing Everything 2023](#).

Table 5: Internet Service Provider Offerings, Speed and Pricing

Provider	Offering Name	Monthly Cost (Internet Only)	Monthly Equip. Cost (N/A if user owns equip.)	Download Speed (Mbps)	Upload Speed (Mbps)	Price per Mbps Download
Comcast	Internet Essentials (ACP) ⁶⁷	\$9.95	None	50	10	\$0.20
Comcast	Internet Essentials Plus (ACP) ⁶⁸	\$29.95	None	100	10	\$0.30
Comcast	Fast	\$102.00* ⁶⁹	xFi Gateway (router+modem): \$15 xFi Complete (includes upgrade after 3 years): \$25	400	10	\$0.26
Comcast	Superfast	\$107.00*	xFi Gateway (router+modem): \$15 xFi Complete (includes upgrade after 3 years): \$25	800	15	\$0.13
Comcast	Gigabit	\$112.00*	xFi Gateway (router+modem): \$15 xFi Complete (includes upgrade after 3 years): \$25	1000	35	\$0.11
Comcast	Gigabit Extra	\$117.00*	xFi Gateway (router+modem): \$15 xFi Complete (includes upgrade after 3 years): \$25	1200	35	\$0.10

⁶⁷ Comcast Internet Essentials and Internet Essentials Plus are available as part of the Affordable Connectivity Program and only available to households that qualify for the National School Lunch Program, housing assistance, Medicaid, SNAP, and other programs. These households can purchase these plans with or without enrolling in the ACP. If a household has Internet Essentials/Internet Essentials Plus *and* is enrolled in ACP, the price of service will be \$0.

⁶⁸ Ibid.

⁶⁹ The promotional rate requires a 1-year contract.

Provider	Offering Name	Monthly Cost (Internet Only)	Monthly Equip. Cost (N/A if user owns equip.)	Download Speed (Mbps)	Upload Speed (Mbps)	Price per Mbps Download
Starry	Starry Connect ⁷⁰	\$15.00	Router: Included	30	30	\$0.50
Starry	Starry Select (ACP)	\$30.00	Router: Included	100	50	\$0.30
Starry	Starry Plus	\$50.00	Router: Included	200	100	\$0.25
T-Mobile	Wireless Home Internet / Wireless Small Business Internet	\$55 ⁷¹	Gateway (router+modem): Included	5G: 33-182 4G: 30-100	5G: 8-25 4G: 6-23	\$0.30-\$1.67 \$0.55-1.83
T-Mobile	Wireless Home Office Internet / Wireless Business Internet	\$55 ⁷²	Gateway (router+modem): Included	5G: 40-196 4G: 37-119	5G: 10-27 4G: 7-25	\$0.28-\$1.38 \$0.46-\$1.49
Verizon	Internet 3 Mbps	\$59.99 ⁷³	Router: \$18	3	1	\$20.00

⁷⁰ Starry Connect is a low-income offering whereby individual properties are enrolled in the program. See [Starry Connect: Better Internet for More People](#) for more details. Please note that the 30 Mbps is not a “standard” ISP data speed offering; however, it is a stated Starry offering.

⁷¹ Price is \$50 with AutoPay.

⁷² Price is \$50 with Auto Pay for Unlimited plan. Unlimited plans are not available in all areas. Prices range from \$25/month (with AutoPay) for 10GB to \$70/month (with AutoPay) for 300GB. (Source: <https://www.t-mobile.com/business/solutions/business-internet-services/business-internet>)

⁷³ Please note that the stated 3 Mbps Verizon service offering is likely delivered via DSL, if in fact it is still offered by Verizon in the County.

Provider	Offering Name	Monthly Cost (Internet Only)	Monthly Equip. Cost (N/A if user owns equip.)	Download Speed (Mbps)	Upload Speed (Mbps)	Price per Mbps Download
Verizon ⁷⁴	Fios (300 Mbps)	\$59.99 ⁷⁵	Whole-Home Wi-Fi Plus (router, Wi-Fi extender[s]): \$15 Whole-Home Wi-Fi (router, Wi-Fi extender): \$10 Router only: Included	300	300	\$0.20
Verizon	Internet 30 Mbps	\$69.99 ⁷⁶	Router: \$18	30	5	\$2.33
Verizon	Fios (500 Mbps)	\$79.99 ⁷⁷	Whole-Home Wi-Fi Plus (router, Wi-Fi extender[s]): \$15 Whole-Home Wi-Fi (router, Wi-Fi extender): \$10 Router only: Included	500	500	\$0.16
Verizon	Fios (1 Gig)	\$99.99 ⁷⁸	Whole-Home Wi-Fi Plus (router, Wi-Fi extender[s]): \$5 Whole-Home Wi-Fi (router, Wi-Fi extender): Included	940	880	\$0.11

* Standard price does not include autopay and paperless discount (\$10) or promotional discounts.

The pricing table highlights the substantially higher prices for the plans, per Mbps, for the Verizon 3 and 30 Mbps plans. Verizon’s web site does not identify where they are offering DSL or fiber service; however, we believe that, given the locations where Verizon is offering 3 and 30 Mbps plans these are generally

⁷⁴ The ACP offers a \$30/month subsidy for eligible households. On top of that, the Verizon Forward Program is a discount offered by Verizon to customers who are enrolled in the ACP. With ACP and the Verizon Forward Program, customers can get free Internet service for the 300 Mbps Fios Home Internet plan, 5G Home Internet plan or LTE Home Internet Plan. Other plans will be discounted but not free. For more information about prices and discounts, see: <https://www.verizon.com/home/free-verizon-internet/>.

⁷⁵ It is unclear whether this price includes any discounts.

⁷⁶ Ibid.

⁷⁷ Ibid.

⁷⁸ Limited-time multiyear price guarantee for households that have not subscribed to a Verizon Home Internet service in the past 180 days. Price does not include \$10/month autopay and paper-free billing discount. Additional discounts are available for Verizon mobile customers.

DSL-only locations. And, in locations where Verizon presents 300, 500, and gig service, they are not offering the 3 and 30 Mbps plans, and therefore we presume these are fiber locations. As a result, it seems that there is no price premium for Verizon's fiber service, or conversely, there is no discounting of low-speed DSL service. The company does participate in the Affordable Connectivity Program and offers a "free" service as part of the plan, and therefore offers an equivalent \$30 plan for those qualifying for ACP.⁷⁹

3.3.2 Internet Service Affordability

For the housing industry, the County follows the HUD-established metric that sets 30% as the percent of household income applied to housing and utility costs. This national standard establishes the rental rates for tenants in the County's affordable housing complexes. Unlike housing costs, there is no accepted national standard for Internet affordability. National associations have set a threshold of affordable broadband as costing 2% of monthly income, while other organizations have stated that 1% of monthly income should not be exceeded by Internet costs.⁸⁰

To assess Internet affordability, the average Internet affordability threshold – 1.5% of annual median income (AMI) -- was applied to Arlington County's household income. This threshold was applied against the average cost of service⁸¹ to two different levels of service that meet the average bandwidth requirements of households for the Arlington County average of 2.12 residents per household.⁸² For example, service packages delivering 100 Mbps download/20 Mbps upload will support email, VoIP, entertainment streaming, Zoom calls and average file uploads. Figure 15 plots the 1.5% affordability threshold against the cost-of-service package recommended for households of different size.

Notably, broadband prices in the United States have been notoriously difficult to study due to a lack of comprehensive data, assorted fees, and varying price-speed tiered structures.

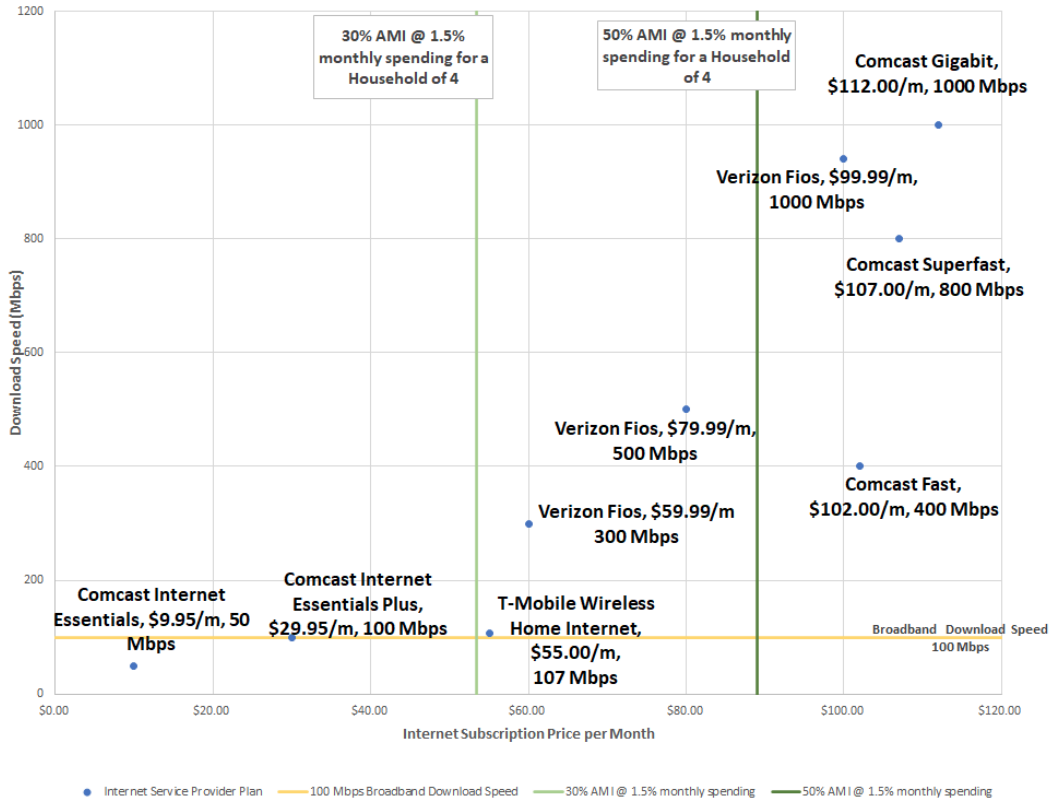
⁷⁹ See [Free Internet with the Verizon Forward Program and ACP | Verizon](#) for more details.

⁸⁰<https://www.nga.org/wp-content/uploads/2021/10/NGA-Broadband-Affordability.pdf>;
<https://a4ai.org/affordable-internet-is-1-for-2/>

⁸¹ Average cost of service was determined through (1) interviews with Arlington County internet service providers and (2) from survey response provided by Arlington County residents as part of information gathered for this report.

⁸² To assess internet affordability households with intensive demand for upload and download speeds and bandwidth requirements were not considered.

Internet Costs and Affordability Thresholds: Download Speeds



Internet Costs and Affordability Thresholds: Upload Speeds

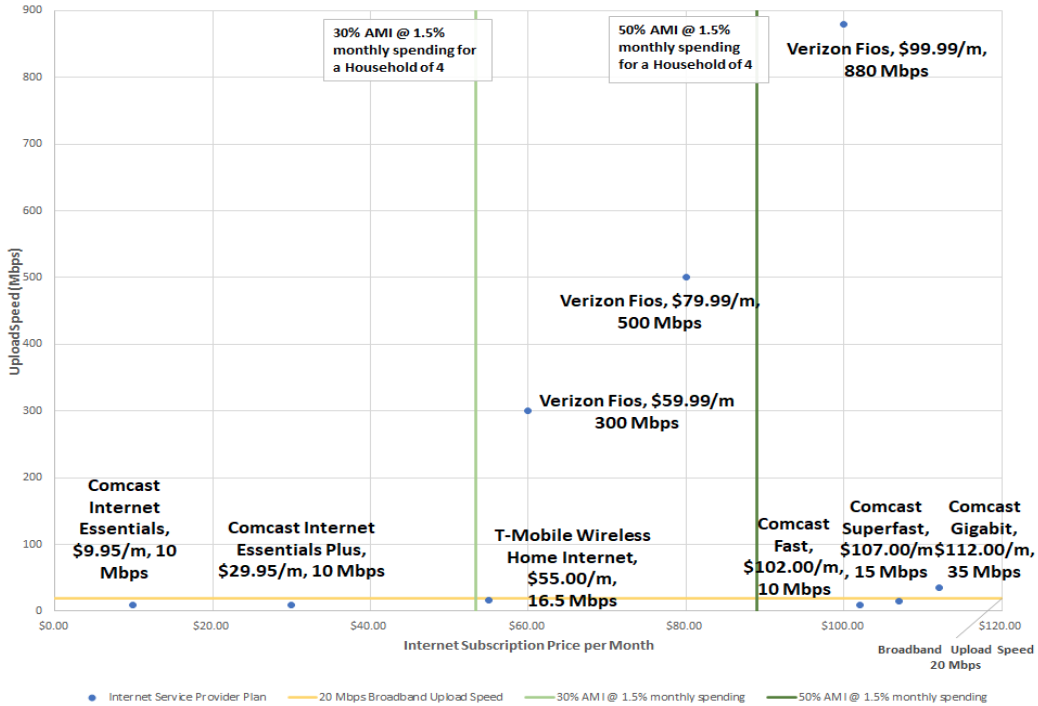


Figure 15: Affordability Threshold by Household Income

Table 6: Income by Household Size⁸³

% of Area Median Income (AMI)	1-person		2-person		4-person		6-person	
	Income	1.5%	Income	1.5%	Income	1.5%	Income	1.5%
100% AMI	\$99,700	\$125	\$113,900	\$142	\$142,300	\$178	\$165,100	\$206
80% AMI	\$79,760	\$100	\$91,120	\$114	\$113,840	\$142	\$132,080	\$165
60% AMI	\$59,820	\$75	\$68,340	\$85	\$85,380	\$107	\$99,060	\$124
50% AMI	\$49,850	\$62	\$56,950	\$71	\$71,150	\$89	\$82,550	\$103
40% AMI	\$39,880	\$50	\$45,560	\$57	\$56,920	\$71	\$66,040	\$83
30% AMI	\$29,910	\$37	\$34,170	\$43	\$42,690	\$53	\$49,530	\$62

3.3.3 Affordability Analysis and What Customers Pay

As part of the eCheckup assessment, household respondents were asked to provide a range of how much they spent on monthly Internet subscriptions. Approximately half (48%) of these respondents reported paying more than \$80 a month for Internet access. The cost that eCheckup respondents are paying for Internet services is higher than the national average of \$64 per month.⁸⁴ While important to note the comparison to national averages, the median household income in Arlington County (\$128,145) is substantially higher than the national median household income (\$69,021),⁸⁵ which contributes to the ability of households to spend more on available Internet services.

⁸³ Source: FY2022 Multifamily Tax Subsidy Income Limits Summary, Washington-Arlington-Alexandria Metro FMR Area; Analysis by Arlington County, CPHD

⁸⁴ Source: "US broadband households ... pay \$64 per month on average for standalone broadband service (in 2021)" – Parks Associates: <https://www.prnewswire.com/news-releases/parks-associates-as-of-q1-2021-41-of-us-broadband-households-have-standalone-broadband-service-paying-an-average-of-64-per-month-301313691.html>

⁸⁵ <https://www.census.gov/quickfacts/fact/table/US,arlingtoncountyvirginia/INC110221>

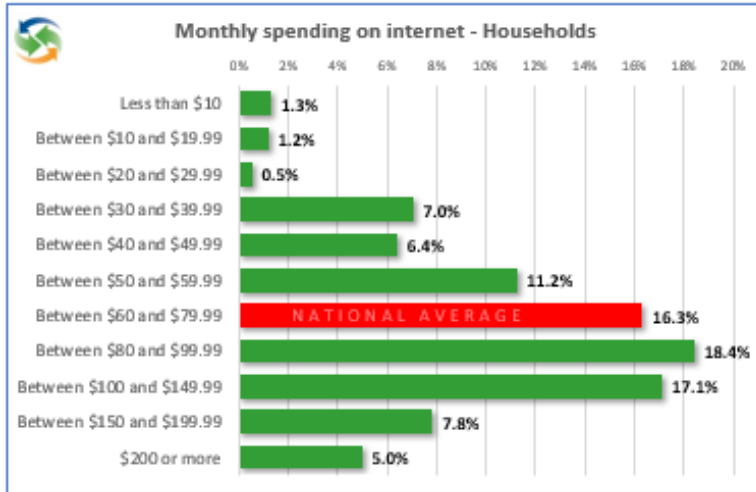
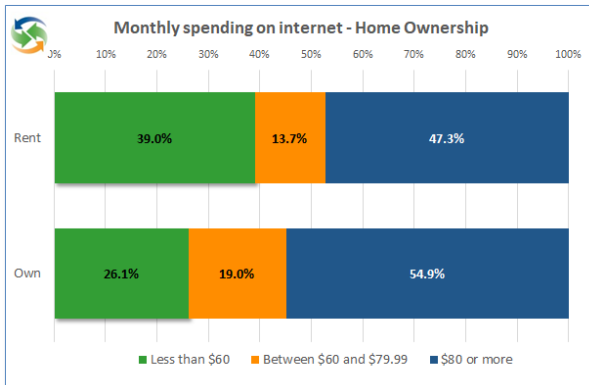


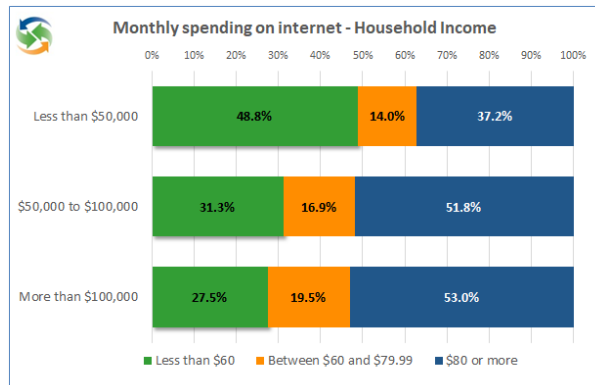
Figure 16: Monthly Spending on Internet – Households

Respondents were also asked to indicate whether they also subscribed to telephone, video, or other packaged services in addition to their Internet subscriptions. This is intended to further verify the packages that respondents are subscribed to at their location. Of those who reported only subscribing to Internet services with no additional package options (321 or 38% of total), 37% are paying \$80 or more per month.⁸⁶

Further analyses per the charts below show that people of color, renters, and low-income households are all paying less-per-month for Internet service than other groups. This could be due to their inability to afford the technology or service level to enhance their online experience as people of color make up an overwhelming number of lower-income households given their overall population in the County.

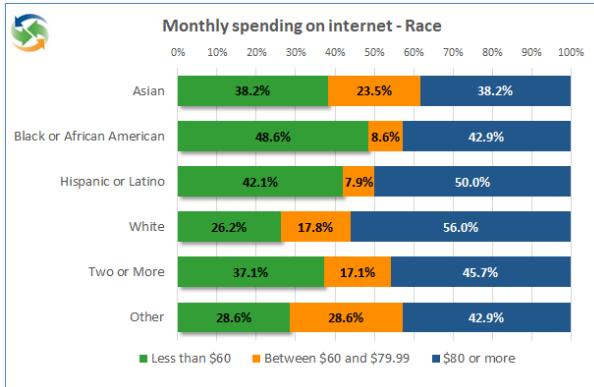


Homeowners are generally paying for higher priced services.

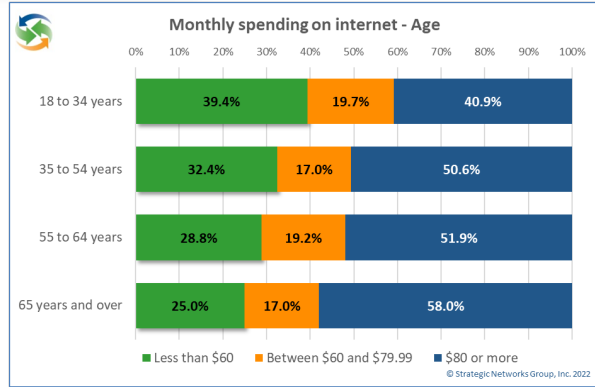


Those with lower incomes are generally paying for lower priced services.

⁸⁶ It is important to note that the higher costs paid by those responding to the eCheckup than the national average could in fact be paying higher costs due to faster data speed services, which could not be directly confirmed by the eCheckup Assessment.




People of Color are generally paying for lower priced services.



Younger households are generally paying for lower priced services.

Figure 17: Monthly Spending on Internet by Home Ownership, Household Income, Race and Age

In addition to federal subsidies and low-cost ISP service packages, a number of more restricted discount service offerings are available to specific demographic groups in Arlington County. For example, some ISPs offer company specific discounts to older adults.⁸⁷ In addition to participating in the ACP, see Section 3.3.1 for low-cost plans offered by Arlington providers. In these circumstances and in an evolving marketplace, it is important for subscribers and stakeholder organizations to engage with targeted groups to keep current on service provider offerings.



KEY FINDINGS

- The price that eCheckup respondents are paying for Internet services is higher than the national average of \$64 per month.
- While overall, Arlington residents can afford higher priced Internet services due to the high median income, there are specific groups who are either unable or unwilling to pay a higher price for Internet service.

⁸⁷ <https://www.hispeedinternet.com/resources/internet-for-seniors> and <https://dailycaring.com/7-sources-of-low-cost-internet-for-seniors/>

3.4 Customer Satisfaction

3.4.1 Customer Service Levels/Quality

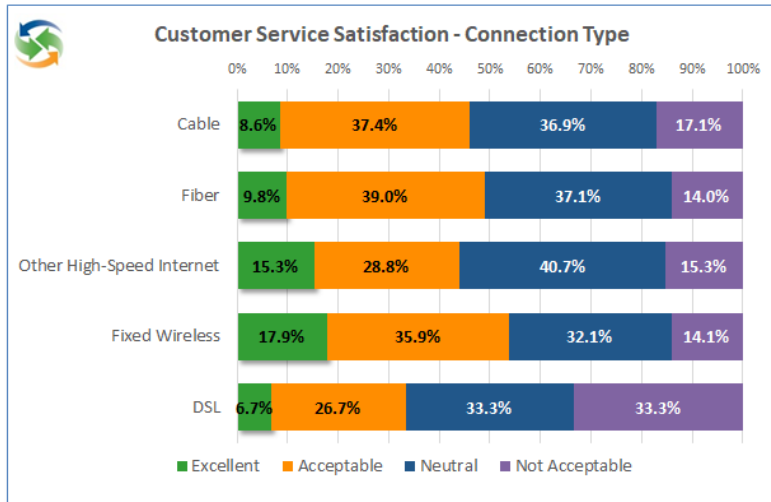


Figure 18: Customer Service Satisfaction by Connection Type

The eCheckup respondents reported a lower satisfaction level with customer service than any other rating category (speed, reliability, and value). This indicates room for improvement from service providers within Arlington County to ameliorate experiences of customers using and considering use of broadband services. When analyzing connection types, as shown in Figure 18, respondents with DSL Internet service reported the lowest levels of “Excellent” and highest levels of “Not Acceptable” customer service from their existing provider. Another

significant factor regarding the customer satisfaction findings was the availability of more than one service provider available according to households. As discussed in Section 3.2.4, 28% of households with one provider stated that customer service was “Not Acceptable” compared to 11% of respondents with two providers. This suggests that an increase in competition could result in improved customer satisfaction ratings for Internet use.

3.4.2 Satisfaction By Housing Affordability and Type

The eCheckup Assessment includes questions regarding 1) satisfaction with data speeds, 2) reliability, and 3) value of broadband service. This section outlines the findings of these three service attributes for housing types (e.g., single-family, multifamily) and by housing affordability.⁸⁸ The following charts highlight the overall percentage of each population that has a positive⁸⁹ perspective related to value, speed, and reliability of their broadband service.

⁸⁸ Affordable housing designation for each eCheckup response with a valid address was determined using Arlington County’s Master Housing Unit Database with three distinct types of affordable housing identified: committed affordable rental housing (all units at the location include affordability restrictions), mixed-income apartments (the location has a mixture of market and affordable housing units), and market rate apartments (a rental location that does not include affordable housing units). Additionally, we report on the findings against all other locations (which largely would be owner occupied residences) as “Other.”

⁸⁹ Positive responses are recorded when the respondent indicated the either of the top two choices from of an overall scale with 4 options. For speed: “Very Fast” and “Fast enough” are positive, while “Neutral” and “Not Fast enough” are negative. Reliability: “Always excellent” and “Very good” are positive and “Occasional Problems” and “Frequent Problems” are negative. Value: “Worth Every penny” and “Acceptable” are positive, “Below expectations” and “Poor value” are negative.

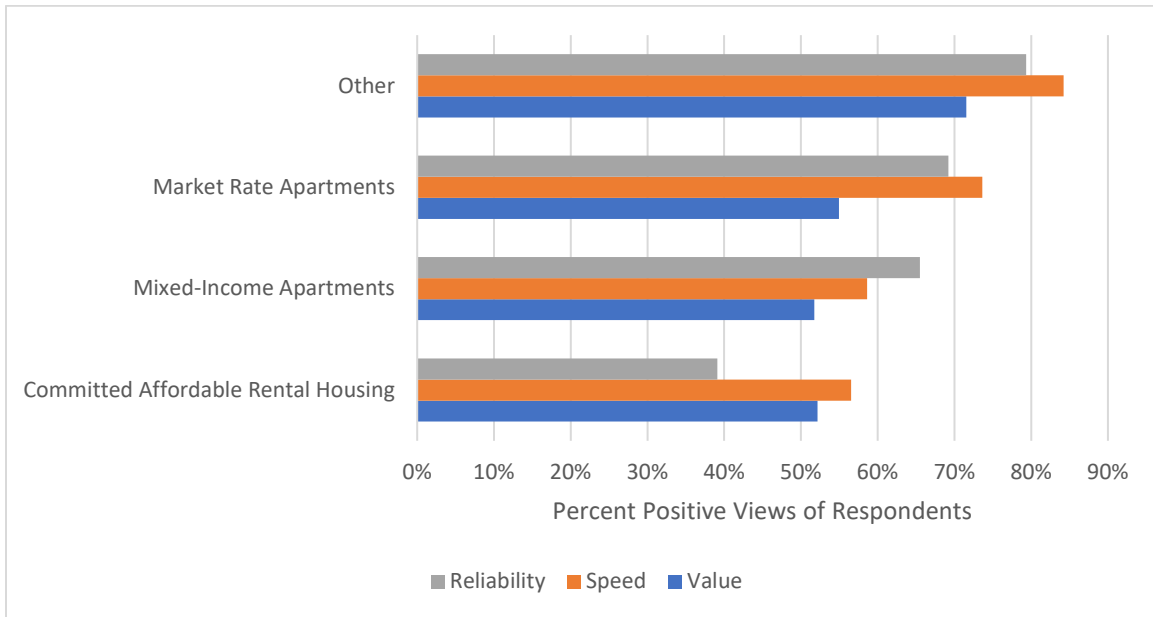


Figure 19: Summary of Satisfaction with Reliability, Speed and Value

The figure makes clear that the respondents who live at committed affordable rental housing facilities report positive views of reliability, speed, and value at far lower rates than non-affordable housing respondents. Again, the “other” category are those locations that are not populated with committed affordable rental housing, mixed-income apartments, or market rate apartment values, and largely represent non-rented properties. In each step towards these “other” locations, the satisfaction level improves. Only 39% of respondents who live at a committed affordable housing facility had a positive view of the reliability for their Internet service compared to 79% of the other category and 69% for market rate apartment locations.

Respondents’ perspectives on data speed also increased by 28% from the committed affordable rental housing to “other” categories. The respondent’s perspectives on the value of their service also increased dramatically with 20% more “other” respondents indicating positive attributions of their Internet service over that of the committed affordable rental housing respondents. It should be noted that most of the respondents who live at a committed affordable rental housing location and provided satisfaction information in the eCheckup had only one service provider at their address. In other words, there were no other competitors at that location. The lack of competition could be a contributing factor to the lack of service satisfaction; however, it could be associated with other underlying factors including but not limited to poor Wi-Fi service, digital literacy issues, insufficient data plan subscriptions, and others.

There were no clear patterns of satisfaction represented in the eCheckup responses according to the residential structure type.

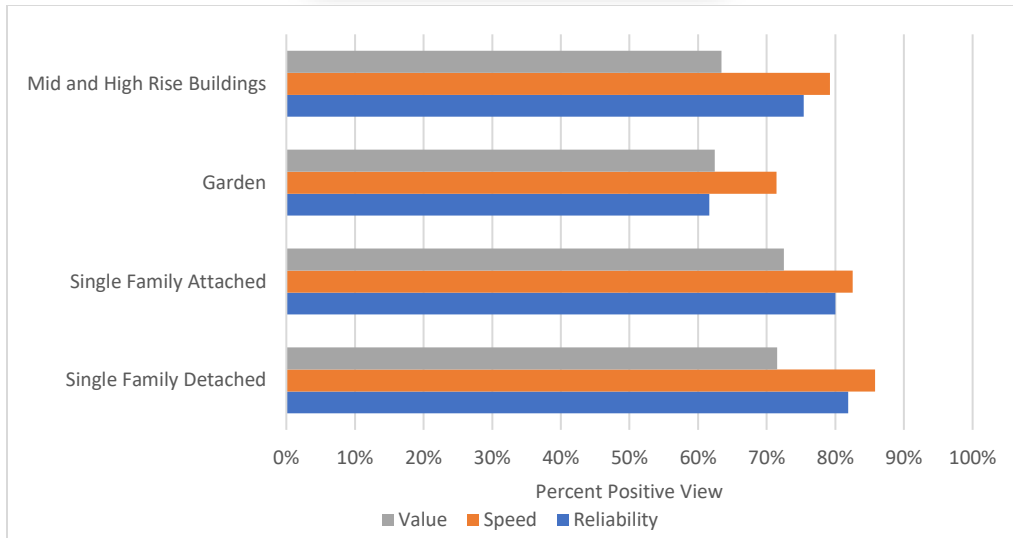


Figure 20: Overall Positive View by Residential Building Type

The figure further underscores that most respondents had a positive view of their service regarding value, speed, and reliability. The single family attached and detached locations had slightly better satisfaction along these metrics. Garden respondents had the lowest satisfaction ratios among all structure classes, but their speed and value satisfaction were not as substantially below (roughly 10% to 14%) the single-family classes as their reliability views (roughly 20% below). In fact, garden respondents were 14% less likely than mid- and high-rise respondents to view their reliability positively.

We note that the services available in garden units are no more likely to have inferior service based on FCC data. The reasons for garden respondent dissatisfaction are not known. It could be that the ISP infrastructure at garden apartments is older and less reliable. Or it could also be the case that Wi-Fi interference among the units is more prevalent. It may be that the age of the structure for many of these respondents could impact these resident's ability to deploy more Wi-Fi access points (no inside wiring, or difficult to add wireless access points), or the construction of their residential units could impede Wi-Fi signals. It is possible that garden respondents themselves are more likely to have older equipment that may not utilize the most recent advances in Wi-Fi technology. It could also be that there is selection bias, whereby garden respondents were more likely to respond if they had a more negative view of their service than other respondent classes for some reason.

The respondents did not share the details regarding their dissatisfaction, and therefore, we do not know the causes of the dissatisfaction. It is possible that some combination of the above suppositions, or an entirely different factor that was not disclosed to the project team could be the cause.



KEY FINDINGS

- Renters had a more negative perception of their Internet service's reliability and value than owners.
- Participants in the study had a more positive view on data speeds than reliability and value and had the least positive view on value.
- Respondents who lived in committed affordable rental housing report positive views of reliability, speed, and value at far lower rates than non-affordable housing respondents.

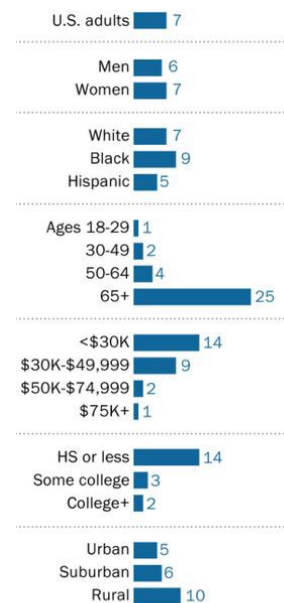
3.5 Internet Subscriptions

According to nation-wide research conducted by PEW, Americans who are not online tend to be older age, lower income, and less educated than those who say they use the Internet.⁹⁰ Of those respondents to the eCheckup Assessment who indicated “No Internet” service connection at their household, all were in the low-income (less than \$50,000 annually) and minority demographic groups. Black or African American and Hispanic groups were the least likely to report using a fiber Internet connection within their household by nearly a 30% differential compared to other groups. Black or African American and Hispanic or Latino households reported 19% subscribing to fiber Internet connectivity, compared to 47% Asian and 51% in White households. Additionally, homeownership was a significant factor in determining the type of Internet connection that a household might have, with 56% of those respondents who own a house reporting fiber Internet connections, compared to 25% of renters. While individual addresses may be in areas considered served based on the FCC data, households have reported via the eCheckup that they vary in satisfaction with their Internet speed, reliability, or service.

Recognizing that there may be more than one reason why people do not use the Internet, the cost of service emerges as the most common factor, and likely presents additional reasoning for not having a computer in the home or other Internet access device.^{91,92} According to the U. S. census, over 6% of Arlington households do not have an Internet subscription. 93.4% of households have a broadband subscription of any type. 85.3% of households are connected with a broadband subscription such as cable, fiber, or DSL. 6.7% of households have a cellular data plan with no other type of internet subscription. Additionally, over 3% of households do not own a computer (including desktops, laptops, smartphones,

Who's not online?

% of U.S. adults who say they do not use the internet



Note: White and Black adults include those who report being only one race and are not Hispanic. Hispanics are of any race. Respondents who did not give an answer are not shown.

Source: Survey of U.S. adults conducted Jan. 25-Feb. 8, 2021.

PEW RESEARCH CENTER

⁹⁰ <https://www.pewresearch.org/fact-tank/2021/04/02/7-of-americans-dont-use-the-internet-who-are-they/>

⁹¹ Twenty-four percent (24%) of households earning less than \$30,000 do not have a smart phone and 40% do not have a computer. <https://ntia.gov/blog/2022/switched-why-are-one-five-us-households-not-online>

⁹² https://digitalinclusion.org/wp-content/uploads/2020/02/Horrigan_Measuring-the-Gap-v1.1.pdf

tablets or other portable wireless devices) and another 3% of households use a smartphone or tablet with no other computing device,⁹³ which may not be optimal for telework or other video streaming functions.

Additionally, a lack of interest or perceived lack of relevance was cited by another large share of nonadopters. Lack of digital readiness – understanding how and why to use the Internet is another important factor. Non-adoption is strongly connected to age, educational attainment, and household income (see Table 7). When these factors are held constant, there is no statistically significant difference in Internet adoptions among different racial and ethnic groups.⁹⁴

Working with the demographic profile of Arlington County and national data on broadband gaps for specific target populations, it is possible to develop a realistic estimate of the number of residents and households in various segments of Arlington County’s demographic groups that would benefit from targeted digital inclusion efforts. To derive estimates of the nature and scale of the digital inclusion gaps in the County, Table 7 profiles the County’s population demographics for groups that research has consistently identified as digitally marginalized. This data is benchmarked against data on their relative Internet adoption rates and/or need for digital literacy and capacity building efforts. Note that sources for these data use the information provided on Arlington County’s Race and Ethnicity Dashboard⁹⁵ wherever possible, updated for the 2017-2021 latest U.S. Census⁹⁶ and the Pew Broadband Project.

Table 7: Demographics of Digital Inclusion Challenges in Arlington County⁹⁷

Digital Inclusion Impacted resident types	% Arlington County (Population or Households)	Arlington County Factor (Population or Households)	Estimated % Needing Digital Inclusion Interventions ⁹⁸	Potential Digital Inclusion Targets in Arlington County
ACP eligible households (<\$35,000 annual income⁹⁹)	15.9%	17,430	100%	17,430
Lack of Household English Proficiency	10.6%	11,610	100%	11,610

⁹³ U.S. Census Bureau ACS 5-year estimate: [S2801](#)

⁹⁴ <https://www.pewresearch.org/fact-tank/2021/04/02/7-of-americans-dont-use-the-internet-who-are-they/>

⁹⁵ <https://app.powerbi.com/view?r=eyJrIjoiTnkY2M5NzAtYjdlZC00YmI0LTk3ODUtMjEwMzY0MWE5IiwidCI6IjgwMzU0ODA0LTZmZGYtNDI4ZS05ZjVmLTUwOTFIOTk0Y2Y1NCIsImMiOiJF9>

⁹⁶ U.S. Census Bureau ACS 1-year estimate: [B28010](#)

⁹⁷ Source for all data sets is the 2021 U.S. Census American Community Survey (1-year estimates) with links to specific census reports embedded in the title for each data category.

⁹⁸ Percentages noted in this column reflect the estimated proportion of each demographic group that does not subscribe to broadband and/or does not have an appropriate device in their homes. To illustrate, Blacks and African Americans comprise 10.3% of the Arlington County households. Of these it is estimated that 30% do not subscribe to broadband and/or do not have a device at home, resulting in an estimated 7,200 black and African American households that would benefit from digital inclusion efforts. See other footnotes for references regarding individual percentages in each row.

⁹⁹ This household income figure is approximately 200% of U.S. poverty level, thus qualifying the Affordable Connectivity Plan broadband subsidy.

Digital Inclusion Impacted resident types	% Arlington County (Population or Households)	Arlington County Factor (Population or Households)	Estimated % Needing Digital Inclusion Interventions ⁹⁸	Potential Digital Inclusion Targets in Arlington County
No Bachelor's Degree¹⁰⁰	20.3%	47,292	17%	8,040
Black/African American¹⁰¹	10.3%	23,995	30% ¹⁰²	7,200
Hispanic¹⁰³	15.6%	36,343	34% ¹⁰⁴	12,360
Asian	11.1%	25,829	26% ¹⁰⁵	6,660
Individuals with a disability	6.1%	14,211	24% ¹⁰⁶	3,410
Adults older than 65	11.6%	27,024	25% ¹⁰⁷	6,760
Households' w/o Internet Subscription¹⁰⁸	3.3%	3,614	100%	3,620
Households' w/o Computers or smart phones for access¹⁰⁹	1.9%	2,104	100%	2,080

¹⁰⁰ [No Bachelor's Degree](#)

¹⁰¹ [Black/African](#)

¹⁰² See [Black, Hispanic adults less likely to have broadband or traditional PC than White adults | Pew Research Center](#) for more details. Figure represents the percentage that lack computers and home broadband.

¹⁰³ [Hispanic](#)

¹⁰⁴ Ibid

¹⁰⁵ See <https://www.statista.com/statistics/368596/us-online-access-householder-race-hispanic/>

¹⁰⁶ U.S. Department of Labor (2022) <https://www.dol.gov/sites/dolgov/files/ODEP/pdf/disability-digital-divide-brief.pdf>

¹⁰⁷ See [Share of tech users among Americans 65 and older grew in past decade | Pew Research Center](#) for more details.

¹⁰⁸ See [ACS Computer Use 2021 1 Year Estimates](#)

¹⁰⁹ The U.S. Census Bureau (Dec. 2021)_1-Year Estimate see [Data.Census.Gov](#) for more details.



4

RACIAL EQUITY ANALYSIS

A high degree of racial and ethnic diversity characterizes Arlington County, where almost 25% of residents were born outside of the U.S. and more than 115 languages are spoken in the homes of local students. In September 2019, the County Board made tangible its commitment to realizing the vision of an equitable Arlington where all are valued, educated, healthy and safe regardless of race with the adoption of an Equity Resolution that directs attention to racial equity as a matter of practice and practical application in Arlington.¹¹⁰ The path to achieving this vision requires equitable access to resources and closing race-based outcome gaps so race does not predict one's success while improving outcomes for everyone. The Board established a formal office to oversee related efforts and published a Race and Ethnic Diversity Dashboard¹¹¹ as a tool to monitor progress and staff in various County divisions have begun the process of using racial equity tool/lens to inform strategies around policy and decisions. These efforts underscore the recognition that diversity can be a strong asset for improving individual and collective quality of life for people of all races and incomes.

¹¹⁰Realizing Arlington's Commitment to Equity <https://www.arlingtonva.us/Government/Topics/Equity>

¹¹¹<https://www.arlingtonva.us/Government/Projects/Data-Research/Demographics/Race-Ethnicity-Dashboard/Arlington%E2%80%99s-Race-and-Ethnicity-Dashboard>

Racial and social equity considerations are being integrated across the Arlington County government enterprise plans, budgets, and programmatic initiatives. Digital Equity was cited as one of several initiatives that could be built upon to address disparities, reflecting the recognition that racial and digital equity are inextricably linked. Because broadband’s applications are so wide ranging, it can deliver services that touch every social determinant of health, economic stability, education, social supports, and civic agency. It is so essential and influential in society that the FCC has deemed it a critical social determinant of health (SDOH), meaning that affordable subscription prices, universal access to connected devices, and a population with digital skills are now vital characteristics of a healthy neighborhood, city, state, or country.¹¹² When any segment of the population is excluded from full participation in economic, social, educational and healthcare opportunities accessible over digital platforms digital inequities become potentially crippling barriers to progress, both for the excluded individuals and their broader communities.

The Arlington County Racial Equity Dashboard explicitly recognizes the link between racial and digital equity in the inclusion of computer ownership as one of the metrics tracked but that is only a partial measure. A complete assessment of the state of digital equity must consider whether adequate broadband is universally available and that all Arlingtonians have the devices and skills needed to take advantage of the many benefits that broadband can deliver. **Racial equity cannot be achieved in the absence of digital equity.**

The 2019 Equity Resolution calls for the County to consider the following questions when making decisions related to budget, capital improvement plans, and other initiatives:

1. Who benefits?
2. Who’s burdened?
3. Who’s missing?
4. How do we know?
5. What do/did we do?

The Internet increasingly defines one’s ability to access educational and healthcare resources, to be engaged in civic, social and faith activities, to seek employment, start businesses, and obtain needed services. A strong and growing case can be made that full participation in modern life demands that everyone has access to high quality, affordable broadband and the skills and equipment needed to fully utilize it. The corollary to this statement is that anyone who lacks such access and skills will be increasingly burdened by their digital exclusion. In Arlington County, as elsewhere, this digital divide disproportionately impacts people of color. Bridging this divide requires a thorough examination of who is at risk, what has been done and what challenges remain to be resolved. The answers to these questions are woven throughout the discussion presented in this section.

4.1 Building on Previous Efforts

The current focus on digital equity is advantaged by previous efforts to define and address the digital divide in Arlington County, which are detailed in *Section 5* of this report. Coincident with the adoption of the Equity Resolution, the County, led by the Department of Technology Services, embarked on a strategic planning process in September 2019 to develop a policy framework built upon and innovating around the County’s previous digital equity efforts. Prior to 2019, efforts around digital inclusion were proactive but overall uncoordinated, stand alone, and not part of a formal strategy to address digital inequities

¹¹² <https://www.fcc.gov/health/SDOH>

holistically. The government’s efforts largely focused on gaps in infrastructure availability, including the establishment of limited free Wi-Fi locations; libraries real, but modest, resources provided public access and one-off digital literacy training and technical assistance; and a few non-profits provided access, training and/or technical assistance that operated on small scales and targeted specific population segments. This is not to say these individual initiatives were insignificant. Between 2017 and 2022, the Housing Division invested \$250,000 from its community development fund to organizations that provide various digital inclusion resources and opportunities to residents.¹¹³ In addition, affordable housing property managers are increasingly incorporating digital inclusion resources to residents at their properties. Arlington’s local housing trust fund plays a major role contributing to the development and sustainability of affordable housing and has indirectly enabled digital inclusion initiatives and opportunities at these properties.

The digital equity planning effort employed by Arlington County in 2019 was important to elevating digital inclusion to a more comprehensive level. It reflected a strategy and processes recognized by the National Digital Inclusion Association and NTIA as best practices in that it: addressed all vital determinants of digital equity (availability, access, and adoption); sought direct and diverse input through stakeholder engagement and needs assessment from the broad digital inclusion ecosystem; and refined emerging strategies for action through public presentation of findings and plans. Multiple departments across the Arlington County government enterprise and external groups with vested interests in promoting digital equity solutions for the Arlington County community, including local community-based organizations and advocates from the County’s diverse ethnic and racial communities were brought together to form the Digital Inclusion Network that began the work to more comprehensively characterize the digital divide in Arlington County and identify digital inclusion challenges and opportunities. Participants in this effort included the following:

- **Core Staff Group:** representatives from the Department of Community Planning, Housing and Development (CPHD), the Department of Technology Services (DTS), the Department of Human Services (DHS), Arlington Public Library, and the Department of Parks and Recreation (DPR).
- **Other County Agencies:** Arlington Economic Development (AED), Arlington Employment Center (AEC), Office of Emergency Management (OEM), Arlington Fire Department (AFD), and Arlington Public Schools (APS)
- **Digital Inclusion Network:** an opt-in group of ISPs, community leaders who provided input from residents with limited English proficiency, older adults, persons with disabilities, and racial minorities.

The Covid-19 pandemic and its echoes intervened with completion of this planning process and implementation of the resulting action plan, which none-the-less provides highly valuable benchmarking information and important insights into the racial and ethnic divide that shapes digital equity challenges that persist in Arlington County today. Importantly, the Pandemic deepened the depth and consequences of the County’s digital divide as it accelerated the transition to a more-fully digital economy and society as essential components of everyday life, as education, employment, and healthcare moved to online systems.¹¹⁴ Communities of color are disproportionately impacted by both the digital divide and negative

¹¹³ See the *Section 5.2* for a full list of projects.

¹¹⁴ National Urban League, https://nul.org/sites/default/files/2021-04/NUL%20LL%20DEIA%20041421%20Latimer%20Plan_vFINAL_1136AM.pdf

consequences of the Pandemic,^{115,116} a correlation that underscores the importance of digital equity as a means of improving racial equity.

4.2 Who Benefits from Broadband and the Burdens of Digital Exclusion

The pillars of digital equity are broadband availability, access, adoption, and application (e.g., telemedicine, job searches and virtual education). These elements provide a framework for addressing the digital-racial equity relationship in Arlington County by understanding who benefits, who is burdened and who is missing with respect to each of these pillars. Implicit in the pervasive influence that broadband imposes on all aspects of modern life is the reality that individuals and communities with the best connectivity and digital skills have significant advantages over non-adopters.

So why is everyone not connecting and using the Internet? Support from multiple assessments conducted over years and populations provides a macro explanation that can be used to contextualize the digital divide in Arlington County. Data for the U.S. and for the Commonwealth of Virginia converge to categorize the challenges defining digital inclusion. Affordability consistently emerges as the primary reason cited by almost two-thirds of unconnected households in both the U.S. and Virginia as why they do not have broadband. The near ubiquitous availability of broadband in Arlington County largely removes that as an explanation for households not being connected. The unconnected in Arlington County, as in Virginia and the U.S., are disproportionately represented by poor and BIPOC¹¹⁷ households.¹¹⁸

The relationship between household income level and broadband subscriptions is direct; people with lower incomes do not use the Internet less but they do subscribe for home service at significantly lower rates, paying instead in commuting times, inconvenience, and inability to fully benefit from the resources available online. Thus, free, publicly available Wi-Fi and devices are not cost-free to residents. Affordability challenges disproportionately impact Arlington’s BIPOC households where the proportion with annual household incomes below \$50,000 is two-three times that of White households.¹¹⁹ Initiatives that address broadband affordability challenges in Arlington County will directly and positively impact racial equity goals.

The affordability challenge is being addressed in part through a portfolio of initiatives targeting eligible low-income households sponsored by individual Internet service providers and through two federal programs (Lifeline and ACP, discussed elsewhere in this study). These programs are needed but there are limits to their impact in Arlington County, where uptake levels significantly lag state and national rates. The large number of languages spoken complicates the outreach needed to increase awareness of the subsidies and eligibility criteria fixed at 200% of the poverty level that does make allowances for communities with higher-than-average cost of living. Some efforts, such as ACP are currently time limited, offering a band-aid approach to a chronic problem.

¹¹⁵ <https://pubmed.ncbi.nlm.nih.gov/32562416/>

¹¹⁶ https://www.dbresearch.com/PROD/RPS_EN-PROD/PROD000000000511664/America%27s Racial Gap %26 Big Tech%27s Closing Window.PDF;REWEBJSESIONID=D105D2BA323A37DC40DCDAD48CFCC3BB

¹¹⁷ BIPOC is an acronym standing for non-White “Black Indigenous and People of Color.”

¹¹⁸ Education Super Highway https://www.educationsuperhighway.org/wp-content/uploads/NoHomeLeftOffline_Infographic_Virginia.pdf

¹¹⁹ <https://www.arlingtonva.us/Government/Projects/Data-Research/Demographics/Race-Ethnicity-Dashboard>

All residents of Arlington County benefit, either directly or indirectly, from what is the essentially ubiquitous broadband availability (*Section 3.2*) that empowers the County’s favorable rates of broadband subscription and computer ownership relative to the State of Virginia and the U.S. (Table 8).

Table 8: Broadband Availability and Uptake¹²⁰

	Broadband Subscriptions	Households with Computers
Arlington County	93.1%	96.6%
Virginia	87.6%	93.4%
U.S.	87.0%	93.1%

These impressive statistics obscure differences in rates of subscription and whether a household has an access device and its type, which vary by race and ethnicity, although not in a manner that is straightforward. The compounding impact of other factors on race and ethnicity contribute to the digital divide that disproportionately impacts people of color and other marginalized populations. Population segments with the lower broadband adoption rates are Blacks, Hispanics and other People of Color, individuals with low educational attainment, lower household income, older adults, and persons with disabilities.¹²¹ The impact of income and educational attainment on broadband adoption are especially strong and revealing of the complicated interplay of factors on digital exclusion.^{122,123}

Applying a race and ethnicity lens to key metrics that correlate with low broadband adoption rates suggests the scale of digital inequalities in Arlington County (Table 9). With limited exceptions, BIPOC residents and households in Arlington County are disproportionately impacted by factors contributing to digital inequities. Note that Asians in Arlington County have educational attainment and computer ownership rates that, while lower than White households, exceed the County average.

Table 9: Arlington County Digital Equity Metrics

	% Pop.	Population % w/o Computer	Population % w/o Broadband	% Un-Employment	% Poverty	% < than BA/BS	Percent Households Limited English	Population % with Disability
Arlington County	100.0	3.4	5.3	2.9	7.9	23.7	8.0	3.7
White	58.5	1.6	3.4	2.2	4.1	17.5	4.6	6.1
Black/African American	8.5	5.8	10.5	5.0	12.0	49.8	5.9	10.1
Asian	11.4	1.5	5.7	3.9	12.2	22.5	20.3	4.7
Multi-Racial/ Combined	5.9	3.4	11.3	3.5	10.6	53.4	23.0	7.7
Hispanic/Latino	15.7	4.2	11.5	4.1	10.4	55.3	25.3	5.3

¹²⁰U.S. Census ACS 2021 <https://www.census.gov/programs-surveys/acs>

¹²¹ NTIA <https://broadbandusa.ntia.doc.gov/node/7382>

¹²² Differences in internet use by White and Black populations disappear when income and educational attainment are held constant. <https://www.pewresearch.org/internet/2014/01/06/african-americans-and-technology-use/>

¹²³ <https://www.pewresearch.org/internet/2014/01/06/african-americans-and-technology-use/>

So, while broadband is widely present across the County there are perceived differences in satisfaction as reported by respondents to the 2022 eCheckup. Using Internet speed as an important measure of broadband quality and value, BIPOC households, and/or those reporting lower incomes in Arlington County, are less satisfied with the service they can access. Part of the explanation for the lower levels of satisfaction expressed by Black and Hispanic respondents may lie in the finding that they are disproportionately smartphone dependent for Internet access. Across the U.S., smartphone ownership across the three demographic groups does not differ (at approximately 80%), but the relative level of dependence on these devices does: only 10% of White smartphone owners depend on it exclusively, compared to 23% of Hispanics and 19% of Blacks. In Arlington County overall almost 10% of households either do not subscribe to broadband (3.3%) or depend exclusively on cellular mobile service (6%).¹²⁴ It is suggested that this may help explain why broadband subscription rates for these BIPOC populations lags that of White populations.¹²⁵

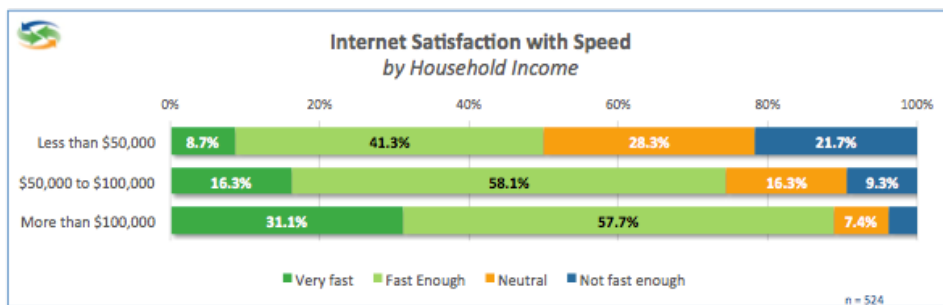


Figure 21: Internet Satisfaction with Speed by Household Income

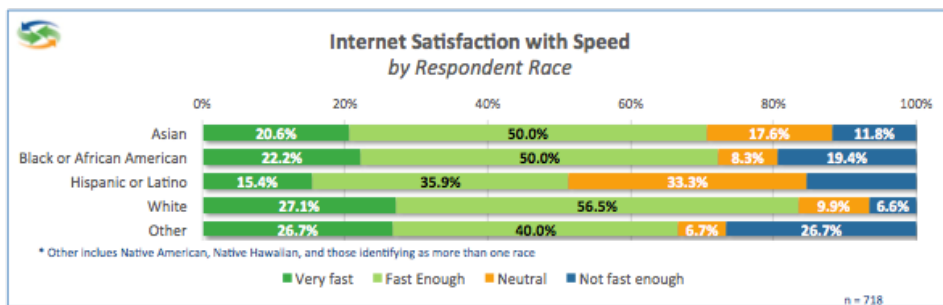


Figure 22: Internet Satisfaction with Speed by Respondent Race

¹²⁴https://data.census.gov/table?q=internet+subscriptions+in+arlington+county+VA&g=040XX00US51_050XX00US51013&d=ACS+1-Year+Estimates+Subject+Tables&tid=ACST1Y2021.S2801

¹²⁵ <https://www.pewresearch.org/hispanic/2016/07/20/3-hispanics-and-mobile-access-to-the-internet/>

Central to digital inclusion is the availability of appropriate devices to access the Internet. The meaning of “appropriate” can vary, depending on who is using it and for what purpose. While smartphones are adequate for basic emails and browsing, they may not support more sophisticated uses such as completing online applications or interactive education and telemedicine applications that may require uploading large data files. Less expensive web-centric Chrome Books and tablet computers can meet the needs of most students, but visual impairments and reduced dexterity make laptops and personal computers better choices for many older adults, while individuals with disabilities may require assistive devices and applications customized to their challenges (for example, text-to-speech for visually impaired users, or speech recognition for users with limited mobility).

Exclusive dependence on smart phones varies by race and ethnic group:

Whites 10%
Blacks 19%
Hispanics 23%

Source: Pew Research
<https://www.pewresearch.org/fact-tank/2021/07/16/home-broadband-adoption-computer-ownership-vary-by-race-ethnicity-in-the-u-s/>

Arlingtonians are becoming more connected as broadband subscription rates and computer ownership (inclusive of all access device types) are trending higher for all demographic groups. According to the latest U.S. Census estimate (2021) 96.8% of Arlington County households subscribe to broadband and 97.1% have a computer. BIPOC households continue to lag their White counterparts on both measures of digital readiness.

Table 10: Percent of Households without Internet or Computers¹²⁶

	No Internet		No Computer ¹²⁷	
	2015	2021	2015	2021
Arlington County	4.6%	3.2%	5.1%	2.9%
White (alone)	1.8%	1.8%	2.9%	1.6%
Black and African American	15.1%	6.0%	10.5%	6.2%
Asian	4.7%	3.6%	5.1%	2.3%
Other¹²⁸	20.8%	8.7%	14.9%	6.1%
Hispanic (any race)	7.0%	7.4%	11.4%	6.5%

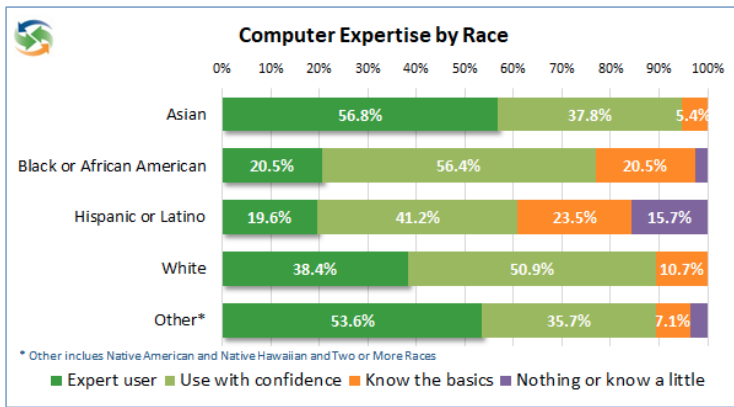


Figure 23: Computer Expertise by Race

Individuals with few, or no, digital skills are increasingly burdened as all aspects of modern life are transacted over the Internet. The eCheckup identified differences in the digital literacy needs of BIPOC individuals in Arlington County. Hispanic or Latino respondents are particularly digitally challenged.

Americans are increasingly concerned about online security and privacy at a time when data breaches, cybersecurity incidents, and controversies over the privacy of online services have become

more prominent, causing some to limit their online activity.¹²⁹ Such concerns may be amplified in the BIPOC community as they are disproportionately at risk for cybercrimes, experiencing attacks that are more frequent and damaging. BIPOC people have a 12% greater chance of experiencing some sort of financial damage as a result of a cybercrime incident, and are 6% more likely to have their identities stolen,

¹²⁶ Source: 2015

<https://data.census.gov/table?q=arlington+county+boradnbad+subscriptions+2015&tid=ACST1Y2015.S2802> and 2021 <https://data.census.gov/table?q=arlington+county+boradnbad+subscriptions+>

¹²⁷ Computer in this context encompasses desktop, laptop, smart phones, tablets or other wireless computers.

https://www2.census.gov/programs-surveys/acs/tech_docs/subject_definitions/2020_ACSSubjectDefinitions.pdf

¹²⁸This report utilizes definitions established for the Arlington County Demographic Dashboard detailed demographic summaries derived from 2021 American Community Survey Data. For reliability purposes, American Indian or Alaskan Native, Native Hawaiian or Other Pacific Islander, Other, and Two or More Races are combined and represented as “Other.” Due to changes in the U.S. Census in definitions and categorization of responses related to ethnicity the direct comparison of changes in computer ownership and internet subscription rates between 2015 and 2020 may not be reliable.

¹²⁹ <https://ntia.gov/blog/lack-trust-internet-privacy-and-security-may-deter-economic-and-other-online-activities>

leading to their reporting feelings of being less safe and private online than White respondents.¹³⁰ It is important that digital literacy training targeting these communities deliver programming on safe online practices.

More than 10% of unconnected households indicate that they “are not interested” in acquiring Internet access and/or computers, largely because they do not believe it is necessary or relevant to their lives. This is a particularly unfortunate attitude for minority and ethnic individuals who are negatively and disproportionately affected by problems that can be significantly ameliorated by information, tools and resources available online. Two examples; related to health and employment, follow.

Racism has a profound and pervasively negative impact on the health and life expectancy of BIPOC communities that experience higher rates of illness and death across a wide range of health conditions when compared to White counterparts. Broadband increasingly serves as a gatekeeper to social determinants of health (where one lives, works, learns and plays). Through telehealth, broadband provides more immediate and direct access to health services and information. Digital equity is inextricably linked to health equity, arguing for considering broadband a *super* determinant of health.¹³¹

In terms of economic benefits, home broadband subscriptions can deliver substantial benefits for low-income families navigating the labor market in the digital era. Broadband makes it easier for job seekers to search for jobs, apply for them, and to keep looking for longer. Low-cost services/subsidies of \$9.95 (e.g., Comcast Internet Essentials) which is widely available in Arlington County has been shown to empower higher home subscriptions and increase the probability of being employed by more than 14% and add more than \$2,000 to household income.¹³² The positive impact resulting from increasing broadband access and adoption in larger cities on employability and income for low-skilled workers (who presumably have lower educational attainment)¹³³ encourages such efforts in Arlington County where BIPOC communities are disproportionately burdened with those challenges.

¹³⁰ <https://www.cpomagazine.com/cyber-security/disadvantaged-groups-more-likely-to-experience-cybercrime-experience-disproportionately-damaging-results/>

¹³¹ <https://www.cdc.gov/minorityhealth/racism-disparities/index.html>

¹³² http://econweb.umd.edu/~zuo/files/Broadband_Zuo_AEJ_Submit.pdf

¹³³

<https://www.sciencedirect.com/science/article/pii/S0736585321001714#:~:text=Overall%2C%20no%20significant%20effect%20of,income%20or%20the%20unemployment%20rate>

CLOSING NOTE ON “EQUITY” MORE BROADLY UNDERSTOOD

Without a coordinated approach, agencies will continue to solve disparate pieces of the problem, leaving holes in otherwise-potent efforts to close the gaps.

Source: National Urban League Digital Equity and Inclusion Plan. <https://nul.org/program/lewis-latimer-plan>

Moving forward, the country’s public officials and their private and civic sector peers face a critical choice. If broadband is essential infrastructure, then regulation and public policy should support every person having equitable access to broadband and the skills necessary to use it. Successful digital inclusion requires meeting people where they are, in communities defined by color and ethnicity but also by ability, education, income, and age. It is only through achieving digital equity that racial equity may be achieved.



5

DIGITAL INCLUSION IN ARLINGTON

The digital divide is the gap between those who have affordable access, skills, and support to effectively engage online and those who do not. The divide prevents equal participation and opportunity to participate in the various benefits of broadband utilization, and disproportionately affects people of color, Indigenous people, households with low income, people with disabilities, older adults, and those who do not speak English as a first language.

In broad terms, **digital equity** is the “what” that a community aims to achieve by having equal access to broadband services and support. Digital equity is necessary for civic and cultural participation, employment, lifelong learning, and access to essential services. **Digital inclusion** refers to the “how” a community can achieve results that help bridge the digital divide. The core elements to working towards digital inclusion include affordable, robust broadband Internet service availability; Internet-enabled devices that meet the needs of all users; access to digital literacy training, quality technical support, and applications; and online content designed to enable and encourage self-sufficiency, participation, and collaboration.

Arlington’s vision states that “All Arlingtonians will have the information technology capacity needed to fully participate in the community and economy.”

This report will detail recent efforts by the County and community stakeholders to employ these principles working towards digital equity and focus on aspects that can realize impactful results in bridging the digital divide. The gaps that exist are examined in this report, focusing on demographic and economic issues that play a part in limiting the capability and awareness of quality-of-life benefits that being online can offer individuals, households and businesses. By knowing where the gaps remain in the community and recognizing the efforts through County engagement and ongoing organizational outreach, a blueprint begins to emerge in how to support those who have been left out of the new digital age and reap the benefits of having a conclusive, equitable community.

5.1 Historical Overview of Arlington’s Digital Equity Work

The following is a brief historical synopsis of Arlington County’s policy and governance responses to broadband access and digital equity needs raised by the community:

- Arlington County’s digital equity work began in 2017 with the Arlington Mill Pilot to provide free wireless Internet service to low-income households by donating ConnectArlington fiber and funds to acquire bulk Internet access and technical assistance. The project surfaced after staff had conversations with the Housing Commission related to ensuring low-income residents have quality, affordable Internet service needed to support their personal and professional development.
- In 2018, a Broadband Advisory Committee was formed to assess Arlington’s fiber asset, ConnectArlington. Their report viewed ConnectArlington as a strategic asset and recommended leveraging it further for research, innovation, digital equity, and telehealth.²⁰¹
- Recognizing that limited policies existed in the County related to Internet service and digital access and use, the Department of Technology Services organized staff across the County and Arlington Public Schools with roles related to Internet access and affordability and device skills and digital training to begin identifying pilot projects and partner conversations that could provide quick solutions with results that would assist in identifying a policy framework.
- In 2019, the group formed a Digital Inclusion Network made up of residents, organizations, and staff interested in digital equity topics. The Digital Inclusion Network provided a formal means to foster broader policy discussions and solicit resident feedback. Due to the COVID-19 pandemic, the group met only twice.
- Strategic planning work paused at the onset of the COVID-19 pandemic. County efforts then used federal resources focused on immediate activities to assist residents with connectivity issues, particularly households with students to meet virtual learning needs, including the provision of outdoor Wi-Fi hotspots around the County and support of a multipronged approach to providing options for students to access the Internet from home. Solutions included developing and funding a partnership program to provide Internet Essentials to qualified school age families and standing up a CBRS network in an area of Columbia Pike.
- Projects implemented during the pandemic reinforced several unanswered policy questions inhibiting decision-making – questions related to the need for more robust analysis of available broadband data and the range of solutions available. The pandemic also raised the importance of having quality, affordable Internet at home.
- In 2021, Arlington County established an interdepartmental Digital Equity Group to set foundational direction advised by three department directors: Community Planning, Housing, and Development, Technology Services, and Arlington Public Libraries.

- Staff efforts dedicated to digital equity currently has no dedicated budget. However, the County received \$3.5 million in compensation for dark fiber and conduit assets in National Landing and Adjacent Areas from JBG Smith in 2021. The funds are generally available for any County initiative but could be used for digital equity activities.²⁰²

5.2 Connectivity

5.2.1 Key Arlington Projects

Arlington Mill

The Arlington Mill pilot leveraged the County’s ConnectArlington network through a public-private partnership with the Arlington Partnership for Affordable Housing (APAH) and other donors. The County provided APAH with a \$95,400 grant in December 2017 for APAH to provide 122 low-income households with free, in-unit high-speed Internet service. This technical solution essentially leveraged ConnectArlington as a bridge between Arlington Mill and the Internet at large and offered free access over this middle-mile network.

It was found that the support to manage and maintain the network required more technical resources than the funding and staff capacity enabled. After the conclusion of the grant, APAH decided not to renew service and instead deployed a different Internet subsidy program for its residents, a rent credit model. The rent credit is a \$10 credit towards rent after documenting proof of Internet service. The amount covers 100% of Comcast Internet Essentials though residents may purchase more expensive options and still receive the \$10 credit.

123 ConnectMe

The 123 Connect Me network pilot program was implemented in late 2020 with the intent of providing LTE wireless Internet service along the west end of Columbia Pike, especially geared towards student access. This was achieved by purchasing CBRS radio and antenna equipment in targeted areas. The capital for the program was made available on the Commonwealth’s Broadband Cares Funding of 2020.¹³⁴ There were successful aspects of the program in providing coverage to end users who are not able to access wireline services. From a technical perspective, the County gained an understanding of benefits and limitations to standing up a CBRS private LTE network from dark fiber access. The program was discontinued due to a lack of utilization to justify upkeep and maintenance. While there are new projects following this program, including working with Comcast and AHC to set up LIFT zones¹³⁵ in the Columbia Pike area to allow for more widely available wireless access, to make similar programs viable, there could be a benefit of working in conjunction to ensure that end user utilization is supported to drive network uptake within the community.

Gates of Ballston

The Arlington County Broadband Internet Feasibility Study (December 2020)¹³⁶ conducted by New Urbana Institute (NUI) focused on a cost and implementation plan for utilizing Arlington County’s dark fiber to offer broadband service to Gates of Ballston—particularly aiming to ensure sufficient service levels for

¹³⁴ \$743,114 through the ARPA program allocated during FY 2021 to 123 Connect Me Program

¹³⁵ <https://corporate.comcast.com/impact/digital-equity/lift-zones>

¹³⁶ <https://www.arlingtonva.us/files/sharedassets/public/Departments/Documents/Final-Report-for-Arlington-County-Broadband-Internet-Feasibility-Study.pdf>

students’ remote learning. Recognizing broadband implementation as having both a technological element and also a human element, NUI emphasized important steps to take with the end users, including building awareness and trust; providing training; and providing tiered technical support, with local “Ambassadors” answering basic questions and more complicated questions, language support, technical fixes, and maintenance being supported by more experienced professionals. On the network side, NUI recommended implementing CBRs for the two communities, arguing that the technology is scalable, will not require complex inside wiring, and supports speeds between 50/5 Mbps and 100/20 Mbps.

Given the maturity of the proposed technology solution and uncertainty about the most appropriate Internet service delivery model, County staff paused implementing this project until further research of various solutions could be explored. County staff noted that this project may be revisited after the conclusion of this broadband study.

ConnectArlington and Arlington Free Clinic

Additionally, Arlington Free Clinic (AFC) is a non-profit that works to advance health and digital equity by directly supporting community members with access and hands-on guidance. Using a network of medical professionals and volunteers, the organization serves many low-income and immigrant populations usually with limited English fluency along with low digital literacy. Providing guidance and community support on health a wide range of services including, mental health services, physical therapy, pharmaceuticals, health education and oral health care, the organization relies on Internet options, stating that approximately 80% of its care and community support is conducted via telehealth. Challenges noted by AFC are training of staff and members to use Internet enabled services and ensuring that there are enough devices to access telehealth Internet platforms. Sometimes as these challenges arise, they have to shift from video conferencing and web services to telephone contact, which leads to less involved and therefore less beneficial interaction. AFC recognizes that using telehealth technology is key to keeping people out of waiting rooms, stating that digital equity is a social determinant of health.

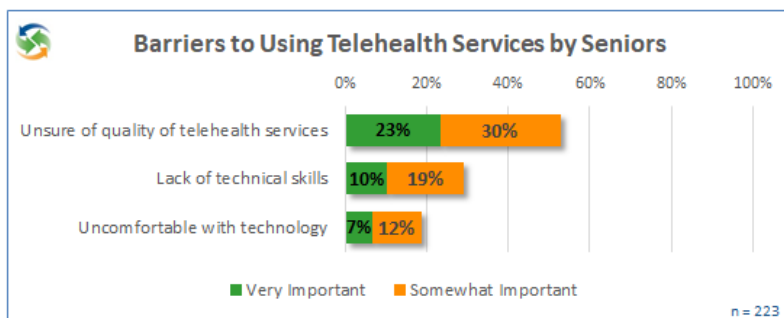


Figure 24: Barriers to Using Telehealth Services by Seniors

As telehealth has become an increasingly important and available method to improving healthcare, utilization of services related to telehealth such as remote monitoring, health research, and video conferencing consultations are viable and necessary considerations to improving quality of life. These benefits are shown to be of interest

to the Arlington County community, with 75% of respondents saying they are “Currently using,” “Plan to use” or “Willing to explore” telehealth services. Respondents were also asked which barriers they perceive are preventing them from accessing these benefits. As shown in Figure 24, the most important barrier was that seniors are “Unsure of quality of telehealth services,” followed by “lack of technical skills.”

It should be noted that the COVID Pandemic ushered in significant, and lasting changes to the nature and number of client services offered by several nonprofits and community-based organizations interviewed by SNG as part of outreach efforts to expand participation in the eCheckup. Some added or expanded online medical and counseling services, provided technical assistance clients with digital connection issues or provided private consultation rooms and equipment to facilitate online appointments. A common theme in these interviews was the expressed need for additional devices, hot spots, and better connectivity to be able to continue and expand availability of telehealth to their clients.



KEY FINDINGS

- The eCheckup found that participating seniors’ biggest barriers to using telehealth were that they were “Unsure of quality of telehealth services,” followed by “lack of technical skills.”

5.2.2 Public Wi-Fi and Other Public Resources

A strategy for addressing the disconnected individuals need for broadband access and/or a computer and printer is the provision on public-use devices and/or free Wi-Fi. Arlington County makes such resources available and publicizes their location as well as public transit options for reaching these sites.¹³⁷ Arlington County has 27 public Wi-Fi locations distributed across the County (Table 11) as of May 2022.¹³⁸ The County has focused public Wi-Fi installations in the zip codes with the highest concentrations of poverty and the greatest population density. Additionally, the County prioritized locations where a library, park, or other community center is in close proximity to ConnectArlington. The ethnically diverse communities encompassed by zip codes 22209, 22211 and 22213 lack a single public Wi-Fi asset. An interactive map is available of these public Wi-Fi locations on the Arlington County website.¹³⁹

Table 11: Distribution of Public Wi-Fi Locations in Arlington County (As of May 2022)¹⁴⁰

Zip Code	Public Wi-Fi locations	Population	Percent HH in Poverty	Median HH Income	Ethnic Composition				
					White	Black	Asian	Hispanic	Other
Arlington County	27	235,764	4.2	\$128,145	60.2	4.2	10.0	15.5	10.1
22201	2	39,240	4.2	\$133,471	70.0	3.8	10.7	11.4	4.1
22202	4	26,813	4.8	\$127,214	57.1	10.5	14.2	12.9	5.3
22203	3	24,775	4.5	\$116,370	60.9	7.5	14.4	11.0	6.2
22204	7	53,451	7.1	\$99,124	40.3	17.4	11.8	26.5	4.0
22205	1	18,754	1.3	\$186,261	72.7	3.1	7.1	12.2	4.9
22206	7	21,055	4.7	\$117,829	61.2	13.6	5.9	14.5	4.8
22207	3	33,726	1.3	\$209,943	74.9	4.4	9.2	6.2	5.3
22209	0	12,627	3.9	\$112,347	60.0	6.1	16.4	13.1	4.4
22211	0	1,606	0	\$131,658	57.4	12.8	0	24.8	5.0
22213	0	4,336	3.7	\$166,676	60.7	2.1	8.3	11.9	15.8

¹³⁷ <https://my.arlingtonva.us/digitalresources>

¹³⁸ <https://www.arlingtonva.us/Government/Topics/Wireless>

¹³⁹ <https://my.arlingtonva.us/digitalresources>

¹⁴⁰ https://www.virginia-demographics.com/search?search_terms=arlington+county (original source 2020 U.S. Census).

In addition to public Wi-Fi locations, all Arlington County public libraries offer free-to-use computers that are available to residents. This is paired with technical assistance and training to ensure that residents do have the ability to access a public computer. ¹⁴¹

5.2.3 Arlington Public Schools Approach to Digital Equity and Inclusion

Several initiatives to provide devices to K-12 students predated the Covid-19 pandemic, but with the abrupt and near-total transition to virtual classrooms, the need arose to ensure that all students had the devices and Internet access necessary to continue their classes. Schools took initiative, assisted by Internet service providers, precipitously to identify students who did not have Internet and necessary devices at home, and to transition to total virtual instruction. Arlington County Schools reported that all students have the devices and equipment needed to enable mobile connections to support total virtual education. Other discount programs target particular demographic groups.

Arlington Public Schools (APS) plays a key role in addressing the digital divide due to their available resources and ability to reach a diverse population of student households within the community. Serving approximately 28,000 students and 7,000 staff countywide, the need to address Internet access and availability was accelerated as remote education became a necessary reality in 2020 due to the circumstances of the COVID pandemic. Arlington Public Schools administration responded with a five strategy multi-pronged approach to ensure that all students had the resources and support needed to continue learning at home. This approach worked to provide public Wi-Fi availability in key areas, especially parking lots outside of schools that students can access. Home Internet access was ensured by a program partnering with the Comcast Internet Essentials plan in which APS offered to pay¹⁴² for service if the student did not have existing home Internet access. This was utilized by approximately 550 student households serving nearly 1,200 students as of September 2022. In the case that a student’s household was not able to get Comcast Internet service or who needed more bandwidth, a cellular MiFi device was provided that allowed the student to access wireless Internet service though a mobile hotspot. This was often the case for larger families who requested APS assistance.

The APS approach was successful in providing access to all students who expressed a need due to a focus on individual students and families to ensure that specific needs were met, as opposed to maintaining a broad community-based methodology. A majority of this digital equity program spending for APS programming was allocated from the Arlington CARES funding, largely distributed during FY 2021.¹⁴³ Additionally, APS ensured that its website and other communications were available in five main languages spoken throughout Arlington County and supporting monthly workshops led by parent groups that improved the capacity to reach various demographic groups.

5.2.4 Library Teleconnect and Hot-Spot Borrowing Program

The Teleconnect Space¹⁴⁴ is an ongoing pilot program offered by Arlington Public Library at the Columbia Pike location, in which a free, private room equipped with PC and web access is available to be reserved by any member of the community. As of November 2022, 60 unique users had booked the space for a

¹⁴¹ <https://library.arlingtonva.us/services/technology-at-the-library/computers-for-public-use/>

¹⁴² <https://www.apsva.us/digital-devices/internet/>

¹⁴³ APS Programming funding amount included \$43,058 for Comcast Internet Essentials programming, \$131,500 for Kajeet/MiFi devices (partnership for wireless internet service with T-Mobile), \$16,600 for 4 wireless access points along Columbia Pike, and \$190,400 for Wi-Fi availability outside of schools.

¹⁴⁴ <https://library.arlingtonva.us/services/meeting-rooms/teleconnect-space/>

total of 85 sessions. The average booking duration being 99 minutes, which allowed members of the community access to the Internet and a device which they may not have been able to use if this service were not available. Job interviews were the most common utilization, accounting for 68% of bookings, followed by Health, Medical and Wellness appointments (24%), college application or scholarship interviews (7%), and a virtual meeting with the Arlington County permit office (1%). The majority of users were Arlington County residents (76%), with most residing in the 22204 zip code (51%). These statistics show that the program has been successful in directly providing Arlington residents with the ability to use the Internet for productive reasons. This also resulted in at least one user getting accepted to a job and another reported user attending a virtual doctor appointment which they would not have otherwise been able to attend. Library staff reported assisting users in basic computer setup and troubleshooting as needed, while maintaining the intended privacy that the program aims to provide.

Another library program that assists with increasing Internet access availability involves allowing library users to check out a wireless Hotspot on a week’s basis. The wireless service is provided by T-Mobile and comes with directions to ensure ease of use for connectivity to the user’s laptop, cellphone, tablet, printers, and other devices. The Hotspot lending program has been recognized as a success by library officials, with the number of Hotspot checkouts increasing by almost 150% from 2019 to 2022 (96 recorded checkouts in 2019 and 247 checkouts in 2022). While most checkouts occur at the Central library location, there has been a noticeable rise in checkouts from the Columbia Pike location over the past year.

5.2.5 State’s Line Extension Customer Assistance Program

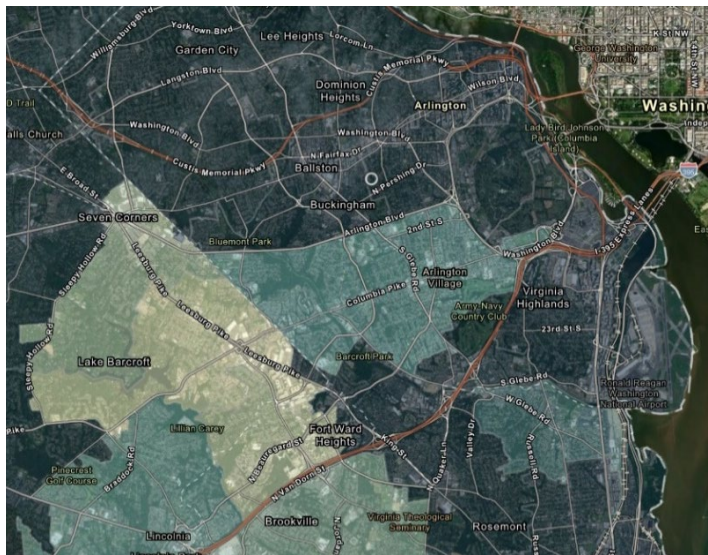


Figure 25: Eligible LECAP Arlington County Area

Providing direct wireline Internet service to households is the most reliable form of broadband that can make an impact by increasing an ISP’s footprint within a community. The Line Extension Customer Assistance Program (LECAP),¹⁴⁵ administered by the state Department of Housing and Community Development, aims to support the extension of existing broadband networks for low-to-moderate-income residents. For household location that are outside of existing Internet service provider’s standard connection drop length from a roadway or easement, LECAP provides assistance to ease the cost incurred by homeowners for special construction costs that are required to extend telecommunications infrastructure

the last mile needed to link up broadband service to the household. There is an interactive map available¹⁴⁶ on the program’s website which shows the eligible household incomes to participate in this program. In some cases, ISPs are also able to encourage specific households to participate in the program if they see it may benefit. Figure 25 depicts the geographic areas within the County, which represent the 22204 zip code, that were designed as eligible to participate in this program. Additional analysis is required

¹⁴⁵ <https://dhcd.virginia.gov/lecap>

¹⁴⁶ <https://vadhcd.maps.arcgis.com/apps/dashboards/79cdf5ff371c44e2a34549398b563699>

to assess the extent to which there are eligible households by comparing household income to their respective broadband infrastructure status to connect within these areas.

5.2.6 Federal Household Benefit Programs

“Affordability” ranks as the number one challenge to broadband adoption and utilization.¹⁴⁷ To access the digital space, individuals need the necessary hardware and software. However, the cost of devices and connectivity is a significant barrier to access for many residents of Arlington County. Pricing structures and support systems to enable households to afford access to broadband and digital technologies are essential.

Qualifying low-income residents and households¹⁴⁸ can subscribe to subsidized fixed and mobile broadband programs to make Internet service more affordable. Some ISPs (including the major providers operating in Arlington County that are identified within this report) offer service for as little as [\\$9.95 per month](#),¹⁴⁹ an amount that can be reduced further (or to zero) when paired with one or more of the federal broadband subsidy programs – [Lifeline](#) and the [Affordable Connectivity Program](#) (ACP) (discussed below). Registration for these programs must be done separately as they operate independently but households that qualify for Lifeline automatically qualify for ACP, and the two benefits can be combined towards broadband or mobile Internet or may be applied independently to Internet (ACP) or telephone (Lifeline) – either landline or mobile.

Lifeline

Lifeline provides a \$9.25 a month discount for eligible subscribers for telephone and Internet services. One discount is available per eligible household. There are currently over 950 participants within Arlington County; however, it is unclear how many are eligible to receive benefits. Households are determined as eligible based on household size and income.¹⁵⁰ As mentioned previously, there are telecommunication providers who offer packages priced at the rate of the Lifeline benefit, allowing those members to get service at no cost.

The Affordable Connectivity Program (ACP)

The ACP is a new federal benefit program that offers a discount of up to \$30 towards a household’s monthly Internet service and up to a one-time \$100 discount towards a device, increasing Internet service affordability and use to eligible low-income households. Compared to Lifeline, ACP offers: higher qualifying income levels that expands the pool of eligible households; a more generous benefit level with more money available per beneficiary to apply towards Internet services; and the possibility of adding assistance towards the cost of a device from participating ISPs. To date, uptake of this opportunity has been limited, nationwide, and in Arlington County, explained by the lack of public awareness and a registration process that favors online applications that are onerous for many in the targeted population. Several government agencies and non-profit organizations in Arlington County are actively promoting this

¹⁴⁷ <https://www.educationsuperhighway.org/wp-content/uploads/Broadband-Adoption-Center-Whitepaper.pdf>

¹⁴⁸ Lifeline and ACP eligibility are based on total annual household income that does not exceed a specific percentage of the federal poverty level (Lifeline’s limit is 135% and ACP’s limit is 200%) and/or qualifying for public assistance programs, such as the National School Lunch Program, Housing Assistance, Medicaid, SNAPP, and SSI.

¹⁴⁹ <https://www.xfinity.com/support/articles/comcast-broadband-opportunity-program>

¹⁵⁰ <https://www.lifelinesupport.org/do-i-qualify/>

benefit to their constituents and stakeholders, including prominent links on their websites and online outreach and in-person in the form of at least one registration fair in September 2022.

The ACP is currently underutilized in Arlington County. As of August 2022, 2,913 households have signed up for this program. This represents only 18% of eligible residents, a lower rate than nationwide (31%) and across the Commonwealth of Virginia (27%).¹⁵¹ All major Internet providers in the County currently participate in the ACP. Therefore, the lower rate is likely attributed to several factors related to community awareness of the opportunity, understanding how to apply under the multi-step enrollment process, and staff capacity and resources to provide adequate assistance.

During the promotion of the Emergency Broadband Benefit Program,¹⁵² the ACP’s predecessor during the COVID-19 pandemic, staff learned the importance of having a trusted person explain the process and offer sign up assistance. There remains enormous opportunity to leverage this program to bring improved Internet service and possibly address device gaps through coordinated outreach and registration campaigns conducted in partnership with community action organizations serving low-income populations. Since April 2022, the proportion of ACP eligible households that have registered for the benefit has increased more than 10 percentage points (from 7.4% to 17.8%), which may be credited towards recent stakeholder outreach awareness and engagement efforts. Communities with uptake rates approaching 30% and high numbers of remaining eligible participants warrant further examination to identify methods and models for effective outreach and registration assistance. Additionally, it is also important to recognize that this program will not be in place forever. Depending on an act from Congress, funding for the ACP could run out as early as 2024¹⁵³ which would leave those receiving this benefit without any support for Internet services.

Table 12: ACP Utilization in Arlington County

Affordable Connectivity Plan Registrations in Arlington County				
Zip Code	Eligible Households	Registered Households (August 2022)	Percent Registered	Remaining Eligible Participants
22201	1,968	278	15%	1,690
22202	1,517	170	10%	1,347
22203	2,251	464	20%	1,787
22204	5,625	1,154	21%	4,471
22205	773	87	11%	686
22206	1,212	360	30%	852
22207	1,119	100	9%	1,019
22209	1,081	294	27%	787

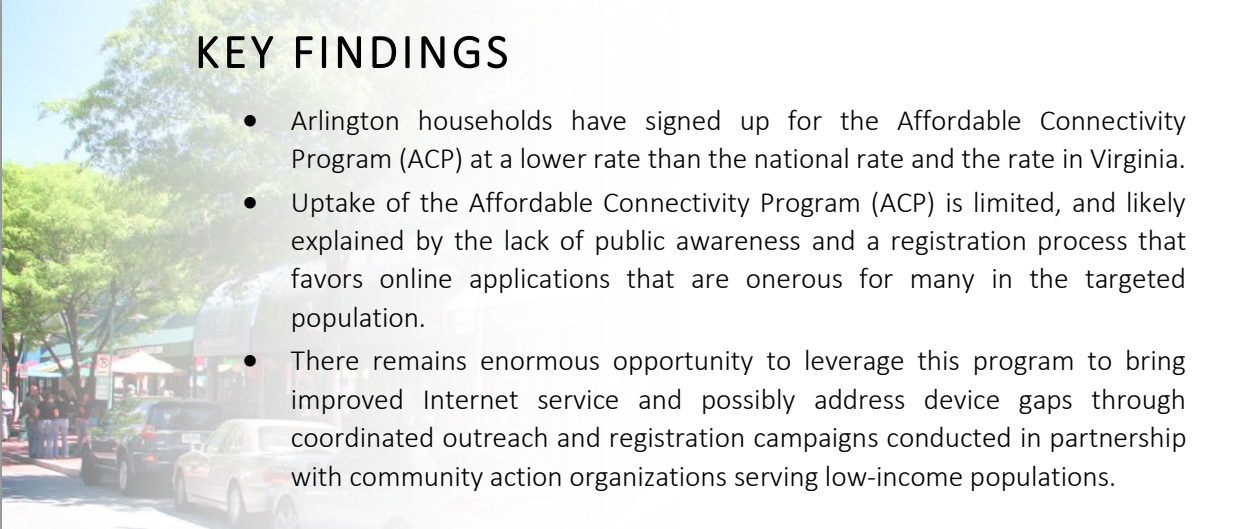
¹⁵¹ <https://www.educationsuperhighway.org/no-home-left-offline/acp-data/#dashboard>

¹⁵² <https://www.fcc.gov/emergency-broadband-benefit-program>

¹⁵³ <https://www.cnbc.com/2023/03/02/internet-more-expensive-low-income-families.html>

Affordable Connectivity Plan Registrations in Arlington County				
Zip Code	Eligible Households	Registered Households (August 2022)	Percent Registered	Remaining Eligible Participants
22211	3	1	33%	2
22213	110	5	5%	105
Total	15,659	2,913	18%	12,746

Federal subsidies and low-cost ISP service packages, along with a number of more restricted discount service offerings, are available to specific demographic groups in Arlington County. For example, some ISPs offer company specific discounts to older adults.¹⁵⁴



KEY FINDINGS

- Arlington households have signed up for the Affordable Connectivity Program (ACP) at a lower rate than the national rate and the rate in Virginia.
- Uptake of the Affordable Connectivity Program (ACP) is limited, and likely explained by the lack of public awareness and a registration process that favors online applications that are onerous for many in the targeted population.
- There remains enormous opportunity to leverage this program to bring improved Internet service and possibly address device gaps through coordinated outreach and registration campaigns conducted in partnership with community action organizations serving low-income populations.

5.2.7 Internet Provider and Community-Based Stakeholder Activities

Affordable Housing Providers

Affordable housing and the Internet intersect directly in Arlington County’s Committed Affordable Properties (CAF). All CAFs are wired for broadband and many offer amenities addressing residents’ Internet affordability challenges, including ensuring choice of internet providers, free Wi-Fi in on-site community rooms/centers, rent rebates to offset Internet costs and, in some properties, free in-unit Wi-Fi. Some property owners have also included the distribution of devices and digital literacy training (referenced later in this section) as part of their offering. The Virginia Low-income Housing Tax Credit program provides additional incentives to developers requesting financial support for newly constructed and/or substantial rehabilitation of housing communities to provide free Wi-Fi in community rooms and units and/or if telehealth access is facilitated. The relationship between the County and CAF developers

¹⁵⁴ <https://www.highspeedinternet.com/resources/internet-for-seniors> and <https://dailycaring.com/7-sources-of-low-cost-internet-for-seniors/>

provides a lever to make access more affordable to low-income residents that qualify for housing subsidies.

Comcast

Comcast Internet Essentials provides Internet service for only \$9.95 per month with no annual contract and includes free equipment (modem/router) for households that qualify (qualifications include participating in the National School Lunch Program, housing assistance, Medicaid, SNAP, ACP, or other programs). For those households in need of faster speeds, Internet Essentials Plus is also offered at \$29.95 for 100/20 Mbps, which can be provided at no cost to the homeowner if they are applicable to receive ACP support. The program also offers a low-cost (\$149.99) new Dell laptop or Chromebook. The company has provided Internet Essentials since 2011 and has connected more than eight million individuals, provided 100,000 subsidized computers, and reached 9.5 million people across the country through digital literacy and training programs as of the first half of 2019.

During a stakeholder interview as part of this project's research, Comcast highlighted a number of their offerings to potentially assist the Arlington community. Their Project Up¹⁵⁵ program is an umbrella program for digital equity and is backed by a \$1 billion commitment to reach tens of millions of people. Project Up includes Lift Zones, Comcast RISE, and digital navigators. Comcast RISE¹⁵⁶ was originally created to support Black, Latino, and Asian-owned small businesses. RISE expanded in November 2021 to all women-owned businesses nationwide. By the end of 2022, RISE had provided support to 13,000 entrepreneurs. Comcast offers consulting, media, creative production, technology (e.g., computer equipment, cybersecurity services), and monetary grants (\$21 million to 2,100 businesses). Comcast is also funding digital navigator¹⁵⁷ and broadband adoption programs.

Locally, the company supports the Alliance for Arlington Senior Programs (AASP)¹⁵⁸ with its Comcast Internet Essentials offering and provided a donation of 15 computers. In Summer 2022, AASP partnered with Comcast to host a sign-up event of its low-income service offering. Comcast provided services and support to the Clarendon Safety and Innovation Zone.¹⁵⁹ Funded by Arlington Public Schools, families without Internet received access to Comcast Internet Essentials.¹⁶⁰

Providing access to residents with a focus on telehealth is an extremely important aspect that can increase Internet utilization among vulnerable populations while realizing the health benefits. Virginia Hospital Center (VHC) has been a champion of promoting telehealth services within the community, responding to the increase in virtual demand during the pandemic with a number of programs that worked to address specific health objectives.¹⁶¹ These programs have been endorsed by medical professionals and are still supported by VHC.

¹⁵⁵ <https://corporate.comcast.com/impact/project-up>

¹⁵⁶ <https://www.comcastrise.com/>

¹⁵⁷ <https://corporate.comcast.com/impact/project-up/digital-navigators>

¹⁵⁸ <https://friendsofthealliance.org/>

¹⁵⁹ <https://www.arlingtonva.us/files/sharedassets/public/projects/documents/technology/safety-and-innovation-zone-board-presentation-updated.pdf>

¹⁶⁰ See [Internet Service Assistance - Arlington Public Schools \(apsva.us\)](https://www.arlingtonva.us/files/sharedassets/public/projects/documents/technology/safety-and-innovation-zone-board-presentation-updated.pdf) See [Internet Service Assistance - Arlington Public Schools \(apsva.us\)](https://www.arlingtonva.us/files/sharedassets/public/projects/documents/technology/safety-and-innovation-zone-board-presentation-updated.pdf)

¹⁶¹ <https://www.vhchealth.org/app/files/public/ce512f02-aa7c-44ee-bffc-a66342a07498/vhc-winter-2021-hyperlinked.pdf>

T-Mobile

T-Mobile’s Project 10 Million¹⁶² offers free hotspots and Internet to 10 million eligible households. Eligibility includes many of the elements that are part of the Affordable Connectivity Program (SNAP, Medicaid, as well as EBT, TANF, and CEP). The program offers 100 GB mobile data per year for 5 years and a free device. Locally, T-Mobile has been a partner in Arlington with the library hotspot lending program.

5.3 Device Access

Owning a device, or at a minimum, having access to a device capable of navigating the Internet and being able to conduct online practices is essential to bridge the digital divide. Viable devices include desktop computers, laptop computers, Chromebooks, tablets, and cellular smartphones. It is also important to have access to a device that best supports the intended use. For example, it is challenging to conduct remote learning, or to complete and sign a job application on a smartphone. Desktop and laptop computers, tablets, and Chromebooks will provide a better user experience whether used at home or at work to conduct a variety of fundamental and advanced online practices. In addition, telehealth medicine is more practical for patients to use web-based services without the requirement to download apps needed for smartphone services.¹⁶³

According to the U.S. census, 4.9% of Arlington County households use a Smartphone for Internet access with no desktop or laptop available. In addition, 3.3% of households are without any computing device available in the household altogether.¹⁶⁴ This is also reflected by eCheckup respondents, 4.8% of who reported mobile wireless as their primary source of Internet connectivity and utilization. The rates of using mobile wireless as the primary form of connectivity were higher among eCheckup responding minority (13.9% of Black or African American, 9.4% of Asian) and low-income groups (22% of households making less than \$50,000 annually).

A key finding from this assessment, as reflected by multiple stakeholder organizations, is that there are not enough devices to serve community members. In some cases, such as the Arlington Neighborhood Village serving aging populations and Arlington Free Clinic promoting tele-health services, non-profits did not have enough devices to ensure that staff had access to perform their everyday operations. Additionally, and a more common issue, is that organizations interviewed reported that they see a definitive need within the community for devices, but they do not have the resources to distribute to those in need. Several organizations who serve the lowest income populations expressed a desire among the residents and clients they serve to participate in digital society but were held back by the lack of availability of an appropriate device.

While the ACP provides one source of support for low-income households to acquire a computing device (see ACP section above), there are other options that help households secure a device. Businesses often replace laptop and desktop PCs after a few years and may be willing to donate these computing devices to the County or a volunteer entity that can refurbish them for distribution to the low-income population of Arlington County. There are examples of Business Improvement Districts (BIDs) coordinating this activity within the Arlington business community. In the case of the Ballston BID, a local IT vendor provided a service of collecting outdated computers from Arlington businesses; however, the vendor then donates

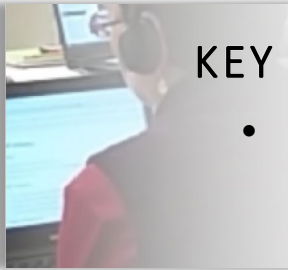
¹⁶² <https://www.t-mobile.com/brand/project-10-million>

¹⁶³ <https://www.healthcareittoday.com/2020/07/23/web-based-vs-app-based-telehealth-features-series/>

¹⁶⁴ Census 5-year [estimate data: B28010](#)

the refurbished computers to a program in the Caribbean as opposed to making them available to local organizations or households in need.

PCs for People ([HOME - PCs for People](#)) provides low-cost refurbished desktops, laptops, and accessories at discounted prices to low-income individuals and families. Computer Core, which also provides digital literacy training to students in Virginia, has distributed 550 devices since March 2020. PCs for People is currently operating in eight local markets, including Baltimore, MD, while refurbished computers are able to be purchased through their portal nation-wide. A few other sources of free refurbished devices including [computerswithcauses.org](#) and [Give Technology](#).



KEY FINDINGS

- Stakeholder organizations that participated in interviews reported that there are not enough devices to serve community members. There are several options for providing devices that exist and need to be explored further.

5.4 Digital Literacy

While digital literacy covers a wide range of skills, it encompasses the technical and cognitive ability required to evaluate, use, and communicate needs of digital information, as well as the ability to use the diverse technologies available to retrieve information, interpret results, and judge the quality of that information. A consequence of attaining digital literacy is that the member of the community understands the relationship between technology, life-long learning, and personal privacy, and can use those skills to actively participate in civic society as it becomes increasingly more digitally involved.

To investigate and fully understand the state of digital literacy within Arlington County, this report covers topics related to digital literacy including a resident’s understanding of how to use a computer and access the Internet, as well as an overview of the importance of privacy and security when using the Internet. Then the programs to address digital literacy within Arlington provided by the County and other non-profit organizations will be highlighted and shown where effective support has been achieved through these efforts.

Household eCheckup respondents were asked to rate their level of computer expertise ranging from “Expert User” to “Nothing or know a little.” While the overall finding reports that most respondents are at least at or above a “Use with confidence” threshold, there are indicators among demographic groups that show a lack of computer literacy and comfort with use. These trends are seen in older age groups, with only 20% of older adults saying they feel like an “Expert user” compared to 60% of those aged 18 to 34 years. Low-income household respondents accounted for nearly all of the “Nothing or know a little” responses (Figure 26), pointing to a definite gap in computer literacy among this group. Additionally, Hispanic or Latino (19.6%) and African American or Black (20.5%) respondents had the lowest levels of “Expert users” among other races.

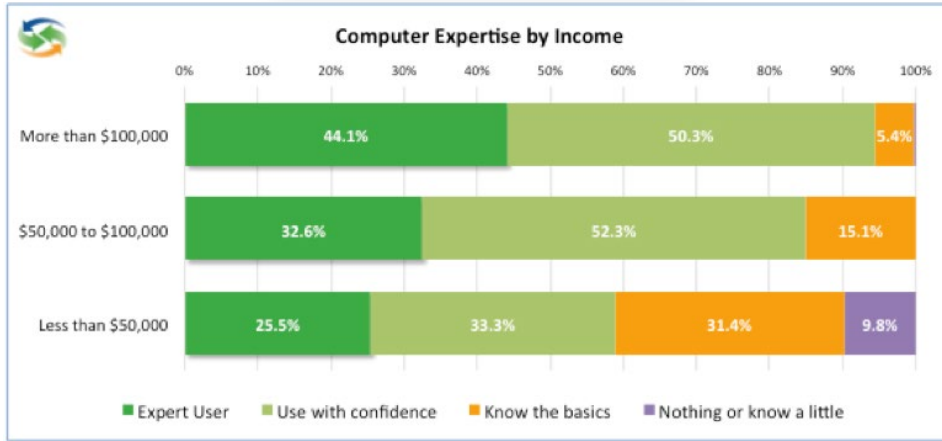


Figure 26: Computer Expertise by Income

A big concern among community members, especially in the workforce development realm, is privacy and security. This is supported by findings from the eCheckup, which indicated that the most significant barrier to using the Internet among household respondents was reported as “Privacy and security concerns,” with 80% of total eCheckup responses saying this is a somewhat or very important barrier. In order to increase Internet utilization and overcome this barrier, residents must be sure that privacy and security concerns are addressed. When cross-tabulated against other demographic factors constant such as age and race, the level of household income shows the highest degree of correlation to identifying with this barrier, as 70% of respondents making less than \$50,000 indicated this was very important compared to 35% of those making more than \$100,000 (see Figure 27). This suggests that a targeted approach to lower income residents that addresses concerns of Internet privacy and security could lead to noticeable increases in Internet utilization.

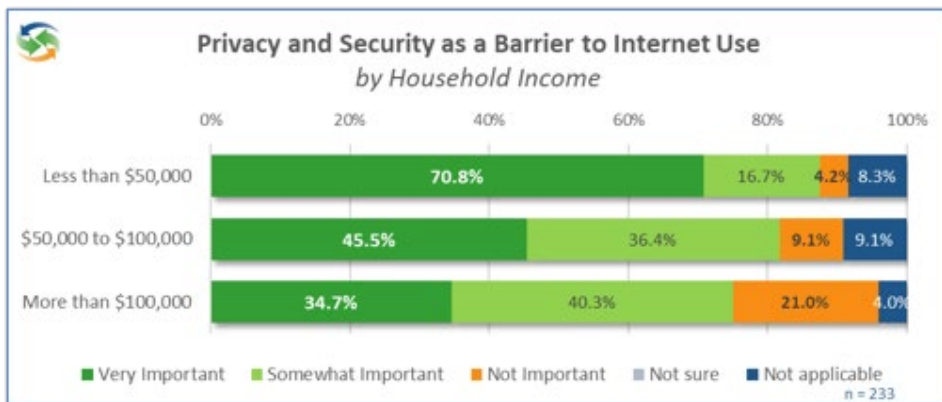


Figure 27: Privacy and Security as a Barrier to Internet Use by Household Income

Findings among business respondents to the eCheckup also show that security and privacy concerns are the two most significant barriers towards adopting online practices, with over 70% reporting that security is a “Very Significant” concern. Supporting local initiatives that offer online security products, monitoring, and training, is an important vehicle to help overcome these reported barriers and allow local businesses to feel comfortable adopting an online economy. This was reinforced during conversations with Arlington’s Employment Center. Privacy and online safety are common concerns among clients, and some have expressed fear that the internet and digital resources will affect their limited resources.

This issue is not unique to Arlington County. An NTIA study completed in 2019¹⁶⁵ identified that nearly three-fourths of American households (73%) had major concerns related to online privacy and security, a number which remained constant from the previous study in 2017. The top concerns were identity theft and credit card fraud. This concern is valid as it is clear that households and businesses need to do more to protect identity, 19% of households in 2019 reported a breach of privacy and security from Internet use. Education about how to protect and be aware of threats is the main course of action that individuals can do to ensure their online safety.

There is also a recognized need for digital literacy within the public safety and emergency response programs within Arlington. As the County attempts to adopt more efficient practices by utilizing online platforms, there are instances where community members are not familiar with and therefore slow to uptake the program. This has a direct effect on public services. For instance, residents are encouraged to report minor crimes and other issues through an online service; however, those who are not familiar with this availability routinely call 911 and jam up the lines when something more important may require those resources.

The County is considering other online initiatives which will require public awareness and expanding digital literacy in order to reach all parts of the community. These programs include a platform for towing cars, crisis tracking on a web-based map, increasing social media interaction, and more rapid alert systems. Additionally, the County currently does not offer a multi-lingual emergency response, which may be difficult to navigate for those less familiar with technology and who have limited proficiency with English. Like many other facets of society, there is a push to become more efficient and serve more of the community through online interaction. When a gap in digital literacy exists, there are segments of the community who will not be able to participate if they are not given the opportunity and resources to interact online.

Challenges common to many ESL (English as a second language) students and residents include affordability, availability, and scheduling of classes, work schedule conflicts, unfamiliarity with school and college systems and the respective enrollment processes, and lack of childcare and transportation, all of which are addressed by online ESL instruction. Delivery of online ESL classes, targeting specific ethnic groups in Arlington, may deliver sub-optimal results due to the disproportionate percentage of Black and Hispanic and Latino people who lack Internet access or a computer at home, and the even larger number who depend on smartphones exclusively for Internet access. Smartphones have been shown to inadequately support online instruction unless the curriculum is specifically designed for mobile delivery. Without the ability to pay for broadband, the necessary devices, an understanding of its importance, or the know-how to use it effectively, some residents will be excluded from the Internet’s many professional, lifestyle, educational and medical benefits.

With a strong focus on this human element in addition to the infrastructure element, Arlington County has developed a working¹⁶⁶ digital equity vision and working set of principles.

Internet Activity Utilization

There are many online practices from which individuals and businesses can benefit. Review and analysis of the eCheckup responses focused on categorizing many of the utilizations into Research and Transaction categories. Conducting the research by end-users is important as it leads to more informed decision

¹⁶⁵ <https://ntia.gov/blog/2021/nearly-three-fourths-online-households-continue-have-digital-privacy-and-security-concerns>

¹⁶⁶ This vision and set of principles have not been formally approved or adopted by Arlington County Board

making and increased awareness of the topic of interest. The top three eCheckup reported uses related to research were:

1. Product Information
2. Health Information
3. Government Information

The eCheckup results show over 90% of respondents are currently using their Internet to research information online related to these topics. In an analysis of how different age groups are using the Internet, eCheckup data reveals that senior citizens are 16% more likely to research health information than those respondents less than 35 years old. It is important to note that this interest in staying informed about health is supported by improving technical assistance and ensuring that those who are researching are doing so effectively and accurately.

Selling items online was a practice currently used by 36.6% of household respondents. Nearly 20% (18.4%) of respondents indicated they plan to sell online which can be a significant new and supplementary revenue stream to households. Significantly, 45% of households indicated no plan to sell online, which may represent missed income opportunities. This could indicate that some households lack the necessary knowledge of how to conduct sales online, find a trusted website with the assurance that payment will be received, obtain an online bank account, and access technical support. Local stakeholder organizations have an important role to play in providing expertise and technical support that can build local capacity with such online practices. This need exists for households and small businesses.

5.4.1 Digital Literacy Efforts

Arlington Employment Center

Many residents that come to the employment center have mental health issues, which makes connecting to the Internet a difficult undertaking without needed support. Reframing the issue with a focus on why Arlington County needs all people to be technologically literate has the potential to drive support for digital literacy efforts and the type of outreach that is required to reach specific groups. The Center maintains two computer labs with 20-30 computers at each facility that are available to their clients, however the Center is also considering providing tables to allow clients to bring in their own computers. The Center has discovered that an investment in the people is as important as the investment in the computers. People need a place to go, even if they have broadband access at home, where they can have access to a printer or to search the Internet anonymously (important given that some have a heightened fear of privacy and security while using the internet). The Center has also provided personal computers to residents that participate in the program. They have also determined that it is difficult to provide digital literacy to clients who lack basic computer skills, particularly since some of the Center's staff could benefit from their own digital literacy training and have difficulty teaching basic internet use.

Skill-up¹⁶⁷ is a free service available to Arlington and Alexandria residents with curriculum focusing on basic aspects of using Internet platforms such as Google and Microsoft. This type of training allows residents to become more familiar and less apprehensive to use such platforms and provide specific training to raise awareness and help community members protect their privacy and online security.

¹⁶⁷ <https://alexandriaarlington.skillupamerica.org/>

Arlington Public Schools and the REEP Program

Arlington Public Schools has been involved in the digital literacy arena with the Arlington Education and Employment Program (REEP),¹⁶⁸ that focuses on adult education for those with limited English proficiency and particularly serves low-income community members. Approximately 2,000 are served within a given year. While the curriculum is broad and includes many life skills, digital literacy is intertwined with many of the topics covered and the program works to education participants about Internet connectivity, setup, and troubleshooting, as well as raising awareness to how the Internet can be used to improve everyday life. In addition to the basic program, the North Star class is more focused on digital literacy training and allows participants to understand all the basics related to operating a computer and using the Internet. This type of instruction is best conducted in-person, as opposed to a webinar or online approach, as evidenced by 80% of REEP program participants stating they prefer in-person instruction. Participants in the REEP programs come from countywide, but it is important to note that over 3-times the participation has occurred within the 22204 zip code which demonstrates a need for ongoing support and demand for digital literacy training in this community.

Department of Parks and Recreation

The Department of Parks and Recreation (DPR) continues to be instrumental in reaching community members and providing digital literacy training and support to a variety of groups. Through a partnership with the Department of Human Services, DPR is able to identify and reach residents who are not connected to the internet and need assistance with digital literacy training. A number of programs aimed at 55+ aged residents provide training that includes learning how to use Mac devices (computers, iPhones, iPads), reducing costs by using the internet or ‘cutting the cord’, assistance using internet programs such as google sheets and WhatsApp, and awareness and sign-up assistance for the Affordable Connectivity Program.¹⁶⁹ In addition, DPR provides instructional learning programs supporting children at local community centers. Support for the homeless community is also provided with free instructional programs that are supported by the McKinney Vento Homeless Assistance Act funding.

Biz Launch

The Arlington BizLaunch Small Business Program has been supporting small businesses in Arlington County for over 20 years. Following the pandemic in 2020, a survey was conducted to determine business concerns, risks, goals, and plans. From these results and the increased demand for businesses to adopt online practices, ReLaunch¹⁷⁰ was developed to provide resources and focused training to small businesses within Arlington. Eligible businesses receive a grant to work with a technical consultant to enhance online services and address any needed equipment upgrades or training. Additionally, many businesses engage in a supplemental web development portion to create and modernize a web page for their business. As of late 2022, demand for this program is surging and the County has a waiting list of businesses who are interested in participating. After meeting with BizLaunch leadership and hearing their success story, ReLaunch is providing a much-needed service in the community helping small businesses compete in the digital economy.

¹⁶⁸ <https://reep.apsva.us/>

¹⁶⁹ [https://www.arlingtonva.us/Government/Departments/Parks-Recreation/Programs/55-Membership/55-Events?dlv_ACG%20OC%20CL%2055Plus%20Page%20Events%20Listing%20Full%20Width=\(keyword=internet\)\(dd_OC%20Composite%20Date=Mar%2027%202023\)](https://www.arlingtonva.us/Government/Departments/Parks-Recreation/Programs/55-Membership/55-Events?dlv_ACG%20OC%20CL%2055Plus%20Page%20Events%20Listing%20Full%20Width=(keyword=internet)(dd_OC%20Composite%20Date=Mar%2027%202023))

¹⁷⁰ <https://www.arlingtoneconomicdevelopment.com/Small-Business/Small-Business-Programs/ReLaunch>

A majority of businesses and organizations (93%) that responded to the eCheckup report having a website for their business/organization. The remaining 7% of businesses indicated that they “Plan to use” a website. This underscores how businesses and organizations realize the importance of being connected to the Internet in today’s economy and digital society – however they have not yet done so. Often this is because they had not yet found trusted, affordable technical support. Lack of internal expertise and knowledge was a barrier to 74% of business respondents (“Very significant” 37% and 37% “Somewhat significant”). BizLaunch has been set up and is successfully helping address these gaps and barriers for businesses, however access to BizLaunch services is limited to the available budget.

To adapt and compete in an increasingly online environment, additional online tools need to be implemented for conducting effective business practices – these include multimedia content and service availability, online advertising, and promotion (including through social media), using online tools to collaborate with staff and external contacts, and supporting teleworking operations, are. When asked about their plans to use in the future, businesses and organizations identified that they were currently using and planning to use all those online practices. Significantly, there were high planning to use responses for the following online practices:

- Accessing collaborative tools (31%)
- Social networking (28%)
- Advertising and promotion (20%)
- Staff training and skills development (20%)

These findings build evidence that a large contingent of businesses within Arlington would be receptive to support and training to enhance collaboration among their employees and customers, as well as social networking and advertising using online platforms. It should be noted that a majority of eCheckup business respondents (63%) were small businesses with less than five employees which indicates a strong



demand for services offered by vendor neutral advisors and technical support, such as Arlington Economic Development who focuses on bridging these gaps with businesses.

Finally, online collaboration methods will require the necessary reliability and symmetrical bandwidth (where upload speeds match download speeds) as a crucial component of videoconferencing and supporting workflows in an online cloud environment. Thirty-six percent (36%) of businesses anticipated that they will use the Internet for the creation of documents and 18% indicated they plan to use video conferencing services in the future. This shows readiness by these businesses to adopt new online practices – which is an action item for local economic development agencies like AED. Additionally, supporting employee teleworking operations is recognized as an important component by businesses, identifying “Employee satisfaction and retention” and “improved productivity” as reasons for having telework options available. Overall, two-thirds (65%) of businesses indicated a “high” or “very high” priority for enhancing online business activities.

Arlington Public Libraries

Arlington Public Libraries have also been instrumental in providing digital literacy training including email and Internet basics, office productivity and video conferencing tools, and basic computer, phone, and tablet troubleshooting. This began in 2007 with the introduction of eBooks and has grown with increased demand since then. During 2022 there were 13 total tech classes with participation of over 50 members at Arlington Library locations. This is in addition to requests for one-on-one help with digital literacy assistance, in which there were 105 requests made in the month from May to December 2022. The tech center is available to make appointments online on the library’s website.¹⁷¹ Another organization leading in providing digital literacy training in Virginia is Computer CORE.¹⁷² Highlighted earlier related to efforts to refurbish and distribute computers, Computer CORE offers online training for residents in basic skills along with workforce development. A focus on security when operating in a digital environment is a foundational component. They state that with their training students have been able to increase salaries by \$12,000 annually. Providing this service to members of the community who are most in need closes the gaps in digital utilization and allows benefits to be realized by all members of the community.

In summary, the following table provides a list of local organizations and County agencies that provide various digital equity focused services for County residents.

Table 13: County Organizations Involved in Digital Literacy Activities

AHC, Inc.: Offers digital literacy programming to residents of their affordable housing properties.
Alliance for Arlington Senior Programs: Provides qualified low-income seniors with free Internet access, free computer training and, in some cases, free use of a laptop. Coordinates sign up events for older adults to enroll in federal low-income Internet benefit programs.
Arlington Commission on Aging: Increasing seniors’ Internet skills and using it to support their engagement in Internet-based programs and service opportunities.
Arlington Retirement Housing Corporation: Provides technological instruction and training for residents to access the Internet and improve their ability to connect with the outside world. Currently encouraging companies and entrepreneurs to develop and produce technology innovations that enhance the health, independence and engagement for lower income older persons in independent and assisted living at Culpepper Garden.

¹⁷¹ <https://library.arlingtonva.us/contact-us/tech-help-by-appointment/>

¹⁷² <https://www.computercore.org/classes/>

Arlington Partnership for Affordable Housing: Provides technology literacy workshops and classes to enable low-income residents to strengthen their technology skills that promote increased ability and comfort with technology—from the use of smartphone apps to Internet research to keyboarding and software skills. Provides STEM programming to children, computer science and tech skills programming for high school students, bilingual computer classes to adults, and a pilot Teladoc for residents.

Arlington Thrive: Provides digital training and devices as an incentive to participate in the training offered, especially for older adults. Helps with re-establishing Internet service.

BU-GATA: Supports digital equity initiatives primarily in the Buckingham neighborhood, where they began supporting Latino apartment tenants in 1992. Among their many tenant services, BU-GATA provides digital connectivity training in the community center.

Computer CORE: The CORE’s mission is to prepare underserved adults in Virginia to realize careers aspiration with foundation digital and professional skills. Courses range from basic computer skills, Internet security, and Microsoft program applications to understanding Cloud applications, website development, and life skill applications. Several resident serving County departments refer residents to Computer CORE classes.

Community Residences: Provides technology supports to individuals with intellectual disabilities who reside at The Springs in order to increase their independence and enable them to integrate with the community.

Edu-Futuro: A non-profit that focuses on empowering immigrant and underserved youth and family members in all aspects related to education, leadership, and workforce development. During 2021-2022, Edu-Futuro delivered job training programming to 341 members through online teaching platforms and individualized work sessions. Curriculum includes assistance in resume building, familiarity with google docs and other jobs skills, and financial planning.

KEY FINDINGS

- Digital Literacy programs offered by community organizations that are already supporting vulnerable populations and businesses show successful engagement and rely on continued support from the County to address the scale of these challenges.

5.5 A Coordinated Approach for Arlington County

Digital Inclusion presents an opportunity to bring together a diverse community within Arlington County and empower many to realize the benefits of using online services. Arlington is in a unique position in terms of widely available broadband service and a number of organizations already facilitating digital inclusion activities and several more that engage with the populations most impacted by the digital divide.

While Arlington County, community-based organizations, and Internet service providers have collaborated on various digital equity projects, efforts by the County are not as coordinated across departments and are often executed through a project-by-project approach. While collaboration between

the three Departments in the Digital Equity Group¹⁷³ is beneficial and has improved some cross-departmental collaboration, there are opportunities to integrate additional County agencies, including Schools and Human Services, both of which offer services and programs that advance digital inclusion. Expanding the Digital Equity Group to include these public facing agencies, that have direct engagement with community members who typically have digital inclusion needs, would consolidate the government and community organizations focus on beneficial digital equity objectives and investments.

There are measurable benefits in consolidating County government, community organization, Community Anchor Institutions (CAI), and the ISPs into a Digital Equity Committee to coordinate digital inclusion and equity programs across these organizations. In the absence of direct County government direction, ideally under a dedicated broadband or digital equity manager, opportunities are being missed to coordinate and collaborate on initiatives to enhance digital equity. Engaging additional community organizations to those mentioned above, along with key public stakeholders from faith based, community groups, and others, functioning within an expanded digital equity advisory group, would expand participation and collaboration on digital equity. Serving in an advisory role under County leadership, this group could prepare and guide a common strategy identifying broadband requirements, goals and objectives, and collaborate on the development of digital literacy training programs, device funding/distribution, technical support, and policy development. These organizations know their clients' needs and how to best approach and assist them. Inviting the ISPs to this advisory group additionally has merit.

The following is a brief list of entities that could be consider for this group:

- Faith based organizations
- Disability services and support organizations
- Veterans service organizations
- The United Way and other Arlington based non-profit organizations that provide service to marginalized members of the County
- Offender re-entry programs and support for formerly incarcerated individuals
- The ISPs

While the scope of this digital equity partnership would encompass all elements of digital inclusion, there are quickly emerging opportunities to coordinate applications to secure funding under federal and state programs. See *Section 6: Broadband Policies* for an overview of funding opportunities, in particular, the Digital Equity Act (DEA) that provided grant funding for digital inclusion initiatives. The County and community-based partners will be challenged in their ability to apply for grant applications without a mutually developed digital equity strategy.

¹⁷³ The Digital Equity Group is an enterprise initiative between the Department of Community Planning, Housing, and Development, Department of Technology Services, and Arlington Public Libraries.



6

BROADBAND POLICIES

Broadband policies and regulations tend to be developed and administered locally, some of which may be in response to a Federal or state policy. Federal and state broadband programs do incorporate specific policies germane to a given grant program, such as minimum upload and download data speeds to drive eligibility. Among other objectives including digital inclusion, local policies can be designed to streamline the permitting process and to expedite underground fiber installation and aerial fiber builds, which minimize the impact to normal resident activities within the County during construction phases.

Several policies were reviewed to assess the extent to which they foster (or inhibit) digital equity and broadband development, including the County's cable franchise agreements, and the affordable housing policies. Independent research on a variety of federal, state, and local broadband programs designed to advance digital equity was conducted. We additionally interviewed ISPs, County broadband program specialists, and various County identified broadband visionaries to obtain their respective ideas and recommendations that may be considered in policy development on advancing broadband access, competition, and data speeds together with their perspectives on achieving digital equity across all segments of the County's diverse population.

6.1 Broadband Policies in Arlington

6.1.1 Arlington County's Cable Franchise Agreements

Arlington County negotiated a Cable Franchise Agreement with Comcast and Verizon to provide video services in Arlington County.¹⁷⁴ While local franchising authorities (LFA) are negotiated by local governments, they are bound by federal FCC legislation that cap the franchise fee at five percent (5%) of annual revenue and allow governments to secure Public, Educational, and Governmental access channels (PEG),¹⁷⁵ both of which are incorporated into the Arlington County Cable Franchise Agreement. In addition to the Franchise Fee, the County levies a Telecommunications Service tax and receives approximately \$1 million annually based on a rate of \$1.68 per month/per user. These funds are applied to a capital account that is used specifically to fund public, educational, and governmental programs, and that could fund digital equity programs.

The agreement process is nonexclusive and competitive where anyone who wishes to negotiate a cable franchise agreement can offer one. Among the various salient terms and conditions in the agreements, it includes a requirement for the franchisee to serve all locations, unless property owners or managers do not provide access rights needed to provide service. In conjunction with the Cable Franchise Agreement service delivery, these cable providers have integrated broadband services that expand their video services to Internet Service Providers (ISPs). The FCC does not currently permit local governments to regulate or charge franchise fees for broadband Internet access service.¹⁷⁶

Perhaps the most critical element of achieving the County's objective of ubiquitous, affordable service is for both Verizon and Comcast to serve 100% of the serviceable locations in the County. As associated responses to the eCheckup have highlighted, competition has a major impact on driving higher customer satisfaction for Internet service. And, in order to provide video service, the ISPs must deploy high-speed cable or fiber to the premises making it a low-cost additional step to offer Internet service to improve their returns per new customer. It is not clear if the ISP interview statements that access to properties is the only impediment to providing service. There are nearly 94 serviceable locations that neither Comcast nor Verizon serve and where property owners are unlikely to impede service. Many of these locations have no wired service provider at all. Many are served by Verizon with DSL service. There are also 900 locations where Starry offers service and only Verizon or Comcast similarly provides service, where it seems clear there is no exclusivity with the property manager and there should be an avenue to secure access for all providers.

The franchise manager indicated that Arlington County does not track the status of each unserved location and does not ask for evidence from the providers that they lack access to unserved facilities. At present, the County is taking the providers at their word that they are not serving locations due solely to access. The current franchise agreement does allow for penalties for non-compliance, and therefore, may be a slight deterrent. It is possible that the low monetary penalties applied are less of a concern to the providers than the (supposedly) public reporting that they paid the penalties.

The public is typically not aware that due to federal FCC regulations, the County is limited in its ability to manage the providers in these franchise agreements regarding broadband facility and Internet access.

¹⁷⁴ RCN has expressed interest but has not taken the opportunity to negotiate an agreement.

¹⁷⁵ <https://www.federalregister.gov/documents/2019/08/27/2019-18230/local-franchising-authorities-regulation-of-cable-operators-and-cable-television-services>

¹⁷⁶ <https://www.fcc.gov/document/fcc-enforces-franchising-laws-promote-broadband-deployment-0>

This is evidenced from a recent public engagement process for an upcoming amendment to Arlington’s Cable Franchise Agreements where half of the comments received were specific to the residents’ broadband internet as opposed to cable service. The other half referenced bundled packages (internet is included with cable service). First, the franchise agreements only enable the County to regulate video service, not Internet service, as regulated by federal FCC legislation. Second, the service providers can bypass Arlington County and use the standard Virginia franchise agreement if they do not like the terms of any Arlington County proposals.¹⁷⁷ The standard state penalties for violations of the agreements have little teeth with penalties that are unlikely to be major motivators for the service providers. Additionally, FCC rules prohibit LFAs from regulating most other services as part of cable franchise agreements. Specifically, Arlington County cannot regulate Internet access (or telephone service) using the cable franchise agreements. For example, Arlington would not be able to regulate the Internet data speeds of the cable franchisees.¹⁷⁸ Unlike for cable products, the County has no mechanism in place to accept public comments or complaints related to internet service and refers residents to file complaints with the relevant offices within state or federal departments.

An assessment of how the County invests the franchise fees collected from their Cable Franchise Agreements with Comcast and Verizon was not undertaken by this study, however, there are options for the County to leverage these funds to advance digital equity. For example, the City of Philadelphia funds the Digital Literacy Alliance^{179,180} program that is focused on digital literacy and inclusion with a portion of their franchise agreement revenues.

The City of Alexandria recently executed a franchise agreement with broadband operator Ting. The franchise provides Ting with access to the right of way for fiber to the premises for the purpose of offering broadband Internet service. This franchise agreement would not fall under the cable franchise agreements restricted by the FCC and could be employed by Arlington County. However, as noted above, it may be unlikely that a franchisee would access Arlington due to the existing competitive environment.

6.1.2 Fiber and Conduit Agreements

Arlington County has made its ConnectArlington excess infrastructure available via lease to organizations since 2015. The County makes both dark fiber and conduit available for third party use. Dark fiber provides the physical medium for fiber optic equipment to transmit and receive data at very high speeds. The conduit allows broadband providers to easily install fiber along a route. The agreements provide a template for sharing ConnectArlington excess assets to provide next generation communications services. Initially, there was limited activity from prospective partners, but in 2019 the Broadband Advisory Board identified a key issue with the initial version of a dark fiber license agreement that created a barrier for ISPs – the agreement was too short in duration to accommodate ISP long term plans.¹⁸¹ The board also recognized ConnectArlington’s role as a middle mile network component and the importance of finding ISPs to provide the first and last mile elements of a broadband service network (See *Appendix A: Internet*

¹⁷⁷ [§ 15.2-2108.21. Ordinance cable franchises \(virginia.gov\)](#)

¹⁷⁸ See [FCC Enforces Franchising Laws to Promote Broadband Deployment | Federal Communications Commission](#) that states “[W]e find that under the Act, LFAs may not regulate the provision of most non-cable services, including broadband Internet access service, offered over a cable system by an incumbent cable operator.”

¹⁷⁹ [Digital-Equity-Plan.pdf \(phila.gov\)](#)

¹⁸⁰ [Digital Literacy Alliance - The Philadelphia City Fund \(philacityfund.org\)](#)

¹⁸¹ See Broadband Advisory Committee Recommendation Document here: [BAC-Document-14-JAN-19-FINAL.pdf \(arlingtonva.s3.amazonaws.com\)](#)

Technologies for more details regarding the Internet Service Provider topology). This recommendation caused the County to change its approach to these agreements.

Since that time, Arlington County has leased its conduit and dark fiber to both Marymount University and JBG Smith. The Marymount agreement was executed in 2020 for a lease term of 10 years to provide dark fiber predominately along Glebe Boulevard using two fiber strands. The JBG Smith agreement is an Indefeasible Rights of Use (IRU) agreement with SEAD OP L.L.C. (a subsidiary of JGB Smith) to “use a share of County-owned excess dark fiber and conduit access in National Landing for a period of up to 99 years.”¹⁸² The agreement is intended to support JBG Smith to “attract high-tech tenants and provide for the planned innovation district in National Landing.”

Ultimately, the degree to which these contract mechanisms are useful to Internet service providers will depend on the fit between their needs and the assets themselves. In other words, a third party must need the specific assets Arlington has to offer to justify the parties pursuing an agreement to use the assets. Additionally, it is important to understand that other providers are offering these types of services and often have, or have access to, much larger networks. For example, a wireless service provider may have an extensive agreement with a national broadband provider that serves the entire region and are likely to prefer those existing contract vehicles first. However, if ConnectArlington’s assets are uniquely capable of providing a needed asset, they will have more marketability to ISPs. In some cases, an ISP may prefer not to conduct business with a competitor, and ConnectArlington assets may be preferable over another third-party that is providing competitive retail Internet service.

6.1.3 Pole Regulations for Small Cell Facilities

Arlington has developed an online permit process and pre-approved aesthetically pleasing light and utility pole designs to house the small cell equipment in order to streamline the process for adding small cells.¹⁸³ The County’s small cell pole access regulations are modeled after the FCC’s ruling affecting *Accelerating Wireless Broadband Deployment by Removing Barriers to Infrastructure Investment*.¹⁸⁴ The objective of both the FCC and Arlington County regulations are to ensure access to utility, traffic, light and other existing and access poles to facilitate the deployment of small cell commercial wireless technologies including 5G. Such deployments are becoming more common and appropriate in urban and suburban environments and mobile and fixed wireless carriers can leverage these regulations to expedite the deployment of small calls to expand network coverage and capacity.

In 2019, Arlington County Code Section 22-8.2 was amended to permit small cell facilities on County-owned structures in the right-of-way where previously only third party (Dominion Energy and Verizon) poles could be used for small cells. Between 2019 and May 2022, approximately 200 permits were issued to install small cells on County and privately-owned light poles.

As discussed in *Appendix A: Internet Technologies*, small cells can help wireless service providers deliver very localized coverage and capacity to a designated area. Small cells in the right-of-way along Arlington streets provide easy access to power and connectivity for the providers as well as proximity to densely populated spaces. The Arlington permit process then facilitates the growth of wireless service throughout

¹⁸² See County announcement here: [County Board Approves Agreement with JBG SMITH for Dark Fiber Access – Official Website of Arlington County Virginia Government \(arlingtonva.us\)](#).

¹⁸³ See [Small Cell Facility in Right-of-Way \(ROW\) Permit – Official Website of Arlington County Virginia Government \(arlingtonva.us\)](#) for more information.

¹⁸⁴ [FCC Facilitates Wireless Infrastructure Deployment for 5G | Federal Communications Commission](#)

Arlington County where required by the wireless service providers, including the potential to use 5G services that can deliver much higher data speeds to mobile and fixed wireless subscribers.

6.1.4 Affordable Housing Policies

6.1.4.1 Consolidated Plan

Every five years, the County develops a Consolidated Plan, to guide the investment of Federal funding for the Community Development Block Grant (CDBG) and the HOME Investment Partnership (HOME) programs. This U.S. Department of Housing and Urban Development (HUD) required plan provides a strategic framework for housing, homelessness, community development, and economic development activities. The County’s plan development process incorporates community participation. One of the primary recipients of these HUD funding programs includes marginalized members of the County’s resident population. This community also tends to be in the greatest need of digital inclusion assistance.

Within the plan narrative, HUD requires communities to report on broadband needs of low- and moderate-income households. Arlington’s most current Consolidated Plan published in FY 2022 notes that digital equity is “more than simply being able to access broadband Internet; it also involves whether that broadband service is affordable to more vulnerable populations and whether households have access to functional devices, as well as education and training that improves interest, price of devices.” In addition, it incorporates two goals related to broadband or digital equity requirements:

- Reduce barriers to equitable access and connectivity to digital technology related to broadband Internet and devices; and
- Support public infrastructure development that improves access to broadband.¹⁸⁵

The County is leveraging the HUD program to advance digital equity to low and moderate-income residents, and while no gaps were yet discovered over the course of preparing this report, based on the scope of the report findings, there may be additional opportunities to leverage the HUD program to the digital inclusion of the affected community, including digital literacy, digital navigators and others.

6.1.4.2 Notice of Funding Availability (NOFA) Scoring Criteria

Beginning in FY2020, Arlington County started incentivizing digital equity components as part of their NOFA for affordable housing developers seeking grants or loans.¹⁸⁶ The scoring criteria for these projects does incentivize free in-unit Internet, digital literacy programming, and ownership of wired infrastructure. The incentive, however, is minimal and is one of many categories the NOFA incentivizes.^{187,188} This then helps to enhance broadband availability in affordable housing units. The NOFA scoring tiers and criteria is as follows:

- **Tier 1 (Receives 5 points):** Provision of high-speed broadband internet to each unit free of charge with a managed support plan. Applicant agrees to providing digital literacy programming. The telecommunications infrastructure will include wiring infrastructure owned by the building owner

¹⁸⁵ <https://www.arlingtonva.us/files/sharedassets/public/housing/documents/hud-narratives-final-fy-2022-2026.pdf>

¹⁸⁶ From the Affordable Housing Investment Fund (AHIF), CDBG, or HOME

¹⁸⁷ See the latest Scoring Guidance (FY2022): [Final-Guidelines FY22.pdf \(arlingtonva.s3.amazonaws.com\)](https://www.arlingtonva.us/files/sharedassets/public/housing/documents/final-guidelines-fy22.pdf)

¹⁸⁸ High-speed is noted as 30 Mbps capacity for downloading and uploading data. This speed requirement has usability limitations that could be reassessed if the County seeks better performance.

to support the provision of current or future broadband services or other future technology needs.

- **Tier 2 (Receives 3 points):** Provision of high-speed broadband internet to each unit free of charge with a managed support plan. Applicant agrees to the provision of digital literacy programming.
- **Tier 3 (Receives 1 point):** Provision of high-speed broadband internet to each unit free of charge with a managed support plan.

It is important to note that Arlington Housing Division’s minimum speed requirement is defined as the ability to support the capability of downloading and uploading data from the internet at a rate of at least 30 megabytes (Mbps) per second. The County recommends that project applicants consult its Digital Equity team about different approaches to deliver broadband connectivity, including assessing the option to leverage ConnectArlington, and that applicants consider a solution that does not limit resident choice to a single internet service provider (ISP). The requirement for 30/30 Mbps data speeds does not align with recent FCC and other federal broadband data speed requirements, nor NTIA’s 100/100 symmetrical speeds benchmark for new construction and perhaps should be reassessed by Arlington’s Housing Division.

Since the start of this incentive, two NOFAs were issued¹⁸⁹ and one project from each round was awarded the highest possible points for digital equity.¹⁹⁰ An overview of these awards is as follows:

- FY2020: One project funded (Arlington View Terrace) among 3 applications received. The project funded received the highest points possible for digital equity.
- FY2022: One project funded (Marbella Site A) among 3 applications. The project funded received the highest points possible for digital equity.

Given the findings of service at affordable housing locations, the incentives are not improving competition. There is 100/20 Mbps services available at all committed affordable rental housing locations, and 100/100 Mbps at some of these locations, and nearly all mixed-income apartments and MARKET locations, however, many affordable housing locations do not have robust competition, and the eCheckup satisfaction results highlighting more dissatisfied customers in affordable housing than market rate are likely highlighting, among other factors, the effects of limited competition. Some residents may even be unaware of other service providers like Starry offering service in their building.

The policies do not mandate that a particular number of competitors be present in affordable housing locations, and they do not require any particular service level agreements that might protect residents from the low rate of reliability, speed, and value depicted in the eCheckup Assessment. In the absence of service level criteria and policies anchored on supporting agreement terms and conditions, broadband service cost, quality and speeds cannot be affected.

6.1.4.3 Strategic Projects

Arlington County is working on several large affordable housing projects with a digital equity component, including Barcroft Apartments, Crystal Houses, and Park Shirlington. The projects are currently in various stages of development and are actively discussing the programming and mechanisms of broadband infrastructure, affordable service, and digital related resident programming.

¹⁸⁹ Arlington County did not issue a NOFA in FY2021 and FY2023

¹⁹⁰ The projects were Arlington View Terrace (FY2020) and Marbella Site A (FY2022)

6.1.5 Site Plan Review Process

The County’s Site Plan Review Process¹⁹¹ provides guidance in the preparation of land use development applications through the identification of major policies, Zoning Ordinance, County Code, and process related issues. The Administrative Regulation 4.1 process standards¹⁹² are administered by the Director of Community Planning, Housing, and Development. The Administrative Regulation 4.1 guides the development and implementation of the site plan submittal process, and the subsequent site construction activities. There are no requirements related to broadband or digital equity currently in the process.

Lack of a broadband and digital equity component in the 4.1 process may miss an opportunity to achieve various broadband infrastructure and digital goals. For example, site plans could include broadband development friendly implementation of telecommunications conduit accessible to all interested cable operators and ISPs, lowering the barrier to entry for more providers. The plan could address Wi-Fi access through the building or campuses, and other requirements to ensure broadband. Similarly, digital equity related requirements including but not limited to free Wi-Fi access, computer and Internet resource rooms in multi dwelling buildings, particularly in committed affordable unit (CAF) buildings, can also be effective in eliminating digital inequity.

6.1.6 Comprehensive Plan

The Code of Virginia requires local planning commissions to prepare a comprehensive plan that considers “strategies to provide broadband infrastructure that is sufficient to meet the current and future needs of residents and businesses in the locality.”¹⁹³

The current Arlington Comprehensive Plan¹⁹⁴ and most of its elements do not directly address broadband or digital equity. The exception is in the 2019 Public Spaces Master Plan element calls the County to consider adding Wi-Fi to provide public internet access in public spaces that are programmed more than half of their time (e.g., community centers, sports fields) as well as in plazas and other public spaces in high-density corridors.

Since the Plan is described as “one of the most important decision-making and priority-setting tools that it used by the County Board, Planning Commission and County Departments,” there are opportunities to incorporate key elements of broadband communications and digital equity into additional elements of the Plan. A Comprehensive Plan that integrates broadband would both define and consolidate the County’s digital inclusion policy framework into a master plan to guide relevant digital equity actions and investments. The key plan elements could be recommended by a Digital Equity Committee and could include broadband infrastructure and digital inclusion



Figure 28: Arlington County's Comprehensive Plan Primary Elements

¹⁹¹ <https://www.arlingtonva.us/Government/Programs/Building/Permits/Site-Plan>

¹⁹² <https://www.arlingtonva.us/files/sharedassets/public/building/documents/administrative-regulation-4.1.pdf>

¹⁹³ See item E. § 15.2-2223.

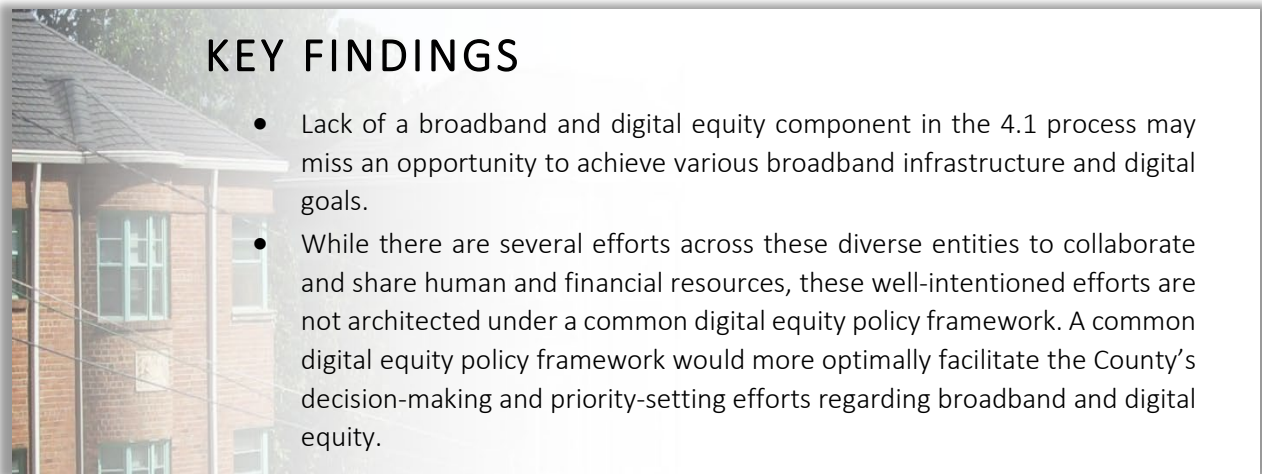
¹⁹⁴ <https://www.arlingtonva.us/Government/Projects/Plans-Studies/Comprehensive-Plan>

initiatives. Input into the committee from key County agencies, community organizations, the business community, and the ISPs would consolidate broadband infrastructure and digital inclusion initiatives recommended from a diverse group of entities, each of which have a unique perspective, broadband requirements, and ideas on how to advance digital equity and incorporate into a master plan.

6.1.7 Lack of a Policy Framework

Arlington County Government, select community organizations, Community Anchor Institutions, commercial enterprises and the ISPs are advancing programs and activities that affected affordable broadband access and digital inclusion. While there are several efforts across these diverse entities to collaborate and share human and financial resources, these well-intentioned efforts are not architected under a common digital equity policy framework. A common digital equity policy framework would more optimally facilitate the County’s decision-making and priority-setting efforts regarding broadband and digital equity.

In September 2019, the County Board adopted an Equity Resolution.¹⁹⁵ To further this commitment to equity, Arlington County Government and Arlington Public Schools participated in a 10-month racial equity cohort program convened by the Metropolitan Washington Council of Governments (MWCOCG) and in partnership with the Government Alliance on Race and Equity, specifically identifying racial equity as a priority.¹⁹⁶ This resolution provides a potential model for firmly establishing digital equity as a County Board initiative, and could be revised to incorporate broadband and digital inclusion principles in a future version of the resolution. The absence of specific broadband and digital equity language represents a gap in the resolution that inhibits Arlington County from advancing collaborative actions to invest and advance digital equity initiatives.



KEY FINDINGS

- Lack of a broadband and digital equity component in the 4.1 process may miss an opportunity to achieve various broadband infrastructure and digital goals.
- While there are several efforts across these diverse entities to collaborate and share human and financial resources, these well-intentioned efforts are not architected under a common digital equity policy framework. A common digital equity policy framework would more optimally facilitate the County’s decision-making and priority-setting efforts regarding broadband and digital equity.

¹⁹⁵ <https://www.arlingtonva.us/Government/Topics/Equity>

¹⁹⁶ See [Realizing Arlington’s Commitment to Equity – Official Website of Arlington County Virginia Government \(arlingtonva.us\)](https://www.arlingtonva.us/Realizing-Arlingtons-Commitment-to-Equity)

6.2 Federal and State Broadband Funding Opportunities and Policies

The Federal Government is investing an unprecedented \$64+B over the next 3-5 years in various broadband programs that offer funding for infrastructure and digital inclusion and equity projects.¹⁹⁷ Some funding flows directly to households, such as the ACP and Lifeline programs; however, the focus of this section highlights funding opportunities for Arlington County. *See Section 5: Digital Inclusion in Arlington* for state and federal funding opportunities that directly benefit households.

6.2.1 The Broadband Equity Deployment (BEAD) Grant

The federal government's Infrastructure Investment and Jobs Act (IIJA) of 2021 plans to inject over \$42B nationally through the Broadband Equity and Deployment (BEAD) grant program into technology initiatives to deliver and expand broadband infrastructure to unserved (<25/3 Mbps) and underserved (<100/20 Mbps) areas with an objective of ensuring 100/20 Mbps minimum data speeds upgradable to 100/100 Mbps service. According to the Virginia Office of Broadband, the greatest percentage of the BEAD funds could exceed \$1.4B¹⁹⁸ in the Commonwealth depending on the number of unserved/underserved households/business identified in the recent FCC National Broadband Map¹⁹⁹ released in September of 2022.

Based on the Televate team review of the National Broadband Map and other information assembled and assessed over the course of the study there are 46 locations identified that are underserved (<100/20) and eligible for BEAD funding. In further analysis of these addresses, some were confirmed to be incorrectly identified as underserved by Comcast, and some are commercial or government facilities. Those remaining underserved may not rise to the interest level of the ISPs to submit for grant funding. Given these discrepancies, there may in fact be additional eligible locations that would have to be identified and submitted through the FCC map challenge process. The State Office of Broadband has the responsibility to administer the BEAD program and received a \$5M planning grant to create the BEAD grant application, evaluation, and award process within the Commonwealth.

Due to the absence of unserved (<25/3), and the limited number of underserved (<100/20) broadband households and businesses required for BEAD eligibility in the County, there are very little opportunities for BEAD funding.

6.2.2 Digital Equity Act (DEA)

Unlike BEAD, the DEA is an important opportunity for Arlington County to secure federal broadband grants either directly, or by supporting/partnering with community organizations, a Community Anchor Institution (CAI), or other eligible entity. The DEA provides funding of \$2.75B spread over two programs (see Table 14) to promote digital inclusion and advance digital equity to ensure all communities have affordable access and can use the Internet to improve their lives. The DEA is available to a broad range of eligible entities and the funding can be used to provide digital literacy training, to develop computer resource rooms, support Digital Navigators to train seniors and other individuals who on how to safely access and use the Internet, and to support additional broadband capabilities including expanding Wi-Fi facilities. It is important to note that during many of the stakeholder interviews, and particularly with

¹⁹⁷ Part of the Infrastructure Investment and Jobs Act of 2021

¹⁹⁸ <https://broadband.money/state-broadband-offices/virginia>

¹⁹⁹ <https://broadbandmap.fcc.gov/home>

those with members of the Information Technology Advisory Committee (ITAC), there was near consensus on the need and benefits of this level of training for seniors and others lacking digital literacy.

6.2.3 Planning for Federal Investment

State BEAD and DEA (plans must be submitted before the end of Q3 2023 to facilitate the grant process. The Office of Broadband expressed plans to offer up to \$25,000 to all state jurisdictions to support broadband planning. That office will also likely seek input from all Commonwealth jurisdiction into the BEAD and DEA planning programs that will facilitate the application and award process. Arlington County has been actively participating in the Commonwealth’s broadband programs and can leverage continued interactions with the Office of Broadband to the best interest of the County and for the entire Commonwealth.

6.2.4 FCC Broadband Mapping

The Federal Communications Commission’s broadband mapping program is a key resource to help understand broadband service in Arlington County. The resource was used extensively to create the statistics and maps presented throughout this document. The Commission’s new Broadband Data Collection initiative for the first time presents a much more detailed view across the country. The address level accuracy of the data is critically important to understand specific gaps in service and can be an essential tool for residents and businesses to understand the providers serving their location. A critical element to the program is the ability to challenge the maps. The challenges can be either location or service related. Location challenges are those that dispute the placement of a particular address, and whether that address would subscribe to mass-market broadband services. Service challenges can dispute which providers deliver service to a particular location, and what data speeds they offer. Challenges can be submitted by governments in bulk, or individually by the public. Challenges set off a process by which the final data and maps may be corrected. More information on the FCC broadband maps and issues associated with the data can be found in *Appendix B: FCC Broadband Data*.

6.2.5 Commonwealth of Virginia Broadband Policies

The Virginia Department of Housing and Community Development (DHCD) oversees the Commonwealth’s broadband programs organized under the DHCD Office of Broadband. In this role, the Office of Broadband will administer both the Federal broadband grants and the state’s broadband programs. The primary state broadband programs are described in the following table, most of which are targeted towards rural and unserved and underserved areas of the Commonwealth. In conversations with the Office of Broadband, County representatives were informed that once the unserved area goals were achieved, the state programs would be expanded to include underserved communities and areas with other challenges, including affordability, that more closely align with the issues in Arlington. While most of programs may not directly support Arlington County eligibility, there are state administered programs from which the County has previously received broadband awards.

6.2.6 Relevant Federal and State Funding Opportunities

The following table describes a variety of Commonwealth of Virginia and Federal government broadband infrastructure and digital equity grant programs.

Table 14: State and Federal Broadband Infrastructure and Digital Equity Grant Programs

Program	Program Description	Monetary Impact	Impact to Arlington
Federal Funding			
Digital Equity Act - State Capacity Program	Annual grant program for 5 years in support of digital equity projects and the implementation of their digital equity plan developed under the State Digital Equity Planning Grant Program. ²⁰⁰	\$1.44B nationally. Funds are awarded to states, territories, and tribal governments. Entities will have separate funding allocations and different programmatic requirements.	The State might elect to pass thru dollars for implementation activities on a variety of digital inclusion, literacy, and equity initiatives and planning activities. The program begins once the State plans are approved anticipated in fiscal year 2024.
Digital Equity Act - Digital Equity Competitive Grant Program	Annual grant program for 5 years to implement digital equity projects that support digital inclusion and spur greater adoption of broadband among covered populations. ²⁰¹	\$1.25B with \$250M per year over 5 years. 10% match (waivable). ²⁰²	Similar timing as State Capacity Program. Applications due to federal government. Eligible applicants include the County, nonprofits, community anchor institutions, and workforce development groups. ²⁰³
Infrastructure Act's Broadband Equity and Deployment (BEAD)	Expand high-speed Internet access by funding planning, infrastructure deployment and adoption programs in all 50 states	\$42 B, nationally, estimated \$1.4B in Virginia 20% minimum; Virginia could require higher match levels depending on how the program is designed	Limited BEAD funding opportunity for the County given low number of properties under federal benchmarks and would require willingness of ISPs to pursue
E-Rate - Schools & Libraries USF Program - FCC	Provides discounts for Internet services to a school or library or within schools and libraries (internal connections, basic maintenance of internal connections, and managed internal broadband connections)	Based upon demand; discounts range between 20% and 90% of the costs of eligible services	Arlington County has leveraged the E-rate program in the past and it is logical to think future funding opportunities will be available.

²⁰⁰ Projects completed under the Digital Equity Act should focus on covered populations: Low-income households, aging populations, incarcerated individuals, veterans, people with disabilities, people with language barriers, racial and ethnic minorities, and rural residents

²⁰¹ Ibid.

²⁰² www.congress.gov/bill/117th-congress/house-bill/1841/text

²⁰³ [47 USC 1724: Digital Equity Competitive Grant Program \(house.gov\)](https://www.congress.gov/bills/117/house/1724/all-actions/1)

Community Development Block Grant Program - HUD	<p>For activities that provide decent housing, a suitable living environment, and expand economic opportunities for low- and moderate-income persons. May be used towards broadband projects (or components within a larger project), including "last-mile" installation of broadband (i.e., no long-haul backbone systems will be installed with CDBG funds). Can also be leveraged to support digital literacy programs as a public service activity.</p>	<p>Formula calculated annually. Up to 20% of the allocation may be used towards public service (e.g., digital literacy). In FY2024, Housing anticipates receiving \$1.3 million. Additionally, Housing may generate additional program income (e.g., repayment of loans) and anticipates \$400,000 in FY2024.</p>	<p>Could be used for broadband and digital equity related activities, Arlington County must include this strategy in the Comprehensive Plan that lays out how federal entitlement funds are spent. County administrators competitive funding processes through competitive NOFAs.</p>
HOME Investment Partnership Program - HUD	<p>Supports a wide range of activities that builds, buys, and/or rehabs affordable housing for rent or homeownership. Can be used towards the costs to develop the physical infrastructure/broadband in affordable housing as long as funds are used as part of the project that involves new construction or rehabilitation of multifamily rental projects and that the broadband infrastructure is located within the same facility that is being constructed or rehabbed.</p>	<p>Calculated annually with a formula from U.S. Department of Housing and Urban Development. In FY2024, Housing anticipates receiving approximately \$823,000. Additionally, Housing may generate additional program income (e.g., repayment of loans) and anticipates \$200,000 in FY2024.</p>	<p>Similar process as CDBG program above.</p>
State Funding			
Virginia Telecommunications Initiative (VATI) - Virginia DHCD	<p>Extends broadband service to currently unserved areas. Supplements construction costs by private sector providers to build, utilize, and capitalize on telecom infrastructure to create strong, competitive communities.</p>		<p>No VATI awards to Arlington from 2017-2022. Due to focus on unserved areas, there are unlikely opportunities for Arlington. However, this program should be regularly assessed.</p>
Commonwealth Connect²⁰⁴	<p>The Commonwealth Connect program is the Commonwealth of Virginia's comprehensive effort to achieve universal broadband access. The In support of this program, the Commonwealth's broadband team is working with local governments and to identify gaps in broadband coverage within those localities and developing plans to fill those gaps.</p>	<p>Includes appropriated Commonwealth funding along with partnership investment from the private sector.</p>	<p>Under this program, Arlington leveraged \$700,000 in Commonwealth ARPA funds. May be opportunities for Arlington to partner with a private entity to expand access to the ConnectArlington network.</p>

²⁰⁴ [Commonwealth Connect Report.pdf \(virginia.gov\)](#)



7

NEXT STEPS

The information learned from this resource evaluation and needs assessment will inform future elements of the County's Broadband Study, including an evaluation of broadband implementation models to select appropriate solutions to address the County's needs and strategic recommendations, along with proposed actions and policies to ensure adequate and affordable broadband access. The next report, the *Model Evaluation*, will examine the options and the associated implementation and cost models to address the underserved broadband infrastructure locations and digital inclusion communities identified in this *Resource Evaluation and Needs Assessment* report. The final report in the series, *Strategic Recommendations*, will detail a list of recommendations and supporting actions to ensure reliable, affordable broadband for the community's needs and to further the County's digital equity goals. The strategic recommendations will include, but not be limited to policy changes, partnerships, staffing resources, and the funding required to achieve the County's desired broadband and digital equity objectives.

8 GLOSSARY

Term	Definition / Explanation
Affordable Connectivity Program (ACP)	The Affordable Connectivity Program is an FCC subsidy program for Internet service and devices to help qualifying households with low-income afford broadband access.
Broadband	Reliable, high-speed Internet connectivity with a minimum speed that evolves with technology improvements. This report defines broadband as achieving a minimum of 100 Mbps download and 20 Mbps upload. The current FCC definition at the time of publishing this report is 25 Mbps download and 3 Mbps upload.
Digital Equity	Digital equity is a condition in which all individuals and communities have the information technology capacity needed for full participation in our society, democracy, and economy. Digital equity is necessary for civic and cultural participation, employment, lifelong learning, and access to essential services.
Digital Inclusion	The activities that achieve results to bridge the digital divide. The core elements to working towards digital inclusion include affordable, robust broadband Internet service availability; Internet-enabled devices that meet the needs of all users; access to digital literacy training, quality technical support, and applications; and online content designed to enable and encourage self-sufficiency, participation, and collaboration.
Download [Speed]	The transfer of digital data from the Internet to the user. In the context used in this report, download speed refers to the speed of the connection or the usage of the connection from the Internet to the user.
Federal Communications Commission (FCC)	The agency overseeing telecommunications regulation in the United States.
(Optical) Fiber	The physical medium used to transport broadband data in an optical network. An optical network uses pulses of light to transmit data over fiber.
Fiber to the premises (FTTP)	Fiber to the premises (FTTP) is an Internet service solution that utilizes fiber optic cable from end-to-end (from the Internet all the way to the customer's property).
Gigabits per second (Gbps)	A unit of measurement for data network speed in the form of billions of bits per second. A bit is the smallest unit of binary data.
Internet Service Provider (ISP)	Organizations that provide Internet access to residential and business customers.
Megabits per second (Mbps)	A unit of measurement for data network speed in the form of millions of bits per second.
Telehealth	Provision of health services remotely through Internet technology platforms.
Underserved area/location	A broadband-serviceable location that achieves less than 100 Mbps for downloads and 20 Mbps (<100/20) for uploads.

Unserved area/location	A broadband-serviceable location that achieves a speed of less than 25 megabits per second (Mbps) for downloads and 3 Mbps for uploads (<25/3).
Upload [Speed]	The transfer of digital data from the user to the Internet. In the context used in this report, upload speed refers to the speed of the connection or the usage of the connection from the user to the Internet.

9 APPENDIX A: INTERNET TECHNOLOGIES

Internet Service Providers use a variety of solutions to enable communications between the Internet and homes or businesses. The physical medium for each element plays a major role in the data speeds available to business and residential Internet customers. The primary media for Internet data transmission are fiber optics, cable, copper, and wireless. In all cases, the data speed of any communication system is based on the amount of bandwidth available over the medium (copper wires, coaxial cable, fiber, or wireless). The more bandwidth a medium has, the more data it can send over that medium. In addition, the bandwidth available to any individual customer is also a function of how bandwidth is shared. For example, a fiber optic cables bandwidth might be shared among 30 households, and a wireless carrier’s cell site might share the same bandwidth among hundreds or thousands of residential and business customers.

Broadband networks can be thought of in terms of transportation networks. Transportation systems take goods from manufacturing sites along interstate highways and rail corridors to local distribution areas, going from large volume trucks and rail cars to smaller delivery vans to get products from manufacturers to businesses and residents. Internet service providers likewise receive traffic from the Internet at an Internet Point of Presence and then transport it along middle mile routes that carry large volumes of traffic to individual neighborhoods. Then, the last mile²⁰⁵ segment of the network distributes traffic to individual homes and businesses. Figure 29 below is a graphical depiction of the Internet Service Provider network topology using these network segments.

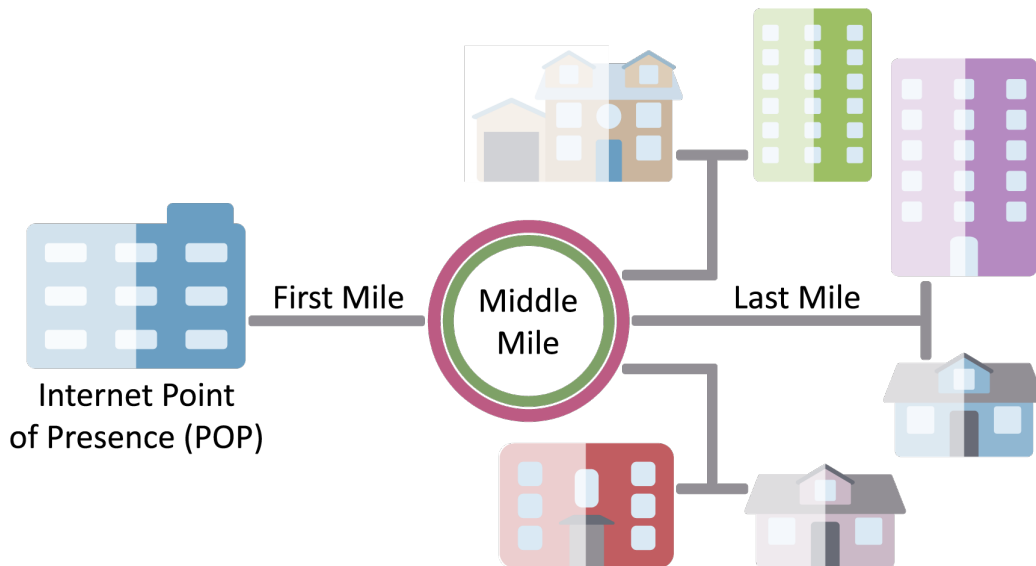


Figure 29: Internet Service Provider Network Topology

Generally, fiber optics are used in most broadband networks along their main routes (the middle mile) due to their very high capacity, ability to transmit a signal over long distances, and their lower

²⁰⁵ The common term, “last mile,” refers to the last leg of the telecommunications network that connects the customer with the ISP’s core network. It is not specifically a mile but is often in that order of magnitude in length depending on a variety of factors including the last mile technology and the number of customers it serves.

maintenance costs (resistance to corrosion due to non-metallic components). The substantial amount of bandwidth in optical systems translates to extremely high data speeds and can easily support the traffic from multiple neighborhoods. However, the last mile medium used will depend on a variety of factors including the ISP's existing infrastructure. The last mile is the most expensive per customer served in broadband networks, and therefore, service providers frequently will reuse, to the extent possible, what assets they already have. The following are the primary mediums and technologies utilized for the last mile to provide broadband Internet service:

- **Copper:** DSL (digital subscriber line) is a technology that transmits data over traditional copper telephone lines. It uses the same copper cabling deployed by telephone service providers over decades (using different part of the frequency spectrum than the traditional voice telephone communication). The data speed can vary depending on the type of DSL technology and distance to the subscriber's location from the ISPs facilities. Verizon is the legacy "Local Exchange Carrier" (LEC) offering telephone service in Arlington County and typically offers speeds of 10 Mbps down and 1 Mbps. Some DSL technologies can deliver more than 100 Mbps.
- **Cable:** Cable based service uses the same coaxial cable that delivers cable television to homes and businesses. The cable operators use a technology called Data Over Cable Service Interface Specification (DOCSIS). It uses a different spectrum than the cable operator uses for television signals to the customer so that it does not interfere with television signals. The current iteration of this technology available in Arlington is DOCSIS 3.1, capable of speeds of 1 Gbps down and 35 Mbps up for most cable-based providers. Cable companies can use more of the available bandwidth on the coaxial cables to provide more bandwidth. Comcast is doing so with a technique called mid-splits that increases their upload data speeds.²⁰⁶ Beyond node splits, DOCSIS 4.0 is capable of maximum speeds of 12 Gbps up and 6 Gbps down to be shared among customers in each network node. Cable-based broadband networks frequently refer to their networks as "hybrid fiber-coax" (HFC) to designate that their networks use fiber optic service up to the last mile of the connection to a subscriber and use coaxial cables for the last mile.
- **Fiber:** Also referred to as fiber to the premises (FTTP), it uses fiber optic cable from the service provider's network hub location to the customer's property. Last mile FTTP networks generally use Passive Optical Network (PON) technology to provide low-cost splitting of fiber capacity among multiple customers. Verizon's current PON version is GPON, standardized in 2003, and achieves 2.4 Gbps down. Verizon has announced that it is moving to Next Generation Passive Optical Networks 2 (NG-PON2) that was internationally standardized in 2015. That technology can deliver 10 Gbps per wavelength (a portion of the optical spectrum) and can support four wavelengths delivering up to 40 Gbps.
- **Fixed Wireless:** Fixed wireless solutions deliver broadband Internet service using terrestrial wireless transmissions from the provider's location (e.g., a cell site) to a fixed customer location. Fixed wireless service contrasts with mobile wireless service which allows mobility of the customer's equipment. The wireless solution may differ per provider. For example, T-Mobile uses cell towers that connect wirelessly to equipment inside the customer's property, whereas Starry's solution requires equipment installed on the roof of a building or outdoors to receive the signal and from there, wired solutions (e.g., fiber) bring the service inside the property. Fixed Wireless

²⁰⁶ See [Comcast focuses on mid-split to get to DOCSIS 4.0, stalls wireless infra plan | Fierce Telecom](#) for more details on the solution.

service can be offered using licensed spectrum that is dedicated to the provider, or unlicensed spectrum that is shared with others. As opposed to mobile wireless services that may have data caps at which speeds are throttled when a certain monthly consumption limit has been reached, fixed wireless solutions generally do not have a data cap. Fixed wireless speeds depend on many factors including the amount of radio spectrum available to provide the service, the use of the spectrum by other operators, and the level of the received signal. T-Mobile offers service at 25/3 and 100/20 Mbps while Starry offers service predominantly at 200/100 Mbps. See additional information about mid-band spectrum and millimeter wave wireless solutions below.

- Satellite:** Satellite service is a form of wireless networks using transmitters in orbiting satellites to provide service. There are two primary classifications of satellite systems: geo-stationary orbit (GSO) and non-geo-stationary orbit (NGSO). A GSO satellite is one that orbits the earth at the same location, such that satellite dishes on the ground fixed on the same location will retain a connection. GSO satellites orbit 26,000 miles above earth. NGSO satellites generally orbit the earth at lower altitudes between 400 and 1200 miles. The shorter distance reduces the time it takes for the signal to travel to the satellite and back down to earth, reducing the delay of communication. In addition, the NGSO satellite is travelling thousands of miles an hour overhead and requires the antenna on earth to track it. Each NGSO satellite also covers much less area than the GSO satellite, which shares its capacity over fewer homes and businesses. This requires more satellites to serve the same area but can yield much higher data speeds. For example, Arlington’s GSO providers HughesNet and Viasat offer service between 25 and 35 Mbps down and 3 and 4 Mbps up while NGSO provider Starlink offers service at 100 Mbps down and 10 Mbps up.

Wireless Spectrum Options:

Millimeter wave (mmWave): Millimeter wave wireless solutions use very high frequency wireless transmissions that have limited range. Most cell phone connections use frequencies between 600 megahertz and 4,000 megahertz but millimeter wave systems use frequencies from 26,000 to 39,000 megahertz. There is much more spectrum available at these higher frequencies enabling higher data speeds to each device/customer – typical speeds of more than one gigabit per second are common. The higher frequencies cannot travel as far or pass through obstructions. Because of their limited range these solutions currently target service in arenas and other densely populated locations for the service. It is possible, however, that in the future that wireless service providers may employ more mmWave service areas and offer very high speed fixed wireless solutions in those areas. The millimeter wave bands are only available to 5G wireless systems.

Mid-Band: Mid-band solutions use spectrum that balances range and peak data speeds. This spectrum is higher in frequency than historical bands used by the cellular carriers (generally below 2 GHz) and have less range than these other bands, but they are not limited to the “line of sight” range for millimeter wave. Therefore, they can be used more easily to serve individual homes and businesses in the vicinity of a cell site. Combined with 5G infrastructure, the mid-band ranges from 2.5 GHz to 4 GHz can utilize channel sizes of 100 MHz (4G channels are limited to 20 MHz) and due to the larger bandwidth available can deliver speeds in excess of 300 Mbps. As a point of reference, T-Mobile uses its 2.5 GHz mid-band spectrum to deliver 120/20 Mbps fixed wireless service, and where the company does not have mid-band coverage, it advertises 25/3 Mbps fixed wireless service.

Small Cells:

Wireless service providers use cell sites to transmit and receive information to subscriber devices (smartphones, tablets, Wi-Fi hotspot devices, and fixed wireless modems). Depending on the environment

they serve, they may have antennae installed on very tall towers in rural areas, perhaps as high as 200 feet above ground level to much smaller towers or poles in suburban and urban areas. The shorter the supporting structure (tower, pole, or building), the smaller the coverage range of the cell site. Traditional urban cell sites may have a coverage radius of only one-quarter to one-half a mile with antennas installed lower than 60 feet. The traditional cell site will have equipment at the base of a tower the size of several refrigerators and with possibly 12 antennas on the tower that may each be six feet tall or more.²⁰⁷

A small cell serves a fraction of that area, and with equipment that is far smaller and generally transmits much less powerful signals. Their size enables them to be installed on low-cost poles, and even hidden inside streetlights. They enable a wireless service provider to deliver highly localized coverage and capacity in an area. Wireless providers will want to place small cells as close to high traffic areas as possible, such as inside arenas, convention centers, malls, and in busy outdoor areas. A provider might combine a utility or light pole proximity to targeted residences and businesses with millimeter wave service to offer highly targeted fixed wireless Internet service. By utilizing poles in the right-of-way, the provider will be more likely to have lower cost access to power and fiber, making the deployment more affordable.

Small cells are not uniquely associated with 5G technology. Wireless service providers can use both 4G and 5G equipment in the small cell architecture. Furthermore, 5G service can be provided by small cells and macro cells (full sized equipment and coverage footprint).

Wi-Fi:

Wi-Fi is a short-range wireless network technology that is commonly used in homes and businesses to connect their smartphones, tablets, laptops, smart devices (TVs, switches, security cameras, etc.), gaming consoles, and other Internet enabled devices to the end user’s network connection with their ISP. Wi-Fi can also be used in public networks such as those who offer free public Wi-Fi where a third party will operate the Wi-Fi access points to directly provide Internet service to users. In that case a third party, and not the homeowner or business owner, operates the Wi-Fi access points (the component that broadcasts the Wi-Fi signals and connects to the wired network).

Wi-Fi has evolved over two decades such that most mobile devices today include Wi-Fi capabilities. Wi-Fi uses unlicensed radio spectrum to communicate between the access point and the client devices. This spectrum is shared with other access points in the community and can cause degradation of service. There are two primary radio spectrum allocations used by Wi-Fi: 2.4 GHz, 5.8 GHz, and 6 GHz. The lower frequency, 2.4 GHz, contains only three non-overlapping frequencies which causes extensive sharing of that band. The 5.8 GHz band has seven times the amount of spectrum, allowing for much higher data speeds (the more spectrum, the more data that can pass over the connection). The 6 GHz band is the latest spectrum to become available to Wi-Fi in 2020 and has more than 17 times the spectrum available at 2.4 GHz. But there is a tradeoff – the higher in frequency, the shorter the range and greater difficulty for the signal to pass through walls and requires more access points to cover the same area.

The 2.4 GHz band was the first band used by Wi-Fi devices. Some older equipment, and even some low-cost specialty equipment (e.g., smart switches) may only support the 2.4 GHz band. Due to the fewer number of channels, the smaller channel size, and typically very high levels of interference in the 2.4 GHz Wi-Fi spectrum. Coupled with an older product that supports the earliest versions of Wi-Fi and you might only see 20 Mbps. In areas where there are many Wi-Fi access points present (e.g., apartments,

²⁰⁷ This can vary substantially depending on they of cell site architecture the wireless provider uses as well as the number of radio spectrum bands the cell site supports and the frequencies of those bands.



townhouses, office buildings, and other densely populated locations), the interference from other access points could drastically lower its performance. The latest equipment will do a better job of managing interference and will also access more spectrum to boost speeds.

It is important to understand the limitations of Wi-Fi and its impacts on quality of service. For example, most smart TVs are connected to the Internet via Wi-Fi. Without a strong signal and equipment that can support at least 5.8 GHz (both a router/access point and the TV itself), it will be difficult to stream Ultra High-Definition television streams that require a 25 Mbps connection. It is critical that high-consumption devices, such as televisions, have solid Wi-Fi connections to deliver reliable, high-quality Internet services.

10 APPENDIX B: FCC BROADBAND DATA

10.1 FCC Data Background

The Federal Communications Commission (FCC) has collected broadband service data since 2000. In 2013, the FCC began collecting service data that included the services available for each provider in each census block. In 2019, the Commission began the rulemaking process to collect more detailed service information. Then, in 2020, Congress passed the Broadband DATA Act that requires the Commission to issue a semiannual map of broadband serviceable locations as well as developing a challenge process for the public to dispute service at particular locations. The FCC then built systems to collect the more detailed, address-level, service information from the Internet Service Providers and in 2022, required the Internet Service Providers to provide their service data by September 1, 2022.

The Commission released the map to the public in November 2022. The underlying data that makes up the broadband service maps is in two components: location and service data. The location data contains information about the physical address, such as its coordinates, its address, land use type, and structure type (business or residential). The service data contains information per address and per service from each service provider and includes the technology utilized and the maximum advertised speeds (i.e., the maximum speeds for a customer's subscription). This service data is updated periodically.

Televate used service data that was published in November 2022. Updates have been made (for example, an update was made on March 4, 2023), and this report does not factor in any changes that may have occurred in the latest iteration.

It is important to understand that this dataset is the very first iteration of both the location dataset and the service dataset. And, as a result, it is likely to have errors. Challenges to the data over time are likely to make it far more reliable and accurate, however, it is the best data available today. The following sections highlight issues identified in the data set during evaluation of the data since November 2022.

10.2 Area Around the Pentagon

The following image from the FCC Broadband map depicts the area around the Pentagon. This area represents many of the grids that show a low percentage of 100/20 service.

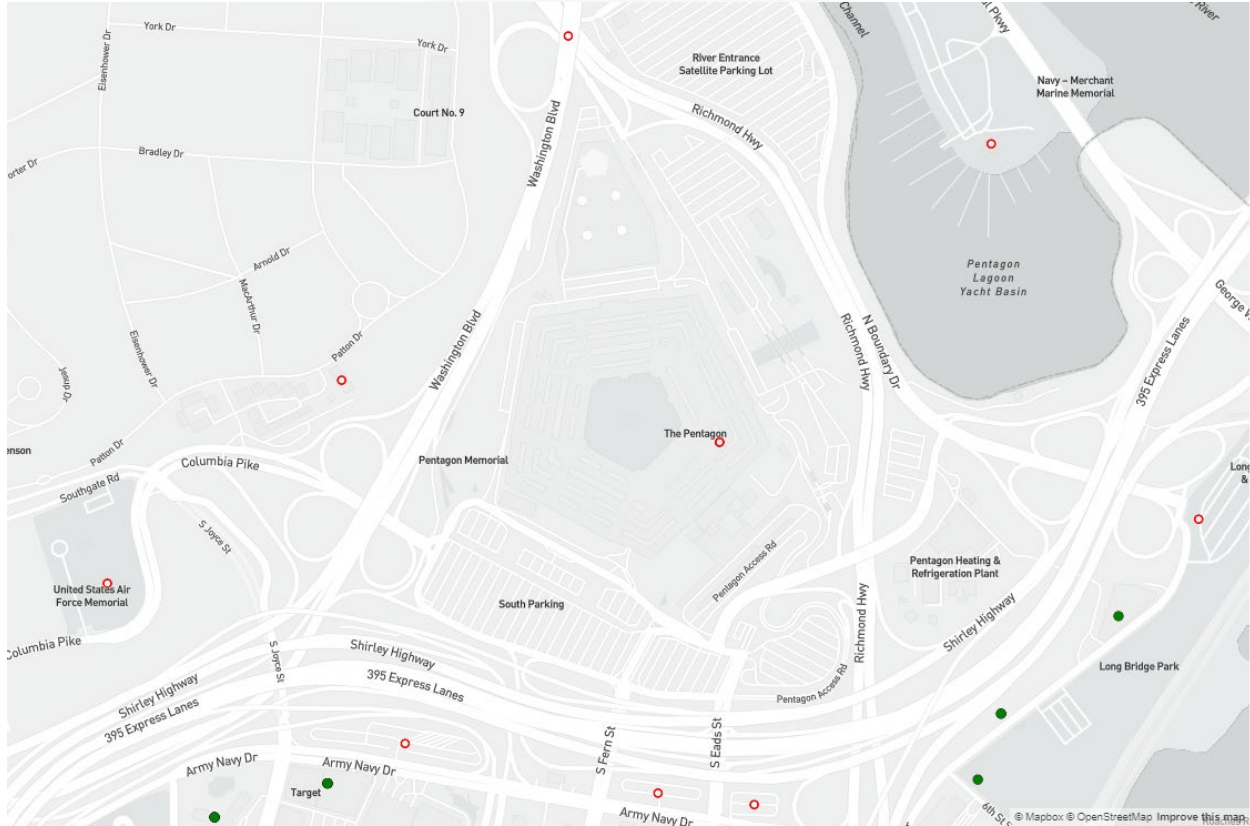


Figure 30: FCC Broadband Data Issues Around the Pentagon

The map shows that the Pentagon itself is a serviceable location as well as locations in Ft. Myers including the Air Force Memorial. More than likely, the Department of Defense does not utilize mass market broadband services – they likely acquire highly customized, highly redundant, and guaranteed broadband data services for the Pentagon, and are unlikely to use mass market services at the other locations. As a result, the locations should be not serviceable. In addition, the map highlights four parking lots that are labeled as serviceable. It is unlikely that the owner would subscribe to mass market Internet service at parking lots. A location directly on Washington Boulevard, listed as 2 Washington Blvd. South, is not a recognizable address. These seven locations are among the 46 locations that are underserved in the FCC data that are likely not serviceable.

10.3 Comcast Carlin Springs Likely Error

Televate noticed a large residential area between Route 50 and N. George Mason Drive that lacked Comcast service while reviewing the data. The following figure illustrates the FCC data with green locations showing Comcast service and red locations showing lack of Comcast service captured on March 7, 2023.

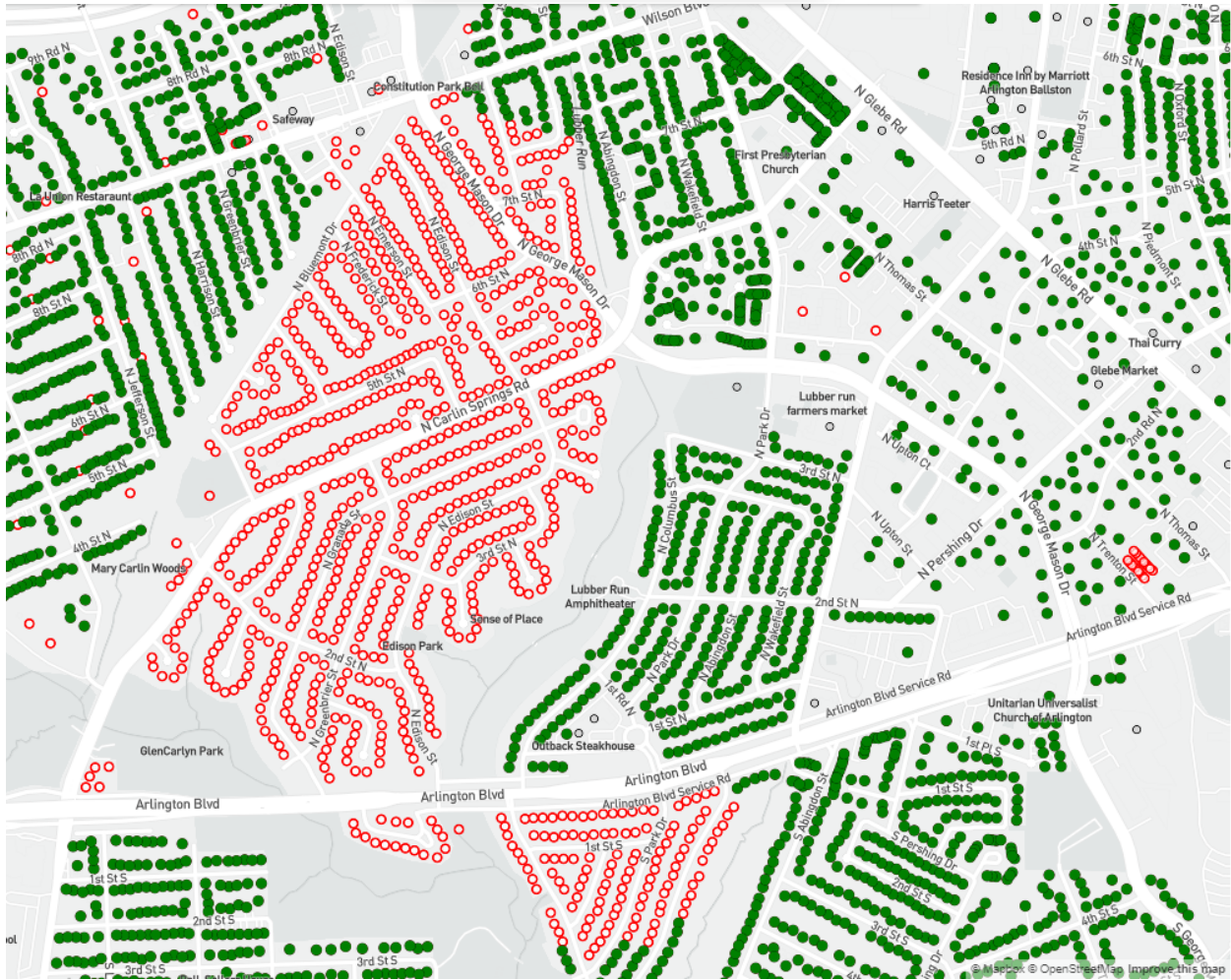


Figure 31: FCC Database Error Near Carlin Springs Road

The red locations represent approximately 950 homes and some businesses. Believing that this may be an error in the FCC database, Televate reached out Comcast to confirm the service gap. Comcast reported that the information in the FCC database was incorrect and that they served the entire area.²⁰⁸ This error has several potential impacts throughout this analysis including:

- The total number of serviced locations for Comcast will be increased
- The total number of exclusive locations will be reduced
- The total number of exclusive locations for Verizon will be reduced (the area represents the majority of locations that are exclusive to Verizon in the current dataset)
- The percentage of locations in that have competition in this area will increase

In particular, there are five residential, multi-dwelling buildings in the Southwest portion of the image at the intersection of Arlington Blvd and N. Carlin Springs Rd. These five buildings are all currently underserved (the best available service is Starlink at 100/10). As a result, if Comcast does serve these areas, it would reduce the number of underserved residential locations by five.

²⁰⁸ Email from Comcast on March 7, 2023.

Televate has addressed this issue where applicable; however, whether or not Comcast will correct the issue and whether it will successfully proceed through FCC processes is unknown at this time. As a result, Televate’s base reporting in this study is on the original dataset, and not a presumed dataset based on Comcast’s claims.

10.4 Bus Stop as Residential Property

In studying the underserved locations, Televate identified one example where the location was erroneously flagged as serviceable. The location in the image below on S. Glebe Rd between S. Ball St. and S. Clark St. is a bus stop but is listed as serviceable and is underserved with the best service coming from satellite provider ViaSat at 30/3. The location is listed as residential property.

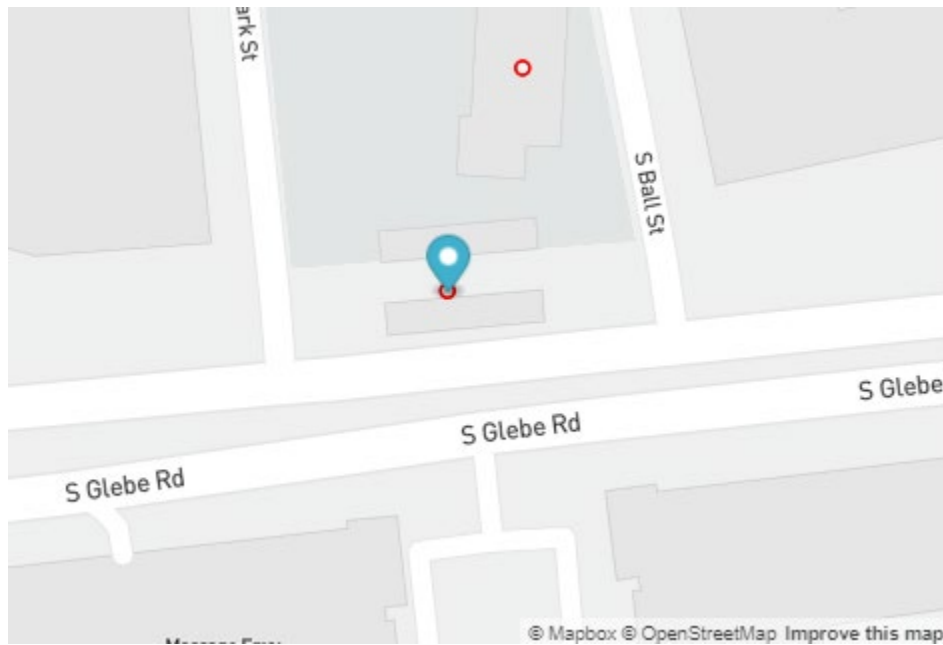


Figure 32: S. Glebe Rd. FCC Map Error

This location is one of the 46 total locations that were underserved in our analysis. Clearly a bus stop is not a location that would subscribe to mass-market retail Internet service, and therefore, should be non-serviceable. As a result, when this and other issues are resolved in the FCC data set, the number of underserved locations are likely to change. While this error would reduce the number of underserved locations, there are possibly other locations erroneously recorded as non-serviceable and are indeed serviceable. It is also important to note that Northeast of this location in red (identifying the location is also under 100/20) appears to be new construction and for-lease according to multiple street views, and therefore, it may not have been reported by the ISPs while the building was under construction as “served.”

Televate did not research the accuracy of the FCC database as part of this project. The examples above were only discovered in the course of preparing this report. It is likely that there are many more errors to be discovered in the data.

11 APPENDIX C: DETAILED RESIDENTIAL SERVICE AVAILABILITY ANALYSIS

11.1 Availability By Affordable Housing Type

The following analyses and graphs were conducted using the FCC’s address-level service availability as of June 2022. The FCC data includes the latitude/longitude of each serviceable address, which was used to determine the affordable housing type using the MHUD database from Arlington County. That database includes all residential properties in Arlington represented as parcels. A geospatial-join mapping process identified the parcel associated with each address point. It should be noted that there may be multiple addresses per parcel (e.g., multiple buildings with different addresses on the same parcel of land).

The following figure highlights the percentage of each affordable housing category from the MHUD database applicable to each service level tier: 100/100 or better, between 100/20 and 100/100, and between 25/3 and 100/20.

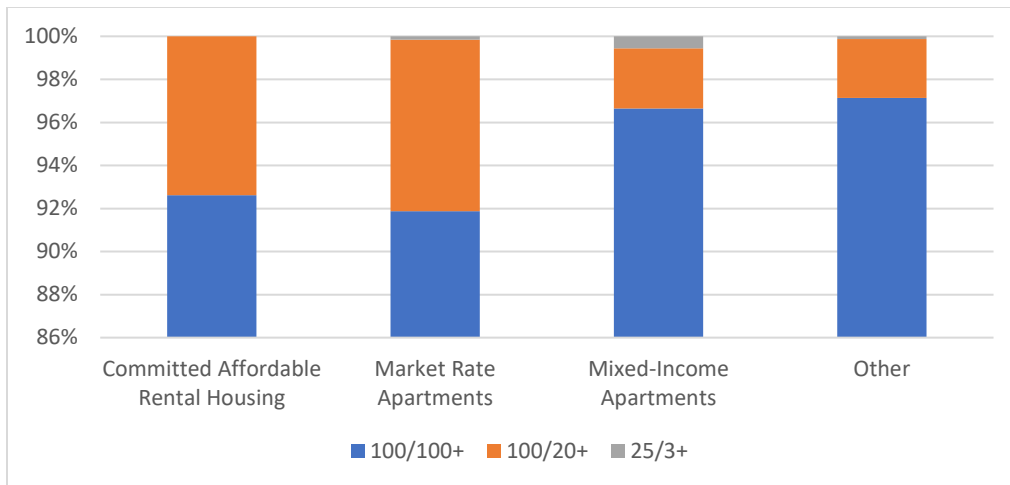


Figure 33: Best Service Available by Affordable Housing Type

Housing Types

Committed Affordable Rental Housing
100% of the units at the property are restricted to households that earn less than a designated income. Households must meet income requirements to qualify for the units and rents are restricted. The Housing Division publishes income and rent limits annually which vary by program and by household size. For more information, visit: [Income and Rent Limits – Official Website of Arlington County Virginia Government \(arlingtonva.us\)](http://www.arlingtonva.us)

Market Rate Apartments
100% of the units at the property are unrestricted to income. Rents fluctuate based upon market conditions.

Mixed-Income Apartments
Properties with one or more units (but not 100%) restricted to households that earn less than a designated income.

All Other Housing
Attached single family housing (e.g., duplex, side-by-side, townhome), detached single-family housing, single-family housing with Accessory Dwelling Units, and Condominiums.

The graph shows that committed affordable rental housing locations are equally as likely as Market Rate locations to have 100/100+ service. And, in fact, mixed-income apartments are more likely to have 100/100+ service than the Market Rate Apartments. No committed affordable rental housing location had less than 100/20 service, versus 0.6% of the mixed-income apartment locations, 0.2% of the market rate apartment locations, and 0.1% of the “other” locations. As a result, the FCC data does not show any substantial difference between service levels of affordable housing and non-affordable housing locations.

The following figure illustrates the percentage of total locations served with broadband speeds by Verizon, Starry, and Xfinity.

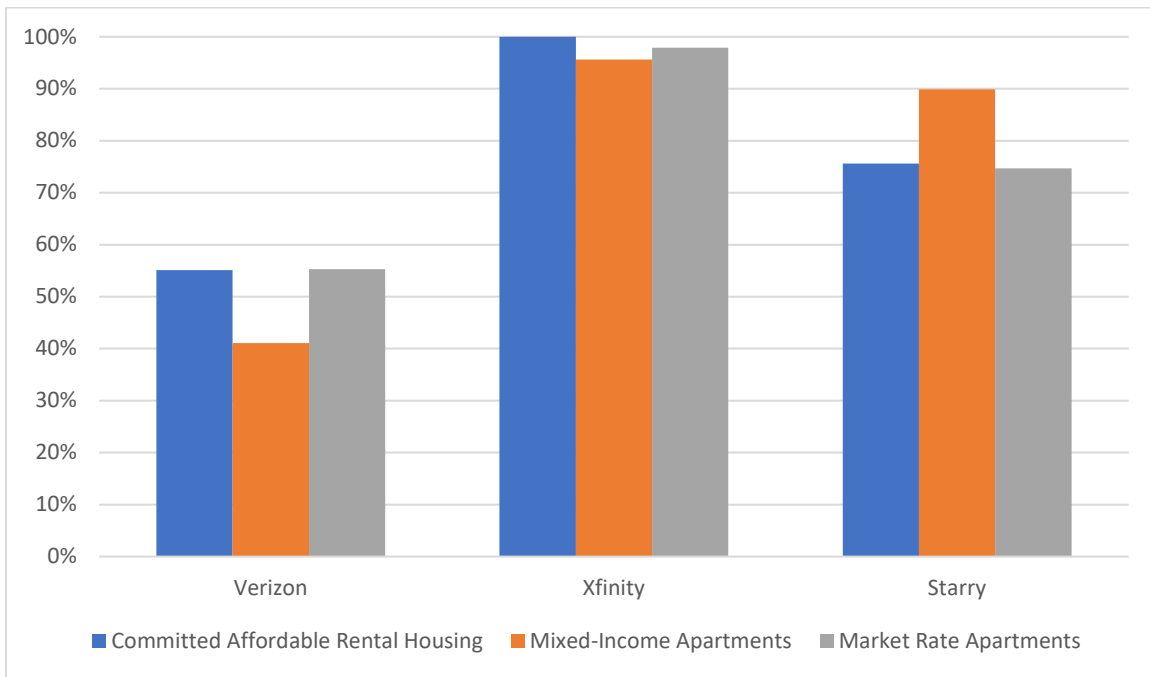


Figure 34: Percent Affordable Property Type Served With 100/20 Service by Provider

The figure shows that Verizon serves 55% and 41% of the CAF and mixed-income apartments respectively. However, Xfinity serves 100% of the CAF locations and 95.6% of the mixed-income apartments. The data also indicate that while Starry serves a far lower percentage of total Arlington County locations overall, it serves more of the committed affordable rental housing, mixed-income apartments, and Market Rate Apartments than Verizon possibly due to Starry’s strategy to serve multi-tenant locations. And, given all three vendors are serving the CAF locations at the same rate as the Market locations, there does not seem to be an influence associated with affordable housing buildings. Furthermore, looking at all types of locations, Verizon is much less likely to serve multi-unit locations overall. While Verizon serves 96% of single unit structures with broadband speeds (100/20), the provider only serves 60% of locations with 20 or more units.

Finally, looking at competition at affordable housing locations, the following figure presents the number of competitors serving the affordable and market rate facilities.

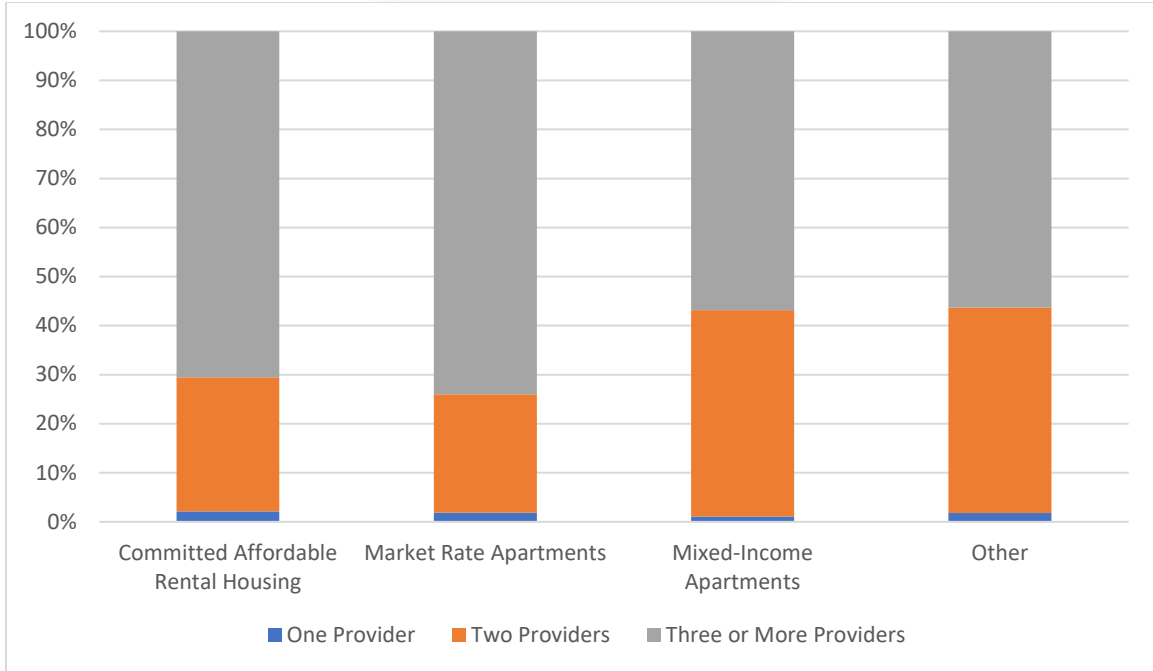


Figure 35: Number of Providers by Affordability Type

Figure 35 above underscores the lack of substantial difference between affordable and market rate properties. CAF properties have negligible higher rates of single provider locations (2.1% compared to 1.8% of market rate properties), and, in fact, CAF properties are more likely to have three or more providers compared to mixed-income apartments and Other properties. In other words, locations that are exclusively affordable housing were likely to have more competition than mixed-income apartments and Other locations but the same rate as Market Rate Apartments. As a result, we see no specific impacts on affordable housing competition levels from the FCC data.

11.2 Availability By Building Type

The MHUD database also contains information regarding the type of residential building. The following graph presents the percentage of serviceable locations that fall into each service level category (100/100 or more, 100/20 or more but less than 100/100, and 25/3 or more but less than 100/20).

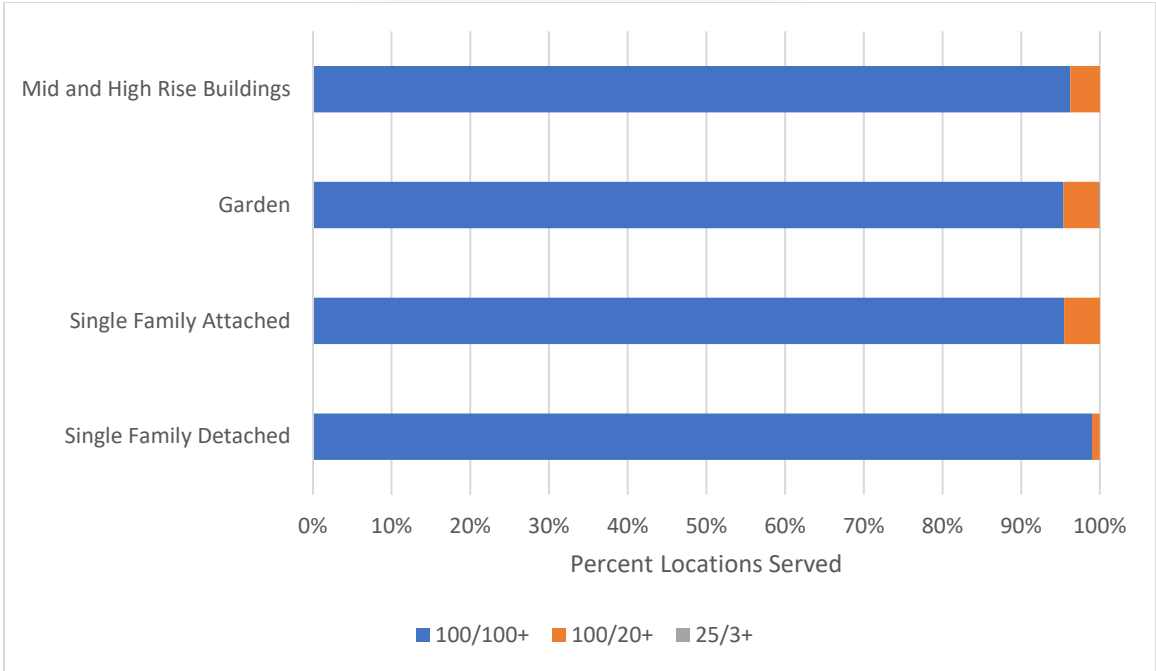


Figure 36: Service Level Availability by Residential Structure Type

As Figure 36 illustrates, all of the classes of residential buildings had more than 95% of their locations served with 100/100 or better service in the FCC data. The percentage of locations that achieved only 25/3 service but less than 100/20 (underserved areas) was 0.12% of garden structures and 0.02% of single family detached structures. The other structure types had no underserved locations. While there are certainly some differences between the classes, they are not significant. Therefore, we see no significant issue with service gaps according to these residential structure classes.

11.3 Availability By Planning Corridor

The following graph depicts the same FCC data against the planning corridors of Rosslyn-Ballston, Richmond Highway, and Columbia Pike and compares these corridors to locations in other areas.

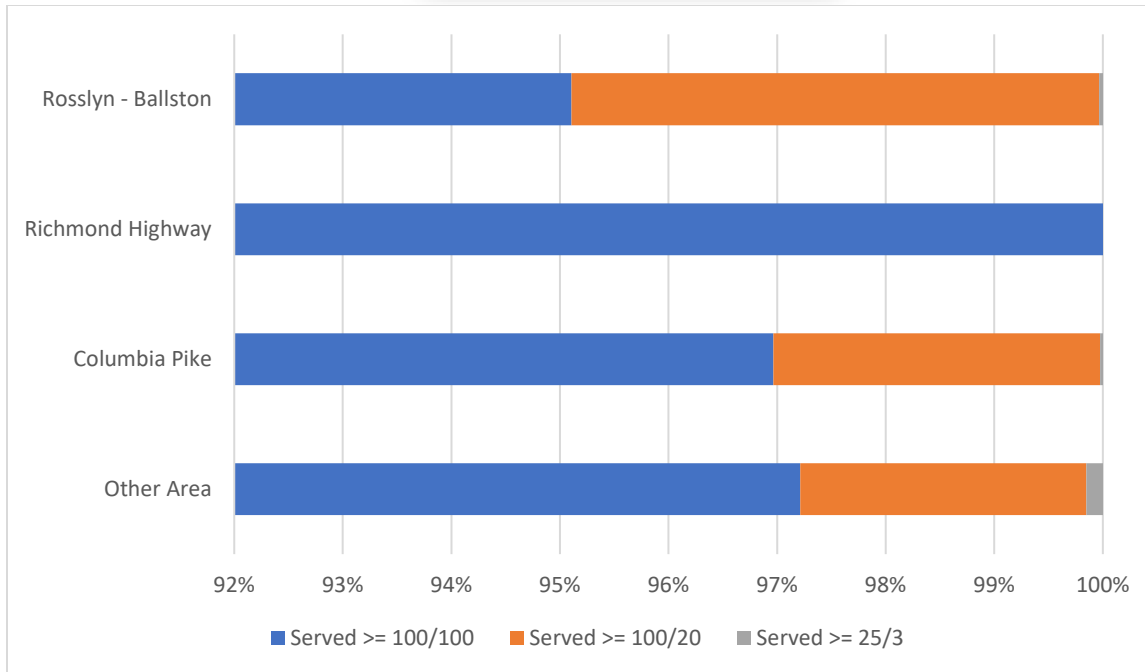


Figure 37: Service Availability Level by Planning Corridor

The data shows that locations in the Rosslyn-Ballston corridor had roughly 2% lower occurrence of 100/100+ service than other areas – it has the lowest rate of 100/100 service at 95% of its locations. One hundred percent (100%) of the locations in the Richmond Highway corridor are served with 100/100+ service. Overall, there was no substantial issue of service in any corridor. As noted above, there are pockets of areas in Rosslyn that are likely causing the slightly lower percentages.

11.4 Availability By Age of Structure

Arlington requested that Televate assess whether the age of the residential building may influence the quality of service. Televate broke the age of the structure into 10-year increments. The following graph highlights the findings:

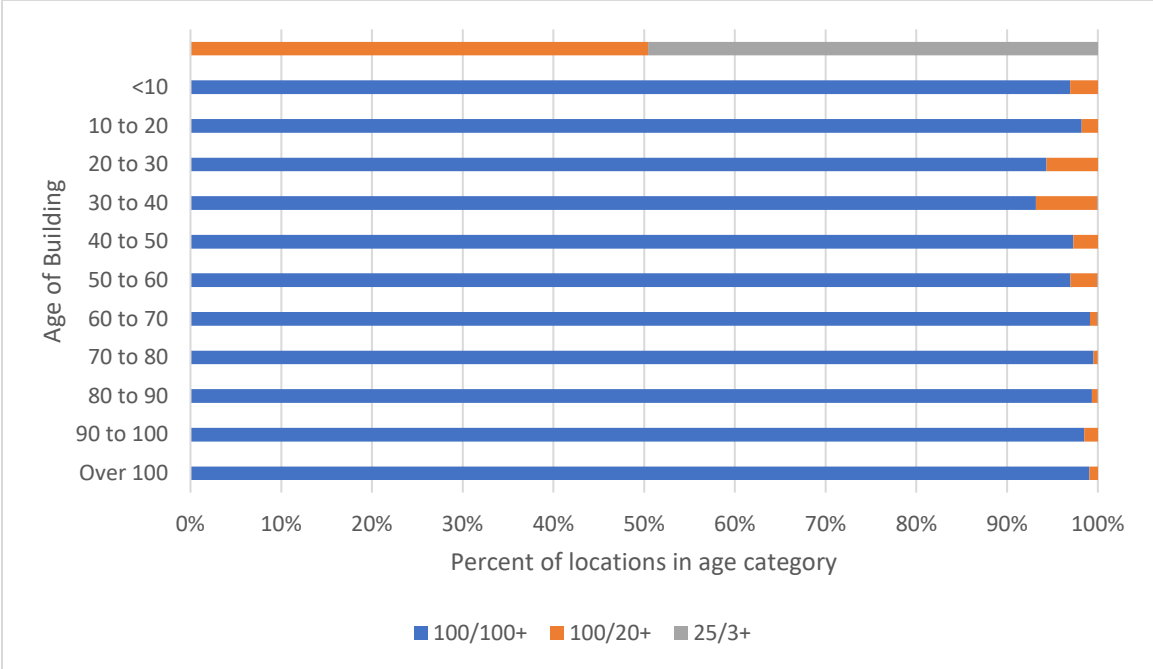


Figure 38: Service Level Availability by Age of Building

The data does not show widescale issues of older buildings. In fact, the least well-served building age falls in the 20-to-40-year range, but still achieves 100/100+ service in over 93% of the locations. Buildings older than 60 years old, in fact, had 100/100+ service in over 98% of all locations. However, overall, there were no substantial impacts of the building age on service availability.

12 APPENDIX D: SUPPLEMENTARY MAPS

The following maps illustrate the maximum data download and upload speeds per grid as reported in the FCC Broadband Maps, and generally reflect the quality and extent of broadband service throughout Arlington County.

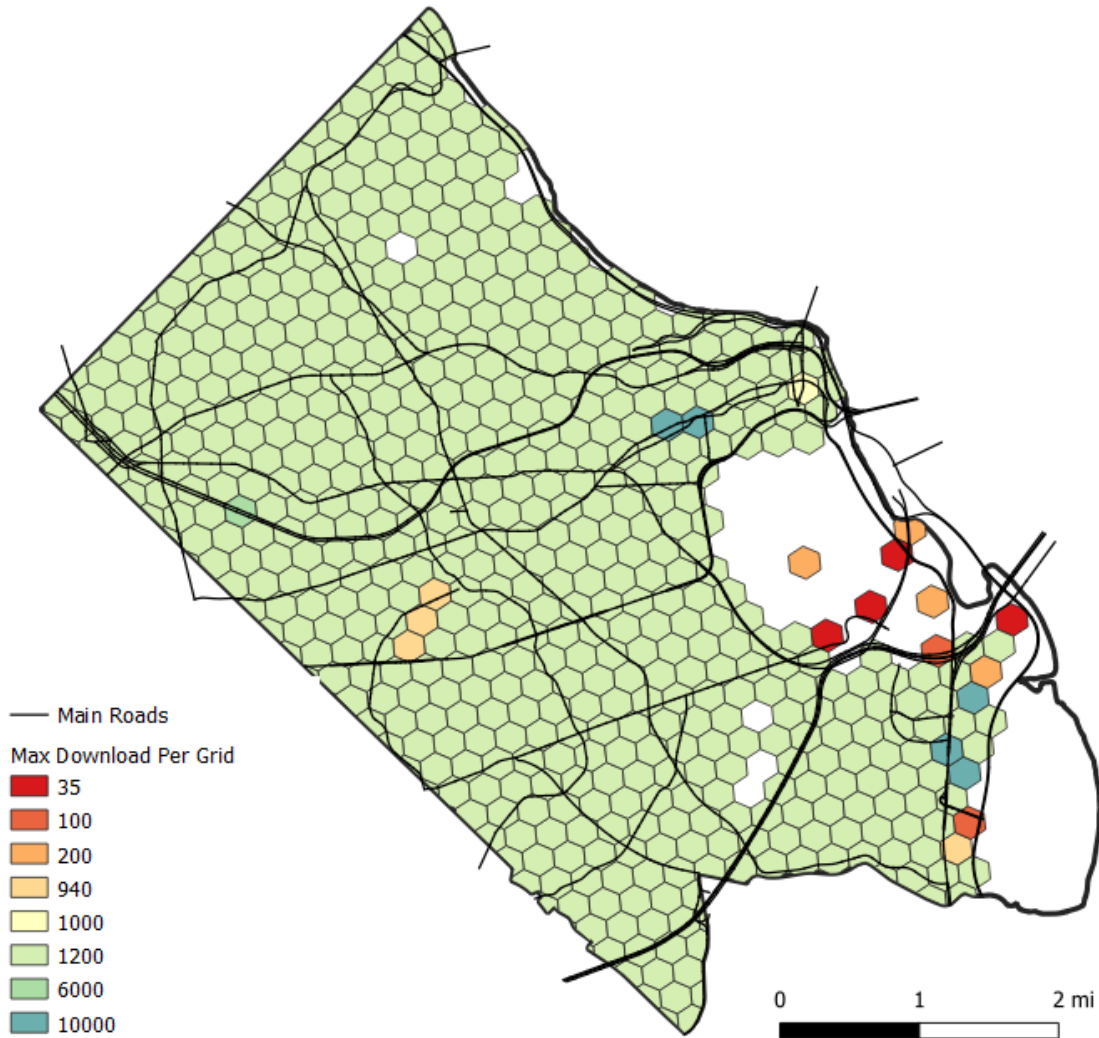


Figure 39: Maximum Download Speed Per Grid (Mbps)

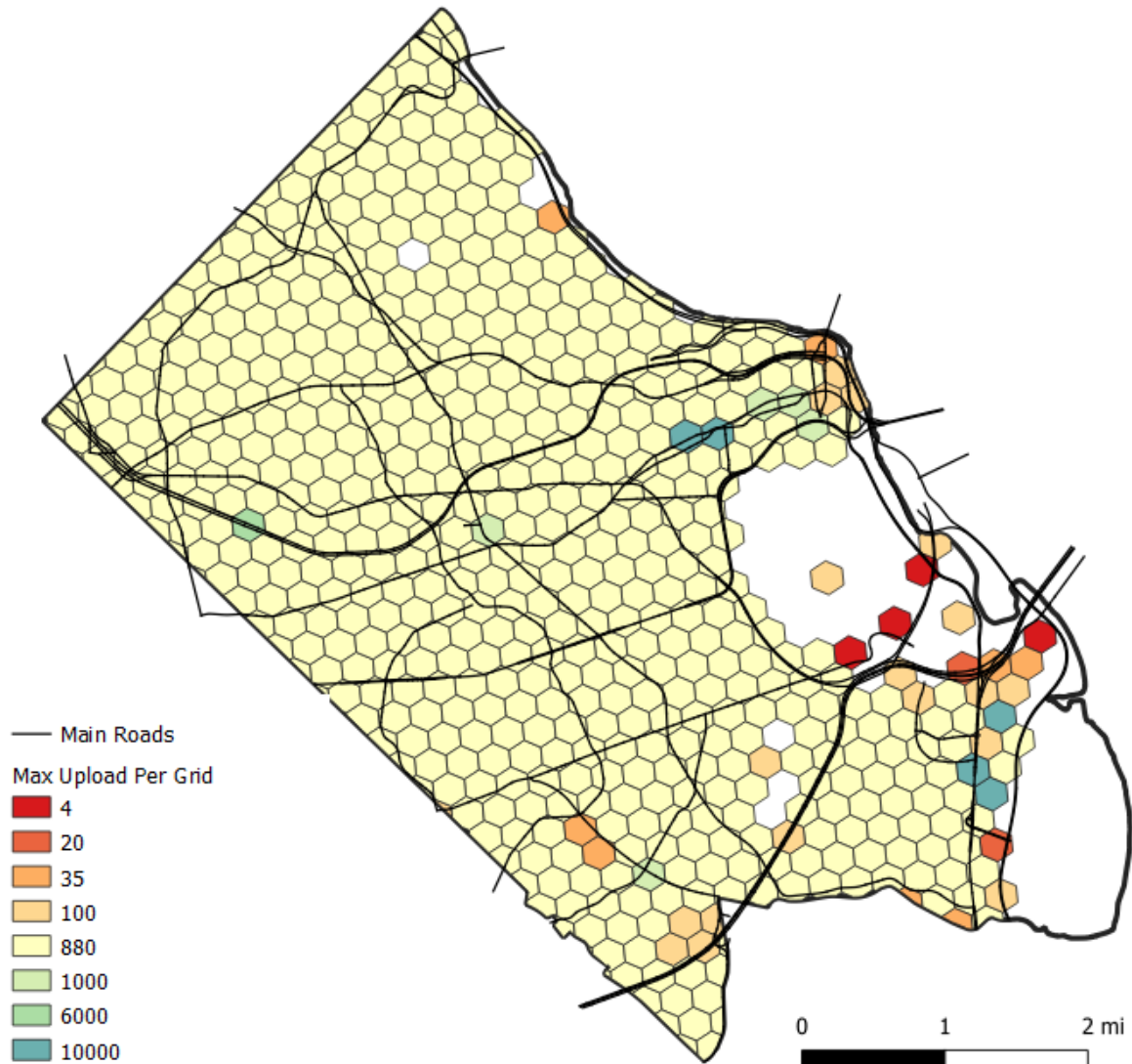


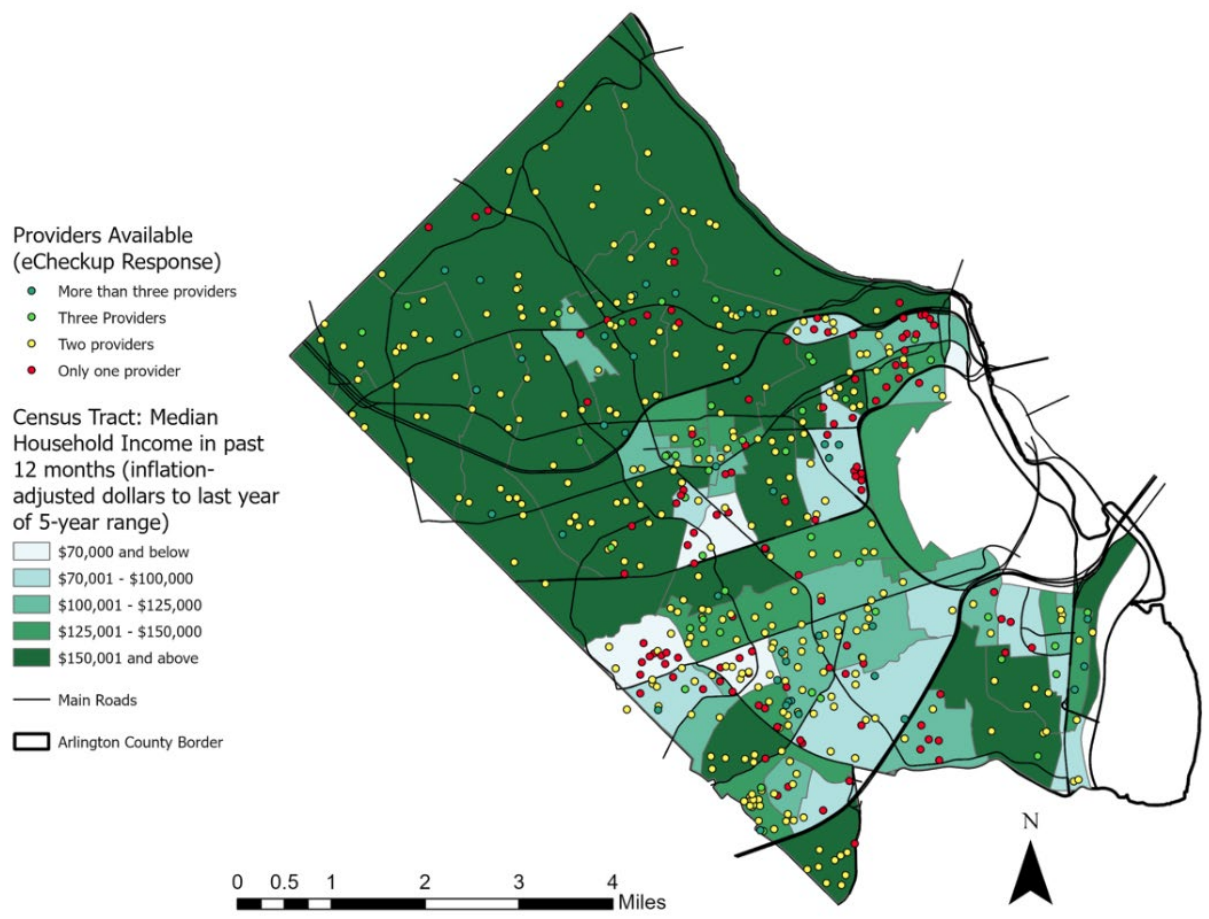
Figure 40: Maximum Upload Speed Per Grid (Mbps)

Service Provider Availability in Arlington County

The following map shows eCheckup responses of how many service providers respondents were aware of to serve their location. The eCheckup data is overlaid with census tract data of median income.²⁰⁹

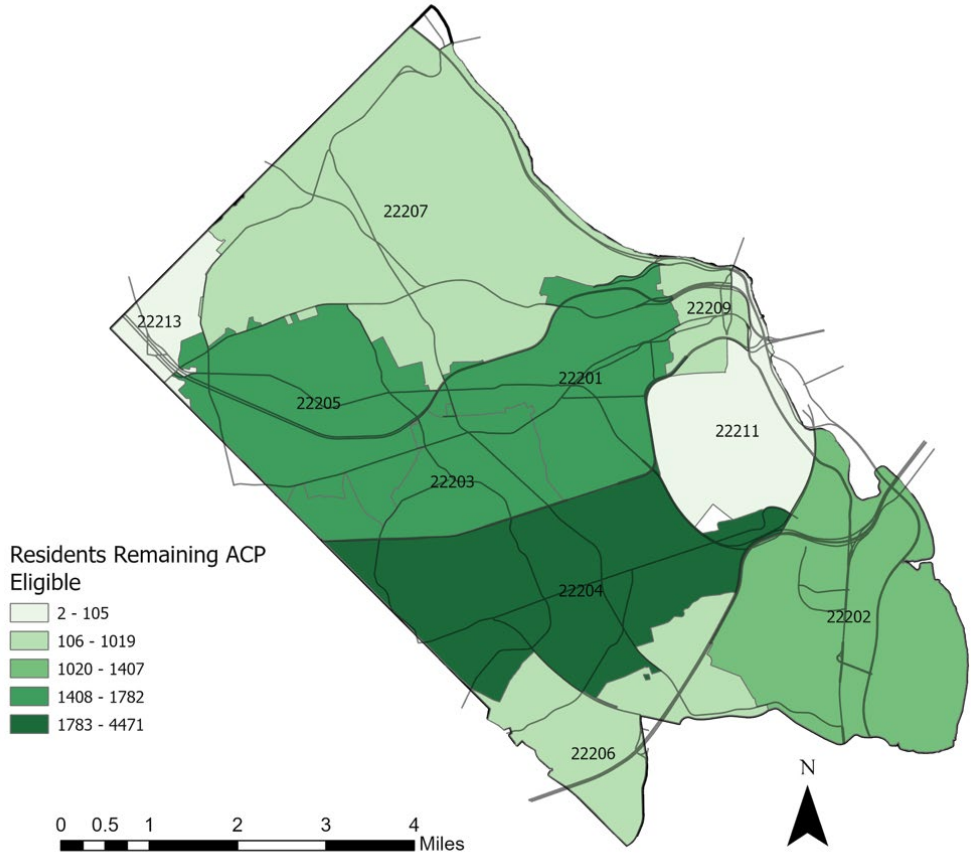
²⁰⁹ Census 2021 5 year estimate Median Household Income:

<https://data.census.gov/table?q=B19013B&table=B19013&tid=ACSDT5Y2021.B19013>



Residents Remaining Eligible to Receive ACP in Arlington County

The following map supplements Table 12 in *Section 5.2.6* detailing residents within zip codes that are eligible but are not currently taking advantage of ACP subsidy.



13 APPENDIX E: DETAILED ISP SERVICE INFORMATION

Provider	Locations Served in Each Service Tier (Most Prevalent Speed in Mbps)				Total Locations Served	Primary Technology
	<25/3	<100/20	<100/100	>=100/100		
HughesNet		35,934 (25/3)			35,934	Satellite
Viasat, Inc.		35,934 (30/3 ²¹⁰)			35,934	Satellite
Xfinity ²¹¹	1 (10/1)	9 (50/8)	34,842 (1200/35)	18 (100/100)	34,866	Cable
Verizon	560 (10/1)	550 (50/4)		33,966 (940/880)	34,602	Fiber
Starlink		28,776 (100/10)			28,776	Satellite
T-Mobile		16,850 (25/3)	11,351 (100/20)		28,201	Fixed Wireless
Starry				7,737 (200/100)	7,737	Fixed Wireless
RCN			647 (1000/20)		647	Cable
Cox			192 (1000/30)		192	Cable
Mediacom			92 (1000/50)		92	Cable
Total Unique Locations	561	35,934	34,924	34,866	35,934	

²¹⁰ Viasat's business speed offering is 35/4 Mbps.

²¹¹ See Section 3.2.2.1 regarding a possible major error in the FCC's database.

14 APPENDIX F: PROVIDERS IN UNDERSERVED LOCATIONS < 100/20 MBPS

A total of 46 locations in the FCC data are in the category of underserved between 25/3 and 100/20. All 46 locations have satellite service of 25/3 or higher. Starlink provides the fastest service at 30 of those locations with 100/10 service. T-Mobile is another provider that helps avoid no-service at these locations, and due to the cost of satellite service, will offer an affordable solution that meets the federal government’s current definition of broadband at 25/3.

Table 15: Providers at Underserved Locations (25/3 to 100/20 Mbps)

Provider	Locations Served	Service Speeds (Mbps)
HughesNet	46	25/3
ViaSat, Inc.	46	30/3 (Residential)
ViaSat, Inc.	46	35/4 (Business)
T-Mobile US	31	25/3
Starlink	30	100/10
Verizon DSL	2	10/1
Verizon FWA	8	50/4
Xfinity	1	10/1

15 APPENDIX G: eCHECKUP RESPONSES

The tables below reflect eCheckup responses and relevant census tables that were used in analysis for this report. Census figures are gathered from 2021 5-year estimates, many as depicted in the Race & Ethnicity Dashboard.²¹²

Household Members Age	eCheckup		Census
4 years and under	77	6.0%	5.8%
5 to 17 years	211	16.4%	13.8%
18 to 34 years	165	12.9%	30.4%
35 to 54 years	387	30.2%	29.0%
55 to 64 years	162	12.6%	9.9%
65 years and over	281	21.9%	11.1%
Total	1283		

Household Income	eCheckup		Census	
Less than \$50,000	51	9.7%	18,123	16.5%
\$50,000 to \$100,000	86	16.3%	25,067	22.9%
More than \$100,000	392	74.1%	66,338	60.6%
Prefer not to respond	109			
Unknown	206			
Total	844		109,528	

²¹²

<https://app.powerbi.com/view?r=eyJrIjojODRhNDkwZWMTNmU0MS00YmMzLWI2MzMtNDQ5MjZmMDAwM2FlliwidCI6IjgwMzU0ODAwLTZmZGYtNDI4ZS05ZjVmLTUwOTFOTkY2Y1NCIsImMiOiJF9>

Race and Ethnicity ²¹³	eCheckup		Census	
Asian	37	4.7%	11,456	11.4%
Black or African American	39	5.0%	8,542	8.5%
Hispanic or Latino	51	6.5%	15,761	15.7%
Native Hawaiian or Other Pacific Islander	1	0.1%	1,012	0.1%
Native American or Alaska Native	1	0.1%	1,012	0.1%
White	597	76.5%	58,542	58.5%
Two or More	40	5.1%	5,123	5.1%
Other (Please specify)	14	1.8%	1,612	1.6%
Prefer not to respond	48			
Total Responding	780			

Education Level	eCheckup		Census	
Primary school/some high school	26	3.1%	10,156	5.3%
High school graduate/GED	25	3.0%	16,022	8.3%
Some college/university	48	5.7%	17,611	9.1%
College/university degree	269	31.9%	77,902	40.4%
Post-graduate degree	475	56.3%	71,170	36.9%
Total	843		192,861	

Employment Status	eCheckup		Census	
Employed	415	65.0%	154,806	78.6%
Not Employed	223	35.0%	42,180	21.4%
Unknown	206			
Total	844		196,986	

²¹³ Note that for analysis conducted in this report figures combined Native Hawaiian or Other Pacific Islander, Native American or Alaska Native, Two or More, and Other into a singular data point assigned as "Other."

Home Ownership	eCheckup		Census		eCheckup		Census	
	Renter				Owner			
Arlington County	257	31.2%	63220	57.7%	567	68.8%	46308	42.3%

Home Type	Single Family				Multi Family Unit			
	eCheckup		Census		eCheckup		Census	
Arlington County	392	53.6%	44740	40.9%	339	46.4%	64652	59.1%

Connection Type	Households	Percent Respondents	Census Percent
Cable	197	23.8%	
Fiber	371	44.9%	
DSL	16	1.9%	
Fixed Wireless	90	10.9%	
Satellite	2	0.2%	3.3%
Mobile Wireless	40	4.8%	
Other High-Speed Internet	64	7.7%	
No Internet	8	1.0%	6.4%
Not Sure	22	2.7%	
Other	10	1.2%	
Dial-up	6	0.7%	0.1%
Total	826		

Speeds (n=321)	Median	Average
Download	100.33	185.61
Upload	46.72	108.58

16 ABOUT THE DATA IN THIS REPORT

The following data was used in this report:

- **American Community Survey (ACS):** Conducted by the U.S. Census Bureau, the American Community Survey provides information on a yearly basis about jobs, educational attainment, languages spoken at home, whether residents rent or own their homes, computer access, Internet access, and other topics.
- **ConnectArlington:** Televate was provided a GIS dataset containing information on the broadband infrastructure used by wired networks on March 1, 2023. The dataset was used to determine the scope and locations of the ConnectArlington conduit infrastructure and calculate the number of miles of conduit available with the infrastructure.
- **eCheckup:** The eCheckup is an online data collection and assessment tool by SNG deployed in localities to gather information from residents, businesses, and organizations on broadband connectivity and utilization, satisfaction with services, benefits and barriers to using the Internet, priority goals, and impacts to education, telehealth, teleworking, and other broadband related economic insights.
- **FCC Broadband Data Collection:** The FCC Broadband Data Collection data set is the new FCC owned and maintained data set.
 - **Location Fabric:** The FCC Location Fabric is a database of addresses and other core information for those addresses. Arlington County executed a license agreement to receive the location fabric for Arlington County addresses and shared that database with Televate. The location fabric includes information such as:
 - Location identifier
 - Street Address
 - Address coordinates (latitude and longitude)
 - Serviceability of the address (serviceable or non-serviceable)
 - Type of structure
 - Number of units
 - **Service Data:** The FCC service data is available for download by the general public²¹⁴ by State and technology type. The comma separated values (CSV) organized files contain a record for each service provider and for each service type per location where service is provided. The data has an “effective date” or the date that the service was in place and is updated by the FCC based on challenges. The data Televate used in performing the analysis was effective as of 6/30/2022 and was current as of 11/18/2022. The fields in the service data include the following information for each location, provider, and service type²¹⁵:
 - Location identifier (links to the location fabric)
 - Provider name

²¹⁴ See [Nationwide Data | FCC National Broadband Map](#) to download the data.

²¹⁵ A single provider might advertise multiple services at an individual location. For example, a provider may offer separate business and residential services, or a provider may offer services via multiple technologies (e.g., copper and fiber) at the same location.

- Technology type
 - Max advertised download speed (Mbps)
 - Max advertised upload speed (Mbps)
 - Code for business, residential, or both service
- **Master Housing Unit Database (MHUD):** Arlington County owns and maintains this database of residential properties in Arlington County. Televate received MHUD data from Arlington County in May 2022 with a file dated 5/13/2022. The data is provided in GIS form using polygons that represent residential land parcels. As a result, there is one record per residential parcel. Multiple buildings, and therefore, multiple addresses may be located on a single parcel of land. Key data used from the MHUD database:
 - Affordability type
 - Structure type
 - Year built
 - Planning corridor

17 ACKNOWLEDGEMENTS

The Televate-SNG Team would like to thank the following individuals and organizations for their assistance in developing this report.

ARLINGTON COUNTY LEADERSHIP

ARLINGTON COUNTY BOARD

Christian Dorsey, *Chair*
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 Jack Belcher, *Chief Information Officer and Director, DTS (former employee)*
 Norron Lee, *Chief Information Officer and Director, DTS*
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COUNTY STAFF

Arlington Economic Development | Arlington Employment Center | Arlington Public Libraries | Arlington Public Schools | Department of Human Services | Department of Parks and Recreation | Department of Technology Services | Community Planning, Housing, and Development | Police, Fire, and Emergency Management

INTERNET SERVICE PROVIDERS

AT&T | Comcast | Starry | T-Mobile | Verizon

BROADBAND INDUSTRY PRACTITIONERS

Federated Wireless | Google | Imagine Wireless | Information Technology Advisory Commission, former and current members | Broadband Advisory Commission, former members | Office of Broadband, Virginia Department of Housing and Community Development

STAKEHOLDERS INTERVIEWED (*CONTINUED*)

COMMUNITY ORGANIZATIONS

AHC, Inc. | Alliance for Arlington Senior Programs | Apartment and Office Building Association of Metropolitan Washington (AOBA) | ArlFiber | Arlington Branch of the NAACP | Arlington Chamber of Commerce | Arlington Commission on Aging | Arlington Free Clinic | Arlington Neighborhood Village | Arlington Partnership for Affordable Housing | Arlington Retirement Housing Corporation | Avalon Bay | Ballston Business Improvement District | Bridges 2 Independence | BU-GATA | Clarendon Alliance | Columbia Pike Partnership | Doorways | Edu-Futuro | Ethiopian Community Development Council | George Mason University | Interfaith Network | Jair Lynch | JBG Smith | La Cocina | Langston Boulevard Alliance | Latino Economic Development Center | National Landing Business Improvement District | Neighborhood Health | New Hope Housing | Northern Virginia Apartments Association | Northern Virginia Chapter of Commercial Real Estate Development (NAIOP) | OAR Of Arlington, Alexandria, and Falls Church | Virginians Organized for Interfaith Community Engagement | Rosslyn Business Improvement District | Standard Development | Wesley Housing Corporation