

1 identical upload speeds. Yet, it is important to note that there are different methods of delivering fiber
2 internet access to homes and businesses (last-mile connections), which vary in reliability. The
3 following are just a few common types:

- 4
- 5 ○ **FTTP** stands for fiber to the premises. As the name suggests, this internet connection uses
6 a fiber cable from the network operator to the premises. This is the fastest and most
7 reliable type of connection possible. It is also the most expensive to install.
8
- 9 ○ **FTTN** stands for fiber to the node or neighborhood. This type of connection can serve
10 hundreds of customers within a one-mile radius. A fiber cable runs from the network
11 operator to a street cabinet. From there, the connection to the premises is made using
12 copper cable (DSL), or coaxial cable. This method is more cost-effective, but bandwidth
13 speeds and reliability are reduced because signals weaken as they travel over copper
14 lines.
15
- 16 ○ **FTTW** refers to fiber to wireless connections. For these types, the fiber cable runs from
17 the network operator to a cell tower or antenna and then connections to users are made
18 via wireless signals. FTTW can serve a great many customers within a particular radius but
19 the signal is not always reliable.
20

- 21 ● **Wireless**

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23 Wireless internet access is a complement to wired connections rather than a substitute because it
24 relies on cable or fiber networks to carry the signal to towers. Transmitters atop cell towers then send
25 the signal via radio waves to routers in users' homes and businesses within a certain radius (depending
26 on the type of tower and its location). Like satellite, the service can also be interrupted by weather
27 or physical obstructions. There is no single wireless technology; rather, there are many different
28 standards, speeds, and issues. Because of this, speeds vary widely, ranging between 5.5 Mbps and
29 2,000 Mbps download speed.¹
30

31 All of these technologies can offer broadband based on the FCC definition of twenty-five Mbps download
32 speed; however, the purpose of the Comprehensive Plan is to lay out strategies based not just on current
33 needs but on the needs of the future. Demand for bandwidth is already significant and has been growing
34 exponentially. In fact, bandwidth for high-end users (e.g., businesses, universities, hospitals, laboratories) has
35 been increasing at a rate of 50%, on average, every year since at least 1984.² For this reason, it is important to
36 make a distinction between fast internet and other broadband technologies that fit the FCC definition.
37 Anything over 100 Mbps is considered "fast" by industry standards.³ Fiber will more than likely remain the
38 preeminent internet technology for decades to come. While legacy broadband technologies provide enough
39 bandwidth to serve the needs of many residents today, it is likely the County's bandwidth needs will continue
40 to increase.
41

42 43 **EXISTING CONDITIONS** 44

¹ Mitchell, B. (2021, June 16). *How fast is a wi-fi network?* Retrieved from Lifewire: <https://www.lifewire.com/how-fast-is-a-wifi-network-816543>

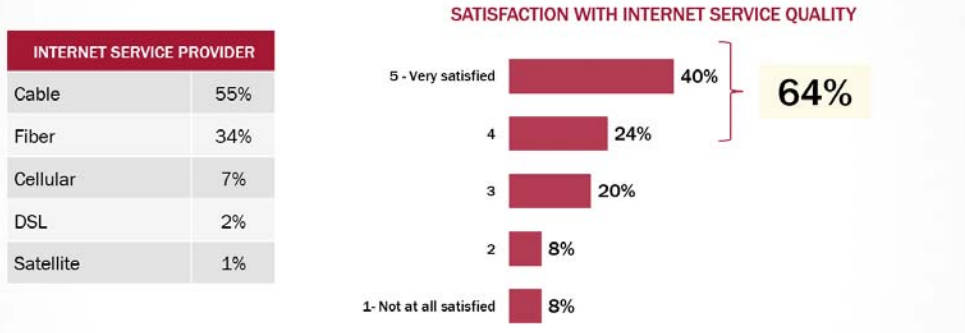
² Evens, T., Boudry, E., Verdegem, P., De Marez, L., Vanhauwaert, E., Casier, K., . . . Verbrugge, S. (2012). Killer applications for fiber to the home networks: Market potential, time horizons and user groups. *E-Business and Telecommunications*, 115-128.; Nielsen, J. (2019, September 27). *Nielsen's law of internet bandwidth*.

³ Cooper, T. (2021, May 3). *How much Internet speed do I need?* Retrieved from BroadbandNow: <https://broadbandnow.com/guides/how-much-internet-speed-do-i-need>

Coverage

Census data from the American Community Survey for 2015 through 2019 show that about 90% of York County residents have a broadband internet subscription in their home, and according to the Comprehensive Plan citizen survey, almost two-thirds of County residents are satisfied with the quality of internet service in their home. Fifty-five percent of County residents use cable internet and 34% use fiber, while the remainder use cellular data, DSL, and satellite internet service.

Cable is the dominant internet service provider and almost two thirds are satisfied with the internet quality in their home



Source: SIR. (2019). York County Comprehensive Plan Study, p. 53.

The survey also found that residents with fiber connections were 24% more satisfied with their service than cable internet users, and that lower County residents were 20% more satisfied with their internet service than those living in the upper County. This is likely because fiber internet service is more widely available to lower County residents as illustrated in the coverage map produced by Virginia Tech below.

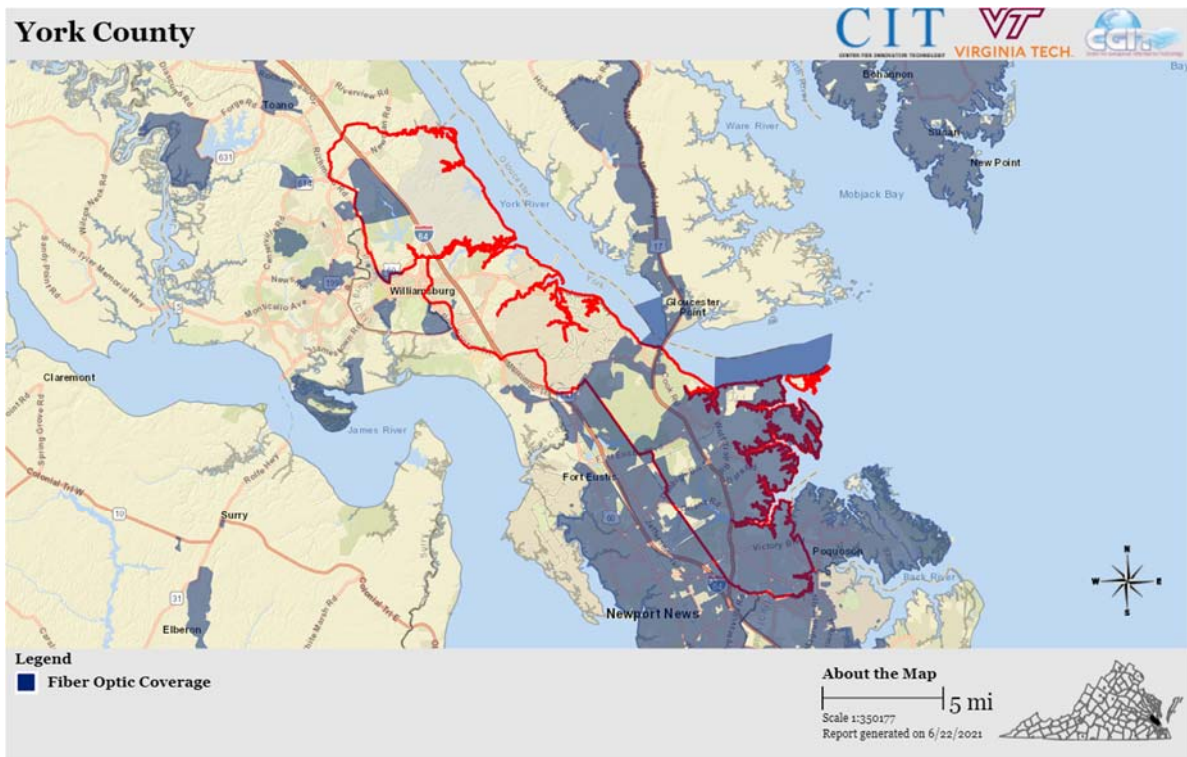
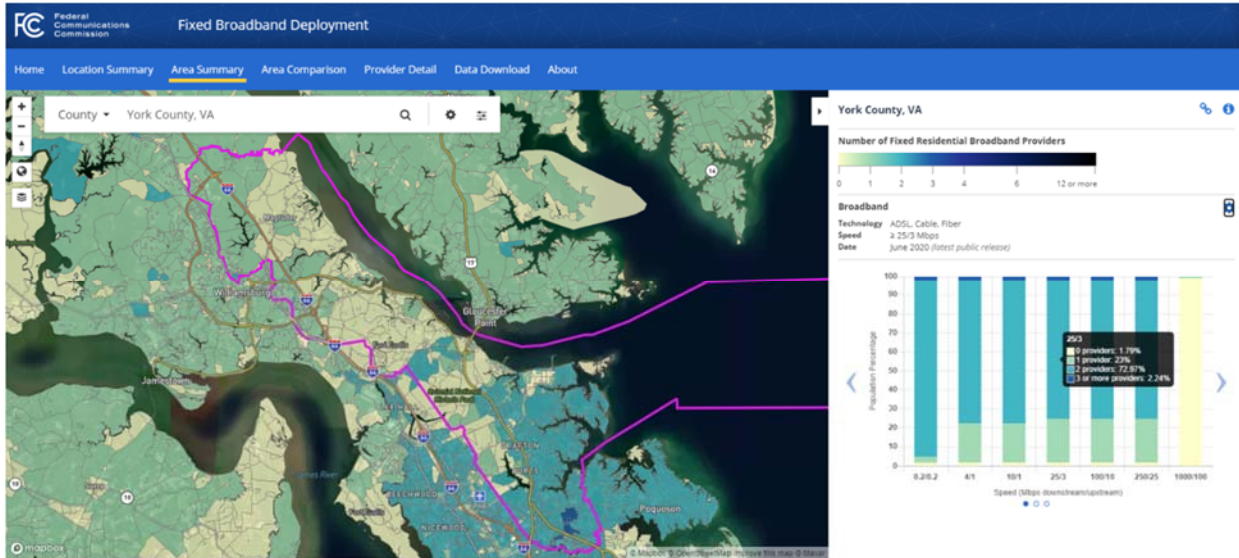


Image Source: Virginia broadband availability map and integrated broadband planning and analysis toolbox. (2019). Retrieved from Virginia Tech: <https://broadband.cgit.vt.edu/IntegratedToolbox/>

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The FCC coverage map below reveals that all homes and businesses in York County have access to at least two broadband service providers; however, some of them are satellite internet service providers. While satellite is considered broadband because it can provide speeds in excess of twenty-five Mbps, it is neither reliable nor fast. Viewing coverage in York County by all internet technologies other than satellite provides a more useful illustration. Most of the upper County has access to just one internet service provider, while the lower County has access to two and even three providers in some areas.



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Image Source: *Fixed Broadband Deployment*. (2020, June). Retrieved from Federal Communications Commission: <https://go.usa.gov/x6yN6>

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Furthermore, some undeveloped areas of the County are unserved which is defined as having up to ten Mbps download and up to one Mbps upload speed.⁴ This information demonstrates two points: 1) Most York County residents have access to broadband internet that satisfies their current needs, but as demand for bandwidth increases, fiber will become essential to provide the bandwidth necessary to satisfy the increased demand, and 2) expanded access to undeveloped areas is needed for economic development.

19 **Infrastructure**

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Many localities in Hampton Roads have constructed, or are in the process of constructing, government-owned fiber networks. Some of these include Gloucester, James City County, Williamsburg, York County, Newport News, Hampton, Portsmouth, Norfolk, Suffolk, Virginia Beach, and Chesapeake. These networks are owned by the local government for the purpose of connecting their public facilities and assets to each other and the internet. These localities must absorb the up-front cost of laying the fiber but realize long-term savings by owning the infrastructure. This provides fast, reliable, and secure service to the locality. Alternatively, leasing bandwidth from networks owned by internet service providers can offer scalable and cost-effective service.

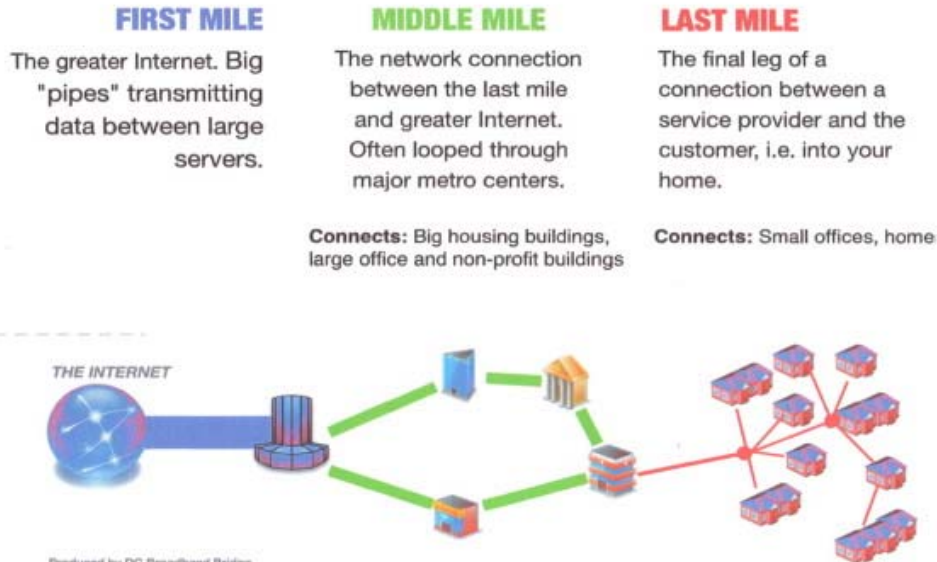
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Localities that own their fiber networks often recoup some costs by leasing out excess bandwidth to Internet Service Providers (ISP) who utilize these networks as a “middle mile”. The middle mile refers to the network connection between the World Wide Web and the last mile connection (e.g., the home or business), which the ISPs construct to connect the end-user to the network. This decreases the cost of infrastructure for the ISP, which encourages competition and reduces the cost of service for customers. The “last mile” can be

⁴ *Virginia broadband availability map and integrated broadband planning and analysis toolbox*. (2019). Retrieved from Virginia Tech: <https://broadband.cg.it.vt.edu/IntegratedToolbox/>

1 delivered to the end user through either a physical cable that runs into the home or business (FTTP or FTTN),
2 or by running the physical cable to a cell tower. The cell tower converts the signal to radio waves, which the
3 end user can access as a Wi-Fi connection (FTTW). The image below illustrates the aforementioned middle
4 and last miles.
5

Internet "Miles"



6
7 Image Source: Menon, S. (2016, October). Access to and adoption of a municipal broadband middle-mile network: The case of
8 the community access network in Washington, D.C. *Government Information Quarterly*, 33(4), 757-768.
9

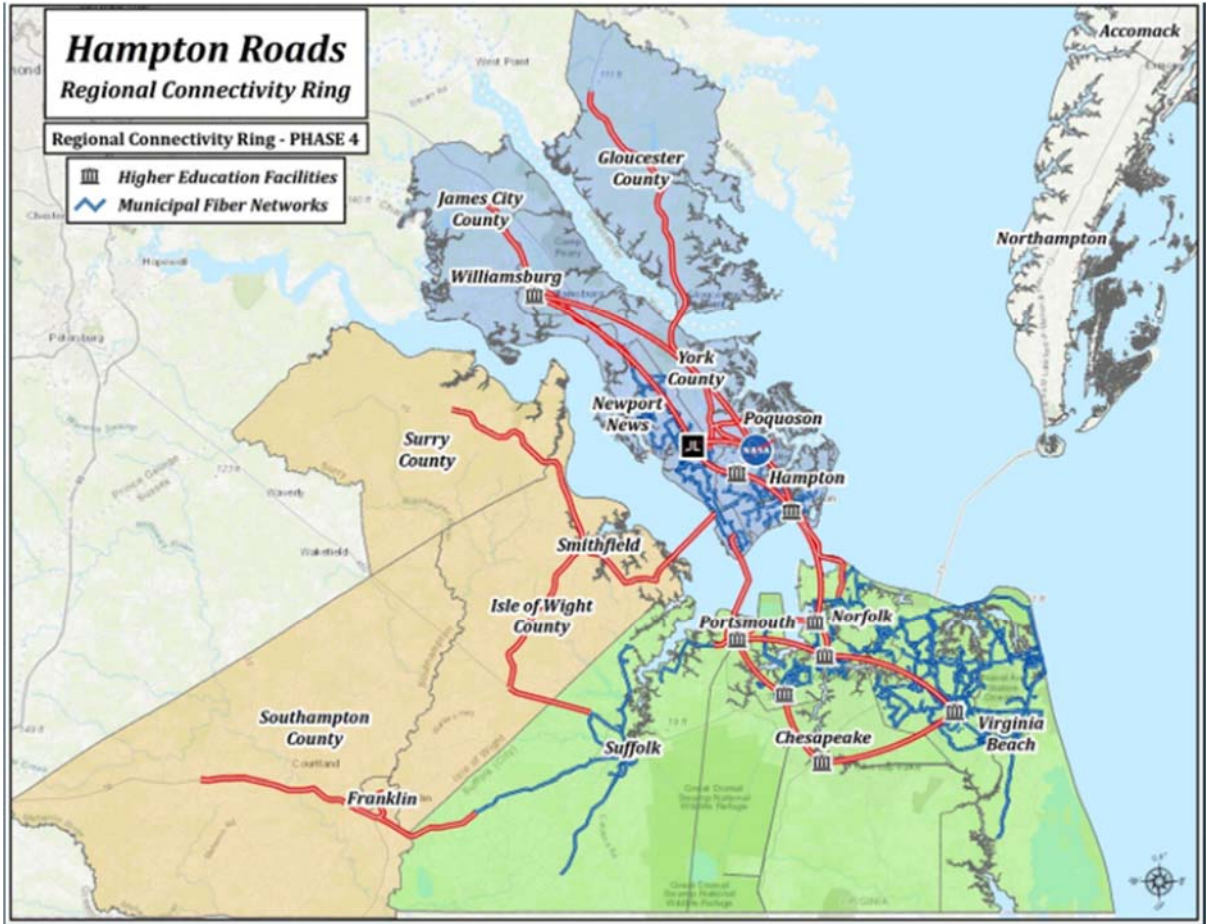
10 Localities that own fiber networks with excess bandwidth capacity that they lease to ISPs own the entirety
11 of the infrastructure. That means they own the fiber cables, which have many fiber strands. York County has
12 taken a moderate approach to satisfy its needs by owning fiber strands and leasing bandwidth from ISPs.
13 When the County leases bandwidth from a privately owned fiber network, this network is referred to as a
14 "lit fiber" network because the network is already "lit" or powered by the company. The County also owns
15 "dark fiber". In these cases, the County purchases fiber strands that were laid by a private company. The
16 County does not own full fiber bundles, so its networks do not have excess capacity to lease. These dark
17 fiber networks are reliable because the County provides the power to them and uses backup generators in
18 the event of a power outage. Dark fiber is also more secure because the strands are not shared and thus are
19 not accessible by anyone who is not granted access to the network.
20

21 PLANNING ISSUES FOR THE FUTURE

22 Hampton Roads Regional Connectivity Ring

23
24 The Hampton Roads Planning District Commission (HRPDC), which represents the region's local
25 governments, is slated to begin construction of a regional fiber network ring in 2021. This network will
26 leverage Virginia Beach's digital port, which houses transatlantic fiber cables, to deliver unprecedented
27 bandwidth to the region. The HRPDC plans to construct the connectivity ring in four phases, beginning by
28 creating a Southside ring. Phase II will entail the creation of a ring through the Peninsula and Gloucester.
29 The Southside ring will be connected to the Peninsula and Gloucester ring in Phase III and the final phase
30 will connect the rural areas (Surry, Smithfield, Isle of Wight, Southampton, and Franklin). The Peninsula
31 connectivity ring is planned to connect higher education institutions (e.g. Hampton University, Christopher
32 Newport University, Thomas Nelson Community College, and the College of William and Mary), research
33 laboratories (e.g. NASA Langley and the Jefferson Lab), hospitals, and other heavy data users, but ISPs will
34

1 be able to lease bandwidth on this fiber backbone to deliver high quality service to businesses and residents
2 as well. The map below illustrates the Hampton Roads Regional Connectivity Ring's path, but it is a
3 preliminary concept rather than a completed plan. Thus, the fiber may not ultimately be laid along the paths
4 that are shown here.
5



6
7 Image Source: *Our five-year pathway to lower cost, faster service, and expanded broadband coverage.* (2021). Retrieved from
8 Southside Network Authority: <https://www.southsidenetworkauthority.com/timeline>
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10 **Economic Development**

11
12 One of the Board of Supervisors' six strategic priorities is to "facilitate value-driven economic development".
13 To expand the County's economic base, it is critical that areas zoned for business have access to broadband
14 internet.

15
16 As an example, data centers have been shown to have a positive impact on local economies. A report
17 published by Oxford Economics found localities that hosted Google data centers realized "employment gains
18 that went further than those directly connected to the data center campus".⁵ Of the counties examined in
19 the report, those located near cities saw the greatest employment gains. York County is strategically located
20 near Virginia Beach, Norfolk, and Richmond. "In 2018 the data center industry in Hampton Roads directly
21 provided approximately 1,322 full-time-equivalent jobs [and,] ... taking into account the economic ripple

⁵ Levine, D. (2018). *Google Data Centers: Economic Impact and Community Benefit*. Oxford: Oxford Economics. Retrieved from <https://www.oxfordeconomics.com/recent-releases/d8d830e4-6327-460e-95a5-c695a32916d9>, p. 5

1 effects generated by that direct impact, ...3,510 full-time-equivalent jobs”.⁶ Furthermore, York County serves
2 as a halfway point between the transatlantic undersea cable port located in Virginia Beach and the QTS
3 Richmond Network Access Point⁷ in Henrico County. Metro Fiber Networks has already made its home in
4 York County for this reason.⁸ York County’s location makes it an ideal site for data centers and other
5 technology based companies, thus it is critical for the County to ensure fiber internet availability in areas
6 that can potentially house a data center or other tech company.
7

8 The economy has been shifting towards entrepreneurial start-ups and home-based businesses. According
9 to a 2018 U.S. Small Business Administration report, home-based businesses have made up about half of all
10 firms for the past ten years.⁹ In York County, approximately two-thirds of business licenses are for home-
11 based businesses. The Comprehensive Plan citizen survey found that 69% of residents support the growth
12 of home-based businesses in York County. According to a Global Workplace Analytics analysis of 2018
13 American Community Survey data, the number of Americans working from home has grown 173% since
14 2005.¹⁰ The COVID-19 pandemic may have accelerated this trend. Broadband internet is crucial for the day-
15 to-day functions of both home-based businesses and remote workers. Consequently, providing fast and
16 reliable internet to residential communities is a York County priority.
17

18 **Public Safety and Other Government Facilities**

19
20 Another strategic priority of the Board of Supervisors is to allocate the “resources necessary to ensure and
21 sustain exemplary public safety functions”. Some of the County’s fire stations rely on lit fiber networks.
22 During major storm events, these networks sometimes go down because they lose power. A County-owned
23 dark fiber network would provide reliable communications and connectivity during those critical times
24 because the County would ensure uninterrupted power through backup generators. The Board of
25 Supervisors’ final strategic priority is to “promote quality technology investments to support the efficient
26 operation of County government”. A supporting initiative is to “expand dark fiber connections to strategic
27 locations”. While public safety is the main reason for expanding the dark fiber network, the cost of running
28 fiber to other locations during the construction process is less than it would be to create these connections
29 as separate projects. The network should therefore be leveraged to serve other government functions, area
30 businesses, and County residents.
31

32 **Education**

33
34 The Board of Supervisors’ third strategic priority is to “facilitate excellent education opportunities for all
35 County citizens”. Studies show that having broadband only at school is insufficient and that school children
36 need broadband in their homes as well. “The Federal Reserve found that... Children who don’t have access
37 to the internet at home are less able to access educational opportunities than those who have broadband

⁶ Mangum Economics. (2020). *The Impact of Data Centers on the State and Local Economies of Virginia*. Richmond: Mangum Economics. Retrieved from http://biz.loudoun.gov/wp-content/uploads/2020/02/Data_Center_Report_2020.pdf, p. 13.

⁷ A network access point (NAP) “is one of several major Internet interconnection points that serve to tie all the Internet access providers together so that, for example, an AT&T user in Portland, Oregon can reach the Web site of a Bell South customer in Miami, Florida. ... The NAPs provide major switching facilities that serve the public.” Source: TechTarget Contributor. (2005, April). *Network access point (NAP)*. Retrieved from TechTarget: <https://whatis.techtarget.com/definition/network-access-point-NAP>, para. 1-2.

⁸ QTS Realty Trust, Inc. (2019, September 24). *QTS and Metro Fiber Networks announce availability of strategic dark fiber network at the QTS Richmond NAP*. Retrieved from Cision PR Newswire: <https://www.prnewswire.com/news-releases/qts-and-metro-fiber-networks-announce-availability-of-strategic-dark-fiber-network-at-the-qts-richmond-nap-300924370.html>

⁹ Office of Advocacy. (2018, August). *Frequently asked questions about small business*. Retrieved from U.S. Small Business Administration: <https://www.sba.gov/sites/default/files/advocacy/Frequently-Asked-Questions-Small-Business-2018.pdf>

¹⁰ Lister, K. (2020, March). *Latest work-at-home/telecommuting/mobile work/remote work statistics*. Retrieved from Global Workplace Analytics: <https://globalworkplaceanalytics.com/telecommuting-statistics>

1 at their homes”.¹¹ All York County schools have broadband internet but it is important that all students in
2 kindergarten through twelfth grade (including home-schooled and private school students) in the County
3 have sufficient access to broadband internet and a computer in their homes.
4

5 Having access to broadband in the home serves no purpose without a computer to access it. Students need
6 sufficient time on a computer to complete their homework. According to Census data, 4.5%, or about 1,166
7 residents of York County do not have a computer. Even families that have a computer may find that one
8 shared family computer is not enough to allow students the time they need to complete their homework.
9 About one-fifth of teens (aged 13 to 17) nationwide “are often or sometimes unable to complete homework
10 assignments because they do not have reliable access to a computer or internet connection”.¹² The type of
11 computing device matters too. Over 6% of York County residents rely solely on a smartphone or tablet and
12 have no other type of computing device.¹³ Smartphones and tablets are not optimized for word processing,
13 creating spreadsheets, and other essential learning activities. These activities are considerably easier to
14 complete on a desktop or laptop computer.
15

16 The York County School Division has integrated the use of computers and other devices into daily instruction
17 and homework assignments. The Division expects all students to complete their work using a computing
18 device and to carry it to school every day. All students must have their own devices that they do not share
19 with anyone else. Students in kindergarten and first grade use a tablet, while second through fifth graders
20 use a two-in-one (a laptop/tablet hybrid). Students in grades six through twelve use a laptop. The school
21 loans devices to students who are unable to purchase them. Home-schooled and private school students
22 are not required to adhere to this technology curriculum and are not eligible to receive a loaned computing
23 device. Fortunately, many ISPs and non-profit organizations offer low-cost or free computers to low-income
24 students.
25

26 **Aging Population**

27

28 Studies show that most seniors wish to age in place.¹⁴ One study found that “76% of Americans age 50 and
29 older” would prefer to stay in their homes as they age.¹⁵ York County’s senior population (aged sixty-five
30 and older) has more than doubled in size over the past twenty years while the total population increased by
31 only about 20%. According to the Weldon Cooper Center’s population projections, the senior population is
32 expected to continue to increase into 2030. This increase is due to the aging Baby Boomer population. The
33 increase in the senior population will increase the demand for accessible medical care. As a result, telehealth
34 services that are accessed through reliable broadband in homes will become increasingly important to serve
35 the aging population. Telehealth reduces the need to travel to doctors’ offices and the physical toll those
36 trips can take on seniors. Regular check-ups can be performed over video web conferencing (which uses
37 significant bandwidth) and doctors can check basic vitals and more using remote medical monitoring devices
38 which send information back to the doctor instantly. In addition, the County should look to expand computer

¹¹ Commonwealth Connect. (2019). *Report on Commonwealth Connect: Governor Northam's Plan to Connect Virginia*. Retrieved from <https://rga.lis.virginia.gov/Published/2019/RD109/PDF>, p. 30

¹² Auxier, B., & Anderson, M. (2020, March 16). *As schools close due to the coronavirus, some U.S. students face a digital 'homework gap'*. Retrieved from Pew Research Center: <https://www.pewresearch.org/fact-tank/2020/03/16/as-schools-close-due-to-the-coronavirus-some-u-s-students-face-a-digital-homework-gap/>, para. 6

¹³ *Types of computers and internet subscriptions*

¹⁴ Beckett, S., & Yannopoulos, E. (2016, July 19). *Fun after fifty*. Retrieved from Freddie Mac: http://www.freddie.com/research/insight/20160719_fun_after_fifty.page; Binette, J., Vasold, K., & AARP Research. (2019, July). *2018 home and community preferences: A national survey of adults ages 18-plus*. Retrieved from AARP: <https://www.aarp.org/research/topics/community/info-2018/2018-home-community-preference.html>; Kaul, K. (2019, June 3). *American seniors prefer to "age in place"--but what's the right place?* Retrieved from Urban Institute: <https://www.urban.org/urban-wire/american-seniors-prefer-age-place-whats-right-place>; Vespa, J. (2020, June 22). *Is America's housing ready for an aging population?* Retrieved from United States Census Bureau: <https://www.census.gov/library/stories/2020/06/old-housing-new-needs.html>

¹⁵ Binette, J., Vasold, K., & AARP Research, para. 1

1 classes and services for seniors at the libraries and the Senior Center so that older residents will know how
2 to access the telehealth services that are available to them.
3
4

5 **GOAL, OBJECTIVES, AND IMPLEMENTATION STRATEGIES**

6
7 **Goal: Expand access to fast and reliable internet (using fiber where possible) for**
8 **residents, businesses, and government facilities to promote economic**
9 **development, contribute to a reliable emergency communications system, improve**
10 **government functions, maintain a high standard of education, make health care**
11 **more accessible to the aging population, and enhance the quality of life for York**
12 **County residents.**
13

14 **Objective 1: Expand access to fast and reliable internet for residents, businesses, and government**
15 **facilities.**
16

- 17 1. Create an initiative to bring more fiber infrastructure to the upper County.
18

19 The upper County is less densely populated than the lower County, which is a possible explanation for
20 ISPs’ reluctance to invest in infrastructure there. The County should ensure the residents and
21 businesses of the upper County have access to the same opportunities afforded by fiber internet as
22 those in the lower County. York County should offer economic incentives for ISPs to invest in fiber
23 infrastructure for the upper County. The County can also ensure the permitting process is as
24 streamlined as possible while maintaining government oversight.
25

- 26 2. Expand the County’s dark fiber network to serve more government facilities and residents.
27

28 Some of the County’s facilities are already connected with lit fiber including Fire Stations 3 (Bruton)
29 and 5 (Skimino), but County-owned dark fiber would provide a more reliable and secure connection.
30 These connections could also be leveraged to serve residents and economic development. For
31 example, a connection to Fire Station 3 in Bruton could be leveraged to provide dark fiber to Magruder
32 Elementary School, Griffin-Yeates Center (home of the Head Start program), and the adjacent Public
33 Works Utility Shop. From there, ISPs could use the infrastructure to connect the adjacent residential
34 areas. Connections to Fire Station 5 in Skimino and the future site of Fire Station 7 on Mooretown
35 Road could be leveraged to deliver dark fiber to Victory Village Shopping Center (where one of the
36 Voter Registrar offices is located) and the surrounding neighborhoods. Another Board of Supervisors
37 supporting initiative for quality technology investments is to provide “open wireless broadband
38 internet service along the Yorktown Waterfront” and the County outlines its plan to do so by 2022 in
39 the current Adopted Capital Improvements Program. Likewise, providing access to broadband at other
40 parks and recreational facilities (Back Creek Park, Kiln Creek Park, New Quarter Park, McReynolds
41 Athletic Complex, Rodgers A. Smith Boat Landing, and Old Wormley Creek Boat Landing) would
42 improve their utility to the citizens.

