Figure 32 - Xfinity's Advertised List of Service Offerings

Download Speeds in Mbps	Type	Price per Month	Contract Terms
50	Cable modem	$65.00	No term contract
100	Cable modem	$83.95	No term contract
200	Cable modem	$29.99	Price for 24 months; 1-year contract
400	Cable modem	$59.99	Price for 24 months; 1-year contract
800	Cable modem	$69.99	Price for 24 months; 1-year contract
1200	Cable modem	$79.99	Price for 24 months; 2-year contract
3000	Cable modem	$299.95	Price for 24 months; 2-year contract

COMCAST BUSINESS Comcast Business offers bundled services that include internet, phone, cable television as well as home monitoring to businesses. However, this study's market research only focused on the minimum Business Internet offerings (excluding bundle packages, to compare fairly with other providers' speed and price offerings) as shown in Figure 33 below.

According to its website[19], Comcast Business offerings are available in all the selected addresses around Southern Chester County (shown in Appendix 2). However, based on publicly available data,[20] the service packages offered do not match the service information for all addresses on the provider's website.

[19] https://business.comcast.com/shop/offers

[20] www.broadbandnow.com

Figure 33 - COMCAST Business List of Advertised Service Offerings

Offering Package Name	Download Speed in Mbps	Type	Price per Month	Contract Terms
Starter Internet	**35**	Cable modem	$35.00	Price for 24 months with 2-year contract
Starter Internet	**35**	Cable modem	$60.00	Price for 24 months with 3-year contract
Starter Internet	**35**	Cable modem	$70.00	Price for 24 months with 2-year contract
Business Internet 200 + Security Solution	**200**	Cable modem	$90.00	Price for 24 months with 3-year contract
Business Internet 300 + Security Solution	**300**	Cable modem	$180.00	Price for 24 months with 3-year contract
Business Internet 1 Gig + Security Solution	**1000**	Cable modem	$250.00	Price 24 months with for 3-year contract
Business Internet 100 + Security Solution	**100**	Cable modem	$149.95	Price for 24 months with 2-year contract
Business Internet 600 + Security Solution	**600**	Cable modem	$349.95	Price for 24 months with 3-year contract

Verizon is the incumbent DSL and fiber broadband provider in Southern Chester County serving residential and business locations throughout the communities within the four school districts. Verizon also advertises a 5G fixed wireless broadband offering and a bundled voice and fiber broadband package under its Fios brand to residential and business customers. The service offerings are shown below in Figures 34, 35 and 36.

According to data found on Verizon's website[21], only 9 of 14 residential addresses can receive service (shown in Appendix 2). However, the service packages offered are not the same for all addresses. For example, in Oxford where the study shows Verizon providing coverage to 88% of the service area, it only offered one type of service out of the seven that is advertised in the area. This one available DSL/high-speed internet service provides a maximum of 7 Mbps down for $40.00 per month, even though it's advertised as delivering up to 15 Mbps for the same price.

[21] https://www.verizon.com/5g/homehttps://www.verizon.com/business/products/networks/connectivity/5g-business-internet

Figure 34 - List of Verizon's High-Speed Internet Service Offerings

Speed in Mbps	Type	Price per Month	Other Information
15	DSL	$40	No term contract
15	DSL	$74.99	No term contract, Verizon home phone service required

Figure 35 - List of Verizon's 5G Home Internet Service Advertised Offerings

Download Speed in Mbps	Type	Price per Month	Contract Terms
300	Fixed Wireless	$50.00	Price for 24 months then adjusted to the regular rate; Requires Autopay; Includes Disney+ for 6 months, one month of 5G Home, Verizon Stream TV Device, and Sling TV for 2 months.
1000	Fixed Wireless	$70.00	Price for 36 months then adjusted to the regular rate; Requires Autopay; Includes Disney+ for 6 months, one month of 5G Home, Verizon Stream TV Device, and Sling TV for 2 months.

Figure 36 - List of Verizon's Fios Advertised Service Offerings

Download Speed in Mbps	Type	Price per Month	Contract Terms
940	Fiber	$159	No term contract; Includes $100 Verizon Gift Card plus Disney bundle for 12 months.
300	Fiber	$39.99	No term contract; Includes $50 Verizon Gift Card (online only) plus Disney bundle for 6 months.
500	Fiber	$64.99	No term contract; Includes $50 Verizon Gift Card (online only) plus Disney bundle for 6 months.
940	Fiber	$84.99	No term contract; Includes $100 Verizon Gift Card plus Disney bundle for 12 months.

Viasat | exede Viasat's Exede satellite broadband offering is available to residential households in Southern Chester County. Viasat provides unlimited internet with no data caps. Viasat's service offerings shown in Figure 37, are available to all residential addresses used in this sample (shown in Appendix 2). However, monthly residential rates are higher than those advertised. For example, in West Grove, the advertised price[22] for the "Unlimited Bronze 12" costs $49.99 as shown in Figure 37, but the available price is $64.99, which is expected to increase to $84.99 after three months[23] (shown in Appendix 2).

[22] https://broadbandnow.com/Viasat-Internet-deals

[23] https://buy.viasat.com/en-US/r/pln

Figure 37 - List of Viasat's Advertised Service Offerings in Southern Chester County

Offering Package Name	Download Speed in Mbps	Type	Price per Month	Contract Terms
Unlimited Bronze 12	**12**	Satellite	$49.99	$49.99/mo promo rate for the first 3 Months, $69.99/mo regular rate; After 40 GB of High-Speed Data usage, you still have unlimited access to Standard Data, which may result in slower speeds.
Unlimited Silver 25	**25**	Satellite	$69.99	$69.99/mo promo rate for the first 3 Months, $99.99/mo regular rate; After 60 GB of High-Speed Data usage, you still have unlimited access to Standard Data, which may result in slower speeds.
Unlimited Platinum 100	**50**	Satellite	$99.99	$149.99/mo promo rate for the first 3 Months, $199.99/mo regular rate; After 150 GB of High-Speed Data usage, you still have unlimited access to Standard Data, which may result in slower speeds.
Unlimited Gold 50	**100**	Satellite	$149.99	$99.99/mo promo rate for the first 3 Months, $149.99/mo regular rate; After 100 GB of High-Speed Data usage, you still have unlimited access to Standard Data, which may result in slower speeds.

HughesNet offers satellite broadband services in the Southern Chester County market with a 25 Mbps plan with different data caps. The plans range from 15GB data cap for $44.99 after promo discount to 75GB data cap for $139.99 per month. Offers require a 2-year contract as shown below in

Figure 38. HughesNet's website[24] indicates that its service offerings are available in all residential addresses (also shown in Appendix 2). They are consistent with their advertised service offerings with what is available to residents based on the data collected for this study. However, their prices are only introductory and will increase after 6 months which is similar to other providers' plans.

Figure 38 - List of HughesNet's Advertised Service Offerings

Download Speed in Mbps	Type	Price per Month	Contract Terms
25	Satellite	$44.99	24-month commitment required; Price for 6 months; 15 GB data allowance
25	Satellite	$54.99	24-month commitment required; Price for 6 months; 30 GB data allowance
25	Satellite	$89.99	24-month commitment required; Price for 6 months; 45 GB data allowance
25	Satellite	$139.99	24-month commitment required; Price for 6 months; 75 GB data allowance

T-Mobile provides 5G and 4G LTE fixed wireless service nationwide. Their advertised download speeds range between 33-182 Mbps and may vary depending on the location, time of the day, weather, and other factors. The service offerings are shown below in Figure 39.

Based on the per address research performed by Magellan, T-Mobile is only offering its services to 6 out of the 14 Southern Chester County residential addresses[25] selected for this study (See Appendix 2).

[24] https://internet.hughesnet.com/order-online

[25] https://www.t-mobile.com/isp/eligibility

Figure 39 - List T-Mobile's 5G Home Internet advertised Service Offerings

Download Speed in Mbps	Type	Price per Month	Contract Terms
115	Fixed Wireless	$50.00	No term contract; Get one year of Paramount+ Essential monthly plan for free.
115	Fixed Wireless	$55.00	No term contract; *Speeds may vary. Sales taxes & regulatory fees included in the monthly price for qualified accounts. Not available in all areas.

ARMSTRONG Armstrong cable's Zoom brand is the dominant offering in the Oxford area for both residential and business consumers. Their advertised speeds range from 25-500 Mbps. Armstrong's services are only available to 2 out of the 14 residential addresses, according to their website's residential service offerings page[26] and shown below in Figures 40 and 41. The two locations are Oxford and Cochranville. These services are only available to one out of 14 business addresses and is located in Oxford (See Appendix 2).

Figure 40 - List of Armstrong's Advertised Service Offerings

Download Speed in Mbps	Type	Price per Month	Contract Terms
25	Cable modem	$34.95	300 GB monthly data allowance
150	Cable modem	$54.95	Price for 6 months; 1 TB monthly data allowance
300	Cable modem	$69.95	Price for 6 months; 2 TB monthly data allowance
500	Cable modem	$89.95	Price for 3 months; Unlimited monthly data allowance

[26] https://armstrongonewire.com/Internet/ServiceLevels

Figure 41 - List of Armstrong's Advertised Fiber Service Offerings

Download Speed in Mbps	Type	Price per Month	Contract Terms
100	Fiber	$69.95	Term contract required for pricing. Additional monthly fees apply. Pricing may vary depending on location.
200	Fiber	$109.95	Term contract required for pricing. Additional monthly fees apply. Pricing may vary depending on location.
300	Fiber	$134.95	Term contract required for pricing. Additional monthly fees apply. Pricing may vary depending on location.
400	Fiber	$184.95	Term contract required for pricing. Additional monthly fees apply. Pricing may vary depending on location.
500	Fiber	$254.95	Term contract required for pricing. Additional monthly fees apply. Pricing may vary depending on location.

Frontier advertises its broadband service being available throughout Southern Chester County as listed in Figure 42. However, according to Frontier's service availability webpage[27] they are only available in 2 (Cochranville and Atglen) out of 14 residential locations, and 1 (Cochranville) out of 14 business addresses (See Appendix 2).

Figure 42 - List of Frontier's Advertised Service Offerings

Download Speed in Mbps	Type	Price per Month	Contract Terms
115	DSL	$49.99	No term contract
500	Fiber Optic – Cable	$49.99	No term contract
940	Fiber Optic – Cable	$74.99	No term contract
2000	Fiber Optic – Cable	$149.99	No term contract

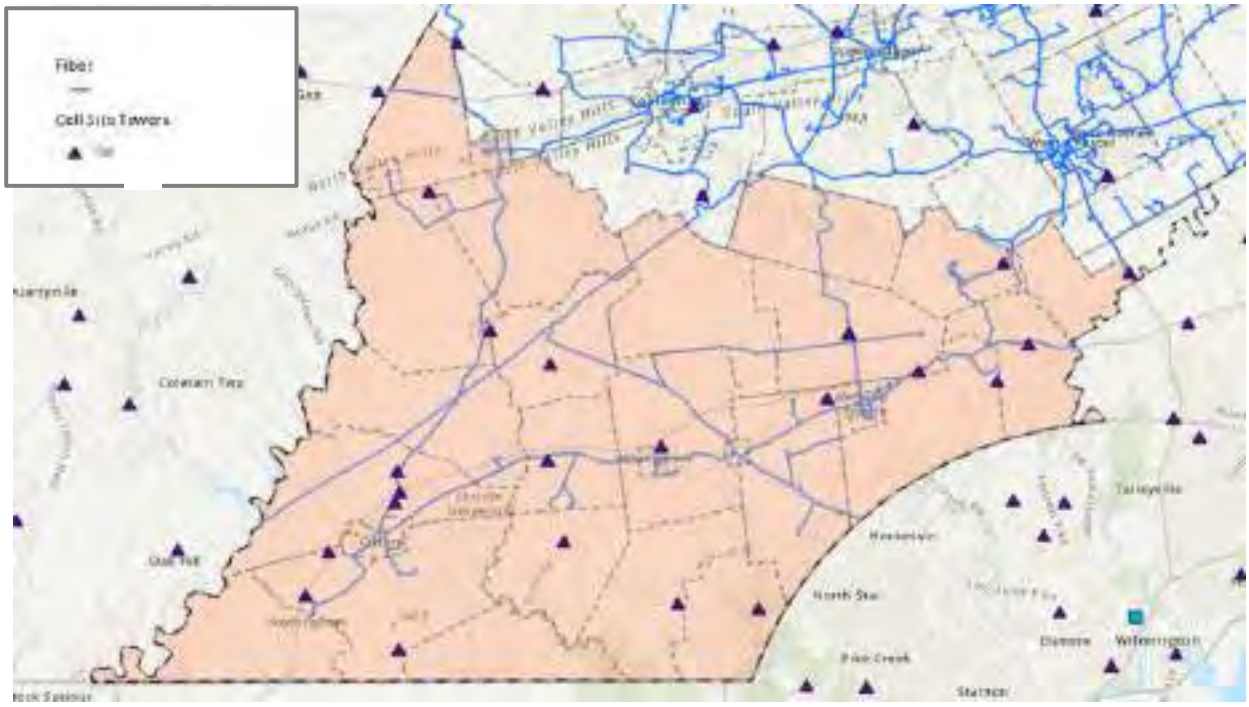
[27] https://internet.frontier.com

Chesconet is a regional, member-driven, middle mile, fiber-based service provider that utilizes Crown Castle's wholesale fiber network to connect every school district and library within the region. Their website[28] advertises a minimum of 1 Gbps download and upload speeds to its members.

Crown Castle fiber services are widely available throughout Southern Chester County, spanning 500 miles of optical fiber facilities. The map shown in Figure 43 below indicates a substantial number of wireless tower facilities and middle-mile fiber routes located across Southern Chester County.

These network assets are ideally located in areas where an affordable last mile solution is needed and can be offered. For example, there are several towers located north and south of Oxford township and several just outside of Kennett Township where numerous mushroom farms are located.

Figure 43 - Crown Castle Fiber Routes and Cell Towers in Southern Chester County



[28] https://www.chesco.net/service-package

MIDDLE MILE FIBER ROUTES EXIST THROUGHOUT THE REGION

There are multiple providers with fiber network assets in Southern Chester County, which include regional "middle-mile" and national and international "long-haul" networks that pass through the area. Several of these providers are regionally focused. Some provide IP transport and enterprise network services, some lease dark fiber that customers must light and manage on their own. As illustrated in Figures 44, 45 and 46 below, there are numerous providers that own fiber in Southern Chester County.

The maps below indicate a robust supply of middle-mile fiber connectivity throughout the region. As a result, the infrastructure needs of local governments in Chester County should be focused on last mile (reaching the end user premises) network construction to ensure affordable services are provided to end user residential, business, farm and anchor customers.

Figure 44 - Middle-Mile and Long-Haul Networks Identified on the Fiber Locator Tool

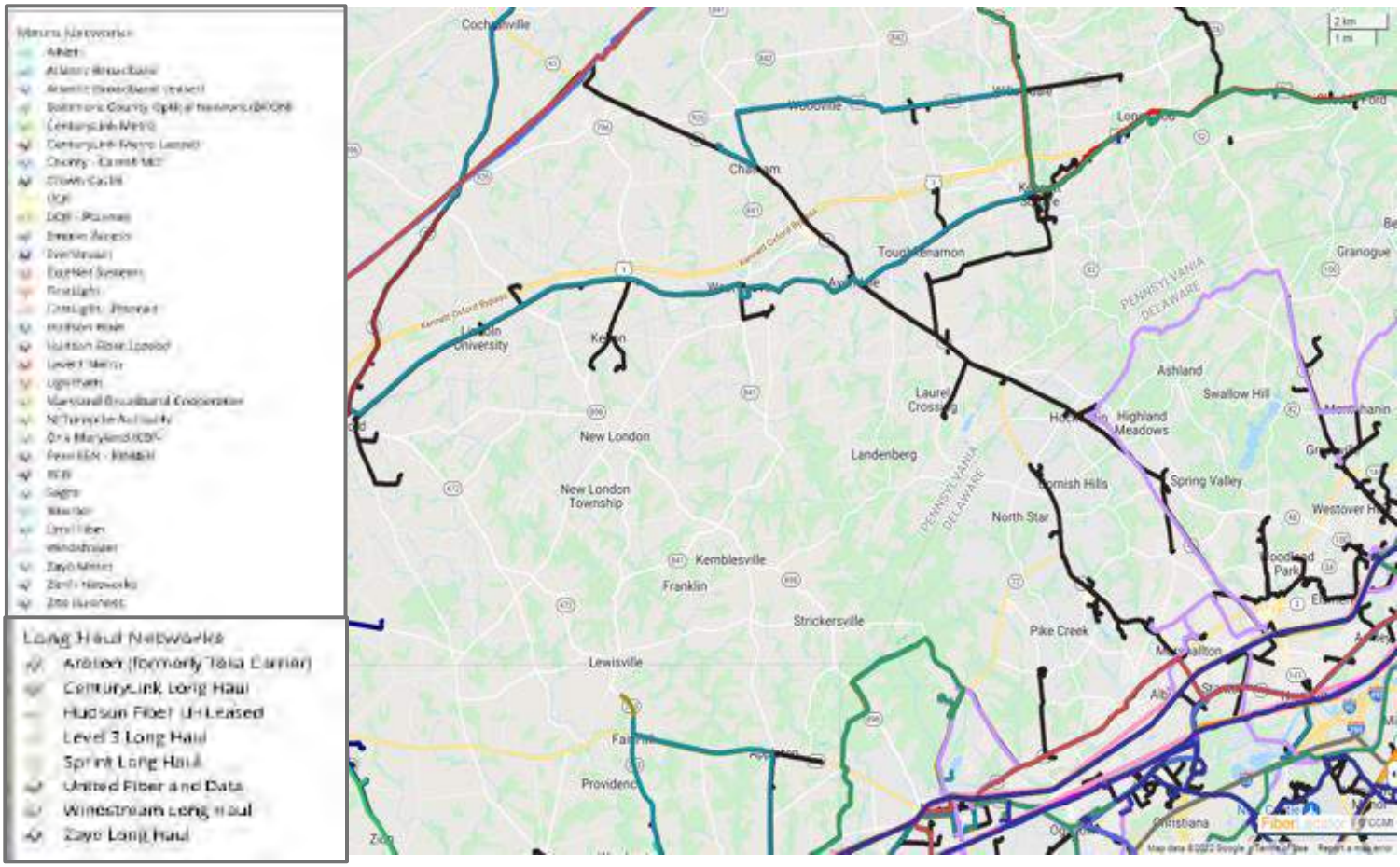


Figure 45 - Middle-Mile Networks Serving Southern Chester County Found on Fiber Locator

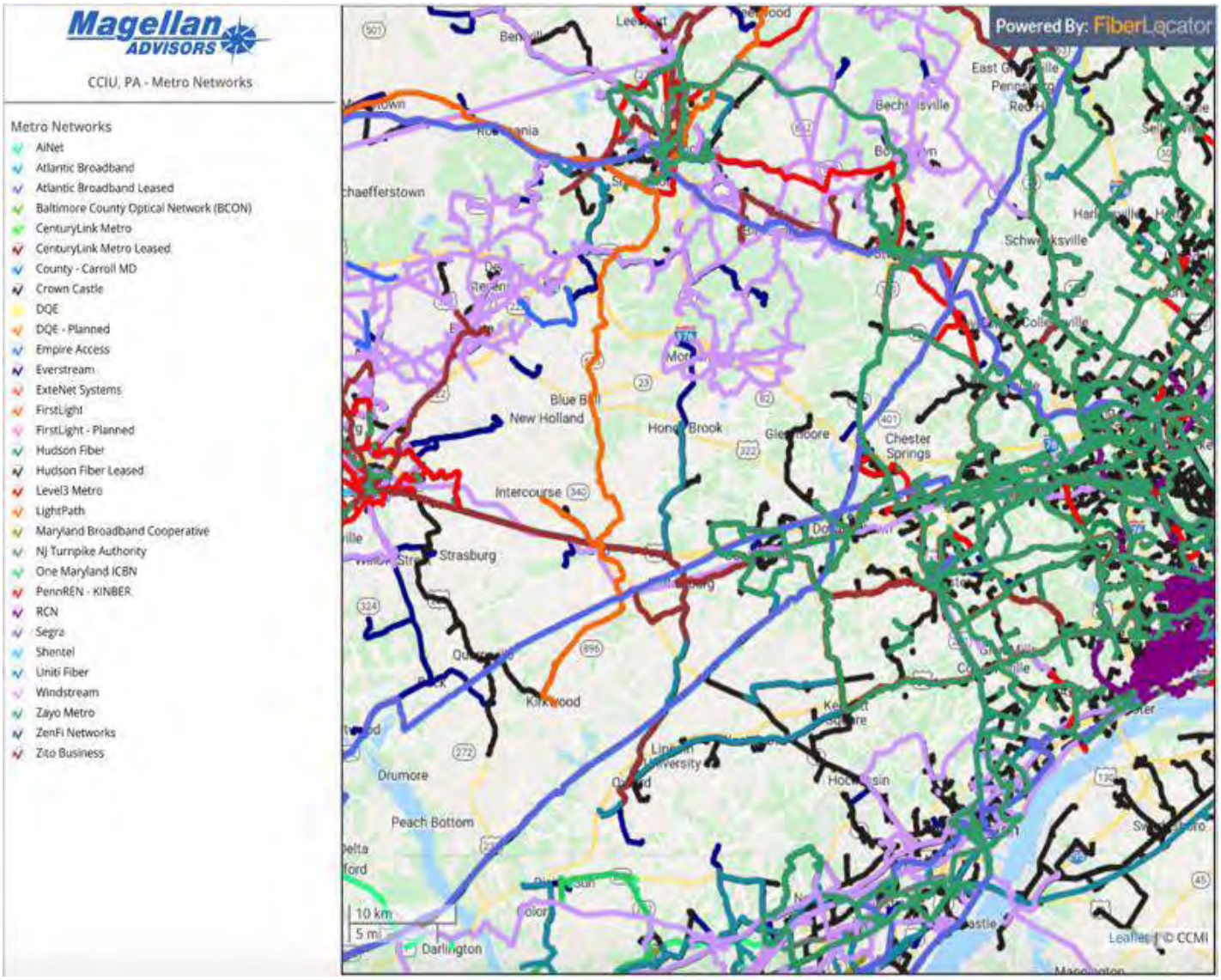
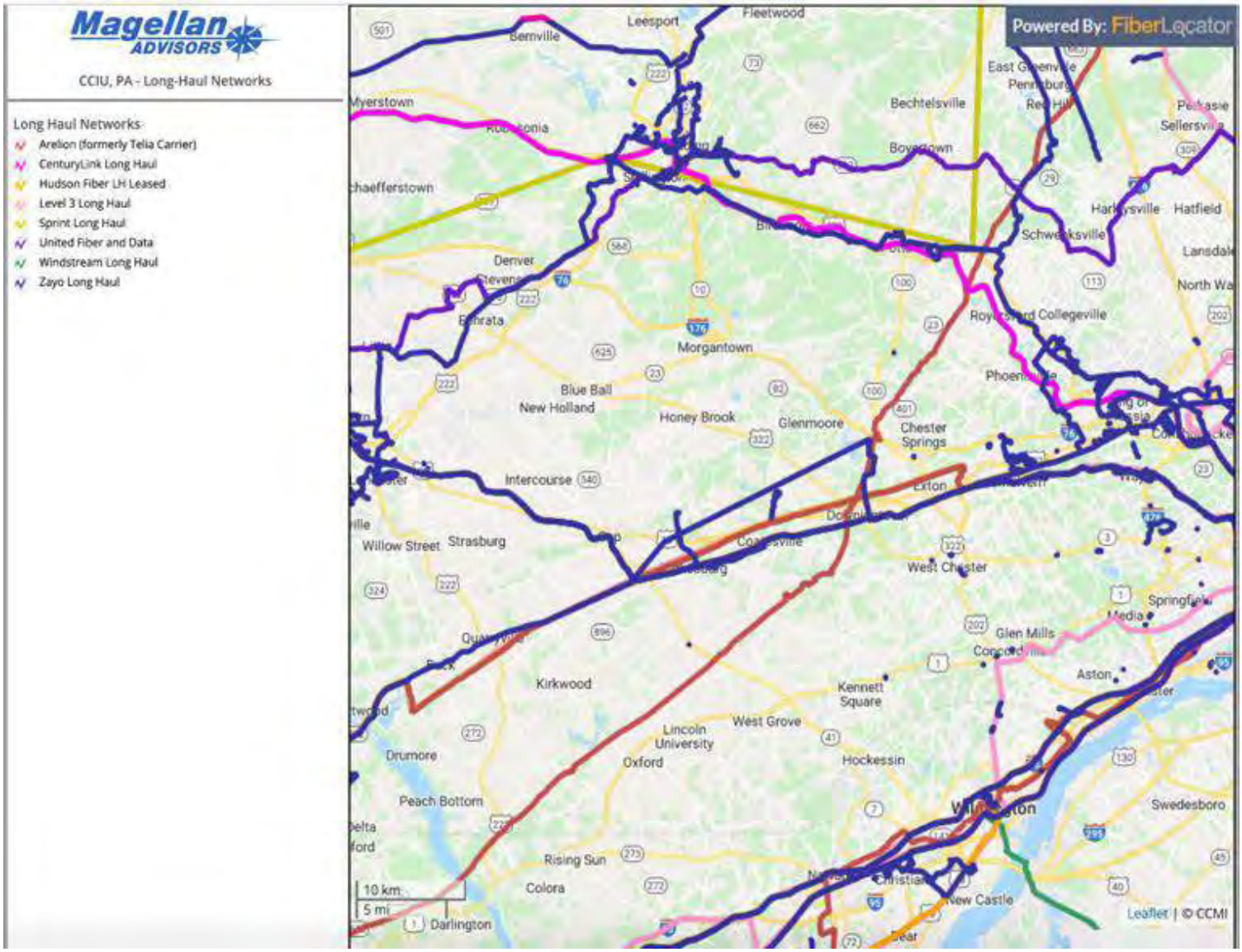


Figure 46 - Illustration of All Long-Haul Fiber Middle Mile Networks



Comprehensive Mapping Analysis of Southern Chester County Region

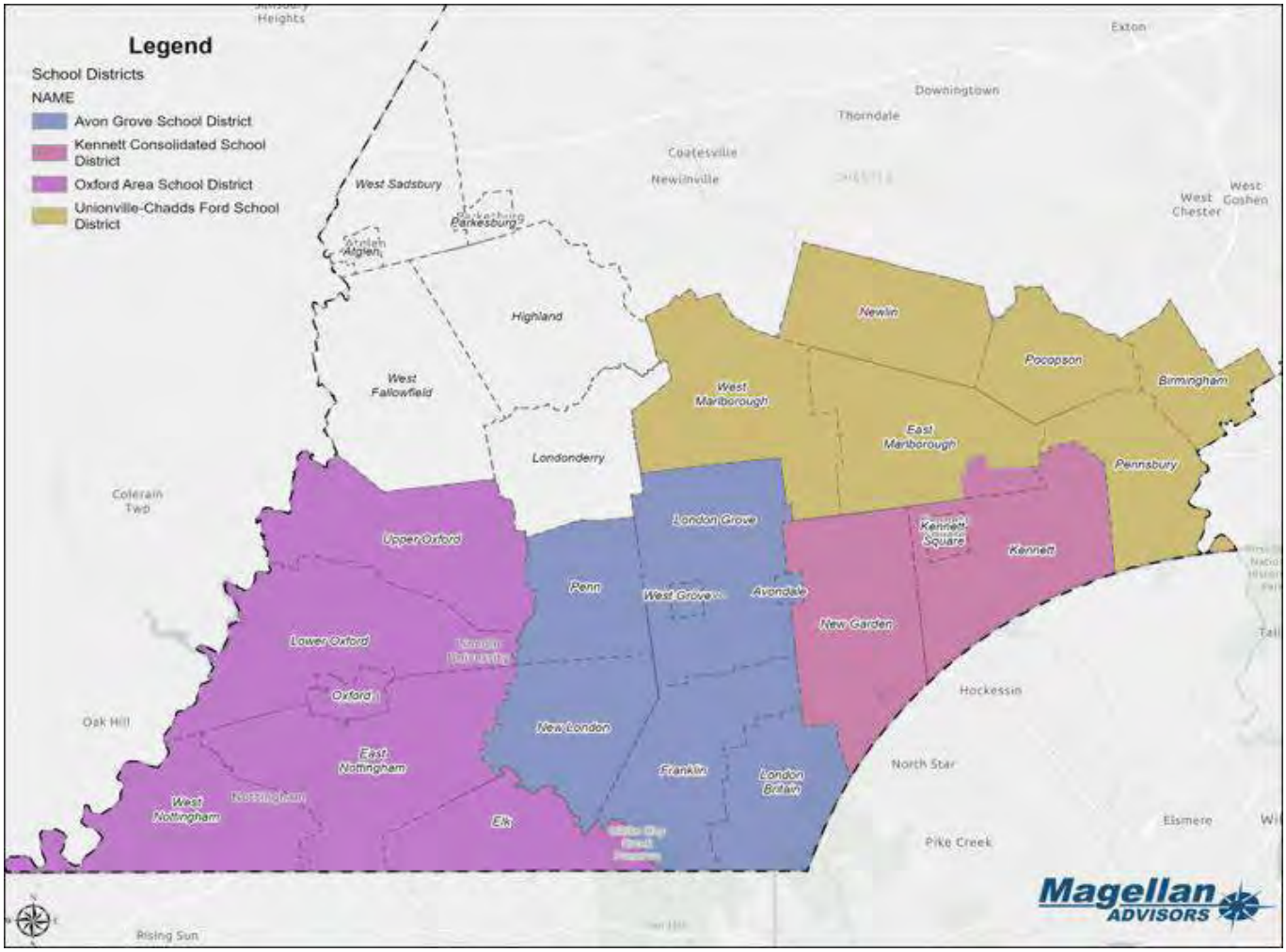
This section includes numerous mapping layers illustrating important characteristics of the project area for this study. The map in Figure 47 below shows each municipality in Southern Chester County.

Figure 47 - Southern Chester County Base Map

Southern Chester County's School District Map

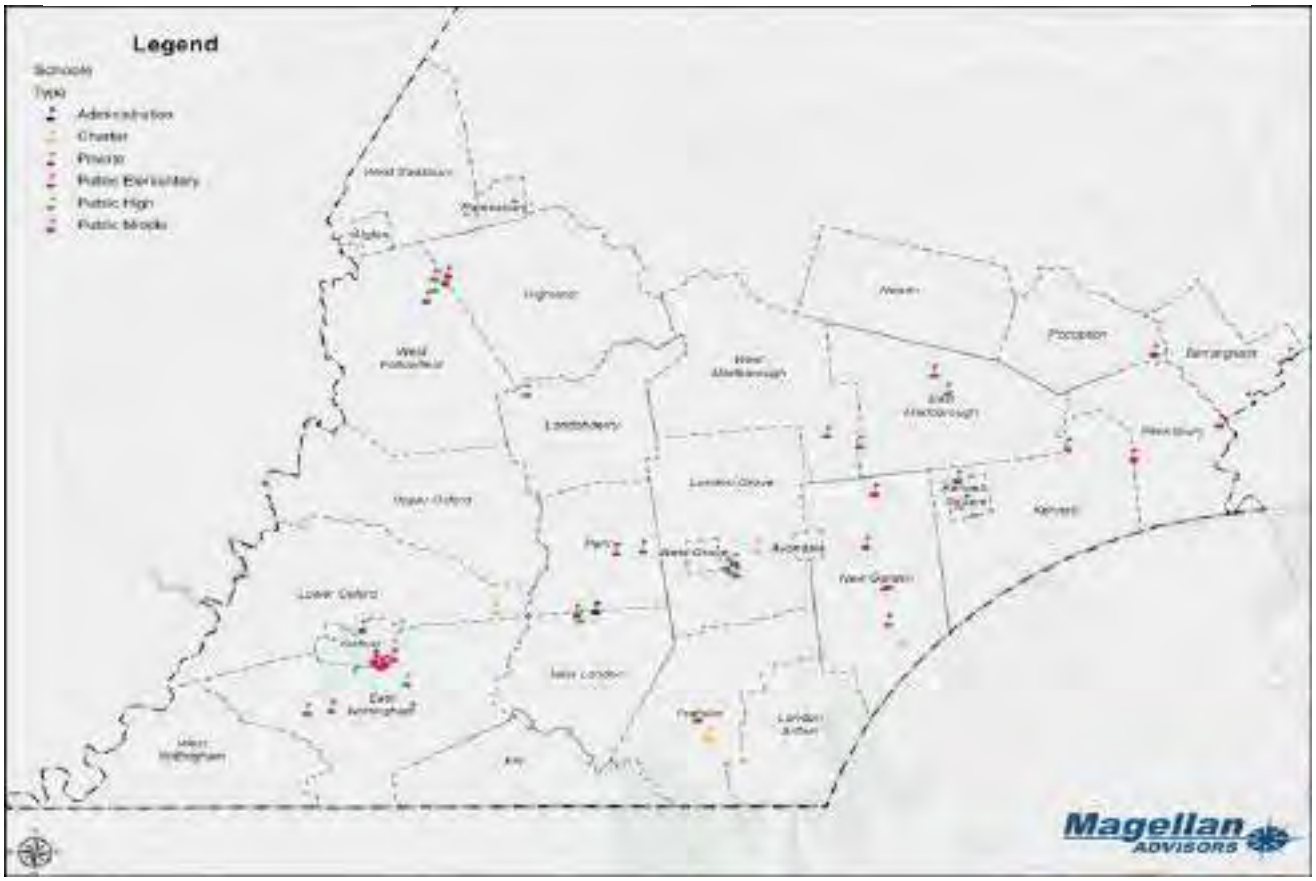
Figure 48 below is an illustration of Southern Chester County's base map overlayed with the four school district boundaries identified as the main project areas for this Study. These school districts are Avon Grove, Kennett Consolidated, Oxford Area and Unionville-Chadds Ford.

Figure 48 - Project Area by School District



School locations by type are pinned across the region shown in Figure 49 below

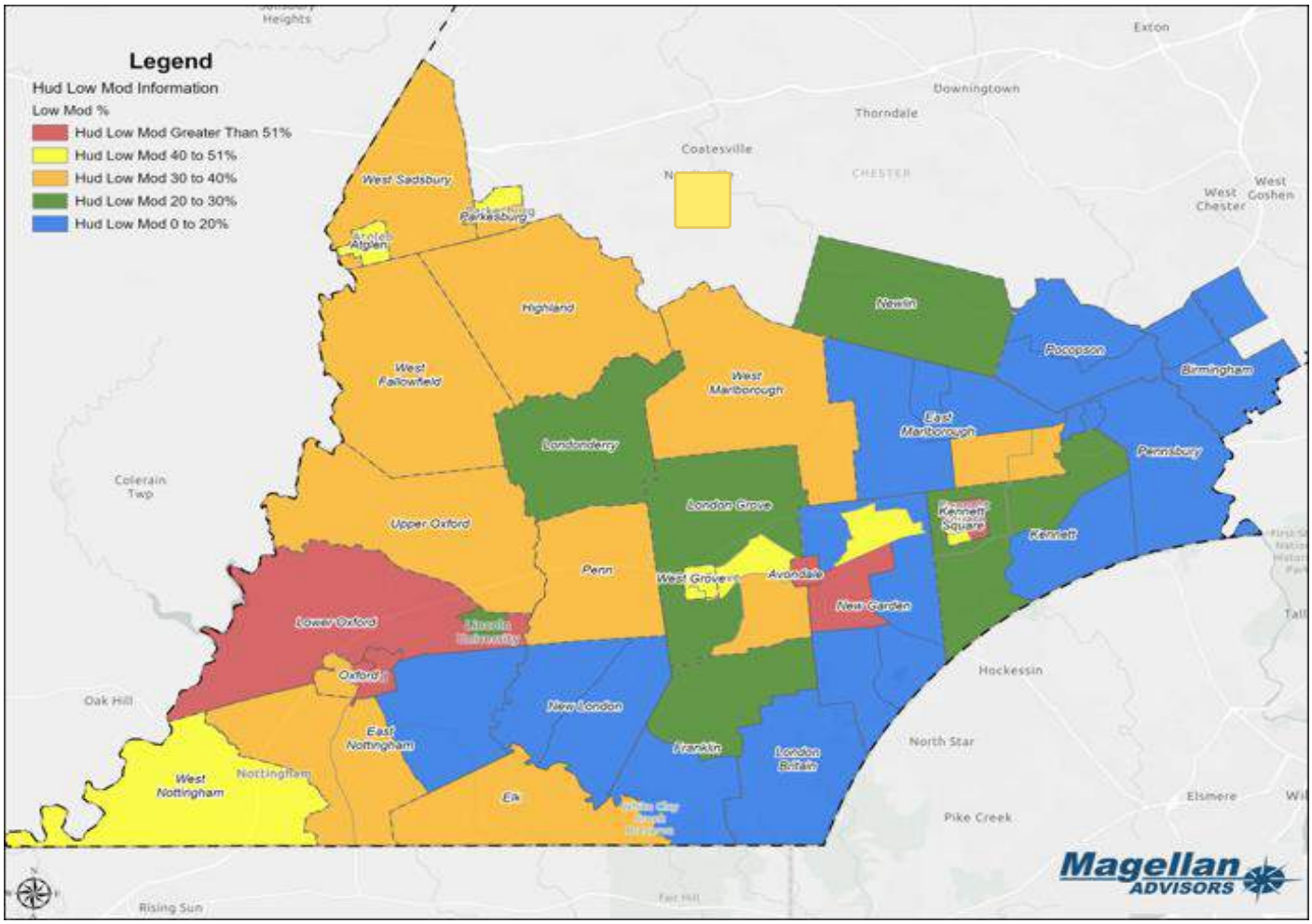
Figure 49 - School Locations



Location of Low-Income Eligible Areas[29] in the region defined by HUD

U.S. Department of Housing and Urban Development (HUD) data was utilized to determine areas that may be eligible for HUD grant programs such as the Community Development Block Grant (CDBG) based upon Low and Moderate Income (LMI) statistics which consider persistent poverty levels for at-risk populations. The map in Figure 50 below indicates that Avondale, part of Kennett Square, New Garden and Lower Oxford all have a Lo/Mod score of 51% or more, which means they are located in areas with "at risk" populations. This metric is a useful benchmark for identifying persistent poverty households in any given census block.

Figure 50 - Low Income Eligible Areas Defined by HUD



[29] Low and moderate income, as defined by the Census Bureau are communities that have a household median income that are either: (a) less than 50% of their specific area's median income (low income), or (b) household median incomes that are at least 50% and 80% of the area's median income (moderate income).

FCC Form 477 broadband mapping data

The FCC defines an area as being "served" with sufficient broadband access if one or more locations receive at or above 25Mbps down and 3Mbps up.

Areas defined as underserved are those receiving speeds below 25 Mbps down and 3 Mbps up and above 10Mbps down and 1 Mbps up.

Areas defined as wholly undeserved are those receiving speeds at or below 10Mpbs down and 1 Mbps up.

Figure 51 -FCC'S Broadband Speed Definitions

Unserved	Less than 10 Mbps down/1 Mbps up
Underserved	At least 10 Mbps down/1 Mbps up and less than 25 Mbps down/3 Mbps Up
Served	At or above 25 Mbps down/3 Mbps up

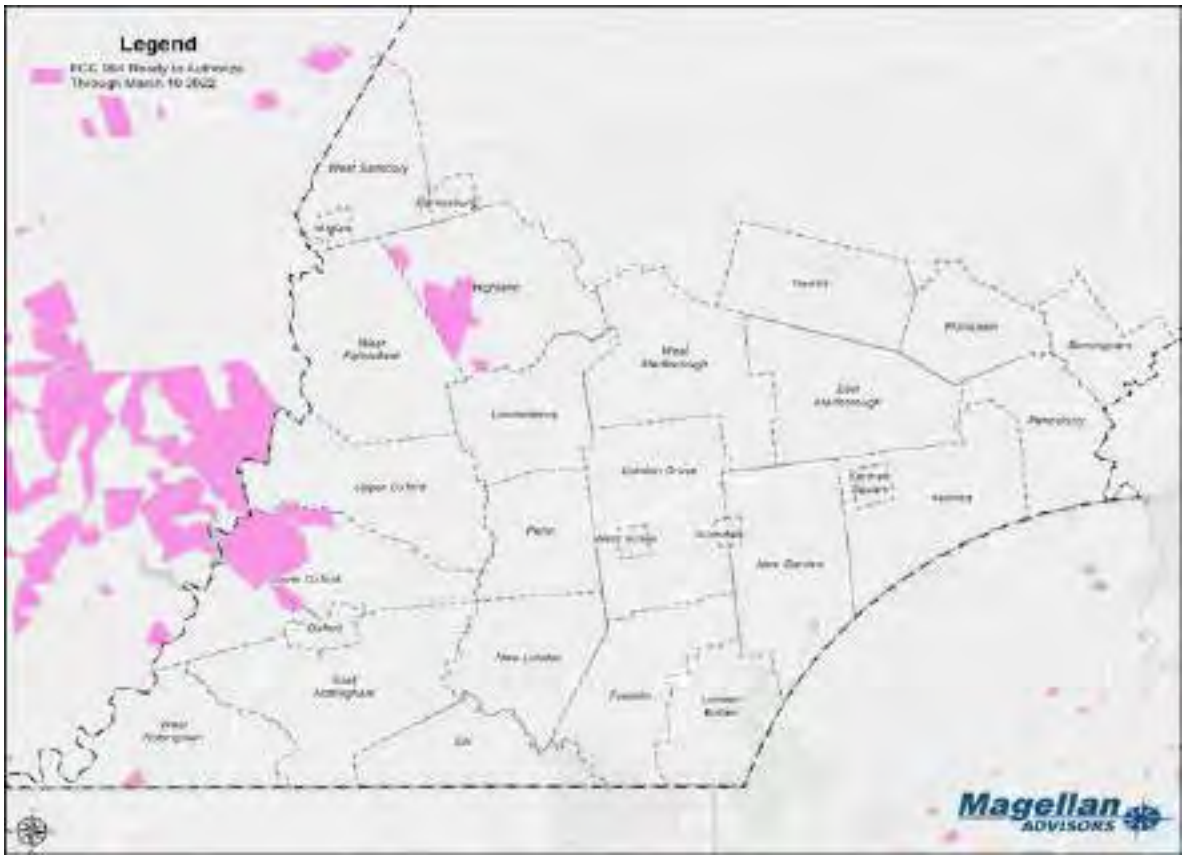
The FCC form 477 coverage data serves as the basis for all its federal support programs with the Universal Service Fund (USF)[30] which include the Affordable Connectivity Program (ACP), the Rural Digital Opportunity Fund (RDOF) subsidy.

[30] Universal Service - Universal Service Administrative Company (usac.org)

FCC's Rural Digital Opportunity Fund (RDOF) funded areas reported as of March 10, 2022

The areas shaded in pink in Figure 52 show census blocks awarded to Windstream Communications in the RDOF auction.[31] These are areas where a provider is awarded federal funds from the FCC based on enforceable build out commitments that must be completed within 10 years. These areas are generally not eligible for other federal funds unless there is a compelling case to do so based on speed to market, build out timelines and other benefits to end users.

Figure 52 - FCC RDOF Auction Awarded Areas to Windstream Communications



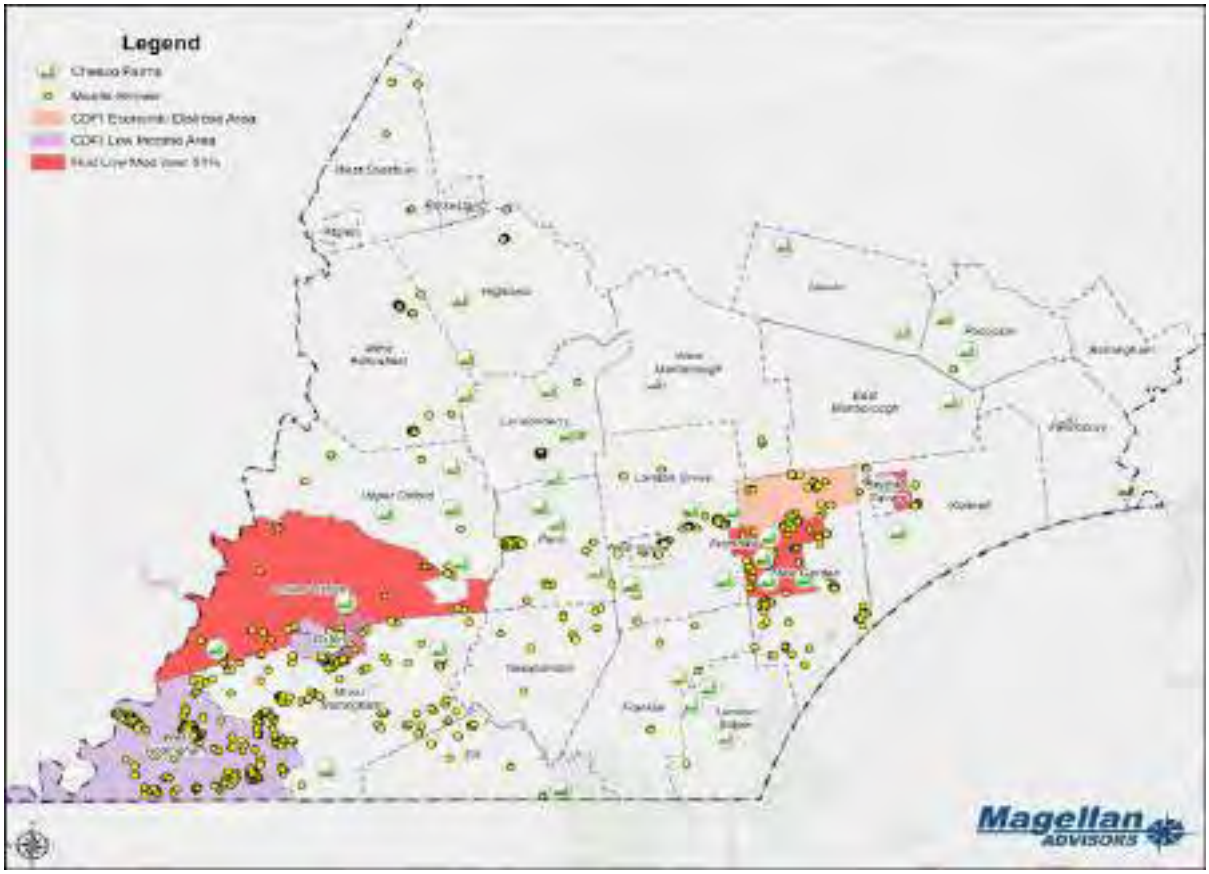
[31] Auction 904: Rural Digital Opportunity Fund | Federal Communications Commission (fcc.gov)

Mushroom Farming Facilities, Mobile Homes and Community Development Financing Initiative (CDFI)[32] data added to further refine the areas of concern

To identify a common set of poverty characteristics in the areas of concern for this study, multiple layers of additional economic and demographic data such as the Southern Chester County's farming facilities, mobile/trailer homes and CDFI data were overlayed as shown in Figure 53 below.

The location of mobile homes are clustered in areas that score over 51% Low/Mod classified by HUD as well as low income and economically distressed areas according to the U.S. Treasury Department. These areas are in Avondale, New Garden, Kennett Township, Lower Oxford and West Nottingham.

Figure 53 - Multiple Demographic Indicators of Poverty Throughout Southern Chester County

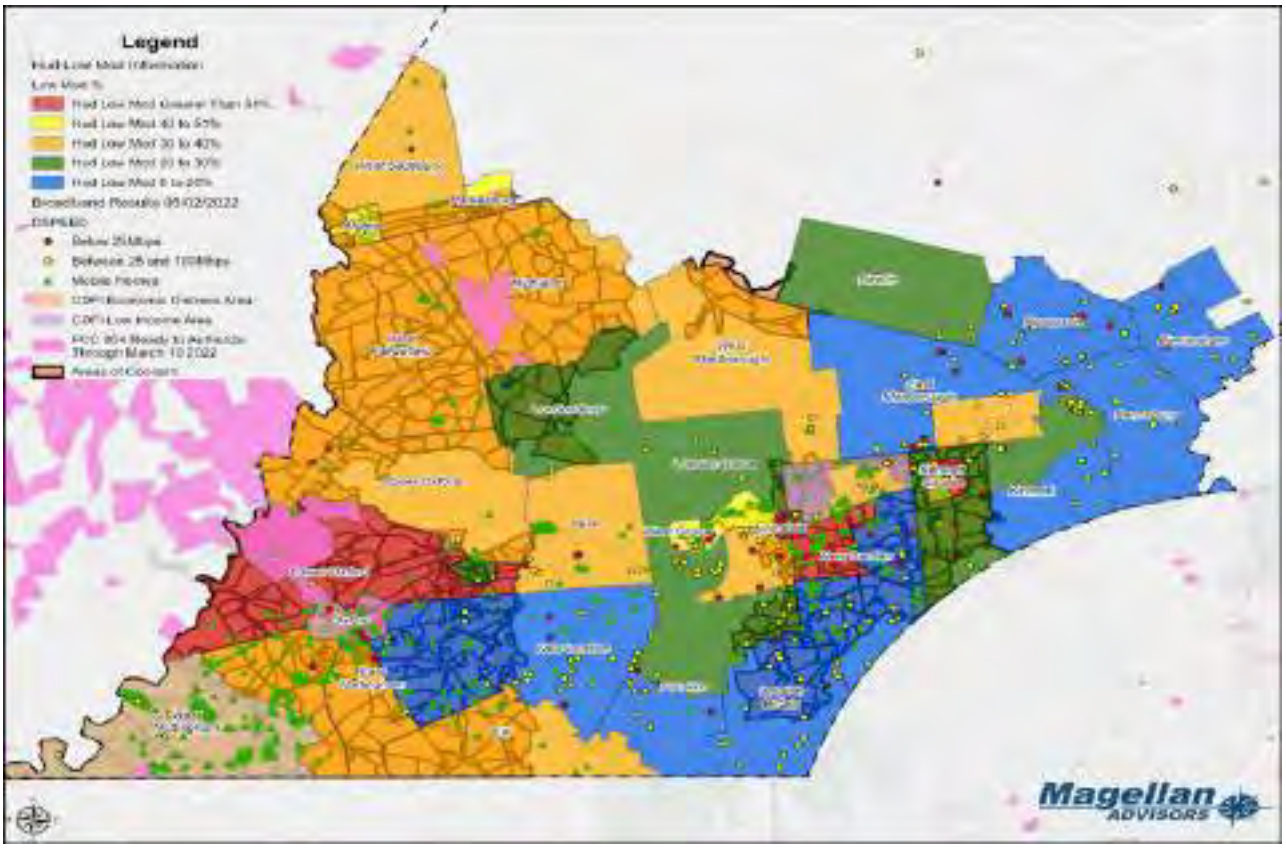


[32] https://www.cdfifund.gov/documents/geographic-studys

OVERLAYED MAPS: HUD/LOW INCOME ELIGIBLE AREAS, MAGELLAN SURVEY SPEED TEST DATA, CDFI DATA, FCC AUCTION 904 DATA (RDOF) AND KEY AREAS OF CONCERN

The map below shows several data layers overlayed to illustrate the primary areas of concern identified for this study. The map includes HUD Low to Moderate Income poverty determinations, Magellan's broadband survey data, Treasury's economic distress determinations based on the CDFI[33]and the FCC's Rural Digital Opportunity Fund (RDOF) subsidized areas in the region. This map shows the areas that are the most in need according to federal poverty benchmarks used by HUD and Treasury as indicated in orange and red.

Figure 54 - Multiple Data Layered Map

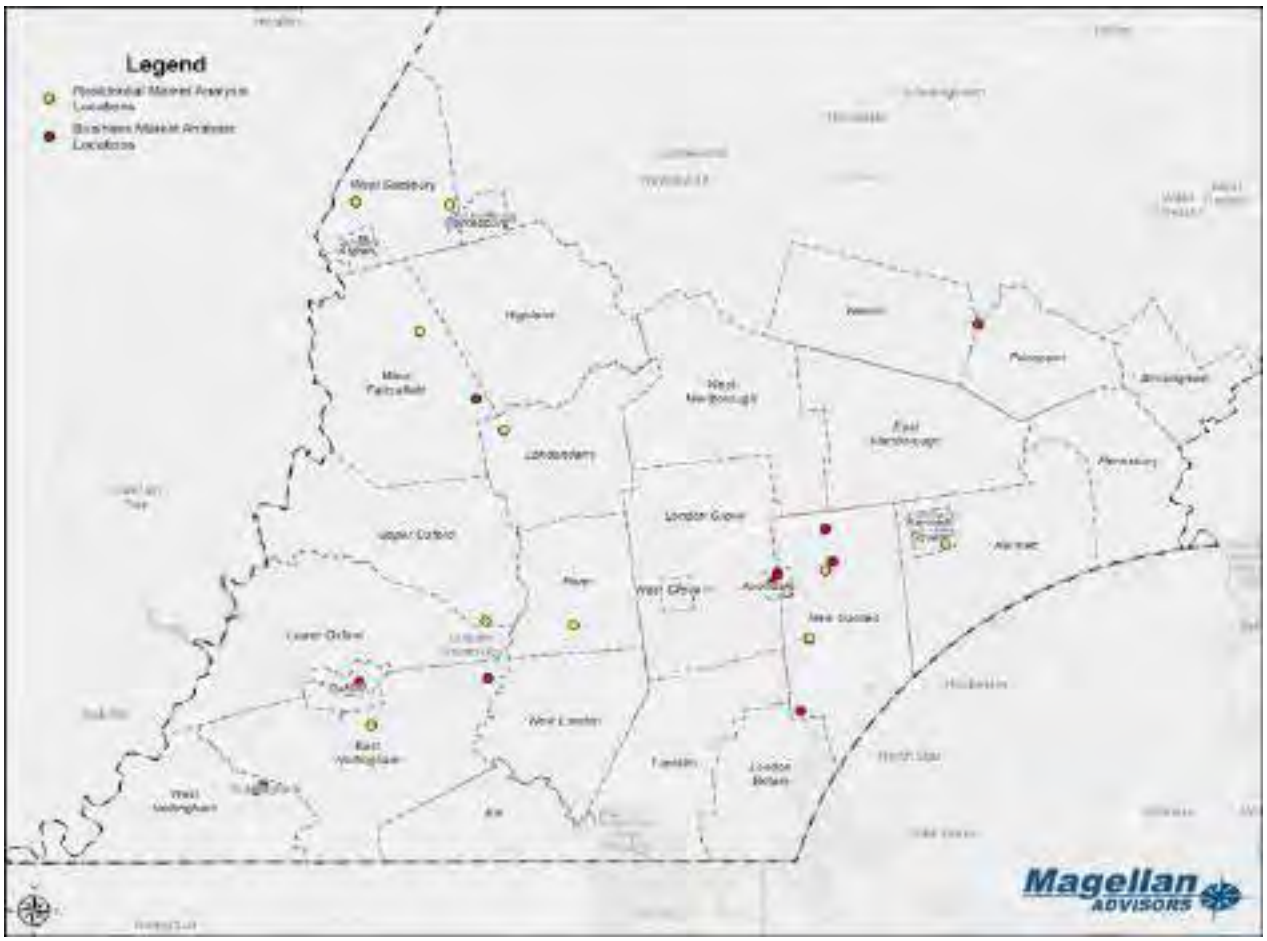


[33] Community Development Financial Institution (CDFI) Certification is a designation given by the CDFI Fund to specialized organizations that provide financial services in low-income communities and to people who lack access to financing - https://www.cdfifund.gov/

MARKET ANALYSIS OF RESIDENTIAL AND BUSINESS LOCATIONS

Magellan selected a random sample of residential and business addresses around the project area per zip code for both residents and businesses to verify the services that the citizens are receiving. The map below shows the location of those addresses.

Figure 55 - Market Analysis Test Locations Among Residential and Business Addresses



KEY AREAS IDENTIFIED AS CHRONICALLY UNSERVED.

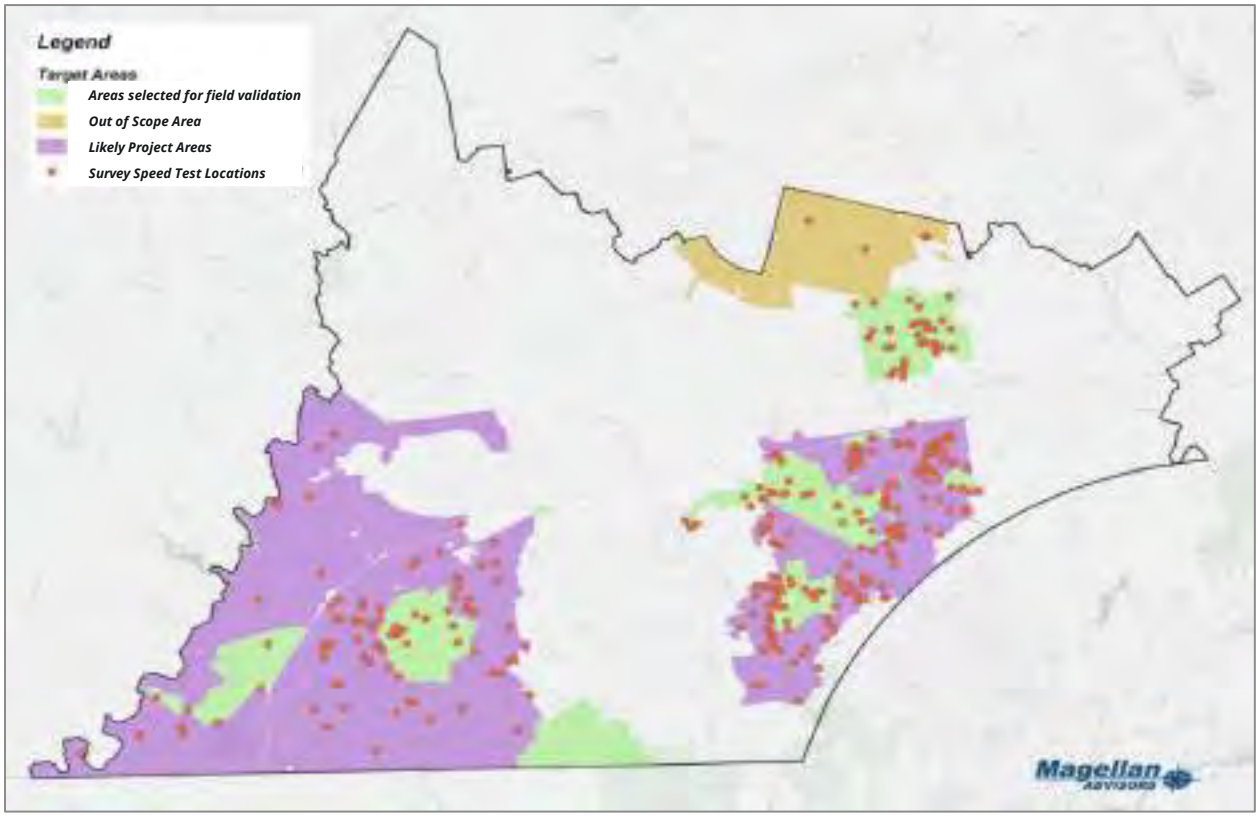
The areas shaded in purple in the map below (Figure 56) are the key areas identified as those with the greatest need and the poorest service and coverage based on all data sets reviewed and integrated into Magellan's mapping analysis identified in this study. The areas in light green were reviewed by Magellan's field validation team.

These areas should be the focus of the local leaders going forward for last mile broadband infrastructure projects. Magellan used the following criteria and data to select these areas which include the data reflected in Figures 56.

1. NTIA census blocks with reported broadband speeds of less than 100 Mbps
2. NTIA census blocks with reported poverty greater than 20%
3. HUD Low Mod households greater than 51%
4. CDFI reported low income and economic distressed blocks as reported by U.S. Treasury
5. Areas classified as underserved by Penn State Cooperative Extension
6. Magellan survey speed test results

The map in Figure 56 below indicates that the areas of greatest need (shaded in purple) are located throughout Kennett, Avondale, Elk Township, Oxford, Freemont, East Marlborough, Landenberg, East and West Five points and Penn Township.

Figure 56 - Areas of Concern Identified for Further Field Analysis Performed by Magellan

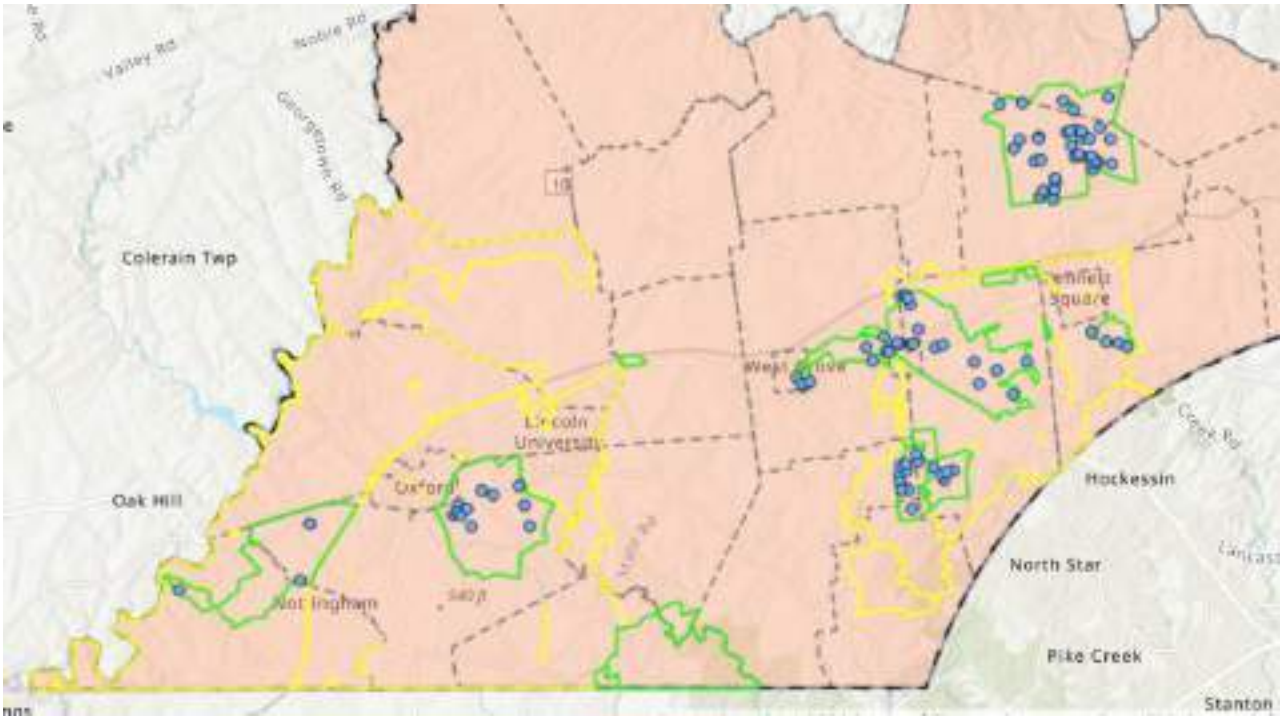


FIELD VALIDATION RESULTS AND CONCLUSIONS

Magellan sent its broadband field validation team into the Southern Chester County region to physically identify and verify network infrastructure within areas where our survey and mapping data showed a potential lack of coverage or where project team members requested further verification of certain areas around the school districts.

Figures 57 and 58 illustrate the areas where field analysis was conducted by Magellan. The fielding team was provided with specific residential addresses for field inspection to determine if any form of broadband infrastructure was visible either on the street or attached to the home.

Figure 57 - Addresses for Field Verification



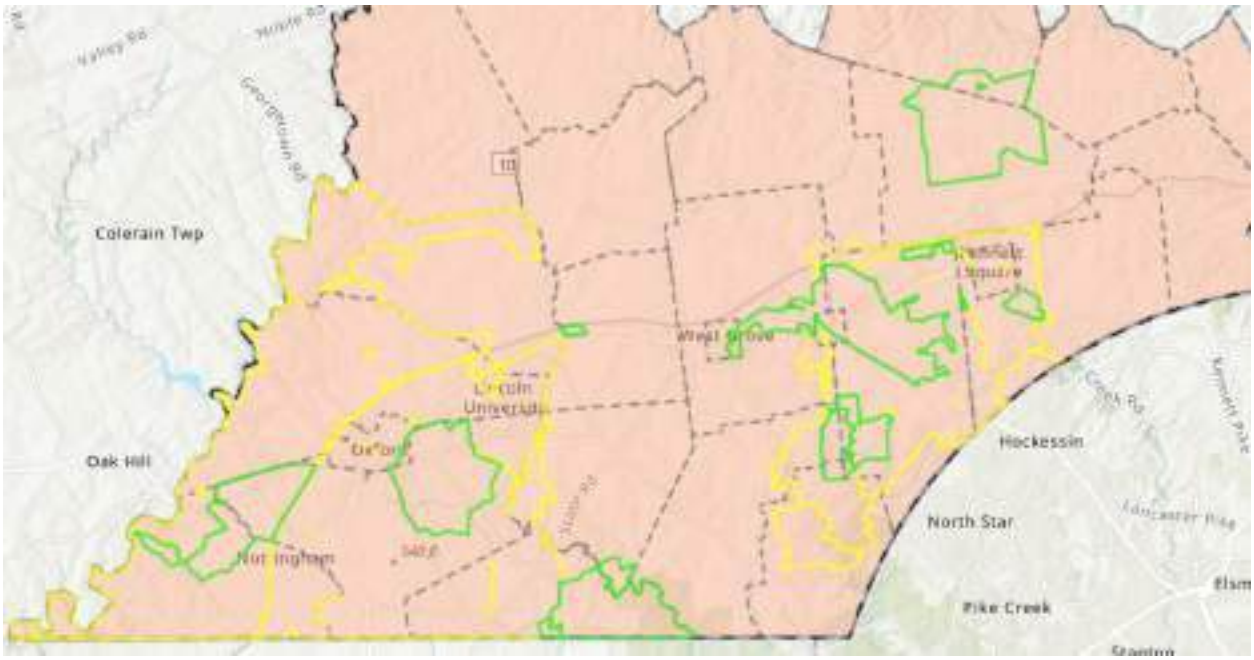
Of the 110 of addresses provided for field analysis, Magellan's fielding team identified each one as having some form of telecommunications facilities either attached to the home or located at the street level on poles.

The existence of these facilities does not alone suggest that households are receiving qualified broadband service as defined by the FCC and other federal agencies identified in this study. In most cases, it does not. Poor service quality and reliability persists for most residential consumers in the region and additional public

investments in these areas would help increase connectivity to households and businesses.

Most households in these areas are economically distressed and unable to afford service even if the facilities are on or near their home. While some infrastructure may exist, it does not mean residents can access those services due to price. Income, education levels, remoteness and other socioeconomic factors were evaluated to supplement the survey to identify where gaps in high-speed broadband access exist.

Figure 58 - Areas Selected for Field Validation (Green) and Proposed Project Areas (Yellow)



As stated earlier, Magellan in coordination with the school district technology directors identified the areas bordered in yellow (see figure 58 above) as the main areas of concern that warranted field validation. The areas bordering in green are the locations where the field teams conducted on the ground validation by walking the streets within these areas.

Table 7 - Field Validation Findings

Community Name	Level of Facilities Present
Elk Township	Broadband or DSL equipment present on some houses
Freemont	No broadband equipment noted
East Oxford/Maple Grove	High amount of infrastructure noted
Landenberg	Minimal infrastructure noted
West Penn Township	No infrastructure noted
East Five Points	Very little infrastructure noted
West Five Points	Very little infrastructure noted
Avondale (West side of Avondale has less infrastructure than the East.)	High amount of infrastructure noted
West Kennett Square	Very little infrastructure noted
East Marlborough Township	Broadband equipment available among all premises checked

Throughout the identified communities marked for field validation, the fielding team made notations of where broadband specific infrastructure was present at the residential locations checked. The specific types of broadband equipment and infrastructure present include pedestals[34], vaults[35] and hand holes[36].

The maps of each area that were validated by the Magellan fielding team (shown in figures 59 -62) suggest that some form of infrastructure and or equipment was visibly present on or near the homes, but this information did not provide enough detail on whether those consumers were truly served with high quality connectivity.

[34] **Pedestal** - a general-purpose, outdoor enclosure. It is the main node for voice, data and video distribution, in a passive optical network (PON). The pedestal is the network interface - at the neighborhood. Options, for its internal components, were designed, according to the global standards bodies.
[35] **Vault -** A fiber optic splice vault essentially serves as a demarcation point for incoming trunk cable in a central office, data center, or other large-scale application.
[36] **Hand holes** - underground vaults that provide access to fiber optic cable and other utilities for splicing & repairs. They are often called pull boxes, splice boxes, underground enclosures, or vaults.

Figure 59 – Infrastructure/Equipment Identified in Maple Grove

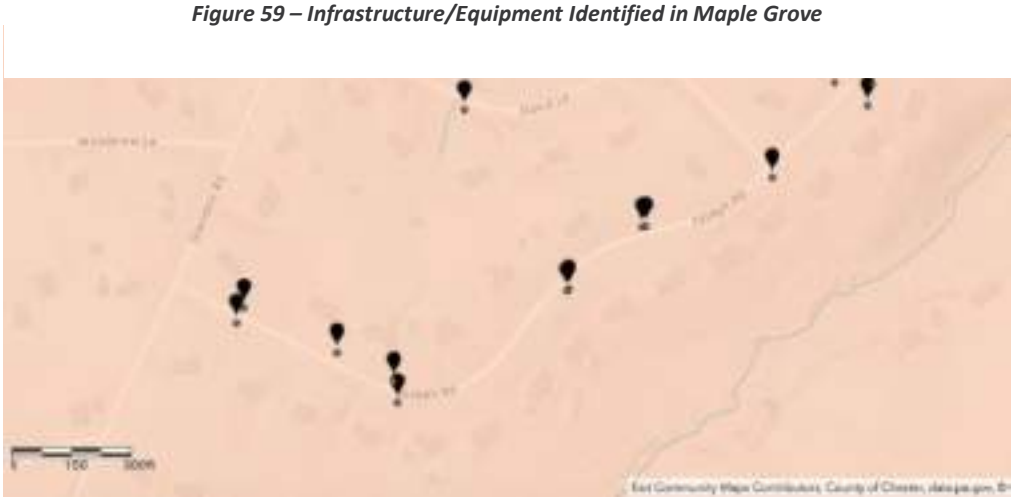
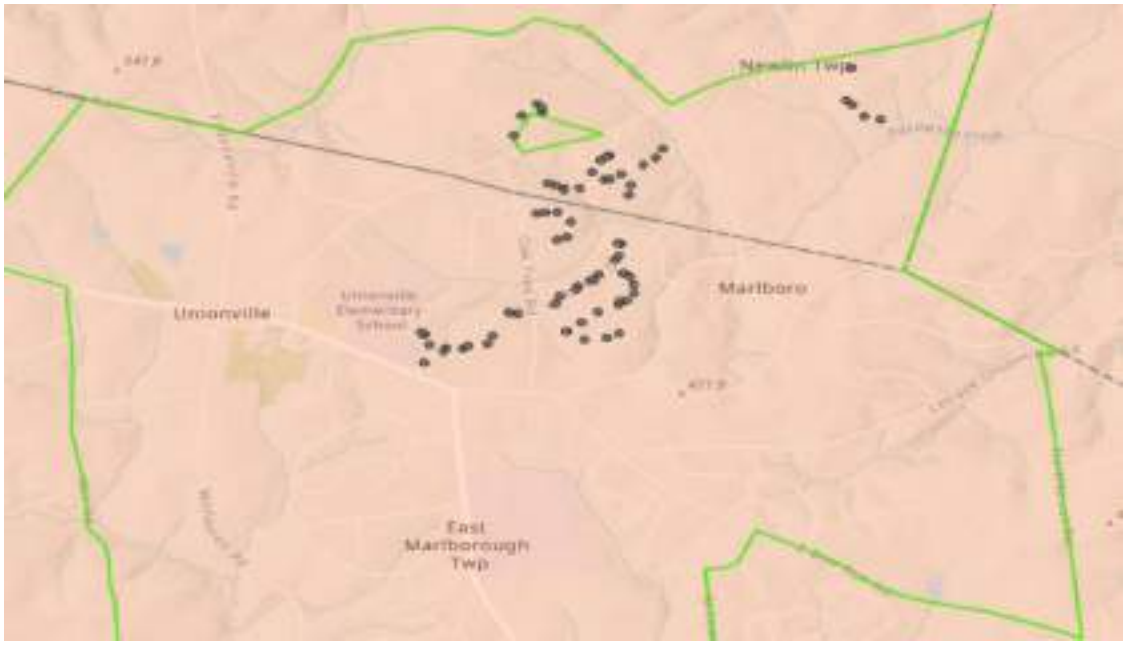


Figure 60 - Infrastructure/Equipment Identified in Elk Township

Figure 61 – Infrastructure/Equipment Identified in North Landenberg

Figure 62 - Infrastructure/Equipment Documented in Unionville-Marlboro



CONCLUSION

The results of the field validation reaffirmed the assumptions of the school district technology directors as well as numerous stakeholders – the primary barriers for consumers in the region continue to center on a lack of affordability and access to reliable, high-quality broadband in their home or business location.

While broadband equipment may be visible in some locations, it is not the primary determinant of whether the residential household is receiving broadband service offered at price points they can afford. Therefore, Magellan recommends that township leaders consider low-cost solutions that may provide affordable universal broadband access to the entire region.

Broadband Project Options for Southern Chester County

As stated throughout this study, last mile broadband access (providing connectivity to the end user premises) is lacking throughout most communities in the region. Due to the presence of numerous cellular towers in the area (owned by Crown Castle), and backhaul capacity (fiber between the towers), Magellan recommends local leaders consider the benefits of pursuing a fixed wireless solution to provide 100% last mile connectivity directly to farms, homes and businesses.

Magellan developed a High-Level broadband network Design (HLD) for a wireless overlay network to connect both residential, business and agricultural customers (mushroom farms) with a robust broadband solution using mid band spectrum (3.5Ghz to 3.7Ghz) known as the Citizens Band Radio Service (CBRS). A description of CBRS is shown in Appendix 3.

This option is far less costly than pursuing a fiber to the premises project that would be both time consuming and cost prohibitive to the region. Given the inherent supply chain delays in procuring fiber assets and the limited supply of skilled workers capable of trenching and installing fiber facilities, a fixed wireless solution could connect these communities faster and with less cost.

A satellite network may also offer similar speed to market benefits as a fixed wireless but may encounter latency challenges especially in rural areas during inclement weather which makes it a less reliable and less cost-effective option. A GEO stationary satellite network means the satellite is in a fixed position in orbit around earth. Two major providers use GEO systems today, HughesNet and ViaSat. Both are relatively

slow in speeds and expensive per megabit transmitted. A LEO satellite is a one where there are multiple satellites in Low Earth Orbits. The customer equipment for these networks switches from satellite to satellite as they pass over the sky. LEO satellites are closer to the Earth, so the latency is less than the GEO. Starlink is the only LEO commercial service available today, but the customer equipment is expensive, and the customer must have a clear view of the whole sky to have reliable service which makes this solution untenable for Southern Chester County.

Figure 63 - Starlink's Equipment Installation Illustration From its User Manual

FIXED WIRELESS SOLUTIONS TO PROVIDE BROADBAND TO MUSHROOM FARMS AND RESIDENTIAL COMMUNITIES

Mushroom farms are a critical segment of the agriculture economy in Pennsylvania, yet they continue to struggle with poor connectivity, thus constraining their productivity and competitive standing in the mushroom production sector nationally.

The mushroom farming sector throughout Southern Chester County is increasingly dependent on high-speed broadband connectivity to boost productivity, enhance supply chain efficiencies and maintain contact with employees.

These benefits are expected to grow and help mushroom farmers remain economically sustainable and expand revenue growth. Precision farming is also essential for helping farmers manage the health and safety of their workforce. Mushroom farms encountered enormous challenges during the pandemic as they tried to stay in touch with their workers to inform them about vaccination locations.

Fixed wireless radios (base stations) transmit data from either a water tank, grain silo, commercial or public safety tower or any tall structure to connect end user premises such as homes, fields or mushroom facilities.

EXTENDING FIXED WIRELESS NETWORKS ON MUSHROOM FARMS INTO RESIDENTIAL PREMISES

Installing equipment on a home or mushroom farm office or facility is the same. Customer premises equipment (CPE) is the device that picks up the wireless signal from the tower and delivers it into the home or farm. The CPE is mounted on the side of the residence or building or can be installed on a pole adjacent to the home or facility.

A high gain antenna is embedded into the CPE that must be pointed to the radios on a tower or vertical structure. The device has an Ethernet connection that is fed into the residence. Figure 64 is a simple graphical depiction of how a fixed wireless network transmits broadband data to and from the public internet back to a customer's premises or farm location.

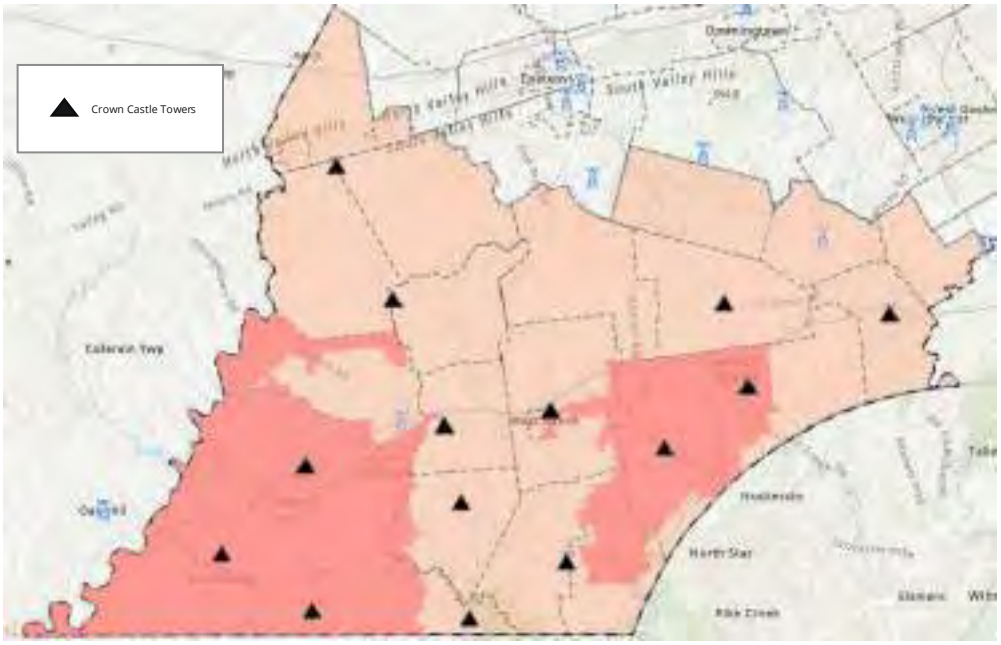
Figure 64 – Illustrations of Precision Agriculture Technologies Used on Farm Fields

The mushroom farmers interviewed for this study indicated that connectivity was virtually nonexistent on at their mushroom facility. Most mushroom farmers cannot

Figure 65 - Customer Premise Equipment Illustration

afford a fiber last mile connection due to high deployment costs. Therefore, Southern Chester County is an ideal location for a precision agriculture network that can serve as a model for other farms and agricultural communities in the state. Federal and state funding agencies are likely to provide favorable scoring to projects that address the economic barriers facing local industries such as agricultural production. Southern Chester County is uniquely suited to reiterate the need for funds to support the agricultural sector with a fixed wireless network solution as outlined in this study.

Figure 66 - Crown Castle Towers



PROPOSED FIXED WIRLESS NETWORK OVERVIEW OF COVERAGE AND COSTS

The proposed fixed wireless network outlined in this section is designed to achieve 100% coverage that would provide speeds ranging from 50 to 100 Mbps download and 10 to 20 Mbps upload. Fourteen cell sites (towers) would be required to provide coverage to the area defined. We recommend 4 base stations per tower for maximum coverage, totaling 56 across 14 individual towers identified across the region (see map above)

Crown Castle towers (listed on the map) were selected for this proposed design since they are located along numerous Chester County fiber routes. Four base stations

were added to each tower with a 90-degree antenna to produce 360-degree coverage. Two 20 MHz channels were used. Channel 1 is used on the North South sectors. Channel 2 is used on the East West sectors.

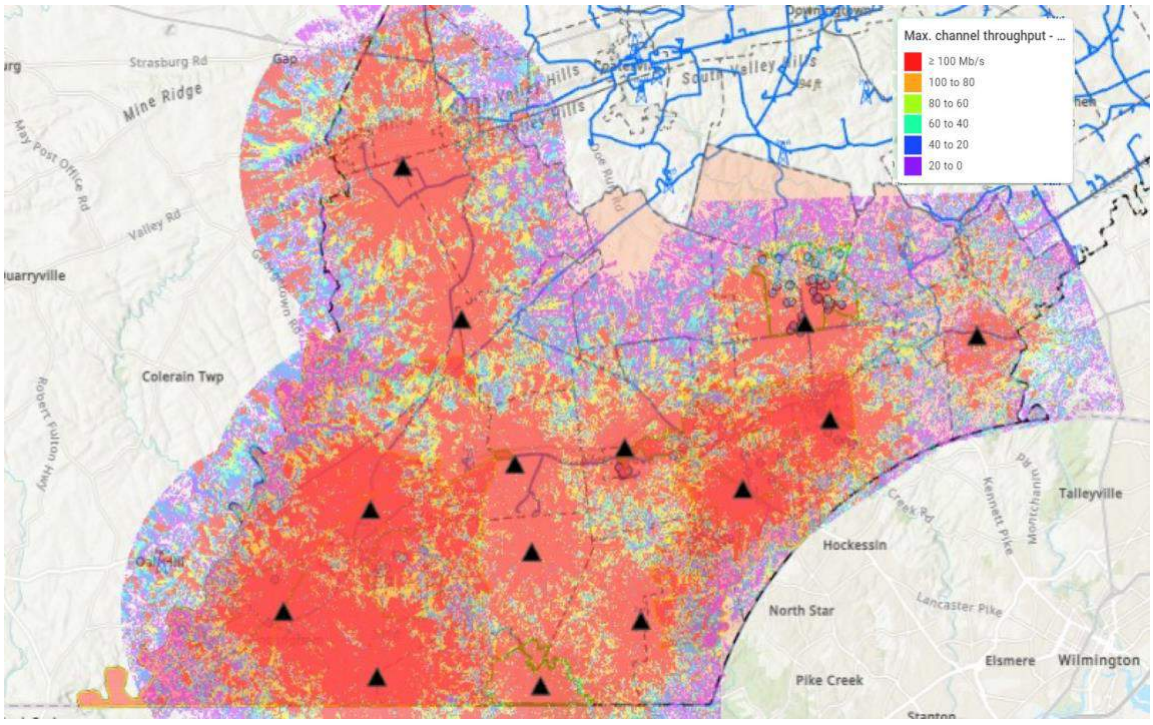
It should be noted that this is a high-level design. The towers were not physically visited or examined by a structural engineer to determine if they are capable of adding additional radio equipment. This will be required before installation can commence.

COVERAGE AND SPEEDS PROVIDED USING FIXED WIRELESS

The Google Network Planner propagation tool[37] was used to perform the propagation analysis (see map below) and considers terrain, obstacles, and equipment parameters (frequency, power, etc.). Using this tool produced the following coverage of the defined area.

The towers selected for this network design will require backhaul connections to the internet of at least 1 Gbps to support throughput from 4 base stations with 90-degree antenna to provide 360-degree coverage. The propagation study shown above illustrates the maximum throughput wirelessly that customers can expect if all the backhaul is properly configured to provide that throughput.

Figure 67 - Wireless Propagation Analysis Using CBRS Spectrum



[37] Network Planner (google.com)

ESTIMATED COST

The following tables present the estimated capital expenditures (CAPEX) and operational expenditures (OPEX) for this network. All federal grant programs cover CAPEX costs for both fixed wireless and fiber deployments. The total CAPEX cost for this network solution is $1,619,800 which is far less than a fiber to the home or premises project. This estimate includes all the "if needed" items. Since commercial towers are recommended for this deployment, those items will likely be provided.

Table 8 - Estimated CAPEX Cost for the Entire Region

Total Area Estimated CBRS Wireless Overlay Cost-CAPEX			
Item	**Cost**	**Units**	**Total Cost**
Tower Capex Existing Towers	$ -	14	$ -
Tower Cost New (if required)	$ 150,000	-	$ -
County Owned Towers/Water Tanks	$ -	-	$ -
Base Station + Antenna Cost	$ 15,000	56	$ 840,000
Base Station Installation	$ 2,000	14	$ 28,000
Microwave Equipment	$ 3,000	-	$ -
Outdoor Router	$ 1,000	14	$ 14,000
Outdoor Cabinet (if needed)	$ 4,000	14	$ 56,000
Electric Service (if needed)	$ 5,000	14	$ 70,000
UPS (if needed)	$ 10,000	14	$ 140,000
10 KW generator (if needed)	$ 5,000	14	$ 70,000
Tower inspection (if required)	$ 2,000	14	$ 28,000
CPE cost ($356 equipment, $350 labor)	$ 706	-	$ -
WiFi Router for Home/Office	$ 300	-	$ -
EPC Access Fee Per CPE	$ 35	-	$ -

Total Area Estimated CBRS Wireless Overlay Cost-CAPEX			
Item	**Cost**	**Units**	**Total Cost**
Subtotal			$ 1,246,000
Engineering, Project & Construction Mgmt	30%		$ 373,800
Total Estimated Capex Cost			**$ 1,619,800**

Subscriber estimates are not included in this scenario, but the CAPEX cost for external CPE equipment is listed above. In areas with robust signal strength, a CPE that is a MiFi device can be used instead of the external pole and high gain antenna.

This type of unit can also be self-installed to cut costs. The self-installed units are compact and can sit on a desk or table. They should be placed in windows. The units have signal strength indicator lights on them that help the user to place them in the best signal location.

Below is the estimated OPEX cost per month for this network. Tower rent is estimated at $1,000 per month and the utilities and backhaul estimates are derived from previous projects. A Spectrum Access System (SAS) fee is also required for each CPE device of $2.00 per premise. Therefore, the minimum monthly OPEX cost would be roughly $21,125.

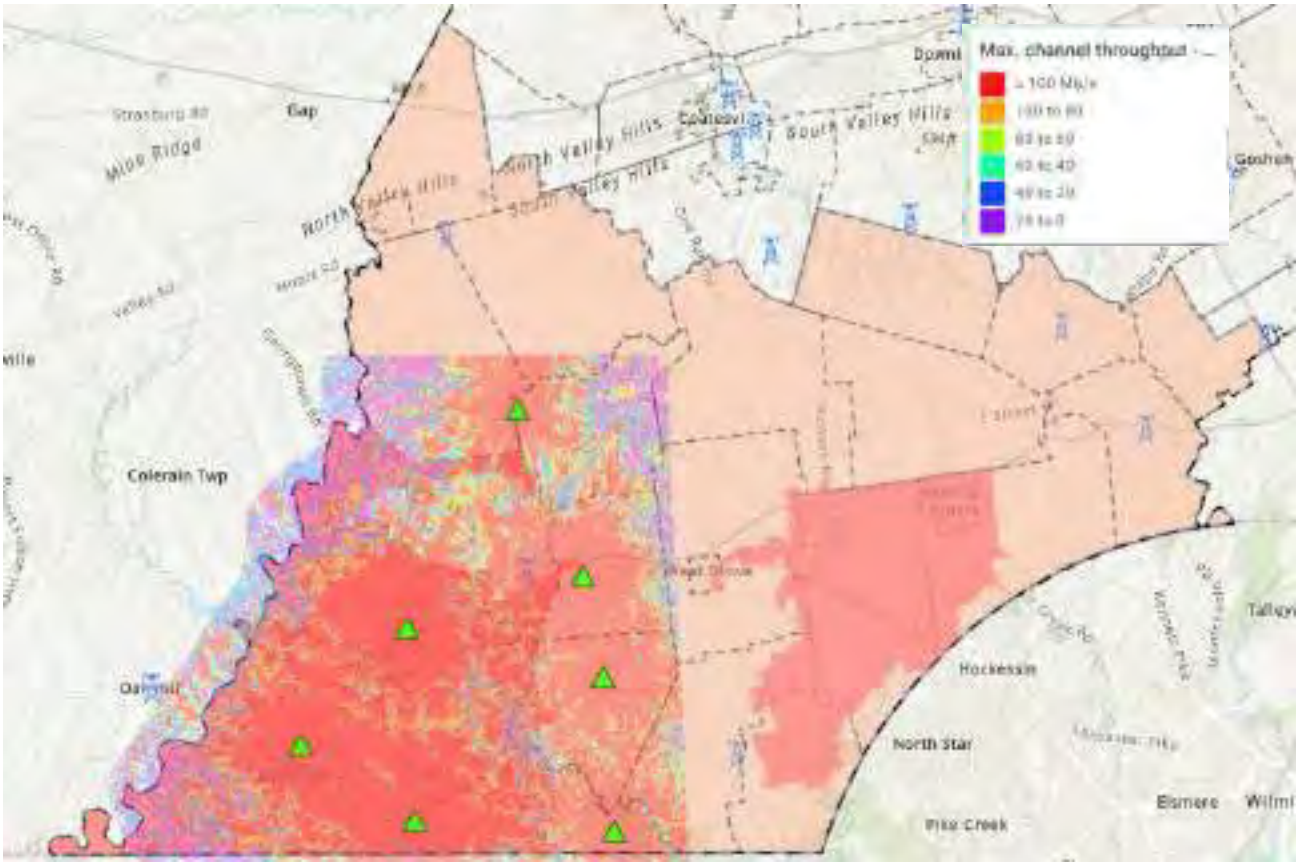
Table 9 - Estimated OPEX Cost

Estimated CBRS Wireless Overlay Cost-OPEX/Month			
Item	**Cost**	**Units**	**Total Cost**
Tower Rental for Commercial Towers	$ 1,000	14	$ 14,000
Utilities	$ 100	14	$ 1,400
Internet Data (if needed)	$ 1,500	1	$ 1,500
SAS fee per CPE	$ 2	-	$ -
Subtotal			$ 16,900
Contingency	25%		$ 4,225
Total Estimated Cost /MO			**$ 21,125**

To manage costs, Magellan recommends a phased approach to implement fixed wireless network throughout the entire region or the project. The areas of concern can be addressed first then the complete area design created if desired. This will allow incremental areas to be completed.

Phase 1 includes a proposed project area covering the areas of concern in the western portion of the defined area. Below is the conceptual design for that area alone. The incremental CAPEX and OPEX cost follow the Phase 1 design.

Figure 68 - Phase 1 Area Conceptual Design

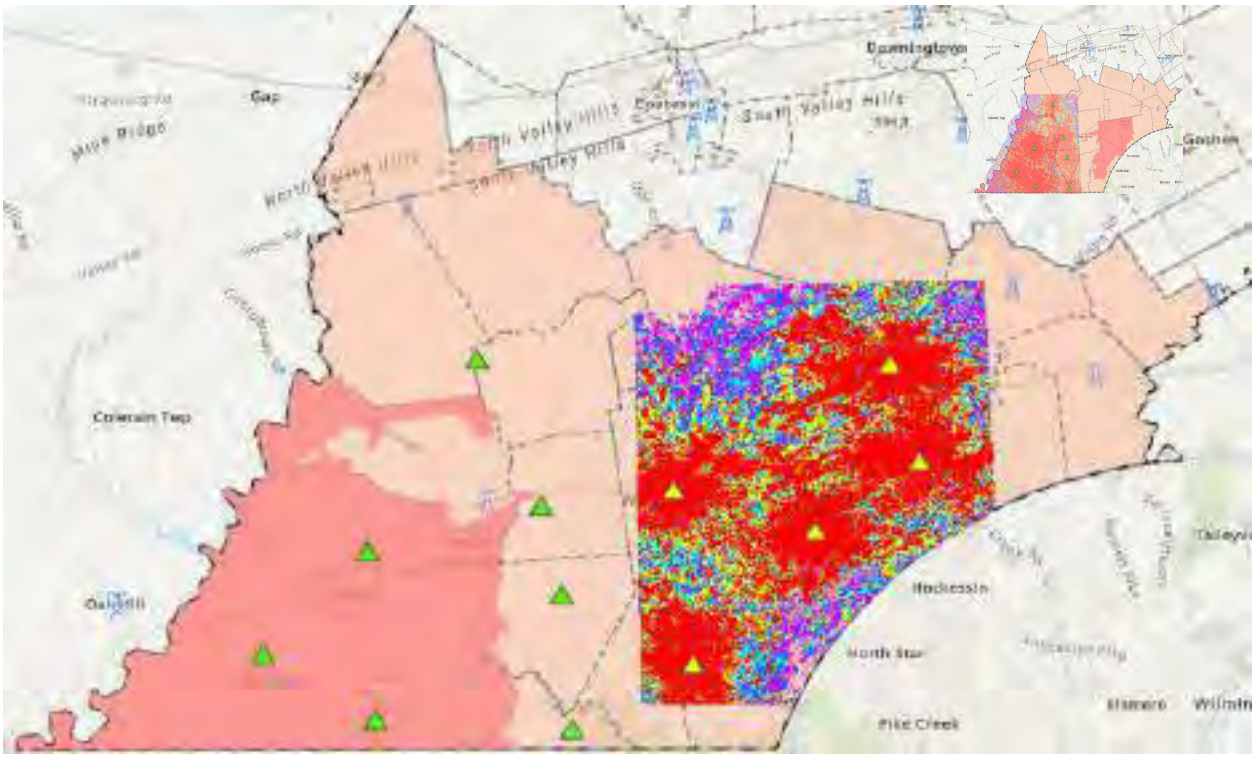


Phase 1 Total Area Estimated CBRS Wireless Overlay Cost-CAPEX			
Item	**Cost**	**Units**	**Total Cost**
Tower CAPEX Existing Towers	$ -	7	$ -
Tower Cost New (if required)	$ 150,000	-	$ -
County Owned Towers/Water Tanks	$ -	-	$ -
Base Station + Antenna Cost	$ 15,000	32	$ 480,000
Base Station Installation	$ 2,000	32	$ 64,000
Microwave Equipment	$ 3,000	-	$ -
Outdoor Router	$ 1,000	7	$ 7,000
Outdoor Cabinet (if needed)	$ 4,000	7	$ 28,000
Electric Service (if needed)	$ 5,000	7	$ 35,000
UPS (if needed)	$ 10,000	7	$ 70,000
10 KW generator (if needed)	$ 5,000	7	$ 35,000
Tower inspection (if required)	$ 2,000	7	$ 14,000
CPE cost ($356 equipment, $350 labor)	$ 706	-	$ -
WiFi Router for Home/Office	$ 300	-	$ -
EPC Access Fee Per CPE	$ 35	-	$ -
Subtotal			$ 733,000
Engineering, Project & Construction Mgmt	30%		$ 219,900
Total Estimated Capex Cost			**$ 952,900**

Estimated Phase 1 CBRS Wireless Overlay Cost-OPEX/Month			
Item	Cost	Units	Total Cost
Tower Rental for Commercial Towers	$ 1,000	7	$ 7,000
Utilities	$ 100	7	$ 700
Internet Data (if needed)	$ 1,500	1	$ 1,500
SAS fee per CPE	$ 2	-	$ -
Subtotal			$ 9,200
Contingency	30%		$ 2,760
Total Estimated Cost /MO			**$ 11,960**

Phase 2: This phase includes the eastern area of concern with 5 tower sites. Below is the conceptual design and costs.

Figure 69 - Phase 2 Area Conceptual Design



Phase 2 Total Area Estimated CBRS Wireless Overlay Cost-CAPEX			
Item	**Cost**	**Units**	**Total Cost**
Tower Capex Existing Towers	$ -	5	$ -
Tower Cost New(if required)	$ 150,000	-	$ -
County Owned Towers/Water Tanks	$ -	-	$ -
Base Station + Antenna Cost	$ 15,000	20	$ 300,000
Base Station Installation	$ 2,000	20	$ 40,000
Microwave Equipment	$ 3,000	-	$ -
Outdoor Router	$ 1,000	5	$ 5,000
Outdoor Cabinet (if needed)	$ 4,000	5	$ 20,000
Electric Service (if needed)	$ 5,000	5	$ 25,000
UPS (if needed)	$ 10,000	5	$ 50,000
10 KW generator (if needed)	$ 5,000	5	$ 25,000
Tower inspection (if required)	$ 2,000	5	$ 10,000
CPE cost ($356 equipment, $350 labor)	$ 706	-	$ -
Wi-Fi Router for Home/Office	$ 300	-	$ -
EPC Access Fee Per CPE	$ 35	-	$ -
Subtotal			$ 475,000
Engineering, Project & Construction Mgmt.	30%		$ 142,500
Total Estimated Capex Cost			**$ 617,500**

Estimated Phase 2 CBRS Wireless Overlay Cost-OPEX/Month			
Item	Cost	Units	Total Cost
Tower Rental for Commercial Towers	$ 1,000	5	$ 5,000
Utilities	$ 100	5	$ 500
Internet Data (if needed)	$ 1,500	1	$ 1,500
SAS fee per CPE	$ 2	-	$ -
Subtotal			$ 7,000
Contingency	30%		$ 2,100
Total Estimated Cost /MO			**$ 9,100**

CONCLUSION

The fixed wireless network designs outlined above would provide another option for both farms and residential locations near mushroom facilities and could be constructed faster than a fiber network involving costly and time consuming boring and siting costs. They also provide the region with options depending on costs and where they wish to devote time and resources first.

Both CAPEX and some OPEX costs are eligible for funding under NTIA's BEAD broadband grant program (discussed in the next section below) but many of the details will depend on how the Pennsylvania Broadband Development Authority decides whether to fully fund projects like those outlined above. The State may be amenable to funding projects that concurrently support economic development by promoting precision agriculture.

Similarly, the cost benefits to the state are notable since they are far less than the costs of a fiber to the premises network that are often time consuming to complete. Time to market is a critical factor for broadband projects and funding authorities may favor those which can deliver connectivity to consumers faster.

Recommendations Regarding Funding, Governance and Next Steps

At the conclusion of this study, the communities throughout Southern Chester County will still be without sufficient broadband access to meet the needs of residential and business customers, including farms.

Community based stakeholders and volunteers throughout Southern Chester County have made tremendous strides in defining the scope of the broadband access and adoption problem and have begun to develop a governance model to continue the momentum generated by public and private stakeholder engagement and mapping analysis performed over the past year.

Magellan recommends local leaders support this momentum by adding staffing capacity and financial resources to the work already underway in the following manner:

1. Identify a lead agency to collaborate closely with key stakeholders in Southern Chester County. The lead agency will help the region apply for state and federal funding for broadband infrastructure and digital equity projects. There are several existing samples of local broadband organizations of various sizes and scopes that involve public and private sector stakeholders to convene and make decisions about broadband.

2. Convene briefings about the findings in this study for the staff and leadership at the Pennsylvania Broadband Development Authority for input and support.

3. Create a broadband leadership team that can advise county, state and local officials about broadband access, deployment and adoption issues facing unserved and underserved communities throughout Southern Chester County. The leadership team will also seek state and federal grant funds for broadband projects in sections of Southern Chester County that have the greatest need.

Short-term goal: Identify a lead agency within Southern Chester County to coordinate all relevant broadband stakeholders and begin governance planning

This study finds a clear case for the creation of a lead agency to coordinate all broadband initiatives for Southern Chester County.

Magellan recommends that the lead agency, in coordination with the township officials and the Southern Chester Chamber of Commerce, create or designate an existing non-profit agency to lead the development of a Southern Chester County broadband strategy. As a starting point, the selected agency may begin by hosting informal discussions with the stakeholders listed above to identify a governance structure and draft a charter for the primary broadband leadership entity.

The governing board may then seek to apply for federal and or state grant funds [38] to finance broadband network projects in rural and unserved areas throughout the region. Such funds are available for this purpose under ARPA as well as the Infrastructure Act and can be used for this purpose.

Purpose and scope focused on the needs of local communities

A local government leadership team could serve to represent the interests of townships and boroughs on matters before the state and provide a cohesive voice on behalf of rural communities throughout Southern Chester County before the recently formed Pennsylvania Broadband Development Authority.[39]

The legislature authorized the creation of a statewide authority to distribute federal broadband funds awarded by NTIA under the Broadband Equity, Access, and Deployment (BEAD) Program[40]. A Southern Chester County agency or leadership team must be well positioned to advocate and apply for funds on behalf of its underserved and unserved communities through partnerships with commercial entities.

Based on meetings and interviews conducted by Magellan over the past six months, the following stakeholders would serve as ideal partners and members of a newly launched Southern Chester County broadband leadership team.

- Chester County Economic Development Council (CCEDC)
- Township managers and supervisors: local government representation is critical towards achieving municipal support for infrastructure projects
- Chester County Intermediate Unit (CCIU): CCIU has been engaged in broadband mapping, coverage analysis and adoption
- American Mushroom Institute (AMI): the connectivity needs of agricultural producers provide an important perspective in broadband planning

[38] Digital Equity Programs | BroadbandUSA (doc.gov)

[39] Pennsylvania Broadband Development Authority - PA Department of Community & Economic Development

[40] Broadband Equity, Access, and Deployment (BEAD) Program | BroadbandUSA (doc.gov)

- Southern Chester County Chamber of Commerce
- Southern Chester County Opportunity Network: advocates Jim Mercante and Joan Holliday have been instrumental in garnering local support and bringing attention to the needs of community residents and businesses

Network governance and oversight

A first step in developing a broadband leadership team is to establish a working group of stakeholders empowered to oversee the operational and regulatory requirements of a new network and to ensure its long-term evolution and financial sustainability. The central element of the governance structure is a governing board that will oversee the following:

1. Making and executing contractual obligations for the management and use of network assets
2. Establishing business practices consistent with local, state, and national laws and regulations
3. Providing oversight of network management, operations, and uses

A formal charter must be developed to address the scope that will inform the roles and responsibilities of the appointed governance board members. The primary goal of the board is to set priorities, and to make objective investment decisions based on the coverage needs of various communities.

Network MOU and model resolution

Governing board members may develop a memorandum of understanding (MOU) for building and using the network and a model resolution in support of the network as a precursor to formalizing the network entity. The MOU would identify roles, responsibilities, and expectations of each and would lay out the basics of the authority's purpose, structure, and operations.

Network management under an "open access model"

The lead agency or leadership team will need to keep track of network assets that it funds, deploys and/or manages, including their ownership and use. The major management task is to track ownership and utilization of fiber strands, towers, and other vertical assets.

The network should be "neutral" to the extent that whoever provides the infrastructure will not block, filter, or slow content from any sources. The network should be "open" for users to access broadband internet access services.

The network would only be designed as a wholesale open access platform for lease arrangements to third party commercial providers for last mile access – it would not

be used to provide retail broadband services to end users. Local governments find open access a compelling model since it attracts multiple service providers to their areas, which generates competition and contains prices for consumers.

Additional recommendations to refine the existing coverage analysis after the completion of this study throughout Southern Chester County

The results of this study provided the county and technology directors for all four school districts with empirical data that validated their anecdotal understanding, experiences, and assumptions regarding the lack of coverage in several areas within their respective regions. The data collected from surveys and other inputs provided by Magellan used for this study also provides a baseline for additional analysis and survey research to continue to occur in the future.

Magellan recommends that local governments and the associated school districts, in coordination with other local and county stakeholders, continue to conduct survey analysis in areas where the current survey participation rate was low or none. As we have stated throughout this study, the residential population throughout these school districts are difficult to reach both physically and culturally and may require field workers to visit them in their home and translate and or explain the purpose of each survey question to elicit a more robust response.

This type of survey work requires trained field staff with bilingual language and cross-cultural awareness skills to effectively interact with members of these households to increase the survey response rate in certain areas.

As our mapping data illustrates, the communities with lowest response rates from the Magellan broadband coverage survey are located northeast and northwest of Avondale, areas throughout Newland township, all of Lower and Upper Oxford as well as the majority of West Nottingham.

Federal and State Funding Analysis and Options for Southern Chester County

Below is an overview of the federal and state broadband funding programs that are the best fit for the region, its stakeholders, and consumers. As indicated earlier in this study, Southern Chester County is an ideal candidate for broadband project funding from county, state or federal agencies but needs greater support and coordination from countywide leaders to increase its chances for an award. At this

time, there is no municipal or nonprofit organization within Southern Chester County that is prepared to apply for these funds.

The need for organizational capacity as well as technical, financial, or operational support from local and regional leaders and their subsequent agencies could not have come at a more important time for the communities in need. The upcoming deadlines for federal funding opportunities for broadband infrastructure projects are on the horizon so time is of the essence for the Southern Chester County region to organize a leadership body involving broadband governance, mapping and infrastructure deployment.

The broadband mapping data developed for this study indicates that there are several pockets of unserved and underserved areas that are noncontiguous yet eligible for funding under certain federal grant programs outlined below. A broadband network solution may require localized focus where these noncontiguous areas are funded and built out separately and connected with middle-mile fiber routes.

Like many rural communities throughout the Northeast, the Southern Chester County region is not geographically homogenous. Rural areas are interspersed with more urbanized towns – resulting in a "patchwork" of areas in need that are not inherently obvious to anyone who is unfamiliar with the region.

Therefore, Magellan recommends a hybrid fiber/fixed wireless network solution that delivers the desired coverage to last mile consumers via fixed wireless that is based on a robust middle-mile network path. This solution is also best suited to meet the needs of farms in the region as well who cannot find any provider to build fiber to reach their farm due to the inherent costs of deployment which to date has been prohibitive. A fixed wireless solution is less costly, easier and faster deploy to reach households and farms in this region.

NTIA'S BROADBAND EQUITY, ACCESS, AND DEPLOYMENT (BEAD) PROGRAM

The Infrastructure Investment and Jobs Act of 2021 (Infrastructure Act) authorized over $42.5 billion to the National Telecommunications and Information Administration (NTIA) to administer the BEAD program, which provides an allocation of grant funds to the states for distribution to subgrantees for last mile broadband infrastructure projects in rural underserved areas.

Eligible subgrantees are determined by the state. These funds will be managed and distributed by the Pennsylvania Broadband Development Authority directed by the

Pennsylvania legislature. All projects must be completed within 5 years from the date of award.

Coverage requirements

Specifically, BEAD program funds must be used to deploy network facilities to last mile "unserved" areas, which are defined as an area where 80% of the residential households receive broadband services at speeds that are less than 25 Mbps down and 3 Mbps up. The next criteria for funds are those areas defined as "underserved" which are areas where 80% of the area receives at or below 100 Mbps down and 20 Mbps up.

Applicants must also offer gigabit connections to community anchor institutions such as libraries and community centers that lack such connectivity.

All projects must offer a low-cost option to eligible subscribers, require all states to have plans to address affordability, and prioritize proposals that improve affordability.

Applicants must also provide an irrevocable standby letter of credit from their financial institution committing to their application for grant funding.

Key Dates:

- States and Territories must submit a letter of intent (signed by the Governor) to NTIA through the application portal to participate by **midnight EST on 7/18/22.**
- The state's Point of Contact (SPOC) may at that time request initial planning funds through the application portal by **midnight EST on 8/15/22.**
- States seeking initial planning funds must **submit a five-year action plan** no later than 270 days **of receipt of the planning funds (9 months later).** States must incorporate a State Digital Equity Plan into their five-year plan.

Total grant amounts for each state will be determined by the revised FCC broadband maps

- States will be notified about future deadlines after the FCC releases its revised broadband maps **(anticipated Nov/Dec 2022).**
- Once FCC maps are published, NTIA will publish the amount of funds each state is eligible to receive from the BEAD program.

States must submit their initial proposals to NTIA after the FCC maps have been released

- **States then have 180 days to submit their initial proposals to NTIA from the date fund amounts are published.** The initial proposal must detail the

subgrantee grant process, etc. These proposals must be made available for public notice/comment including stakeholder input.
- Once the NTIA approves a state's initial proposal, they will allow the state to draw up to 20% of its grant fund allotment to conduct statewide grant programs.

States must submit their final proposals to draw their remaining 80% of total funds

- Final proposals will be due to NTIA one year from the date of approval of the state's initial plan, after which the remaining 80% of the total amount will be available for draw from the state.

Funding amounts:

- Each state may receive a minimum of $100 million and may request up to $5 million for initial planning costs including staffing, onboarding consulting support and mapping costs, etc.
- After the publication of the FCC's broadband coverage maps, the final allocation amount for each state will be determined based on the number of unserved locations identified by the FCC.
- After the NTIA approves a state's initial proposal, it will authorize the state to draw 20% of its total award amount.

Matching requirements:

- States and or subgrantees must provide matching funds of at least 25% of project costs. Funds from CARES, ARPA, the Infrastructure Act or the consolidated appropriations act of 2020 can qualify for match purposes under this program. Projects that contribute more than 25% match may be scored higher than those that do not.

State Challenge Process:

- After states submit their initial proposals to NTIA, they must conduct a challenge process to allow stakeholders to challenge the state's initial proposal regarding whether an area is served or unserved. States must submit all successful challenges to NTIA for review and approval.

Non-infrastructure eligible costs for states:

States are also permitted to use their BEAD allocation to fund non-infrastructure related costs such as:

- User training for cybersecurity, privacy and other digital safety.

- Remote learning or telehealth services/facilities.
- Digital literacy/upskilling (from beginner-level to advanced).
- Computer science, coding and cybersecurity education programs.
- Implementation of digital equity plans (to supplement, but not to duplicate planning grant funds received by the Eligible Entity).
- Broadband sign-up assistance that provides technology support.
- Multi-lingual outreach to support adoption and digital literacy.
- Prisoner education to promote pre-release digital literacy, job skills, online job acquisition skills, etc.
- Digital navigators (trusted guides who assist community members in internet adoption and the use of computing devices).
- Direct subsidies for broadband subscription, where the Eligible Entity shows the subsidies will improve affordability for the end user population (and to supplement, but not to duplicate or supplant, the ACP).
- Costs associated with stakeholder engagement, including travel, capacity-building or contract support.
- Other allowable costs to carry out programmatic activities of an award.

These non-infrastructure costs and use cases will be developed based on the required stakeholder engagement conducted by states prior to developing and submitting its five-year plan to NTIA.

BEAD program analysis for Chester County:

We encourage Southern Chester County leadership to begin to engage local stakeholders in that region, such as local township officials and Southern Chester County Chamber of Commerce to establish an action plan to formalize a leadership structure that would be eligible to apply for these funds.

It is recommended that the Leadership Team begin to identify funding which may be available to help the leadership team meet the 25% match requirement. Projects that commit a higher percentage of cash match over in-kind will be scored higher than those who commit only in-kind resources.

The BEAD grant program contains rigorous build out, operational, financial, and engineering requirements as well as labor, workforce development and study obligations. Applicants must also commit to providing a “low-cost offering” to low-income consumers during the useful life of the assets funded by the grant.

To meet these obligations, a newly created leadership team or agency may increase its chances for an award by partnering with a fiber provider or an established fixed wireless provider committed to the goals of the communities outlined in this study.

In the near term, local leaders should brief members and staff at the Pennsylvania Broadband Development Authority on a monthly basis about the findings in this study and discuss its goals for participating in the BEAD program when it opens next year.

AFFORDABLE CONNECTIVITY PROGRAM (ACP)

Eligible low-income households enrolled in the Affordable Connectivity Program (ACP) may receive a monthly benefit of up to $30 per household per month from qualifying providers who participate in the program.

The ACP benefit can be used for internet access services and a one-time discount of up to $100 for eligible households to purchase a laptop, desktop computer or tablet from participating providers if they contribute more than $10 and less than $50 toward the purchase price.

The ACP benefit is limited to one monthly service discount and one device discount per household. Eligible households are those with incomes at or below 200% of the Federal Poverty Guidelines, or if a member of the household meets at least *one* of the criteria below:

- Received a Federal Pell Grant during the current award year;
- Meets the eligibility criteria for a participating provider's existing low-income internet program;
- Participates in one of these assistance programs:
  - The National School Lunch Program or the School Breakfast Program, including through the USDA Community Eligibility Provision;
  - SNAP
  - Medicaid
  - Federal Public Housing Assistance
  - Supplemental Security Income (SSI)
  - Women Infants and Children (WIC)
  - Veterans Pension or Survivor Benefits
  - Monthly benefits under the federal Lifeline program.

Consumers may find a qualifying ACP service provider in their community by visiting the Companies Near Me tool that identifies the participating providers by zip code[41]

41 Companies Near Me - Universal Service Administrative Company (lifelinesupport.org)

To apply for the ACP benefit, a qualifying consumer must apply by visiting AffordableConnectivity.gov to submit an application or print out a mail-in application.

Similar to the federal Lifeline monthly end user subsidy, the ACP benefit is provided to the participating provider from the FCC/USAC who then discounts the consumer's monthly broadband bill. All new providers seeking to participate in the ACP program must file an election notice with the FCC and USAC and provide the following to participate:

- A statement identifying where the provider received Bureau approval to participate in the ACP.
- A statement confirming whether the provider intends to distribute connected devices and supporting documentation. Providers seeking reimbursement for connected devices must submit a statement of intent to distribute connected devices as part of their election notice.

ACP analysis for Southern Chester County

Affordability is problematic for residential consumers throughout Southern Chester County across the four school districts. The chronic levels of poverty experienced in this region have put broadband access out of reach for these consumers. Yet the participation in the FCC's Affordable Connectivity Program is low relative to the total eligible population county wide.

According to the FCC's ACP participation data collected from January – May 2022,[42] only 3,160 qualified low-income consumers are receiving the benefit and 29 consumers are claiming the benefit for eligible devices across all of Chester County. Both existing providers, local and county leaders can do better to help eligible consumers become aware of this program.

To raise awareness and increase participation in the ACP, local and county leadership in coordination with stakeholders in Southern Chester County such as La Communidad Hispana, Mighty Writers and the Garage Community and Youth Center among others could conduct workshops at mushroom farms and/or other community service organizations about the benefit and how eligible low-income families can apply.

The Affordable Connectivity Program flyer is included as Figure 70 and the FCC and the Universal Service Administrative Company (USAC) has numerous training and

[42] ACP-Households-and-Claims-by-County-January-May-2022.xlsx (live.com)

outreach resources including videos and materials translated in Spanish[43]. Magellan staff also has extensive expertise in this program and can assist local and county leaders with outreach and training efforts to increase participation in this important program.

We encourage local and county leaders and public or private sector partners to download the all the application materials and enrollment information from the USAC website[44] and provide the information to eligible consumers at food banks, senior centers, mushroom farms, churches and community support organizations. If local leaders create a broadband entity for the purpose of applying for any of the funding opportunities outlined above, they will be required by law to participate in the ACP program as well.

[43] Programa de Descuentos Para Internet (ACP) | Federal Communications Commission (fcc.gov)

[44] Application and Eligibility Resources - Universal Service Administrative Company (usac.org)

Figure 70 - FCC's Affordable Connectivity Program Flyer That Can Be Distributed Widely to Low Income Households

AFFORDABLE CONNECTIVITY PROGRAM

WHAT IS IT?

The Affordable Connectivity Program is an FCC program that helps connect families and households struggling to afford internet service.

The benefit provides:

- Up to $30/month discount for internet service;
- Up to $75/month discount for households on qualifying Tribal lands; and
- A one-time discount of up to $100 for a laptop, desktop computer, or tablet purchased through a participating provider.

WHO IS ELIGIBLE?

A household is eligible for the Affordable Connectivity Program if the household income is at or below 200% of the Federal Poverty Guidelines, or if a member of the household meets at least one of the criteria below:

- Participates in any of the following assistance programs: SNAP, Medicaid, Federal Public Housing Assistance, Veterans Pension or Survivor Benefits, SSI, WIC, or Lifeline;
- Participates in any of the following Tribal specific programs: Bureau of Indian Affairs General Assistance, Tribal TANF, Food Distribution Program on Indian Reservations, or Tribal Head Start (income based);
- Participates in the Free and Reduced-Price School Lunch Program or the School Breakfast Program, including through the USDA Community Eligibility Provision;
- Received a Federal Pell Grant during the current award year; or
- Meets the eligibility criteria for a participating broadband provider's existing low-income internet program.

TWO STEPS TO ENROLL

1

Go to **AffordableConnectivity.gov** to submit an application or print a mail-in application

2

Contact your preferred participating provider to select an eligible plan and have the discount applied to your bill.

Some providers may have an alternative application that they will ask you to complete.

Eligible households must both apply for the program and contact a participating provider to select a service plan.

LEARN MORE

Call 877-384-2575, or

Visit **fcc.gov/acp**

Appendices

APPENDIX 1- STAKEHOLDER OUTREACH LIST

Date	Name	Title	Affiliation	Location
12/14/21	Catlin Ganely, John Walker and Jessica Sibley	Senior Directors, Government Affairs	Comcast	Freedom Region.
12/13/21	Chester County School Technology Directors kick off meeting	All four Technology Directors from each School District in the project scope	CCIU	Kennett Consolidated, Unionville-Chadds Ford, Avon Grove, Oxford Area
12/22/21	Michael Roth	Senior Advisor	PA Dept of Agriculture Office of the Secretary	Harrisburg
12/28/21	Jim Mercante and Joan Holliday	Community Volunteers	Chester County Digital Equity Coalition	Kennett
12/30/21	Rob Troxell	Business Outreach Manager	Upward Broadband	Paradise
1/4/22	Dave Houseman	President	Chesconet	Downingtown
1/6/22	Shawn Beqaj	VP of Regulatory & Interconnection	Armstrong Cable	Pittsburgh
1/7/22	Tom Robb and Jim Geiger	Directors	Crown Castle Fiber	King of Prussia
1/14/22	Bob Norris	Kennett Square Council Member	Kennett Sq Borough	Kennett Square
1/17/22	Jorge Duchini	Deputy Director	Advisory Council on Latino Affairs	Kennett Square
1/17/22	Cheryl Kuhn	Executive Director	Southern Chester County Chamber of Commerce	Avon Grove

Date	Name	Title	Affiliation	Location
1/20/22	Maricela Ayllon	Family Services Director	Tick Tock Early Learning Center	Avon Grove
1/27/22	Donna Sensing	Community Health Nurse	Hispanic Health Ministries	Avon Grove
2/1/22	Ernie Holling	Executive Director	Chester County Assoc. of Township Officials (CCATO)	Chester Springs
2/2/22	Mike Murphy	Director	Chester County Dept of Emergency Services	West Chester
2/3/22	Amanda Blevins	Community Engagement Manager	La Communidad Hispana	Kennett
2/3/22	Bobby Kagel	County Manger	Chester County	West Chester
2/4/22	Joe Sherwood	Director	Chester County Library System	West Chester
2/11/22 5/3/22	Pat Bokovitz	Director	Chester Count Dept. of Human Services	West Chester
2/15/22	Marian Moskowitz	Chair	Chester County Board of Commissioners	West Chester
2/21/22	Eden Ratliff	Township Manager	Kennett Township	Kennett
2/21/22	Harry Chrissy	Economic Resource Development Agent	Penn State Cooperative Extension Service	Allentown
2/22/22	Brian O'Leary	Executive Director	Chester County Planning Commission	West Chester

Date	Name	Title	Affiliation	Location
2/24/22	Matthew Franchak	Broadband Advisor	Office of State Senator John Kane	Harrisburg
2/28/22	Ronan Gannon	Executive Director	Las Communidad Hispana	Kennett
3/2/22	Robert Pantucci	Director	Verizon Wireless - PA/DE	Coatesville
3/3/22	Whitney Hoffman	Former Town Supervisor	Kennett Township	Kennett Township
4/20/22	Amy Scheuren	Program Director	Kennett Area Community Service	Kennett
4/20/22	Rachel Lebus	Executive Director	Oxford Area Neighborhood Services Center	Oxford
4/20/22	Carey Bresler	Director	Oxford Public Library	Oxford
4/20/22	Bill Steller	CFO	Phillips Mushroom Farms	Kennett
4/21/22	Sara-Dickens Trillo	Director	Mighty Writers	Kennett
4/21/22	Kristin Pronto	Director	The Garage Community & Youth Center	Kennett
4/21/22	Rachel Roberts	President	American Mushroom Institute	Throughout Southern Chester County
	Amy Ducharme	Project Coordinator	American Mushroom Institute	
	Meghan Klotzbach	Owner Operator/VP of Sales and Marketing	Mother Earth Organics	
	Stephanie Chapman	HR Director	Phillips Mushroom Farms	
	John D'Amico	Owner Operator	J.D. Mushrooms Inc.	
	Emily Bettencourt	Government Relations	South Mill Champs	
	Chris Alonzo	Owner/Operator	Pietro Industries	
5/2/22	Gary Smith and MaryFrances McGarrity	President/CEO And Vice President	Chester County Economic Development Council	Exton
5/3/22	Carlos Obrador	Consular General	Mexican Consulate	Philadelphia

APPENDIX 2 - BROADBAND AVAILABILITY AT SPECIFIC RESIDENTIAL AND BUSINESS ADDRESSES

Residential	Xfinity	Verizon	Viasat	HughesNet	T-Mobile Home Internet	Ultra Home Internet	Armstrong Cable	Upward Broadband	Frontier	EarthLink
19380 Westgrove - 492 Kelton Pennocks Bridge Rd	✓	✗	✓	✓	✗	✓	✗	✗	✗	✗
19311 Avondale - 37 Gap Newport Pike	✓	✗	✓	✓	✓	✓	✗	✗	✗	✗
19348 Kennett Square - 800 Park Ave	✓	✓	✓	✓	✓	✓	✗	✗	✗	✗
19363 Oxford - 499 5th St	✗	✓	✓	✓	✓	✓	✓	✗	✗	✗
19362 Nottingham - 150 Kirks Mill Rd	✓	✓	✓	✓	✗	✓	✗	✗	✗	✗
19382 West Chester - 988 Centennial Dr	✓	✓	✓	✓	✗	✓	✗	✗	✗	✗
19317 Chadds Ford - 5 Brook Ln	✓	✓	✓	✓	✓	✓	✗	✗	✗	✗
19365 Parkesburg - 5229 Strasburg Rd	✓	✓	✓	✓	✗	✓	✗	✗	✗	✗
19374 Toughkenamon - 144 Pine St	✓	✓	✓	✓	✗	✗	✗	✗	✗	✗
19350 Landenberg - 700 Penn Green Rd	✓	✗	✓	✓	✗	✓	✗	✗	✗	✗
19352 Lincoln University - 120 Turners Pond Dr	✓	✗	✓	✓	✗	✓	✗	✗	✗	✗
19330 Coatesville - 324 Honeycroft Blvd	✗	✓	✓	✓	✓	✓	✓	✗	✓	✓
19320 Coatesville - 1798 Ridgeview Dr	✓	✓	✓	✓	✗	✓	✗	✗	✗	✗
19333 Atglen - 1196 Zook Rd	✓	✗	✓	✓	✓	✓	✗	✗	✓	✗
	12	3	14	14	6	13	1	0	2	1
% Coverage in Southern Chester County	86%	64%	100%	100%	43%	93%	14%	0%	14%	7%

Businesses	Comcast Business	Crown Castle	Verizon Business	Verizon	Windstream	CenturyLink Business	Armstrong Cable	Frontier	Telesystem
19090 Wedgrove - 10 Exchange Pl	✓	✗	✗	✓	✗	✗	✗	✗	✗
19311 Avondale - 122 Pennsylvania Ave	✓	✗		✓	✗	✗	✗	✗	✗
19348 Kennett Square - 401 Birch St, Kennett Square	✓	✓	✓	✓	✗	✗	✗	✗	✗
19363 Oxford - 506 Market St	✓	✗	✓	✓	✗	✗	✓	✗	✗
19362 Nottingham - 196 Baltimore Pike	✓	✗	✗	✓	✗	✗	✗	✗	✗
19382 West Chester - 1810 Beagle Rd	✓	✗	✓	✓	✗	✗	✗	✗	✗
19317 Chadds Ford - 1617 Baltimore Pike	✓	✗	✓	✓	✗	✗	✗	✗	✓
19365 Parkesburg - 108 W 1st Ave	✓	✗	✓	✓	✗	✗	✗	✗	✗
19374 Toughkenamon - 1470 Baltimore Pike	✓	✗	✓	✓	✗	✗	✗	✗	✗
19350 Landenberg - 100 Landenberg Rd	✓	✗	✓	✓	✗	✗	✗	✗	✗
19352 Lincoln University - 695 Oxford Rd	✓	✗	✗	✗	✗	✗	✗	✗	✗
19330 Cochranville - 1074 Gap Newport Pike	✓	✗	✗	✗	✗	✗	✗	✓	✗
19320 Coatesville - 152 Strode Ave	✓	✗	✓	✓	✗	✗	✗	✗	✗
19310 Atglen - 120 Liberty St	✓	✗	✗	✗	✗	✗	✗	✗	✗
	14	1	8	11	0	0	1	1	1
% Coverage in Southern Chester County	100%	7%	57%	79%	0%	0%	7%	7%	7%

APPENDIX 3 – OVERVIEW OF ALL AVAILABLE BROADBAND TECHNOLOGY PLATFORMS

The term "broadband" refers to high-speed connectivity to facilitate seamless access to content, data streaming and high resolution file exchanges that include video and voice. Although demand for high-speed data are rapidly increasing, the FCC defines broadband as delivering at least 25 Mbps downstream and 3 Mbps upstream. Cable, DSL, fiber, and wireless are the prime broadband delivery systems used to meet these demands by connecting users to the internet.

Broadband networks are divided into several general components, each of which has some different technological options:

1. Bulk, whole Internet Protocol exchange to Tier 1 providers
2. Backhaul transport to internet exchange point

3. Local "backbone" feeder and/or middle-mile network
4. Access and distribution network

The foundational component is internet exchange or peering. There are a few organizations that operate tier 1 Internet Protocol (IP) networks that peer—or connect—directly to each other for the internet core. Generally, tier 2 networks connect to tier 1, and tier 3 connect to tier 2. Any device or network must be physically connected to and exchange data with one of these networks to access the internet.[45] All of these networks are interconnected at a few Internet Exchange Points (IXP), which are basically data centers, almost universally via fiber-optic technology.

Each provider also has a core network that connects all of its major sites and into one or more IXPs. No customers are connected directly to these core networks, including "long haul," which consist of fiber with some microwave. Providers' core networks are extended to customers via feeder "metro" or "middle-mile" networks. Major customers may be connected to the feeder networks, but most customers get service from access networks that are interconnected via the distribution infrastructure. Distribution and feeder networks are almost entirely fiber and can also act as backbones for connecting multiple sites into a network.

Access networks provide the widest technology options. The traditional options were coaxial cable and twisted pairs of wires. These "legacy" technologies from analog voice and television services were transformed into digital connections but could not overcome inherent limitations of wires. Fiber and wireless are becoming more common because they are more capacious and/or flexible.

FIBER BASED NETWORKS

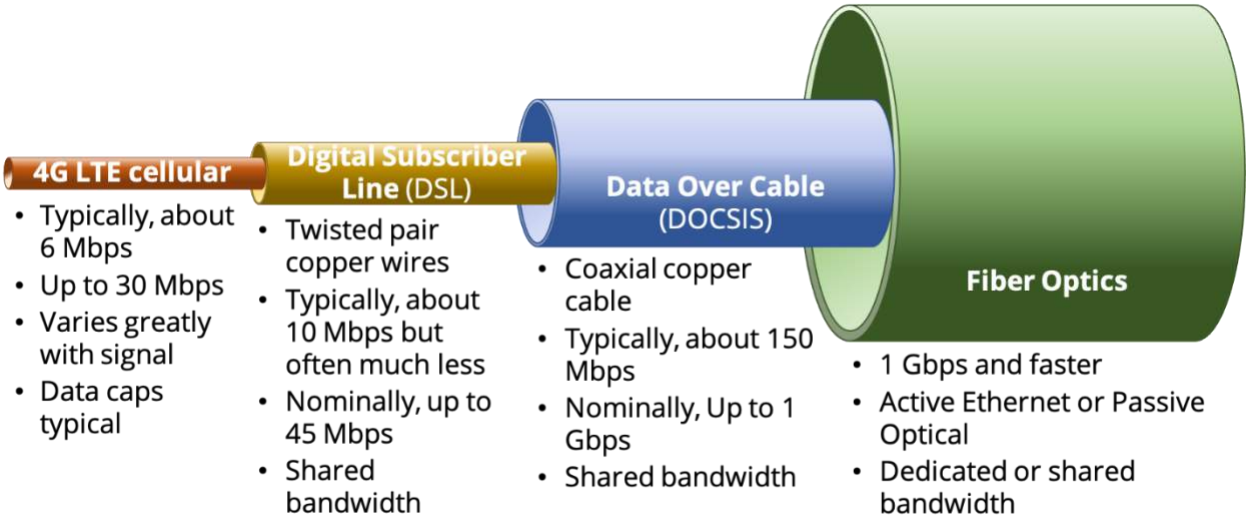
Fiber can carry light signals for miles without degradation. The light spectrum within fibers can be subdivided into "colors"—referred to as "lambdas"—each of which can carry separate data streams. The number of lambdas is limited only by the laser technology. Currently, 200 lambdas are common for what is called Dense Wavelength Division Multiplexing (DWDM), but thousands are possible. The new standard is 100 Gbps over a single lambda, which gives a single fiber an effective throughput of 20 terabits per second.

Fiber-optic cables (or just "fiber") are strands of glass the diameter of a human hair that carry waves of light. Unlike other connections that carry electrons across copper wire, fiber supports fast, reliable connections by using photons across glass, giving it the capacity to carry nearly unlimited amounts of data across long distances at

[45] It is quite possible to have a private IP network that is *not* physically connected. No devices on such networks can reach the internet or vice versa.

spectacularly fast speeds. Fiber's usability and resiliency have brought it to the forefront of broadband, making it a highly desired asset for all entities, public and private, that own or control it. The availability of a reliable, cost-effective fiber connection creates opportunities for the communities it serves.

Figure 71 - Network Technologies Compared



The figure above illustrates the relative difference between common internet connection methods, comparing access technologies from basic dial-up through DSL, cable, and fiber. Whereas traditional broadband technologies have an upper limit of 300 Mbps, next-generation broadband that utilizes fiber-optic connections surpasses these limitations and can provide data throughputs of 1 Gbps and greater.

FIXED WIRELESS BROADBAND PLATFORMS

Wireless uses radio frequencies, sent and received via antenna and radios that generate signals which can be anywhere in the radio spectrum band, from 30 Hz to 300 GHz, although most radio communications use frequency bands are from 300 KHz to 30 GHz. Wi-Fi operates in unlicensed 2.4 and 5.9 GHz bands. Cellular services, in contrast, uses multiple bands to balance distance and speed. Generally, higher frequency radio spectrum carries more information but covers shorter distances.

5G BROADBAND SERVICE

"5G" is the fifth generation of wireless technology driving evolution of the wireless communications technology platform. First generation, "2G" and "3G" wireless service was provided beginning in the 1980s and 1990s using large towers, "4G" was

characterized by development of “apps” that needed sustained reliable connectivity which in turn drove antenna densification, while “5G” relies upon even more closely spaced, small antennas.

Current 4G deployments are aimed at densification and increasing capacity in high-use areas while “5G” small cell facilities are also being deployed in larger numbers to greatly increase speed and data capacity on a “fill-in” basis. 5G uses relatively low power transmitters which cover a radius of approximately 400 feet, thus it requires more antennas spaced closer.

5G networks operate multiple frequencies in three bands using millimeter wavelengths, the highest of which is anticipated to offer download/upload speeds of 1 Gbps. The actual speed and range the consumer gets depends on a variety of factors, including what frequency is being used by the service provider – low-band, mid-band, or high-band. There are tradeoffs among the different bands, between speed and distance/coverage. Low-band and mid-band deployments would likely be most useful and beneficial in Southern Chester County.

Low-band frequencies work well across long distances and in rural areas; speeds are greater than 4G but slower than other 5G frequencies. Mid-band frequencies are currently sought after since they permit greater speeds while covering relatively large areas. High-band frequencies provide the fastest speeds but in more limited circumstances such as close to the antenna and in areas without physical obstructions (i.e., windows, buildings, walls). Also, obtaining 5G service requires the use of a 5G-ready device, of which at present there are only a handful (though the number is growing).

Figure 72 - 5G Network Architecture[49]

Local governments in Chester County should be cautious about the "hype" regarding the promises of 5G but should consider the benefits of spectrum enabled fixed wireless and mobile use cases in rural areas. 5G provides the basic infrastructure for Smart City applications based on the "Internet of Things" (IoT), which can transparently connect many, small devices. This trend can be applied to revolutionize industrial processes and applications including agriculture, manufacturing, and business communications.

The pandemic is accelerating shifts for 5G internet technologies and business trials. Perhaps the obvious example is the ubiquitous use of Zoom meetings to communicate, conduct remote learning and receive job training.

CITIZENS BRAOADBAND RADIO SERVICES (CBRS)

4G LTE[46] cellular, which is evolving to 5G, is the most common radio access network (RAN) technology, but 4G is limited to providers with licenses for essential spectrum. LTE can also be used in other spectrum, specifically the 4.9 GHz band that is set aside for public safety broadband and the 3.5 GHz Citizens Broadband Radio Service (CBRS) spectrum.

The FCC set aside the 3550-3700 MHz (3.5 GHz) spectrum in 2015 for CBRS. The spectrum can be used for fixed or mobile broadband. Fixed services provide access to the internet from a specific location. It typically requires an external antenna with

[46] LTE stands for "Long Term Evolution."

direct line-of-sight to the central base station antenna. Speeds are generally comparable to DSL and cable modem offerings.

Fixed wireless can be deployed as a Point-to-Point (PtP) or Point-to-Multipoint (PtMP), and we recommend both for Southern Chester County. PtP involves a one-to-one relationship between antennas at different locations. It is typically used for interconnecting sites, such as a headquarters or main buildings, to a remote facility. Internet service providers typically use this approach for connecting to customer locations where they do not have wired infrastructure. End-users typically use it as a backup or secondary connection or for non-critical sites because the connections have less capacity than fiber and are susceptible to environmental degradation from foliage, weather, and other factors.

PtMP involves multiple—even hundreds of—users' antennas connecting to a single, central base station. This model and infrastructure are very similar to cellular but with more bandwidth and without the mobility. As illustrated Figure 69 PtP and PtMP are complementary technologies. PtP can be used to interconnect PtMP base stations as well as for remote sites (although fiber is preferable due to its capacity and reliability).

The networks require Line of Sight (LOS) or near Line of Sight (nLOS) to operate. The systems utilize proprietary protocols and specialized devices to achieve the long ranges and high throughputs. Different vendors' products may not interoperate with each other.

Figure 73 -How PtMP and PtP Wireless Connect Communities

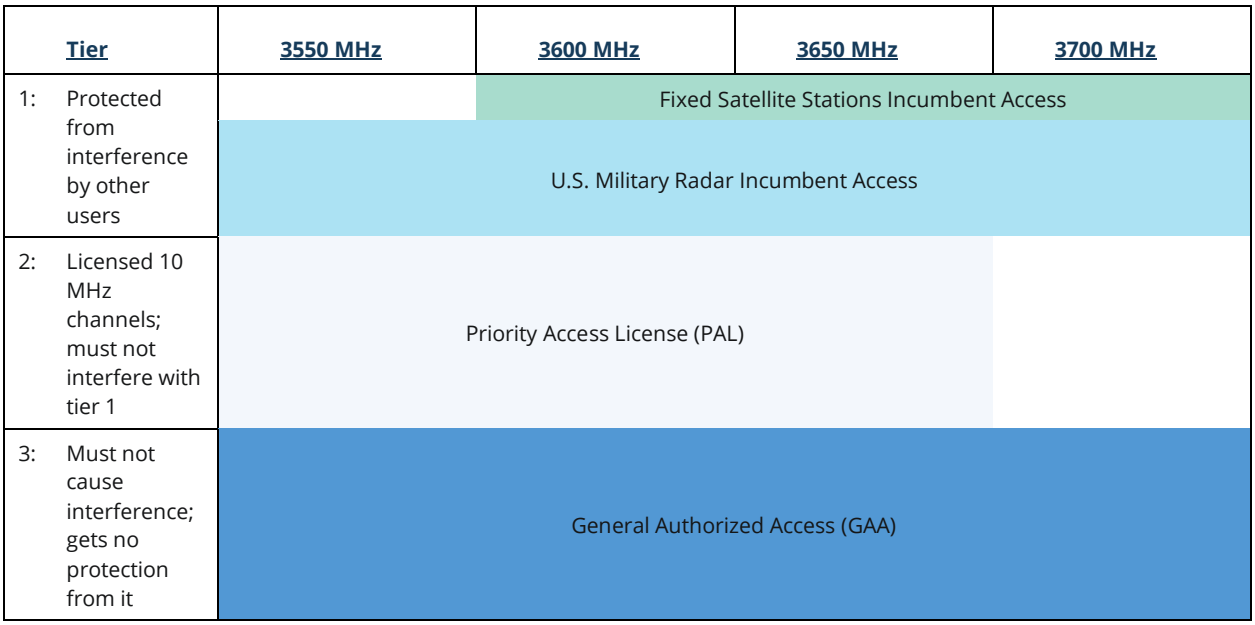
The FCC used a new, shared spectrum approach for CBRS with three tiers of users, diagrammed in the figure below. Current, incumbent, tier 1 spectrum users, which include US military, fixed satellite stations, and, for a limited time, wireless internet services providers (WISPs) are protected from interference by other users. Ten Priority Access Licenses (PAL) for 10 MHz channels between 3550 and 3650 MHz in a specific county were auctioned off by the FCC in July 2020. These licensees are protected from interference by other users. A licensee may aggregate up to 4 PALs. Any portion of the spectrum may be used without a license for General Authorized Access (GAA), but this may not interfere with incumbent or PAL users.

CBRS uses will be managed by a Spectrum Access System (SAS) with which all Citizen Broadband Service Device (CBSD) base stations must be registered. There are two classes of CBSD. Class A base stations, which can transmit at 1 watt of power, are meant for smaller-scale indoor, enterprise, or campus use. Class B base stations can transmit at 50 watts, giving them much greater range. Strategically placed radio signal sensors will ensure that uses do not interfere with each other, particularly military radar.

Another important characteristic of CBRS is the LTE protocol commonly used with the spectrum. LTE is also used for 4G cellular data service, so it is widely implemented in user equipment. CBRS involves different spectrum, but some smartphones have

antennas that operate in the CBRS bands. It is relatively easy and economical to add CBRS/LTE to devices without changing their operating characteristics or systems. Therefore, there are few barriers to end user adoption.

Figure 74 - CBRS User Tiers



The combination of CBRS/LTE base stations and user equipment is referred to as a radio access network (RAN), which includes a network core that authenticates and authorizes user equipment and manages connections to multiple base stations. This allows for mobile roaming from base station to base station without loss of connectivity and makes RANs very secure. The downside of a CBRS/LTE RAN is that some entity must operate the network core and the Spectrum Access System (SAS). These are relatively inexpensive services that can be purchased from vendors or can be installed and maintained on private servers.

STARLINK AND OTHER LOW-EARTH ORBIT SATELITE ACCESS NETWORKS

Starlink (https://www.starlink.com/) is an initiative of Space X to use thousands of low-earth orbit satellites (LEOS) as infrastructure for wireless internet access. It follows a couple of similar efforts that failed and is competing against several newer efforts, including OneWeb (https://www.oneweb.world/), an Amazon, Inc., effort and another by China's state space agency. Like any other wireless connection, each and every one of these satellites must have a radio transceiver, with a power source, and

spectrum. They must also be placed into orbit and have means to aggregate traffic to IXPs. All of this creates huge barriers to coverage and performance, only some of which can be overcome with financial resources.

As of August 2020, Starlink has placed approximately 700 low-orbit. Each Starlink rocket launch places 60 of these very small satellites in orbit. Starlink estimates they will need a minimum of 12,000 units activated to provide any significant kind broadband coverage in the US. Starlink estimates it will take at least 48,000 units to provide adequate broadband worldwide. Presently Starlink is experiencing about 3% failure rate among launched units.

Starlink has recently begun a limited beta test in Washington state due to the limited number of satellites available and the best area of coverage. Participants in the alpha test paid $499 for equipment and $99 per month for between 50 and 150 Mbps. Anecdotal evidence suggests users are getting even faster speeds.[47]

Starlink has not released detailed information on the results, and it is unclear of the actual speeds achieved or any technical issues encountered. Given the current rate of the launch schedule and assuming no major difficulties we project that it will take 3 to 5 years for Starlink to have enough satellites in place to provide meaningful services across the U.S. and another 3 years to provide robust world-wide services.

It is still unknown what areas and strategy Starlink will use to market, price and support services. What geographic areas will it serve? What will be its pricing strategy? Will Starlink have data caps? Will it be robust enough for commercial and governmental services? Regardless of any of these issues, Starlink will need ground support services of Fiber/Fixed wireless backhaul and long-haul transport to provide reasonable co-location services to become economically viable. Based on these and other "unknown" variables we believe that it is a risk to rely on Starlink providing meaningful, economical robust services until another 3 to 5 years, at least.

WI-FI

Wi-Fi is a wireless local-area network (LAN) protocol based on the IEEE's 802.11 Ethernet standard. Wi-Fi is quite flexible and inexpensive to deploy but requires substantial expertise to manage effectively and can be difficult monetize.

It is not technically an access technology, although it is sometimes used as such. A Wi-Fi access point simply bridges wirelessly connected devices into a wired network. Each access point can support multiple logical networks—a password-protected

[47] Source: https://www.businessinsider.com/starlink-internet-satellite-public-beta-speed-spacex-mbps-elon-musk-2020-11

"private Wi-Fi" and an open "public Wi-Fi," for example—each of which has a unique service set identifier (SSID). An additional layer of management and security is typically provided via an integrated router.

Wi-Fi uses unlicensed spectrum that has multiple other uses, including cordless phones and garage openers, and can be subject to interference. This issue can usually be circumvented by adding access points and careful configuration. Like other wireless technologies, multiple Wi-Fi access points can be integrated into a network via PtP wireless links, which is part of the protocol, as well as being physically wired together. Indeed, multiple access points in various locations can be integrated into a logical network, all using a single SSID, via a centralized server.

The latest version, Wi-Fi 6, is faster, more efficient, and more flexible than ever before.[48] Wider channels allow for faster data rates. More sophisticated encoding—translating digital data into radio signals—reduces interference and improves propagation. Wi-Fi 6 handles more devices at lower power, making it more suitable for use in sensors and other remotely located, small-scale devices.

[48] For additional information, see https://www.wi-fi.org/discover-wi-fi/wi-fi-certified-6.

APPENDIX 4 - FCC FORM 477 BROADBAND MAPPING DATA: DEFINITION OF SERVED VS. UNSERVED

The FCC currently defines an area as being "served" with sufficient broadband access if one or more locations receive at or above 25 Mbps down and 3 Mbps up.

Areas defined as underserved are those receiving speeds below 25 Mbps down and 3 Mbps up and above 10Mbps down and 1 Mbps up.

Areas defined as wholly unserved are those receiving speeds at or below 10Mpbs down and 1 Mbps up.

Unserved	Less than 10 Mbps down/1 Mbps up
Underserved	At least 10 Mbps down/1 Mbps up and less than 25 Mbps down/3 Mbps Up
Served	At or above 25 Mbps down/3 Mbps up

The FCC form 477 coverage data serves as the basis for all its federal support programs with the Universal Service Fund (USF)[49] which include the Affordable Connectivity Program (ACP), the RDOF subsidy program, the Rural Health Care Program and the Schools and Libraries program (E-rate).

The coverage definitions above are not universally used by other federal departments and agencies who administer broadband funds such as the NTIA, the U.S. Treasury and the USDA's Rural Utilities Service (RUS). However, the FCC's coverage definitions typically set the watermark for the broadband industry since the bulk of their subsidy funding is derived from the FCC programs listed above.

[49] Universal Service - Universal Service Administrative Company (usac.org)

APPENDIX 5 – SURVEYS: PAPER AND ONLINE

Paper Survey

CCIU Broadband Survey

We are trying to determine where affordable, reliable, accessible high-speed broadband internet is available to our residents and especially our students attending K-12 schools in the districts. The COVID-19 pandemic shed a strong spotlight on the digital divide in Chester County and there are many residents who continue to face difficulty to access the internet for school, work, health care, and finances, completing regular homework assignments online, let alone engage in virtual learning. Your feedback is important to this study to help assess where students are in most need!

Please take a moment to complete this survey from a computer at home as there is a speed test embedded within the survey. If you'd like to take a survey from your device connected to Wi-Fi/Internet service, please visit the CCIU Broadband Survey.

From your smartphone
(please be certain you're connected to Wi-Fi at home or business)

From a computer at home
http://s.alchemer.com/s3/CCIU-Broadband-Survey

******Please use this paper-based survey if you do not have internet access at home or a smartphone device.***

1) How many students are attending K-12 school in your household? And what school do they attend?

   # of students _____ School District(s)_____

2) Address for the location where you reside and where the survey is being taken. *We need to know your address to identify where broadband is and is not available.*

   Street Address _____

   Apartment or Suite _____

   City _____ State _____ Zip Code _____

3) What is the primary language spoken in the home? _____

4) Are there any language barriers for any members of the household that would create issues for using the internet or computer devices? Circle one - YES NO

5) Does the family own a desktop or laptop computer, tablet, or smartphone?

Page 1 of 2

Circle one – YES NO
If yes, how many? _____ How many are provided by the schools? _____
If no, and if because of the ability to use the computer, would the family member(s) be interested in attending a digital literacy class if offered by the public school system or library? Circle one - YES NO

6) Do you use your cellphone as a hotspot to provide Wi-Fi to other devices?
Circle one - YES NO

7) What activities do household members typically use the connected device for and how often?

8) If you do not have internet at the location from which you are completing this survey, why does this location not have broadband internet? *Choose all that apply*
   - ○ Access available elsewhere (work, school, library, public/free Wi-Fi, etc.)
   - ○ Available services are too expensive
   - ○ Available services are too slow or unreliable
   - ○ Broadband is not available at this location
   - ○ Do not need internet services
   - ○ Smartphone meets internet needs
   - ○ Other - _____

9) What would better internet or broadband mean to you, your family, your organization and the area? Is there anything you would like to know about broadband in the area?

_____

_____

Return to Chester County Intermediate Unit (CCIU) at fold here, seal, stamp, and mail

From: _____

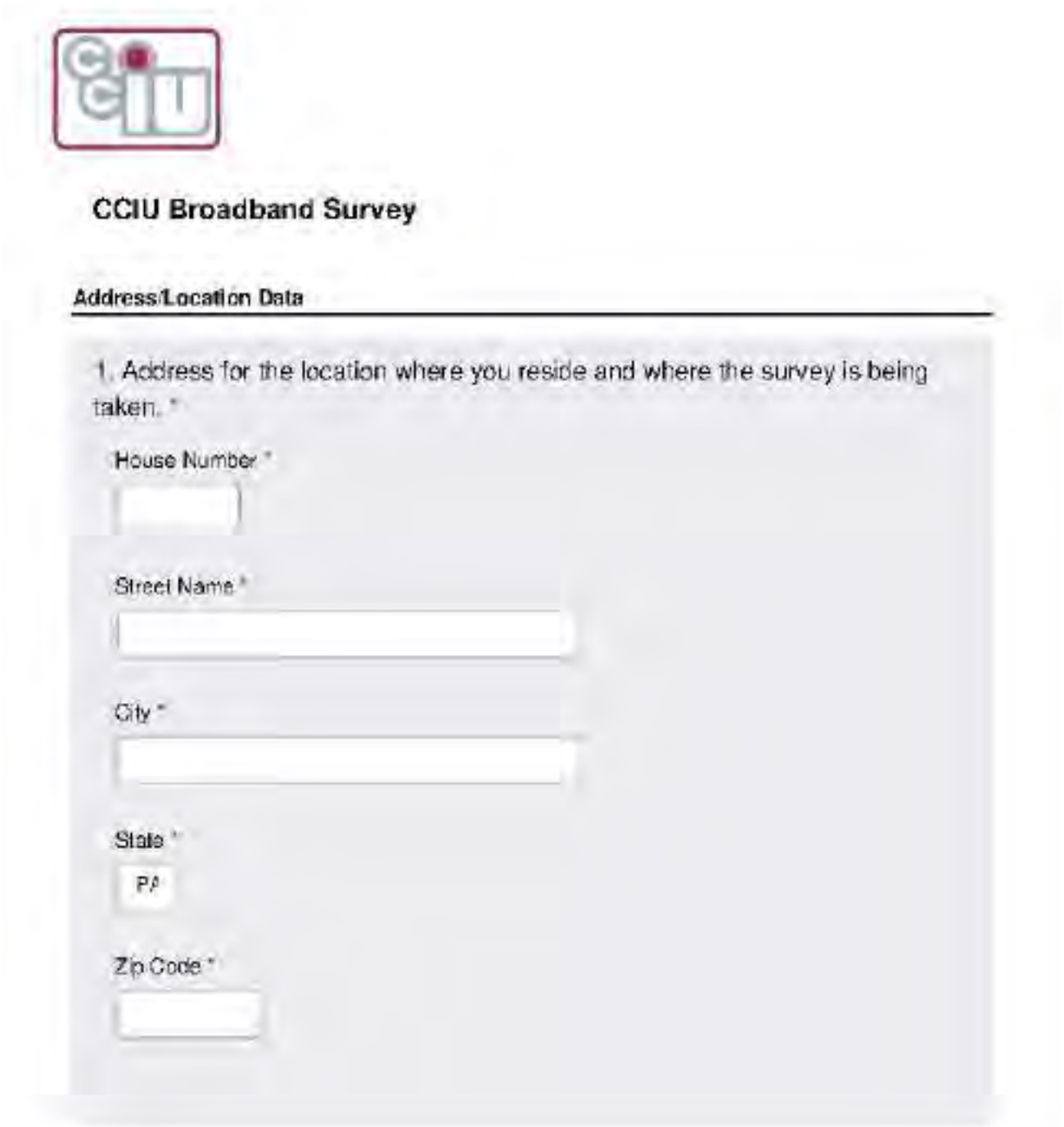
_____

_____

Place Stamp Here

Chester County Intermediate Unit (CCIU)
455 Boot Road Downingtown, PA 19335

Online Broadband Survey



CCIU Broadband Survey

Address/Location Data

1. Address for the location where you reside and where the survey is being taken. *

House Number *

Street Name *

City *

State *

PA

Zip Code *

2. What is the age of the oldest and youngest person in the household?

Oldest

Youngest

3. How many students are attending K-12 school in your household?

Number of Students

4. What type of device are you taking this survey on?

Desktop
Laptop
Tablet
Smartphone

5. What school district do they attend? Please choose from the list, choose all that apply.

- ☐ Avon Grove
- ☐ Coatesville Area
- ☐ Downingtown Area
- ☐ Great Valley
- ☐ Kennett Consolidated
- ☐ Octorara Area
- ☐ Owen J Roberts
- ☐ Oxford Area
- ☐ Phoenixville Area
- ☐ Tredyffrin/Easttown
- ☐ Unionville-Chadds Ford
- ☐ West Chester Area
- ☐ Charter School
- ☐ Non-public/Private School
- ☐ Other

6. Does anyone in your household attend a higher education institution (college, university, community college) ?

- ○ Yes
- ○ No

7. Does the family own a connected device (desktop or laptop computer, tablet, or smartphone)? *

- ○ Yes
- ○ No

8. How many connected devices (desktop or laptop computer, tablet, or smartphone) does the household own?

# of devices

9. How many communications and other electronic devices do you currently have in the home (computer, tablet, cell phone, etc.)? Estimates are fine.

Computers	eReaders	Smart speakers
Laptops	Media Players	Smart TVs
Tablet	AppleTV/Streaming Device	Other
Smartphones	Gaming consoles	

10. Why doesn't your family own a desktop or laptop computer, tablet, or smartphone?

- ☐ Do not need or want one
- ☐ I don't know how to use the technology
- ☐ Access to a device at school, work or elsewhere
- ☐ Technology is too expensive
- ☐ Broadband is not available to this location to support the technology
- ☐ Available services to support the technology is slow or unreliable

11. If the reason you don't own a computer, laptop, tablet or smartphone because of having the ability to use the computer, would the family member(s) be interested in attending a digital literacy class if offered by the public school system or library?

- ○ Yes
- ○ No
- ○ Unsure

12. How many devices in your household are provided by the school district?

13. Do you use your cellphone as a hotspot to provide Wi-Fi to other devices?

- ○ Yes
- ○ No
- ○ Unsure

14. What is the primary language spoken within the home?

- ☐ English
- ☐ Spanish
- ☐ Mandarin
- ☐ Hindi
- ☐ Other - Write In

15. Are there any language barriers for any members of the household that would create issues for using the internet or computer devices?

- ○ Yes
- ○ No
- ○ Unsure

16. What activities do household members typically use the connected device for and how often?

	Daily	A few times a week	A few times a month	A few times a year	Never
Do schoolwork or training	☐	☐	☐	☐	☐
Operate a home-based business	☐	☐	☐	☐	☐
Consult a doctor or other healthcare professional	☐	☐	☐	☐	☐
Telecommute or work from home	☐	☐	☐	☐	☐
E-Commerce/Buy or Sell Products	☐	☐	☐	☐	☐
Gaming	☐	☐	☐	☐	☐
General research and information	☐	☐	☐	☐	☐
Special interests, hobbies, causes	☐	☐	☐	☐	☐
Entertainment, music, movies	☐	☐	☐	☐	☐
Interpersonal communications: email, social media, etc.	☐	☐	☐	☐	☐

17. Do you have high-speed, broadband internet to your home? *

- ○ Yes, this location has internet.
- ○ This location only has internet via dial-up, satellite or cell phone
- ○ No, this location does not have internet access

Internet Access

18. Who is you internet provider(s)? *

- ☐ Xfinity / Comcast
- ☐ Verizon
- ☐ Verizon / Fios
- ☐ Armstrong
- ☐ Frontier / Frontier Communications
- ☐ T-Mobile Home Internet
- ☐ Windstream
- ☐ Earthlink
- ☐ Upward Broadband
- ☐ Service Electric Cablevision
- ☐ Ultra-home Internet
- ☐ Viasat
- ☐ HughesNet
- ☐ Other - Write In

19. How much do you pay for your internet service each month?

20. What is your contracted internet speed?

21. How often is your broadband out or slow?

Select the option that best describes how often the location experiences each of the following problems.

	Never	Once a year or less	Every few months	Every few weeks	Every few days	Daily, every day
The service slows down.	○	○	○	○	○	○
The service is out briefly.	○	○	○	○	○	○
The service is out for less than an hour.	○	○	○	○	○	○
The service is out for an hour or two.	○	○	○	○	○	○
The service is out for several hours.	○	○	○	○	○	○
The service is out for a day or more.	○	○	○	○	○	○

Speed Test

22. What is the actual speed of your internet service? Click the "Start Test" button below to find out! Wait for the tests to finish. Results will be automatically entered in the survey.

Oops! Something went wrong and the NDT test didn't load!

Please Try Again

If this continues to happen, please contact support@measurementlab.net

The NDT (Network Diagnostic Tool) is a bandwidth test that will test your upload and download connection speeds as well as provide additional diagnostics about your network.

To run the test, you'll be connected to Measurement Lab (M-Lab) and your IP address will be shared with them and processed by them in accordance with their privacy policy. M-Lab conducts the test and publicly publishes all test results to promote internet research. Published information includes your IP address and test results but doesn't include any other information about you as an internet user.

Start Test

Download: 0 Mbs
Upload: 0 Mbs
Latency: 0 ms

Download	
Upload	
Latency	

No Broadband Internet

23. Why does the location for which you are completing this survey not have broadband?

Select all that apply

- ☐ Do not need or want internet services
- ☐ Access internet elsewhere (work, school, library, public/free Wi-Fi, etc.)
- ☐ Available services are too expensive
- ☐ Available services are too slow or unreliable
- ☐ Broadband is not available to this location
- ☐ Smartphone meets internet access needs

24. Do students in your household complete schoolwork on a mobile phone because internet is not available?

- ○ Yes
- ○ No
- ○ Unsure

25. If you had affordable, high-speed internet, what would you use it for?

Select all that apply

- ☐ Schoolwork
- ☐ Telework
- ☐ Telehealth
- ☐ Gaming
- ☐ Video streaming
- ☐ Security cameras
- ☐ Online research
- ☐ Other - Write In

Final Thoughts

26. What would high-speed, affordable broadband internet do for your household?

Online Cellular Survey

CCIU Cellular Internet Survey

Address/Location Data

1. Address for the location where you reside and where the survey is being taken. *

House Number *

Street Name *

City *

State *

Zip Code *

2. What is the age of the oldest and youngest person in the household?

Oldest

Youngest

3. How many students are attending K-12 school in your household?

Number of Students

4. What type of cellular phone are you taking this survey on?*

iPhone
Android
Other

5. What school district do they attend? Please choose from the list, choose all that apply.

- Avon Grove
- Coatesville Area
- Downingtown Area
- Great Valley
- Kennett Consolidated
- Octorara Area
- Owen J Roberts
- Oxford Area
- Phoenixville Area
- Tredyffrin/Easttown
- Unionville-Chadds Ford
- West Chester Area
- Charter School
- Non-public/Private School
- Other

6. Does anyone in your household attend a higher education institution (college, university, community college) ?

- ○ Yes
- ○ No

7. Does the family own a connected device (desktop or laptop computer, tablet, or smartphone)? *

- ○ Yes
- ○ No

8. How many connected devices (desktop or laptop computer, tablet, or smartphone) does the household own?

on computers

9. Why doesn't your family own a desktop or laptop computer, tablet, or smartphone?

- ☐ Do not need or want one
- ☐ I don't know how to use the technology
- ☐ Access to a device at school, work or elsewhere
- ☐ Technology is too expensive
- ☐ Broadband is not available to this location to support the technology
- ☐ Available services to support the technology is slow or unreliable

10. If the reason you don't own a computer, laptop, tablet or smartphone because of having the ability to use the computer, would the family member(s) be interested in attending a digital literacy class if offered by the public school system or library?

- ○ Yes
- ○ No
- ○ Unsure

11. How many communications and other electronic devices do you currently have in the home (computer, tablet, cell phone, etc.? Estimates are fine.

Computers		TiVo/Ruku	
Laptops		Gaming consoles	
Smartphones		Smart speakers	
eReaders		Smart TVs	
Media Players		Other	

12. How many devices in your household are provided by the school district?

13. Do you use your cellphone as a hotspot to provide Wi-Fi to other devices?

- ○ Yes
- ○ No
- ○ Unsure

14. What is the primary language spoken within the home?

- ☐ English
- ☐ Spanish
- ☐ Mandarin
- ☐ Hindi
- ☐ Other - Write In

15. Are there any language barriers for any members of the household that would create issues for using the internet or computer devices?

- ○ Yes
- ○ No
- ○ Unsure

16. What activities do household members typically use the connected device for and how often?

	Daily	A few times a week	A few times a month	A few times a year	Never
Do schoolwork or training	☐	☐	☐	☐	☐
Operate a home-based business	☐	☐	☐	☐	☐
Consult a doctor or other healthcare professional	☐	☐	☐	☐	☐
Telecommute or work from home	☐	☐	☐	☐	☐
E-Commerce/Buy or Sell Products	☐	☐	☐	☐	☐
Gaming	☐	☐	☐	☐	☐
General research and information	☐	☐	☐	☐	☐
Special interests, hobbies, causes	☐	☐	☐	☐	☐
Entertainment, music, movies	☐	☐	☐	☐	☐
Interpersonal communications: email, social media, etc.	☐	☐	☐	☐	☐

17. Do you have high-speed, broadband internet to your home?*

- ☐ Yes, this location has internet.
- ☐ No, this location does not have internet access or only through cellular service.

Cellular Internet Access

18. Who is your cellular provider(s)? *

- [ ] AT&T
- [ ] Cricket
- [ ] T-Mobile
- [ ] Verizon
- [ ] Other - Write In

19. How much do you pay for your cellular service each month?

20. Do you have data caps on your cellular plan? If so, what is the data cap and what is the charge?

- ( ) Yes
- ( ) No

21. What is the data cap and what are the costs for exceeding the data cap?

Data cap

Cost

22. How often is your cellular service spotty or do you have dropped calls?

Select the option that best describes how often the location experiences each of the following problems.

	Never	Once a year or less	Every few months	Every few weeks	Every few days	Daily, every day
The service slows down.	○	○	○	○	○	○
The service is out briefly.	○	○	○	○	○	○
The service is out for less than an hour.	○	○	○	○	○	○
The service is out for an hour or two.	○	○	○	○	○	○
The service is out for several hours.	○	○	○	○	○	○
The service is out for a day or more.	○	○	○	○	○	○

Speed Test

23. What is the actual speed of your internet service? Click the "Start Test" button below to find out! Wait for the tests to finish. Results will be automatically entered in the survey.

Oops! Something went wrong and the NDT test didn't load!

Please Try Again

If this continues to happen, please contact support@measurementlab.net

The NDT (Network Diagnostic Tool) is a bandwidth test that will test your upload and download connection speeds as well as provide additional diagnostics about your network.

To run the test, you'll be connected to Measurement Lab (M-Lab) and your IP address will be shared with them and processed by them in accordance with their privacy policy. M-Lab conducts the test and publicly publishes all test results to promote internet research. Published information includes your IP address and test results but doesn't include any other information about you as an internet user.

Start Test

Download: 0 Mbs
Upload: 0 Mbs
Latency: 0 ms

Download
Upload
Latency

No Broadband Internet

24. Why does the location for which you are completing this survey not have broadband? *

Select all that apply.

- [ ] Do not need or want internet services
- [ ] Access internet elsewhere (work, school, library, public/free Wi-Fi, etc.)
- [ ] Available services are too expensive
- [ ] Available services are too slow or unreliable
- [ ] Broadband is not available to this location
- [ ] Smartphone meets internet access needs

25. Do students in your household complete schoolwork on a mobile phone because internet is not available?

- ( ) Yes
- ( ) No
- ( ) Unsure

26. If you had affordable, high-speed internet, what would you use it for?
Select all that apply

- [ ] Schoolwork
- [ ] Telework
- [ ] Telehealth
- [ ] Gaming
- [ ] Video streaming
- [ ] Security cameras
- [ ] Online research
- [ ] Other - Write In

Final Thoughts

27. What would high-speed, affordable broadband internet do for your household?

Reference List

1. ACP-Households-and-Claims-by-County-January-May-2022.xlsx (live.com)
2. American Rescue Plan Act (ARPA) | Chester County, PA - Official Website (chesco.org)
3. 22.0% Poverty Rate in Oxford borough, Pennsylvania (welfareinfo.org)
4. 6.9% Poverty Rate in Chester County, Pennsylvania (welfareinfo.org)
5. Demographic Data (chescoplanning.org)
6. DP03: SELECTED ECONOMIC... - Census Bureau Table
7. Solutions - FiberLocator
8. https://www.fiberlocator.com/
9. Companies Near Me - ACP - Universal Service Administrative Company (affordableconnectivity.gov)
10. https://www.broadbandsearch.net/.
11. FCC Map for Chester County - https://go.usa.gov/xud6v
12. How Fixed Broadband Service Providers Can Access the Location Fabric – BDC Help Center (fcc.gov)
13. FCC website: https://go.usa.gov/xud6v
14. FCC website: https://go.usa.gov/xudFY
15. FCC website: https://go.usa.gov/xudFZ
16. Speedtest by Ookla - The Global Broadband Speed Test
17. Broadbandsearch.net- a data resource that aggregates data from the FCC, NTIA and the Bureau of Labor and Statistics, and performs data confirmation with each of the providers https://www.broadbandsearch.net/
18. https://www.xfinity.com/learn/internet-service
19. https://business.comcast.com/shop/offers
20. www.broadbandnow.com
21. https://www.verizon.com/5g/homehttps://www.verizon.com/business/products/networks/connectivity/5g-business-internet

22. https://broadbandnow.com/Viasat-Internet-deals
23. https://buy.viasat.com/en-US/r/pln
24. https://internet.hughesnet.com/order-online
25. https://www.t-mobile.com/isp/eligibility
26. https://armstrongonewire.com/Internet/ServiceLevels
27. https://internet.frontier.com
28. https://www.chesco.net/service-package
29. Low and moderate income, as defined by the Census Bureau are communities that have a household median income that are either: (a) less than 50% of their specific area's median income (low income), or (b) household median incomes that are at least 50% and 80% of the area's median income (moderate income).
30. Universal Service - Universal Service Administrative Company (usac.org)
31. Auction 904: Rural Digital Opportunity Fund | Federal Communications Commission (fcc.gov)
32. https://www.cdfifund.gov/documents/geographic-studys
33. https://www.cdfifund.gov/
34. **Pedestal** - a general-purpose, outdoor enclosure. It is the main node for voice, data and video distribution, in a passive optical network (PON). The pedestal is the network interface - at the neighborhood. Options, for its internal components, were designed, according to the global standards bodies.
35. **Vault -** A fiber optic splice vault essentially serves as a demarcation point for incoming trunk cable in a central office, data center, or other large-scale application.
36. **Hand holes** - underground vaults that provide access to fiber optic cable and other utilities for splicing & repairs. They are often called pull boxes, splice boxes, underground enclosures, or vaults.
37. Network Planner (google.com)
38. Digital Equity Programs | BroadbandUSA (doc.gov)
39. Alleghenies Broadband | Mission | Bringing High Speed Broadband to Rural Southern Alleghenies
40. American Rescue Plan Act of 2021 (opm.gov)

41. Broadband Equity, Access, and Deployment (BEAD) Program | BroadbandUSA (ntia.gov)
42. Pennsylvania Broadband Development Authority - PA Department of Community & Economic Development
43. Broadband Equity, Access, and Deployment (BEAD) Program | BroadbandUSA (doc.gov)
44. SLFRF-Final-Rule-FAQ.pdf (treasury.gov)
45. Companies Near Me - Universal Service Administrative Company (lifelinesupport.org)
46. ACP-Households-and-Claims-by-County-January-May-2022.xlsx (live.com)
47. Programa de Descuentos Para Internet (ACP) | Federal Communications Commission (fcc.gov)
48. Application and Eligibility Resources - Universal Service Administrative Company (usac.org)

Demographic and other information that might be useful for Lydia M in creating and submitting grant applications

A. From the Broadband Feasibility Study done for southern Chester County, executed in early to mid 2022, and released in late 2022

a. On page 9 of the final report – paragraph heading "Why Affordable and Reliable Broadband Matters to Families and Businesses in Southern Chester County":

Like electricity in the 1930s, broadband is an essential utility and vital to the economic growth and survival of rural, agriculturally based communities throughout Pennsylvania. Rural households and businesses throughout Southern Chester County continue to struggle with inadequate bandwidth, costly service plans and spotty coverage. Due to the demographics of the region, a significant percentage of low-income residents live in sparsely populated areas. Yet, incumbent broadband providers have not demonstrated a willingness to invest in network upgrades given the low average revenue per user (ARPU) generated by consumers in these areas. Despite the availability of federal broadband subsidies over the last 20 years to offset fiber last-mile deployment costs of incumbent wireline providers in underserved communities, the lack of adequate broadband service remains unchanged in these communities

b. On page 11 of the final report – paragraph heading "Widespread poverty and food insecurity throughout four school districts":

The prevalence of persistent poverty and food insecurity among Hispanic migrant farm workers is well known and directly correlated with low broadband adoption and computer usage in the region. Over 22%[3] of Oxford families live below the federal poverty rate vs. 6.9%[4] for the rest of Chester County. Poverty in Avondale is 43%[5] with over 35.4%[6] without health insurance coverage. These percentages are staggering and underscore the economic hardship experienced by residential consumers in these communities.

According to numerous interviews with community advocates and case workers who work closely with the migrant farm worker community, over 400 families visit local food banks in Oxford, Kennett and West Grove each week. Monthly costs for broadband are simply out of reach for most low-income families.

References in footnotes

3 22.0% Poverty Rate in Oxford borough, Pennsylvania (welfareinfo.org)

4 [1] 6.9% Poverty Rate in Chester County, Pennsylvania (welfareinfo.org)

5 Demographic Data (chescoplanning.org)

6 [1] DP03: SELECTED ECONOMIC... - Census Bureau Table

c. On page 18 of the final report – paragraph heading "Input from Local and County Economic Development Leaders":

• Chester County Economic Development Council (CCEDC) on December 22, 2021 and January 11, 2022

• Chester County Planning Commission on January 11, 2022

• Southern Chester County Chamber of Commerce on January 17, 2022

These officials reiterated a common theme: Southern Chester County is struggling economically and compared it to “the last frontier.” The region simply cannot grow economically without access to affordable broadband.
These officials also indicated that Oxford Area and Avon Grove are the top two school districts that are in dire need of help from the county or state agencies due to their income status, low English proficiency and a lack of stable housing. Most families have no ability to drive to where they can get access because they do not own a car or have sufficient resources to purchase alternative forms of transportation.
Broadband is vital for these communities to survive.

d. On page 71 of the final report – paragraph heading “Location of Low-Income Eligible Areas in the region defined by HUD”:
U.S. Department of Housing and Urban Development (HUD) data was utilized to determine areas that may be eligible for HUD grant programs such as the Community Development Block Grant (CDBG) based upon Low and Moderate Income (LMI) statistics which consider persistent poverty levels for at-risk populations. The map in Figure 50 below indicates that Avondale, part of Kennett Square, New Garden and Lower Oxford all have a Lo/Mod score of 51% or more, which means they are located in areas with “at risk” populations. This metric is a useful benchmark for identifying persistent poverty households in any given census block.

Figure 50 - Low Income Eligible Areas Defined by HUD

[Unable to figure out how to insert chart from page 71 of feasibility study report]

From ChescoPlanning.org: American Census data; population breakdown for Chester County; I can get it for municipalities as well, I think. If that would be helpful.

	Pennsylvania		Chester County	
Label	**Count**	**Percent**	**Count**	**Percent**
SEX AND AGE				
Total population	13,002,700	100.00%	534,413	100.00%
Under 5 years	667,816	5.10%	28,252	5.30%
18 years and over	10,353,548	79.60%	412,886	77.30%
65 years and over	2,483,054	19.10%	92,128	17.20%
Median Age: Both sexes	41	N/A	40.5	N/A
RACE				
Total population	13,002,700	100.00%	534,413	100.00%
White	9,750,687	75.00%	413,103	77.30%
Black or African American	1,423,169	10.90%	29,526	5.50%
Am. Indian and Alaska Native	31,052	0.20%	1,450	0.30%
Asian	510,501	3.90%	35,252	6.60%
Nat. Hawaiian and Other PI	4,276	0.00%	133	0.00%
Some Other Race	508,531	3.90%	18,878	3.50%
Two or More Races	774,484	6.00%	36,071	6.70%
HISPANIC OR LATINO				
Hispanic or Latino (of any race)	1,049,615	8.10%	43,542	8.10%
Not Hispanic or Latino	11,953,085	91.90%	490,871	91.90%

RSVP Volunteers Digital Literacy program

	All Counties	All Counties	Kennett Area Expenses					
			2025 (year one budget) Kennett Area			**2026 (year two budget) Kennett Area**		
Expense forecast Digital literacy Program:	Digital Literacy 2024 Forecast	Digital Literacy 2025 Forecast	Dig Lit Exp for Kennett area (1)	Addition of Digital Navigator for Kennett	**Year 1 cost**	Dig Lit Exp for Kennett area (1)	Addition of Digital Navigator for Kennett	**Year 2 cost**
Empolyee Related Expenses	153,087.97	157,680.61	75,686.69	50,572.00	**126,258.69**	77,957.29	52,089.16	**130,046.45**
Professional Fees - Audit/Accounting services	6,173.42	6,358.62	3,052.14	2,039.36	**5,091.50**	3,143.70	2,100.55	**5,244.25**
Insurance	3,405.80	3,507.97	1,683.83	1,125.09	**2,808.92**	1,734.34	1,158.85	**2,893.19**
Occupancy	6,645.12	6,844.47	3,285.35	2,195.19	**5,480.54**	3,383.91	2,261.04	**5,644.95**
StaffTraining/Dues/Subscriptions	8,942.31	2,942.31	1,412.31	943.67	**2,355.98**	1,454.68	971.98	**2,426.66**
Staff Travel	640.84	1,200.00	576.00	1,500.00	**2,076.00**	593.28	1,545.00	**2,138.28**
Office Expense / Equipment	903.08	930.17	446.48	2,590.00	**3,036.48**	459.88	865.20	**1,325.08**
Technology	17,922.62	17,922.62	8,602.86	9,112.00	**17,714.86**	8,860.94	9,385.36	**18,246.30**
Communications	2,636.36	2,636.36	1,265.45	600.00	**1,865.45**	1,303.42	618.00	**1,921.42**
Printing	1,225.05	1,225.05	588.03	1,000.00	**1,588.03**	605.67	1,030.00	**1,635.67**
Postage	174.19	179.41	86.12	57.54	**143.66**	88.70	59.27	**147.97**
Program supplies & Volunteer FBI checks, excess liab and recognition	5,314.77	5,314.77	2,551.09	850.00	**3,401.09**	2,627.62	875.50	**3,503.12**
Total	207,071.53	206,742.37	99,236.34	72,584.86	**171,821.20**	102,213.43	72,959.90	**175,173.33**

(1) Kennett area expenses are 48% of total digital literacy expenses. Based on # clients in Kennett area.