openbroadband

Broadband Feasibility Study

For

Alexander County, NC

INDEX

Summary of Community Workshop and Opportunities

Open Broadband facilitated a community workshop in order to further validate the findings of the County's Broadband Survey. The workshop included the current members of the Alexander County Broadband Committee in addition to other local leaders. During the workshop, Open Broadband asked each participant to characterize their experience with Internet service. The collective response of this focus group was consistent with the findings of the County's Broadband Survey, which found that consumers are generally dissatisfied with Internet availability and quality. For those without Internet, they lack options to get it; among survey respondents with service, significant improvements are desired: 12 percent have mobile-only access to broadband; a majority (84 percent) is interested in additional broadband service options; and nearly half consider speed of service to be insufficient.

Several issues stood out from the workshop, and should be addressed in the next stage of the broadband planning program:

> \+ There is universal demand for higher speeds across sectors: public, private, residential, commercial
> \+ Local leadership is concerned that any new broadband development regime include some affordable options
> \+ Businesses are especially crippled by a dearth of upload capacity (access to the cloud)

The workshop and pre-meetings with staff helped us gain a better understanding of the County's economic development goals and objectives. Because broadband planning is fundamentally about helping communities remain competitive and grow sustainably, we expand on these key workshop findings with the following analysis and recommendations:

Because broadband drives economic development, and advancing economic growth and prosperity is important to community leaders, Alexander County should follow through on its current broadband program. The Appalachian Regional Commission, echoing the position of the National Broadband plan, stated in a 2016 report that the "networks, devices, and applications that comprise [the broadband] ecosystem drive each other in a virtuous cycle." Communities must be networked, however, to fully participate in the positive upsides of this ecosystem. Stated more plainly, gaining 4 Mbps of broadband increases household income by $2,100 per year, while online job searches result in 25 percent faster reemployment. [1] As the County's broadband program is developed, it can complement an advanced economic development agenda that tracks broadband-related economic indicators like increases in new business starts; decreases in property distress; positive trends in local labor market and economic well-being indicators; upward trends in commercial and residential occupancy rates; and increased local capacity to support entrepreneurship.

Making progress on the County's broadband agenda is critical to the viability of existing business. Alexander County must have 21st Century infrastructure to support the competitiveness of its businesses in the modern, Internet-dependent economy. The County's industrial base -- and its economic impact on the County, in turn -- both face real risk under the status quo. Schneider Mills, for example, reported at the workshop it takes days to upload files to a remote office, while remote technicians cannot diagnosis onsite equipment because of connectivity issues. Once broadband issues are resolved, Alexander County can help their legacy industry further their competitiveness through advanced technology. Among many examples of this is the "maker economy" movement that has had a profound impact on the

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[1] Patterson, et al. (August 2016). "Broadband Planning Primer and Toolkit" Appalachian Regional Commission. Retrieved from: https://www.arc.gov/news/article.asp?ARTICLE_ID=574

technological transformation of legacy industrial manufacturing. Many companies in this space are profiled in a 2015 book from Rework America, a technology policy think tank. (See Chapter 2, "Fresh Chances in a Networked World.") [2]

The County's business expansion and attraction strategies, both for large firms and mom & pops, will become more robust when high-speed broadband availability is a marketable asset. Quality broadband availability can allow the County to target technology-oriented businesses like advanced manufacturers. Likewise, small businesses must have the Internet to reach global markets. Elsewhere in North Carolina, economic development efforts are focused on supporting the transition of manufacturing-based local economies into technology-based ones, while building on the strengths of existing business and expertise. Rutherford and Polk Counties, for example, utilized their broadband program as a springboard to attract a Facebook datacenter and to support a new tourism strategy with an equestrian facility as the centerpiece. [3]

At a more advanced level, the County can spearhead a local effort in support of entrepreneurship and small business by facilitating development an innovation center or incubator space with gigabit internet capability (1000Mbps).
There are many promising statewide models of communities pursuing this strategy at a scale compatible with local assets and capacity; see *Business North Carolina*, September 2016, for examples.[4] Communities have used these spaces to provide public access to high-speed Internet, to advance science and arts education, and to offer training and workforce development, including programs that support "digital inclusion." Still others have focused on a real estate development play and attracted co-workers and startups. The Innovate NC initiative, led by NC State's Institute for Emerging Issues, offers some strong examples of fresh thinking around civic and corporate leadership and new approaches to Main Street entrepreneurship. The City of Wilson may offer a particularly useful case.[5] Promisingly, Stats America's Innovation 2.0 index finds that the innovation capacity in Alexander County is relatively good compared to peer communities. [6]

Broadband matters to "employee availability" – meaning both the talent base for employers and the quality of life for residents. An analysis of Alexander County labor market data revealed that just over 10,200 people commute out of the County each day for work, almost double the number that commute in. Meanwhile, about 46 percent of workers commute less than 10 miles between work and home, but over twenty percent commute more than twenty five miles, and about 11 percent travel more than 50 miles between home and work. [7] Some workers are willing to tolerate lengthy commutes, but the trend, especially among millennials, is to drive less, according to research out of the Department of City and Regional Planning at UNC Chapel Hill.[8] These data suggest that shifting demographic trends may compel Alexander County to focus more on strategies that keep the community attractive to existing residents and help retain millennials. In sum, the County supports an employment center in neighboring counties and the residential population is an important part of the County's tax base. For these reasons, and based on what was stated as immediate concerns of residents, robust residential broadband options are very important to the County's long-term economic viability. For

[2] Rework America. (2015). The John and Mary R. Markle Foundation. *America's Moment: Creating Opportunity in the Connected Age*.
[3] Ibid.
[4] See articles: "You say you want a revolution" (http://businessnc.com/say-want-revolution/) and "Creative Sparks" (http://businessnc.com/creative-sparks/)
[5] Sanseverino, Nan. (June 13, 2017). "First in Future: City of Wilson Chief Planning and Development Officer Rodger Lentz, with IEI Policy Manager Sarah Langer Hall" Retrieved from: https://iei.ncsu.edu/podcasts/firstinfuture19/
[6] US Economic Development Administration. Stats America. Retrieved from: http://www.statsamerica.org/ii2/overview.aspx
[7] Bureau of Economic Analysis. On the Map. Data retrieved December 6, 2017. https://onthemap.ces.census.gov/
[8] Jaffe, Eric. (July 13, 2015). The Clearest Explanation Yet for Why Millennials Are Driving Less. *The Atlantic.* Retrieved from: https://www.citylab.com/transportation/2015/07/the-clearest-explanation-yet-for-why-millennials-are-driving-less/398366/

example, during the workshop, we heard that a work-from-home consultant struggled for months to get adequate Internet service, while a real estate agent lamented over his inability to sell homes with sub-standard Internet service to prospective buyers. Another participant noted that Alexander County's natural beauty and low cost of living have recently attracted retirees, but a combination of a limited housing stock and broadband-related infrastructure issues have frustrated efforts to fully develop this as a strategy for growth.

Economic competitiveness, educational opportunity and talent attraction and retention go hand in hand. Alexander County's talent attraction, talent development, workforce development, youth development, K-12 education, higher education, and continuing education all demand robust technology resources, both for individuals and institutions. Workshop participants representing the school system and higher education reported that educators are routinely limiting what is asked of students for homework assignments, due to lack of Internet access at home. As Alexander County's broadband program develops, educators and local training resources will play a vital role in helping people integrate the Internet into their work and life. The County's role will be to help market and promote these digital inclusion efforts, which will in turn help the network provider's balance sheet.

While Alexander County is well on its way, this conversation is just the beginning of an important journey toward economic renewal, economic mobility and a more prosperous future. There are reasons to feel encouraged. The level of community engagement Alexander County has been able to achieve is promising, and should continue to be nurtured as the process moves ahead. The recommendations above are meant to help give context to the County's broadband plan – and to help fully realize its potential.

Local Broadband Market Assessment

Open Broadband engaged stakeholders and inventoried fiber, telecom enclosures, mountains, ridgelines and vertical assets across the County. The data were compiled in order to help identify ways to increase broadband deployment and utilization in Alexander County. The remainder of this report fully details and summarizes our findings; the final section offers our recommendations.

Our engagement focused on four key questions: (1) where broadband is offered in the County; (2) customer satisfaction with current service options; (3) infrastructure available to enable more broadband throughout the County; and (4) options for bringing broadband to the underserved and unserved.

Findings:

+ Broadband coverage is relatively complete in Taylorsville, including a several-mile area surrounding the City, along U.S. Route 64 east of Taylorsville through Hiddenite and Stony Point, and in the southwest quadrant of Bethlehem. Spectrum's cable system provides the majority of this coverage. There are pockets lacking coverage in these areas, and some businesses note issues with getting consistent speeds through Spectrum.

+ There are many fiber routes spanning the County border-to-border. Fiber stretches along Route 64 west and along NC Highway 90 east of Taylorsville. Providers here include AT&T, Spectrum, and Spirit Communications, which resells to MCNC and Google. NC Highway 16 from the northern border to the southern border of the County is covered by Spectrum and AT&T fiber with only a few small gaps. Century Link crosses the County, with

fiber running up NC 127 from Catawba County to Route 64, and along All Healing Springs Road through Mt Olive Church Road and NC 16 into Wilkes County.

+ Both AT&T and Spectrum have significant middle-mile fiber networks running a few miles out of town in most directions. This middle-mile fiber reaches further into less populated areas than expected. However, the corners of the County are not reached by fiber.

+ While Spectrum offers adequate broadband, the copper providers, AT&T and CenturyLink, offer little broadband. AT&T's website shows very little broadband availability even next to their fiber-fed cabinets. This is consistent with County residents' reports of requesting DSL, but AT&T not making DSL ports available for sign-ups. AT&T advertises uVerse on their website, but it appears to be available in only a very few pockets of the County. CenturyLink shows no DSL availability, even next to their brick switching centers.

+ Two mountains provide significant viewsheds into the north-northeastern and southwestern portions of the County. There are also several ridgelines, cellular towers and water tanks that could be leveraged to bring wireless Internet to the Industrial Park and the northeastern and southwestern portions of the County.

+ Affordability is a pivotal issue for many residents, as noted in the Broadband Survey and Open Broadband's November workshop. Fortunately, each provider has a reduced cost program for qualifying households.

+ With a significant number of fiber routes, three existing providers, as well as key vertical infrastructure, offer opportunity to extend excellent broadband into some portions of the unserved and underserved areas.

Service Providers

The three main high-speed Internet service providers in Alexander County are AT&T, CenturyLink and Spectrum (formerly Charter Cable). Of these, only Spectrum can consistently meet the FCC's definition[9] of broadband at 25Mbps to the customer and 3Mbps from the customer, with AT&T doing so in very limited areas.

AT&T serves all of Alexander County, except for the southwestern corner which is served by CenturyLink. In the majority of the County, AT&T's only offering is DSL, which cannot meet the broadband definition. Traditional DSL services can only realize 6Mbps to customers within 1.5 miles of the serving cabinet. DSL speeds rapidly degrade from this distance outward. AT&T offers uVerse only in town and a very few nearby areas. AT&T's website says uVerse provides 18 to 50Mbps to the customer. The uVerse service areas appear to overlap Spectrum's service territory.

Spectrum is the bright spot for broadband in the County. Using cable modem technology, Spectrum provides 60 to 100Mbps downstream to the customer wherever they offer service.

CenturyLink does not meet the broadband standard in any area of the County. CenturyLink advertises 10Mbps downstream and 1Mbps upstream from the customer. Their website shows DSL availability at a number of sample addresses. However, without scheduling an installation it would be impossible to know if DSL ports are, in fact, available to sign up new customers.

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[9] FCC defined broadband as 25Mbps/3Mbps in the 2015 Broadband Progress Report https://www.fcc.gov/reports-research/reports/broadband-progress-reports/2015-broadband-progress-report .

HughesNet, a satellite service, is used by 5.7percent of the residents who reported having broadband. The upside to HughesNet's service is that is available where no other service is available. However, the fastest speed available is 15Mbps to the customer which is below the FCC standard. Also, it is reported this speed costs $400 per month. At the Open Broadband workshop in November, stakeholders reported HughesNet was consistently slow and unreliable. Because of the cost, the unreliable nature of the service, and the fact they are not facilities-based, this report does not consider HughesNet a viable service provider.
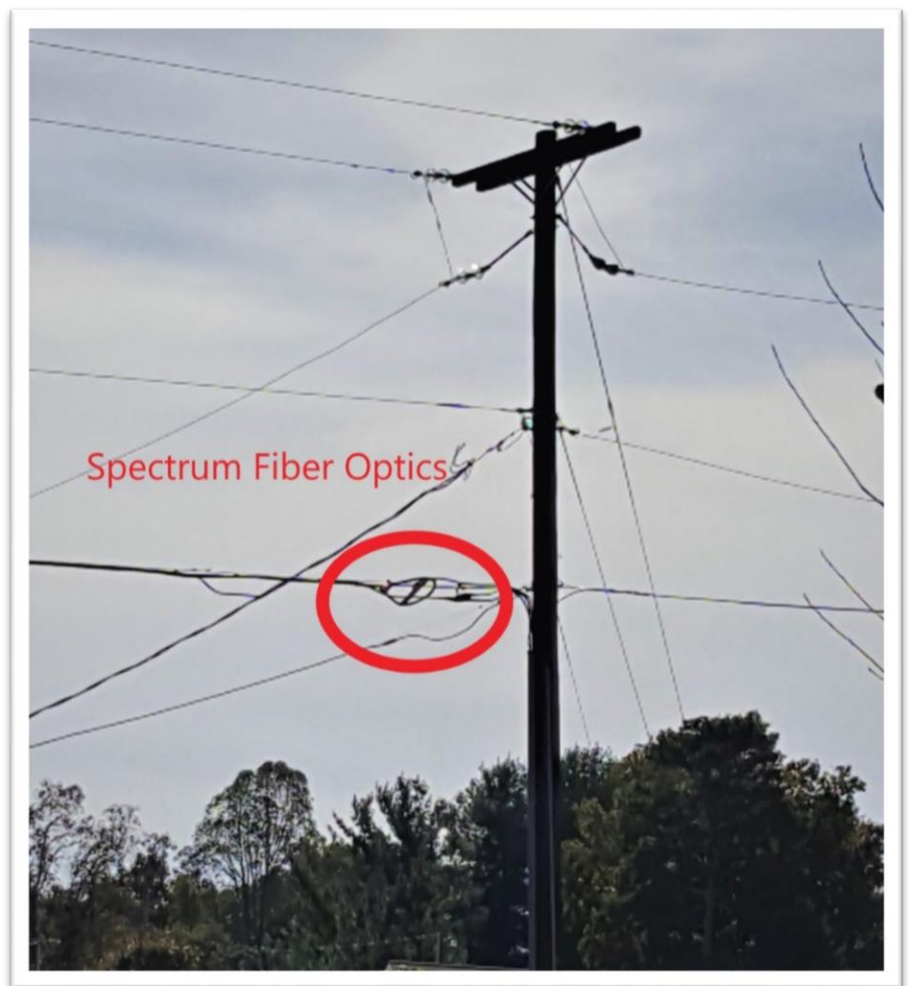
Availability

Availability of any high-speed Internet option is the main problem for residents of Alexander County. Although 84.7 percent of survey respondents report subscribing to high-speed Internet, the majority of the geography in the County is not served with what can be defined as "high-speed," using the current FCC definition of broadband.

Served areas are defined as areas with high-speed Internet meeting the FCC criteria of 25/3Mbps. These areas follow the Spectrum service territory: almost all of the Town of Taylorsville, a few miles in each direction out of town, and a narrow corridor surrounding these routes: NC Highway 16 north and south of town, east along Highway 90 through Hiddenite and Stony Point, Rink Dam Road connecting NC 127 and NC 16 near the shore of Lake Hickory, and a large portion of the Bethlehem community on either side of NC 127. Spectrum does have some holes in each area, and their network does not extend beyond what would be considered neighborhood densities.

Spectrum's fiber/coax infrastructure

Underserved areas can be defined as areas where broadband speeds do not exist, but Internet speeds above dial-up are available. For Alexander County, "underserved" will match DSL-only areas offered by the copper providers, AT&T and CenturyLink. These areas include almost the whole northwest quadrant of the County bounded by NC 16 to the east and US 64 to the south, a vast portion of the northeast quadrant of the County bounded by NC 16 and US 64, and the south-southeast portion of the County surrounding Paul Payne Store Road. There are also pockets in the southwestern quadrant of Bethlehem as well as a few within the town of Taylorsville that are

unserved, such as the neighborhoods of Fairway Oaks and Cornerstone. The underserved areas should nearly match the areas where Spectrum is absent. There may be a few streets where AT&T offers uVerse and Spectrum is not present, but this is likely the exception. Our sampling has found uVerse to overlap with Spectrum's cable modem service.

A CenturyLink DSL pedestal cluster

Unserved areas can be defined as not having broadband nor any high-speed Internet service at all. Most areas of the County should be within reach of DSL although the corners in the northwest, northeast and south-southeast corners could be too far out for DSL. AT&T lacks DSL ports to turn up new customers and is not investing in adding more ports. The DSL port issue was reported by residents at the November workshop and is confirmed by AT&T's website not returning any DSL service offerings even next to their fiber-fed DSL cabinets.[10] With very little availability of DSL, we conclude the County's underserved areas are effectively unserved for residents requesting new service from AT&T.

Increased availability of broadband may be possible because AT&T and Spectrum are bound by the FCC to meet some build-out conditions. Requirements are stipulated in the approval of the AT&T-DirecTV merger and also in the Charter-TWC merger for each to increase the number of broadband households in the U.S. The AT&T-DirecTV merger requires[11] that AT&T extend fiber to the premises of an additional 12.5 million residences and small businesses before June 2019. The Charter-TWC merger requires[12] an additional 2 million residential broadband locations by May of 2021. It is important to note that the companies may choose other areas to fulfill their FCC requirements and are under no

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[10] November 13, 2017 Stakeholders meeting in Taylorsville.

[11] AT&T- DirecTV Merger Conditions FCC 15-94 p.155 III. FIBER TO THE PREMISES (FTTP) DEPLOYMENT
https://apps.fcc.gov/edocs_public/attachmatch/FCC-15-94A1.pdf

[12] Charter- TWC Merger Conditions FCC 16-59 p. 218 V. RESIDENTIAL BUILD-OUT CONDITION
https://apps.fcc.gov/edocs_public/attachmatch/FCC-16-59A1_Rcd.pdf

obligation to build in areas they claim they cannot justify the return on investment. However, discussions with these providers could be worthwhile. There are no known build-out requirements for CenturyLink.
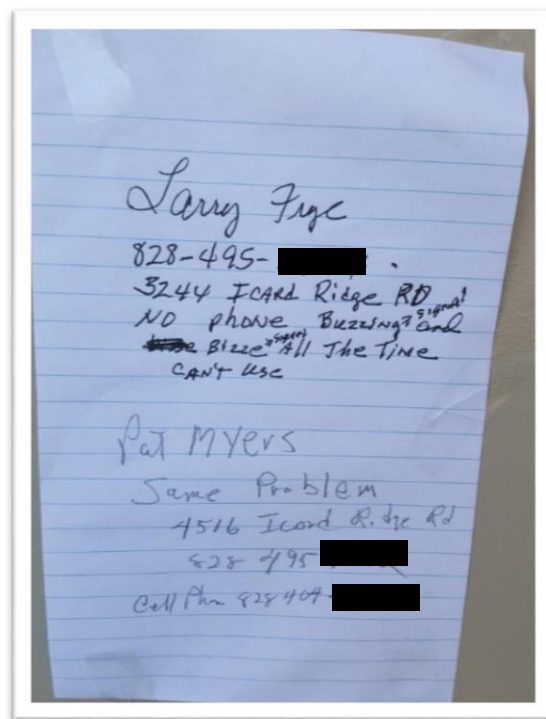
Affordability

Affordability is a barrier to many residents in the County, as shared in the November workshop the Broadband Survey[13]. Fortunately, each service provider has a low-cost broadband offering but at reduced speeds.[14] A chart below summarizes low-cost offerings.

Low-Income Programs (Residential)				
Provider	Data Cap	Install	Modem	Monthly
AT&T Access 10 Mbps	150GB or 1TB	$0	$0	$10.00
AT&T Access 5 Mbps	150GB or 1TB	$0	$0	$5.00
CenturyLink 1.5 Mbps	not stated	Yes, not priced	$0 yr 1, then $10/mo or $100 one-time	$9.95 yr 1, $14.95 after
Spectrum up to 30/4 Mbps	None	$0	$5.00/mo	$14.99

Future Considerations

The future of broadband in Alexander County looks good now that the County has taken the proactive step to assess the market and engage other service providers. Without this step, there is no indication that the existing service providers will increase coverage or speeds. Fierce competition has led the major carriers to choose to invest almost entirely in metro areas and bypass small communities. Spectrum, which offers quality service by most accounts, still has not extended into neighborhoods within their footprint. AT&T has a rural wireless option providing 10/1 Mbps from their cell sites; however, because AT&T has deployed cell sites only along major highways and within town, the majority of underserved areas will remain so. AT&T and CenturyLink have demonstrated nationally that they are disinvesting in copper DSL. They have also neglected to upgrade to a more fiber-rich architecture.

Two customers are forced to register their complaints with Century Link with a handwritten note.

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[13] The Broadband Survey reveals at least 16.3percent of those who didn't purchase Internet cited affordability as the cause.
[14] https://www.att.com/shop/internet/access/#/
http://www.centurylink.com/assets/pdfs/699712-EV17CKBRO7892_LR_TAM1.pdf
https://www.spectrum.com/browse/content/spectrum-internet-assist.html

Alexander County Service Provider Matrix

Speed and Availability (As Advertised)

Provider	Downstream	Upstream	FCC Standard	Geographical Availability *estimated % of County*
AT&T DSL	6 Mbps	768 kbps	25 Mbps / 3 Mbps	< 10%
AT&T uVerse	25 - 50 Mbps	< 6 Mbps	25 Mbps / 3 Mbps	< 20%
CenturyLink	10 Mbps	1 Mbps	25 Mbps / 3 Mbps	< 10%
Spectrum	60 - 300 Mbps	10 - 30 Mbps	25 Mbps / 3 Mbps	~ 40%

Pricing for Business

Provider	Data Cap	Install	Modem	Monthly
AT&T DSL		*Not offered on website in any of sampled areas.*		
AT&T uVerse 25 Mbps	not stated	$99.00	$0	$40.00
AT&T uVerse 50 Mbps	not stated	$99.00	$0	$50.00
CenturyLink 10 Mbps	not stated	$59.99	$9.99/mo or $99.99 one-time	$64.99
Spectrum 100/ 10 Mbps	None	$99.99	$0	$59.99 yr 1, $79.99 after
Spectrum 200/ 15 Mbps	None	$99.99	$0	$99.99 yr 1, $119.99 after
Spectrum 300/ 20 Mbps	None	$99.99	$0	$159.99 yr 1, $179.99 after
				*Spectrum notes prices will increase in 2018

Pricing for Residential

Provider	Data Cap	Install	Modem	Monthly
AT&T DSL		*Not offered on website in any of sampled areas.*		
AT&T uVerse up to 50 Mbps	1TB	$99.00	$0	$40.00 yr 1, $70.00 after
CenturyLink 10 Mbps	not stated	$60.00	$0 yr 1, then $10/mo or $100 one-time	$45.00 for life
Spectrum 100/ 10 Mbps	None	$49.99	$0	$39.99 yr 1, $64.99 after
Spectrum 300/ 20 Mbps	None	$49.99	$0	$89.99 yr 1, $104.99 after
				*Spectrum notes prices will increase in 2018

Reliability/ Suitability as Reported by Users

Provider	Reliability/ Scalability	Backups/ Cloud	Video Streaming	Remote Diagnostics (Machinery Control)
AT&T DSL	Poor/ Poor	Not suitable	Not suitable	Poor
AT&T uVerse	Inconsistent/ Good	Okay	Good if consistent	Good if consistent
CenturyLink	Poor/ Poor	Not suitable	Not suitable	Poor
Spectrum	Good/ Good	Okay	Good	Good

Public-Private Partnership Options

North Carolina law precludes Alexander County from owning, operating or investing in broadband service to the public. This narrows down public-private partnership options by eliminating municipal owned networks and municipal service to the public.

A privately owned and operated network is the only viable option. Fortunately, a number of new service providers are interested in providing broadband in the County.[15] The County can make it easier for new providers by leasing available fiber capacity, allowing access to County facilities such as water tanks at reduced rates, examining the

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[15] Open Broadband attended the November 16, 2017 service providers meeting. Four new service providers attended, but no incumbents expressed interest.

telecommunication tower ordinance to reduce barriers for private ISPs to install necessary vertical assets[16], making conduits available and instituting rules going forward to make access to conduits and poles easier for new providers.

Grants and other special funding will be necessary to help carriers spread into the sparsely populated areas of the County because the network costs will likely exceed what a carrier can justify. A long-term plan is necessary to bring grants and special funding to help interested carriers reach these outlying areas.
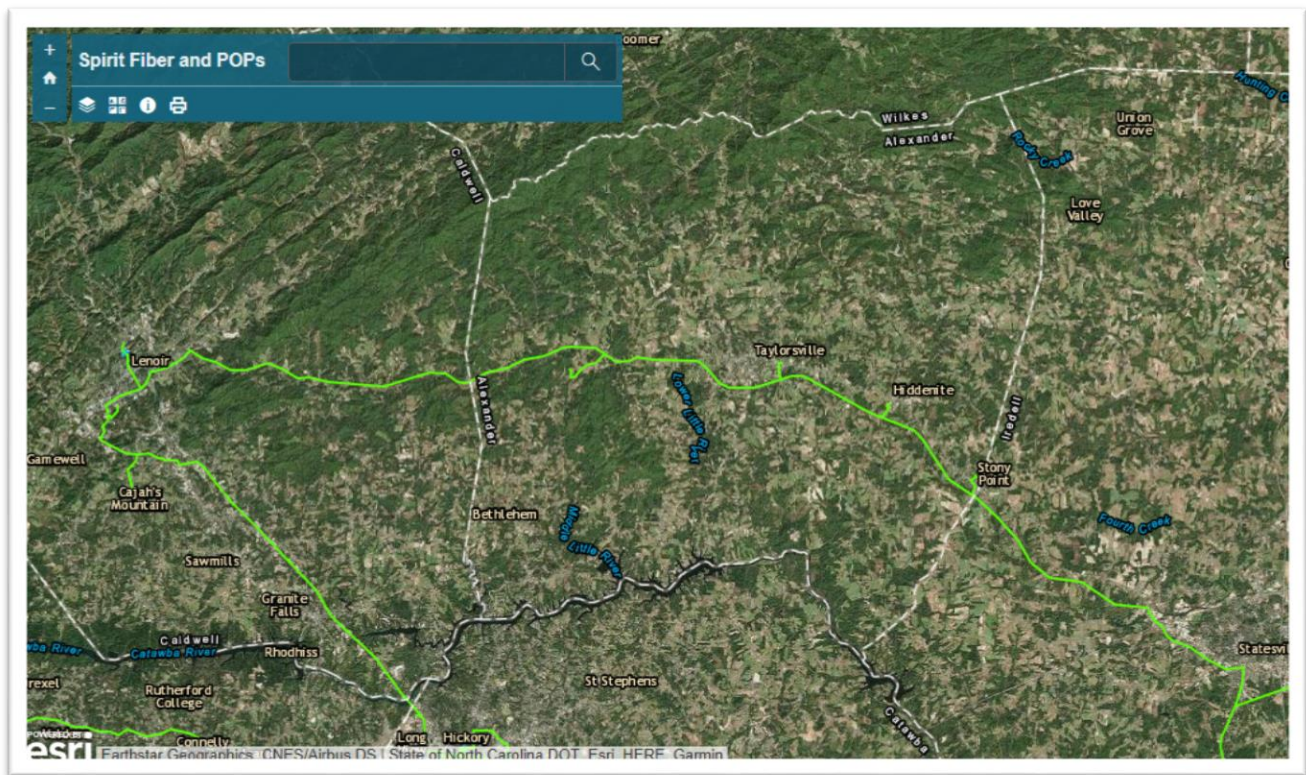
Spirit's advertised fiber route

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[16] Jackson County has such provisions in their tower ordinance now.

Current County Broadband Capabilities

Fiber

The good news is there is a lot of fiber in Alexander County, especially along the named highways, in town and radiating out of town for a few miles. Open Broadband has driven every route in the County and found extensive infrastructure. However, it is not always possible to find every fiber route or provider because the cables are not always well marked.

AT&T fiber optics pedestal

There are several **long-haul fiber** routes spanning the County. These include AT&T, Century Link, Spectrum and Spirit (who leases fiber to MCNC and Google as well as others). AT&T has fiber running along US 64 from the Caldwell County line running east through town and out NC 90 through Hiddenite and Stony Point into Iredell County. Also, AT&T has fiber from NC 16 coming from Catawba County north through town and almost to the Wilkes County line. Their fiber runs from US 64 down NC 127 crossing into CenturyLink's territory to a cell tower on Sam Hefner Rd.

CenturyLink has fiber running from NC 127 at the Catawba County line up to US 64, along All Healing Springs Road, connecting to Mt Olive Church Road and NC 16 into Wilkes County. The route north of US 64 appears to be over 20 years old and likely would have only a few fibers in the cable.

Spectrum has fiber running the length of NC 16 north to south running through town. From town, it extends west along US 64 to NC 127 and south into Catawba County. They also run from town east along NC 90 through Hiddenite and Stony Point into Iredell County.

Spirit's fiber spans US 64 east to west with spurs running to a cell tower off NC 127 at Stafford Mtn Road and another tower just north of US 64 off Old Mountain Road. They also run to a hut in front of an Energy United substation just east of Boston Road. Spirit leases fiber to others such as MCNC as well as Google.

Very old CenturyLink (formerly Centel) fiber marker off Mt. Olive Church Rd.

One provider leaves the Spirit hut aerially and runs east along Hwy 90 to Iredell County. This could be MCNC's fiber. However, it is not marked.

Middle-mile fiber is defined as fiber to electronics that transpose the fiber signals onto copper or coax to serve residences and businesses. There is surprisingly more middle-mile fiber in Alexander County than expected relative to the number of unserved and underserved areas. Both AT&T and Spectrum have many miles of cable throughout town and extending out of town. Leveraging this fiber could be a challenge because a) the carrier is under no obligation to provide access to fiber or circuits, b) there may not be enough fiber to make some available to an alternate service provider, or c) the service provider may charge more than can be justified.

AT&T has fiber running to 19 of their 22 buildings and cabinets throughout the County as listed in Exhibit A. These are most likely DSL Access Modules (DSLAMs) which serve customers with DSL. Beyond the main routes, town and short spurs off the main routes to towers and DSL cabinets, AT&T has fiber spreading out in the County along the routes shown in Exhibit B.

Spectrum has fiber in town, along the main routes mentioned above and the excursions in Exhibit B.
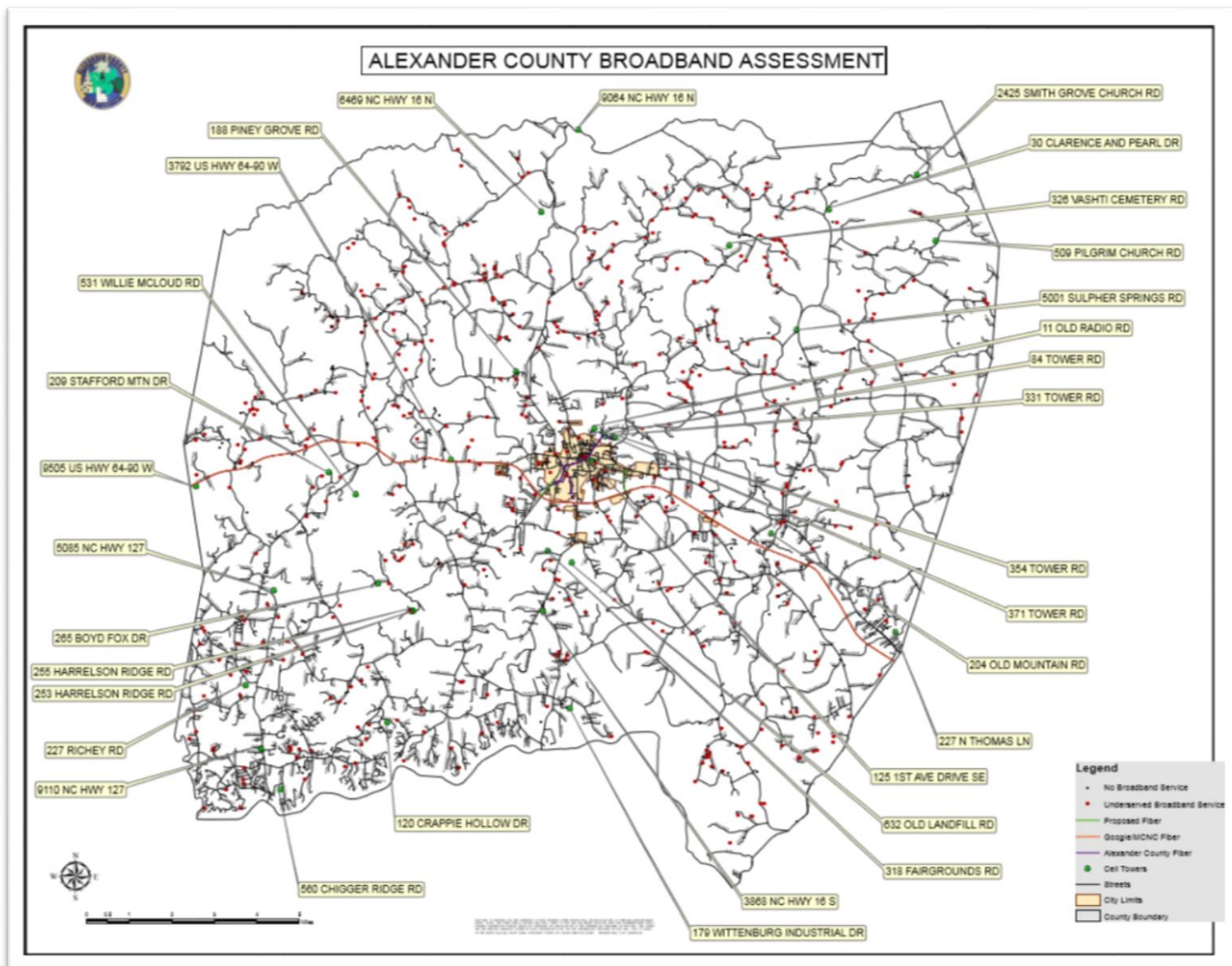
CenturyLink has a very limited territory with only a few spurs.

Fiber-to-the-Premise can be found at several schools, most government buildings and most tower sites. Most providers have not found it economically viable[17] to install fiber to customer premises outside of these key facilities without a grant or other special funding. Businesses expressed a real need for reliable, high-speed, symmetric broadband at the November Stakeholder's meeting.

Locations that have fiber feeds currently:

- Alexander County installed several miles of cable to numerous government offices in town as well as to their facilities on Linney's Mountain. County fiber reaches Linney's Mountain Tower, Emergency Management, Social Services, Alexander County Administration, the Senior Center, the Evidence Building, two Catawba Valley Community College locations, the Law Enforcement Center, the Health Department, Tax Office/ Register of Deeds, Courthouse, Town Hall and the Taylorsville Police Department. MCNC is building a spur to tie into Alexander County's fiber network to provide higher capacity and lower costs than currently provided.
- Spectrum has fiber running past the Industrial Park. They also serve a few schools including Hiddenite Elementary, East Alexander Middle School and, it appears, to Alexander Central High School. There may be other schools with fiber feeds that were not apparent.
- AT&T does not appear to have fiber to many locations though they do have fiber to the Industrial Park. Since their cables are buried in most cases, it is hard to ascertain which buildings are served.
- The cell towers in the County almost all have fiber feeds. AT&T is the most common carrier followed by Spectrum. Spirit feeds three towers and Vertical Bridge serves one near Ellendale. The three SBA towers in the northeast corner of the County built for Carolina West Wireless are fed by microwave from the fiber-fed tower at Sulphur Springs Rd near Jim Milsaps Rd.

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[17] The cost of a fiber mile is around $65,000 for buried in average soil and $36,000 aerial. This does not include drops to customers, conduit, installation labor or electronics.

ALEXANDER COUNTY BROADBAND ASSESSMENT

6469 NC HWY 16 N
9064 NC HWY 16 N
2425 SMITH GROVE CHURCH RD
188 PINEY GROVE RD
30 CLARENCE AND PEARL DR
3792 US HWY 64-90 W
326 VASHTI CEMETERY RD
509 PILGRIM CHURCH RD
531 WILLIE MCLOUD RD
5001 SULPHER SPRINGS RD
11 OLD RADIO RD
84 TOWER RD
331 TOWER RD
209 STAFFORD MTN DR
9505 US HWY 64-90 W
5085 NC HWY 127
354 TOWER RD
371 TOWER RD
265 BOYD FOX DR
204 OLD MOUNTAIN RD
255 HARRELSON RIDGE RD
253 HARRELSON RIDGE RD
227 RICHEY RD
227 N THOMAS LN
9110 NC HWY 127
125 1ST AVE DRIVE SE
120 CRAPPIE HOLLOW DR
632 OLD LANDFILL RD
318 FAIRGROUNDS RD
560 CHIGGER RIDGE RD
3868 NC HWY 16 S
179 WITTENBURG INDUSTRIAL DR

Legend
· No Broadband Service
· Underserved Broadband Service
— Proposed Fiber
— Google/MCNC Fiber
— Alexander County Fiber
● Cell Towers
— Streets
City Limits
County Boundary

Vertical Assets

Alexander County is fortunate to have some key mountains in and adjacent to the County. There are also more than 27 major towers in the County, 11 water tanks, a few private structures and a few towers just outside the County. The fastest and most cost-effective method of increasing broadband availability in the County will be via leveraging vertical assets. Most of the major towers are owned by the big name tower companies such as American Tower, Crown Castle and SBA. Of these, American Tower is known for working with smaller entities with the other tower owners being very costly in many cases for a wireless broadband play. The tower at 9110 NC Highway 127 is at an EMS station. It is a slim tower but appears to be over 120 feet tall. A few towers in and adjacent to the County are owned by the U.S. Government making them unlikely candidates.

Besides these towers, there are a couple more tower structures in Alexander County as well as a few significant towers at high elevation just beyond County lines. A privately owned tower, less than 200-feet tall, is near 3267 Three Forks Church Rd which is four miles west-northwest of town. This is significant because it is the only tall structure in the northwest quadrant of the County. There is a small monopole at lower elevation inside a substation off Little River

Church Rd near the intersection of Shew Rd. However, the short height and low elevation would give minimal reach in an area where signal is much needed.

Just outside of Alexander County are towers at Moore Mountain, Pores Knob, Fox Mountain and a cell tower off NC 16 just north of the county line. Moore Mountain has a couple of short and slim towers that may be of minimal use. However, it is reported the landowner is easy to work with if additional towers are desired. Off NC 16 just north of the county line, a Carolina West Wireless site owned by SBA sits. Pores Knob has multiple towers just off Cove Gap Rd. Most of the towers on Pores Knob are heavily loaded but there is potential for some lightweight antennas. Fox Mountain is just over the northeast border of the County with an NC Highway Patrol tower with a significant viewshed into the northeastern portion of Alexander County.

Last Mile Gaps and Opportunities

In our view, there is opportunity for reliable, high-speed broadband to be obtained in a reasonably short time-frame by many businesses and citizens of Alexander County.

There is a clear opportunity for a service provider to lease fiber capacity to towers for a fixed-wireless last mile. Alexander County could see an immediate benefit for local industry if a service provider focused on providing high-speed, symmetrical broadband to a few businesses. Many citizens could also benefit if the broadband holes in town and neighborhood areas were addressed. Households more scattered throughout the County within reach of the towers could have true high-speed broadband availability instead of being denied DSL or suffering from poor, inconsistent speeds. Existing towers in the County can be used to spread coverage as the business case allows.

The most challenging area will be the northwest quadrant of the County where practically no towers exist and the land begins rising into the foothills of the Appalachians. The south-southeastern portion will also be a challenge with fewer towers and scattered population. Special engineering and funding may be required to address these problems.

Recommended Broadband Strategy

Affordable broadband in Alexander County is an important element for economic health for the County, a service to enhance the quality of life for residents, and an asset to improve delivery of government services. Today there are gaps in affordable broadband coverage, and an aged copper network that is not supportive of 25Mbps speeds. There is little evidence that the incumbent providers are investing in their networks to ensure all County residents and businesses have broadband speeds of 25Mbps and above. This environment makes it difficult for the County to attract new residents that work-from-home, or new businesses that are heavily dependent on cloud applications. In an ideal world the incumbent ISPs would be investing in the County. Instead, residents expressed the viewpoint that existing providers "are unresponsive", and service can be unreliable.

There are multiple technology options to address these problems, including fiber to the premise, fixed-wireless, mobile wireless, satellite, and copper DSL service. Of these, the options best suited for 25Mbps+ speed are fiber and fixed-wireless. If money were no object, fiber to every property would be a valuable infrastructure investment. However, fiber can also cost $65,000/mile to build, which makes many rural areas uneconomical to serve. Fixed-wireless can provide up

to 1000Mbps speed at shorter distances, and 100Mbps+ speed at longer distances. Given the population density in Alexander County we recommend that both fiber and fixed-wireless providers be encouraged to build out, knowing that fixed-wireless is more likely to be cost effective for the remote areas.

Alexander County needs more investment by the ISPs. Therefore, our recommended broadband strategy is two-fold:
1) stimulate ISP investment in broadband infrastructure supporting speeds of 25Mbps to 1000Mbps
2) focus on having affordable broadband offered in all areas of the County to fill in the gaps

The first step is aggregating demand data, which has already been performed with the assistance of the NC Broadband Infrastructure Office. Sharing user demand with service providers is the next step in the process, and was completed by the County in November 2017. Based on what we've seen in other counties in North Carolina, we anticipate that this data will not result in an infrastructure investment by the incumbent ISPs, who appear to be comfortable with the status quo. However, service provider meetings in other NC counties have been effective in receiving proposals from new ISPs.

The most effective approach to get the incumbent ISPs to increase investment is to threaten their revenue base by having competitive ISPs enter the County and take market share. When competition occurs, service improves, prices go down, and consumers win.

Action step 1: To attract competitive ISPs, the County should be prepared to provide assistance in the form of access to County owned property such as radio towers, water towers, poles, buildings, and any fiber assets. Access should be free to low-cost, pay-as-you-grow to incent the ISP to make the investment while minimizing their risk. The County should ensure the ISPs have an easy to implement permitting process for new broadband construction and ROW access. This will help make construction speedy and predictable. This could include a one-touch-make-ready process for pole attachments. These actions cost the County no cash, but are valuable to the ISP in lowering the cost for deployment. The details of the assistance required will vary upon the service provider's needs (fiber will be different than wireless), and will be listed in the proposals received from the participants at the service provider meeting.

Action step 2: Seed the competitive effort by offering the County's internet contract to an ISP in return for 1) the ISP's commitment to serve the areas with the greatest gaps in broadband coverage, 2) a commitment to make service speeds of 100Mbps to 1000Mbps available where technically feasible, and 3) a commitment to offer 25Mbps service for no more than $30-40/month in order to address the affordability issue. A change in service providers would be cost neutral, or even a cost and performance savings for the County. To the extent the contracts for the school system, community college, and a few of the larger businesses in the County could also be leveraged together, it would provide a strong base of revenue to help justify an ISP's investment. We've seen this pooled approach achieve success in North Carolina in attracting a new ISP. Having guaranteed anchor clients is very attractive for a new ISP.

Action step 3: Work with the state broadband office, state legislature representatives, and Golden LEAF to obtain grant funding for broadband infrastructure. This will require a detailed deployment plan, ready to implement once funded. As the next step from the service provider meeting, the County should solicit proposals to develop such a deployment plan, suitable for use in grant applications. Gaston County recently received a $1M grant from the state for economic development efforts surrounding broadband deployment. Open Broadband would be happy to provide introductions to the Gaston County representatives who made it happen.

Action step 4: Broadband infrastructure is only the beginning, it's what is done with that infrastructure that makes the difference. We encourage the County to view a high-capacity broadband program as a catalyst for its economic development agenda and to incorporate broadband development planning efforts and successful implementation regularly in marketing and communications outreach aimed at business retention, expansion and recruitment and quality of life for residents. Based on our analysis of commuting patterns, the County supports an employment center in neighboring counties making the residential population an important part of the County's tax base. Robust residential broadband options are therefore important to the County's long-term economic viability. At a more advanced level, the County can spearhead a local effort in support of entrepreneurship and small business by facilitating development an innovation center or incubator space with gigabit internet capability (1000Mbps). There are many promising statewide models of communities pursuing this strategy at a scale compatible with local assets and capacity: communities have used these spaces to provide public access to high-speed Internet, to advance science and arts education, and to offer training and workforce development, including programs that support "digital inclusion" and ensuring residents are educated in the most affordable access programs. Still others have focused on a real estate development play and attracted co-workers and startups. A county owned building could be used for this purpose, or it that can be at the community college or other suitable location. The service contract for the gigabit service can go to the ISP enticed in action step 2.

Action step 5: Since action always speaks louder than words, the County should consider funding a Pilot Program with a new ISP to deploy high-speed broadband in designated under-served areas. A Pilot Program with fixed-wireless can be funded with $50,000. This will result in a tangible benefit in the designated areas, and serve as a catalyst in shaking up the status quo for the incumbent ISPs. A successful Pilot Program will also encourage the new ISP to expand deployment further into the County at their own expense.

Action step 6: While the incumbent ISPs have left Alexander County in its current state, it is recommended to make another request of AT&T and Spectrum to expand their coverage areas and speeds which exceed the FCC standard of 25 Mbps. These ISPs have gone through mergers, and may have service level requirements to fulfill. It is worth the effort to express the concern to the incumbents, and provide them with the survey data and interest level from the County.

Thank You

Thank you for the opportunity to work with Alexander County. We will review these findings with you in person in more detail, and discuss how to proceed with next steps.

Best,

Alan Fitzpatrick
CEO
Open Broadband, LLC
alan@openbb.net
704-237-0102

Alexander County Copper Service Buildings and DSLAMs

AT&T	Type	Location	Fiber Fed
	Building	Center St at 1st St	Yes
	Building	N Thomas Ln at Stony Point	Yes
	Building	Pine Cove Rd at Friendship Church Rd	Yes
	DSLAM	101 Drumstand Rd	Yes
	DSLAM	2615 Church Rd	Yes
	DSLAM	Carrigan Rd at CI Chapman Rd	Yes
	DSLAM	Church Rd north of Rink Dam Rd	Yes
	DSLAM	Daniels Lumber Rd just south of Hwy 16N	Yes
	DSLAM	Drumstand Rd at Mt Wesley Church	Yes
	DSLAM	Ellendale Fire Dept Rd	Yes
	DSLAM	Gill Childers Rd at D. Roy Rogers	No
	DSLAM	Hunter Bridge Rd Rd at Old Mountain Rd	Yes
	DSLAM	Hwy 127 at Blankenship Rd	Yes
	DSLAM	Lawson Childers Rd at Vashti Rd	No
	DSLAM	Little River Church Rd at Hwy 16N	Yes
	DSLAM	Old Hwy 90 at Hwy 64/ Hwy 90	Yes
	DSLAM	On Cheatham Ford Rd just south of Poplar Springs Rd	No
	DSLAM	On Crouch Rd at Paul Payne Store Rd	Yes
	DSLAM	On Millersville Rd at Paul Payne Store Rd	Yes
	DSLAM	Teague Town Rd at Church Rd	Yes
	DSLAM	Three Forks Rd across from Bebber Rd	No
	DSLAM	Three Forks Rd across from Zeb Watts Rd	Yes
CenturyLink	Building	8782 Hwy 127S	Yes
	DSLAM	Bethlehem School Rd at Icard Ridge Rd	Yes
	Building	Hwy 127 at Shiloh Church Rd	Yes
	Building	River Hills Ct at Lakeshore Ln	Yes

Service Provider Middle Mile Routes

AT&T
- Liledoun Road to Barrett Mountain Rd to the tower off Boyd Fox Road.
- Linney's Mountain to Black Oak Rock Rd to a DSLAM at the intersection of Vashti Rd.
- Linney's Mountain to Rocky Springs Rd to Rocky Face Branch.
- Hiddenite community's Hiddenite Church Rd to Sulphur Springs Rd from Hwy 90 north to just past the intersection of Vashti Rd to the new SBA tower that Carolina West Wireless is on.
- Hiddenite community's Old Mountain from Hwy 64 south to County Line Road and along County Line Road most of its length.
- Old Mountain Road west on Drumstand Road to AT&T DSLAM northeast of the intersection with Paul Payne Store Rd.
- Millersville Rd from Hwy 64 south to a DSLAM on the northeast intersection with Paul Payne Store Rd and back along Paul Payne Store Rd to a DSLAM at the intersection of Paul Payne Store Rd and Taylorsville MFG Rd and likely back to town on Paul Payne Store Rd.
- Fairgrounds Road of Hwy 16S to a Crown Castle Tower.
- Wittenberg Rd of Hwy 16S to an American Tower Company tower.
- Connecting Hwy 16S with Hwy 127 via Friendship Church Rd to Church Rd to Rink Dam Rd.
- DSLAM at the intersection of Church Rd and Teague Town Rd possibly from fiber on Friendship Church Rd or possibly going north to connect with fiber at Barrett Mountain Rd/ Liledoun Rd.
- Town out Three Forks Church Rd to a DSLAM southeast of the intersection with Zeb Watts Rd.

Spectrum
- Linney's Mountain to Black Oak Ridge Rd stopping just past Dee Loudermelk Ln.
- White Plains Rd north from Hwy 90 terminating at East Alexander Middle School.
- Hiddenite community up Sulphur Springs Rd from Hwy 90 north to Hiddenite Elementary.
- Craftmaster Ln north from Hwy 90.
- Old Mountain Rd from Hwy 90 south to Old Concord Church Rd.
- Millersville Rd from Hwy 90 south to just past Mt Wesley Church Rd and one branch off on Taylorsville MFG and stopping at Paul Payne Store Rd.
- Asplaugh Dam Rd for a mile from Hwy 16S.
- Connecting Hwy 16S with Hwy 127 via Friendship Church Rd to Church Rd to Rink Dam Rd.
- Liledoun Road from town and stopping at Barrett Mountain Rd with one branch going a mile down Sipe Rd.
- River Hills Ln off Rink Dam Rd stopping at Lakeshore Ln.
- Davis Cove Rd off Rink Dam Rd stopping before Wren Rd.
- Hubbard Rd off Hwy 127S and turning south on Wildlife Access Rd.
- Bethlehem School Rd from Hwy 127S to Icard Ridge Rd.
- Sam Hefner Rd from Hwy 127S to Icard Ridge Rd.

CenturyLink has a very limited territory with only a few spurs.

- Advent Church Rd but connector is unknown.
- Bethlehem School Rd from Hwy 127S to Icard Ridge Rd.
- Rink Dam Rd and onto River Hills Ln stopping at a CenturyLink-marked hut across from Lakeshore Ln.

Exhibit C

Attendee List for 11/13/17 Broadband Workshop

Greg Cronk (Alexander County IT Director)

David Icenhour (EDC Director)

Milton Campbell (Commission Chairman)

Dr. Bill Griffin (Alexander County Schools Auxiliary Services Director)

Andy Warren (Schneider Mills)

Russ Harrow (Royale Komfort Bedding)

Terry Davis (Mid-Atlantic Wood Products)

Tim Holder (EnergyUnited Economic Development)

Lou Lauer (Local Small IT Business Owner)

Ronnie Robinette (Taylorsville Town Board)

Chad Ritchie (Alexander County IT Dept.)

Alishee Stamey (Head Park Ranger at Rocky Face Park)

Gary Herman (Alexander County EDC)

Brett Fansler (Executive Director of CVCC Alexander Center)

Marshall Winstead (Realtor)

James Thomson (Vice President of IT for Craftmaster Furniture)

Jeremy O'Brien (Network Engineer for Alexander County Schools)

Kim Bishop (Technology Specialist for Alexander County Schools)

April Chapman (Home-Based Pharmacy Consultant)

Al Maxwell

Jody Call

Christa Wagner Vinson (Open Broadband)

Alan Fitzpatrick (Open Broadband)

Kent Winrich (Open Broadband)

Stephen Morris (Open Broadband)

Water Towers

FEATURE	OWNER	LATITUDE	LONGITUDE	TYPE	ADDRESS
Duke Power Dam Tower	Duke Power Co	35.823	-81.194	Lattice Tower	1248 Wayside Church Rd, Taylorsville NC 28681
100,000 Gallon Tank	Alexander Board of Education	35.873	-81.316	Water Tank	237 Landis Ln Taylorsville NC 28681
100,000 Gallon Tank	Alexander County	35.919	-81.267	Water Tank	530 Hwy 127, Taylorsville NC 28681
100,000 Gallon Tank	Schneider Mills Inc.	35.938	-81.195	Water Tank	1170 NC Hwy 16 N Taylorsville NC 28681
Liledoun Water Tank	Carolina Glove Co.	35.898	-81.206	Water Tank	2138 Liledoun Rd Taylorsville, NC 28681
Lower Water Tank	Town of Taylorsville	35.929	-81.166	Water Tank	80 Tower Rd, Taylorsville NC 28681
Upper Water Tank	State of North Carolina	35.929	-81.163	Water Tank	355 Tower Rd, Taylorsville NC 28681
Ellendale 600,000 gallon Water Tank	Alexander County	35.919	-81.267	Water Tank	530 HWY 127, Taylorsville NC 28681
Paragon films Water Tank	Paragon Films	35.544	-81.715	Water Tank	245 W E Babb Industrial Blvd Taylorsville NC
Craftmaster Water Tank	Craftmaster Furniture Inc	35.909	-81.118	Water Tank	3457 NC Hwy 90 E, Taylorsville NC 28681
Shurtape Water Tank	Shurtape Technologies Inc	35.864	-81.052	Water Tank	8510 NC Hwy 90 E, Stony Point NC 28678
Water Tank	EPI & G LLC	35.84	-81.308	Water Tank	100 Teague Town Rd, Taylorsville NC 28681
Water Tank _North	DeHART Enterprises Inc	34.841	-81.313	Water Tank	7738 NC Hwy 127, Hickory NC 28601
Water Tank_South	DeHART Enterprises Inc	34.841	-81.313	Water Tank	7738 NC Hwy 127, Hickory NC 28601
Alexander Water Corp Water Tank North	Alexander Water Corp	35.89	-81.078	Water Tank	6210 NC Hwy 90 E, HIddenite NC 28636
Alexander Water Corp Water Tank South	Alexander Water Corp	35.89	-81.078	Water Tank	6210 NC Hwy 90 E, Hiddenite NC 28636
Carolina Glove Co Water Tank	Carolina Glove Co	35.895	-81.213	Water Tank	140 Glove MIll Rd, Taylorsville NC 28681
Old Rock Tenn Water Tank	Sixteen Realty Inc	35.915	-81.174	Water Tank	486 S Center St, Taylorsville NC 28681
Mitchell Gold Hiddenite - Water Tank	The MItchell Gold Co	35.901	-81.082	Water Tank	375 Sharpe Ln, Hiddenite NC 28636
Fairgrounds Water Tank	Fair Grounds	35.89	-81.189	Water Tower	272 Fairgrounds Rd Taylorsville NC 28681
Lewittes Water Tower	Proverbs 13:11 LLC	35.917	-81.146	Water Tower	1721 NC Hwy 90 E, Taylorsville NC 28681
Millersville Water Tower	Alex Associates	35.851	-81.183	Water Tower	119 Nester Rd, Taylorsville NC 28681
Liledoun Water Tower	James R Ferguson	35.896	-81.211	Water Tower	2370 Liledoun Rd Taylorsville, NC 28681
Schneider MIlls Water Tower	Schneider Mills Inc	35.938	-81.194	Water Tower	1170 NC HWY 16 N
Water Tower	Tommy Hubbard	35.925	-81.17	Water Tower	116 Linneys Mountain Rd, Taylorsville NC 28681
Water Tank	Homer Biddy	35.197	-81.152	Water Tower	1426 NC Hwy 90 E, Taylorsville NC 28681
Craftmaster Water Tower	Craftmaster Furniture Inc	35.91	-81.12	Water Tower	3457 NC Hwy 90 E, Taylorsville NC 28681
Shurtape Water Tower	Shurtape Technologies Inc	35.865	-81.051	Water Tower	8510 NC Hwy 90 E, Stony Point NC 28678
Prison Water Tower	State of North Carolina	35.886	-81.18	Water Tower	632 Old Landfill Rd, Taylorsville NC 28681
Old Lewittes Water Tower	LIAT LLC NC Limited	35.917	-81.18	Water Tower	100 5th Ave SW, Taylorsville NC 28681

Fox Mountain, Iredell County

Highway Patrol Tower

OPERATOR: NC Highway Patrol
LAND OWNER: UNKNOWN
HEIGHT: 170 ft
FCC LICENSE: 1275675
LATITUDE: 35-59-52.5N
LONGITUDE: 80-59.59.5W
ELEVATION: 1,749 ft
YEAR BUILT: 2013
CONSTRUCTION: SST
COMMENTS: Great viewshed of northeast Alexander County and eastern Iredell.

Pores Knob, Wilkes County

SBA Tower plus Small Adjacent Tower

OPERATOR: SBA # 10227
LAND OWNER: Yperen Family
HEIGHT: 182 ft
FCC LICENSE: NA
LATITUDE: 36-02-48.9N
LONGITUDE: 81-09-22.1W
ELEVATION: 2,670 ft
YEAR BUILT: 2001
CONSTRUCTION: SST
COMMENTS: AT&T, T-Mobile and Carolina West Wireless on main tower. Fiber fed. The main
                   tower is totally loaded and AT&T and T-Mobile are evaluating costs to upgrade.
                   Small tower appears aged and limited.

Pores Knob, Wilkes County

Government Tower

OPERATOR: US ARMY CORPS OF ENGINEERING
LAND OWNER: UNKNOWN
HEIGHT: 147.6 ft
FCC LICENSE: 1274300
LATITUDE: 36-02-48.9N
LONGITUDE: 81-09.22.0W
ELEVATION: 2,648 ft
YEAR BUILT: 2010
CONSTRUCTION: GUYED
COMMENTS: Government unlikely to cooperate on co-location.

Pores Knob, Wilkes County

Cross Structure

OPERATOR: UNKNOWN
LAND OWNER: UNKNOWN
HEIGHT: 100 + ft
FCC LICENSE: NA
LATITUDE: ~36-02-48.9N
LONGITUDE: ~81-09.22.0W
ELEVATION: 2,648 ft
YEAR BUILT: ?
CONSTRUCTION: GUYED
COMMENTS: Inspirational but appears of limited capacity.

Moore Mountain Rd, Alexander/Wilkes County

OPERATORS:	ALEXANDER FIRE DEPT, OTHER TWO-WAY RADIO
LAND OWNER:	UNKNOWN
HEIGHT:	~50ft/~ 80 ft
FCC LICENSE:	NA/ NA
LATITUDE:	36-02-06.3N
LONGITUDE:	81-11-43.9W
ELEVATION:	2390 ft
YEAR BUILT:	Both unknown.
CONSTRUCTION:	Taller tower is guyed. Smaller is self-support.
COMMENTS:	Two-way radio repeaters on both towers. Each has a very small sheds though one is a military surplus shelter. Agreeable landowner.

3267 THREE FORKS RD, TAYLORSVILLE

OPERATORS: ALLIANCE VOICE & DATA SOLUTIONS info@alliancevds.com
LAND OWNER: ADAM CHILDERS
HEIGHT: ~199 ft
FCC LICENSE: NA
LATITUDE: 35-56-35.3N
LONGITUDE: 81-13-48.6W
ELEVATION: 1140 ft
YEAR BUILT: UNKNOWN.
CONSTRUCTION: GUYED. SLIM TOWER.
COMMENTS: Microwave feed and three small sectors up top.

3574 LITTLE RIVER CHURCH RD SUBSTATION

OPERATORS:	ENERGY UNITED
LAND OWNER:	CRESCENT ELECTRIC MEMBERSHIP
HEIGHT:	~ 80 ft
FCC LICENSE:	NA
LATITUDE:	35-58-22.5N
LONGITUDE:	81-14-30.7W
ELEVATION:	1130 ft
YEAR BUILT:	UNKNOWN.
CONSTRUCTION:	MONOPOLE.
COMMENTS:	VERY LIGHT LOADING.