Broadband Market Analysis Update

City of Columbia Water & Light

February 6, 2017

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I. Executive Summary

Columbia Water & Light (CW&L) and the City of Columbia commissioned the development of a Broadband Feasibility Study, and Magellan Advisors provided its Report in June 2014. The Report recommended that CW&L transform its broadband business model from simply leasing dark fiber as it does today, to deploying an open-access network, selling lit transport bandwidth to partnering service providers. Magellan's recommendations to CW&L included developing a Broadband Business Plan that would lay out key strategies for CW&L to move forward with implementation, financing, managing, and operating a lit fiber network. More specifically, Magellan's recommendations concluded that the downtown core would be an ample location to begin buildout of such a network. It was determined that the downtown core would be able to connect the current fiber routes due to the density of businesses and residents, as well as the conclusions from the stakeholder outreach which demonstrated a need for greater speed, redundancy, and availability. In addition, providers have indicated that cost and complexity to build in the downtown area is prohibitive, which in turn makes developing a business case for deployment difficult to attain.

Since the delivery of the Report from the Feasibility Study, numerous incumbent providers have announced plans to deploy fiber based gigabit services to areas of Columbia. During this time, Columbia has tabled moving forward with an open-access platform, taking a "wait and see" approach to see if the providers step up their service levels in the area – ultimately achieving the city's goals of faster and more reliable Internet speeds for Columbia based businesses.

As part of the development of the Feasibility Study in 2014, Magellan Advisors met with area providers to understand the extent of their local infrastructure, the services provided, and plans for network/service expansion within the Columbia market. While most providers participated in the process and were very open and willing to share data, some decided not to participate due to the competitive nature of their business – which is understandable and expected. The City of Columbia believes with the passage of time there has been progress in network development by the area providers and desires to update the Private Broadband Inventory section of the Feasibility Study previously delivered. This update is provided to assess the extent of changes in high-speed Internet access, availability, and pricing that broadband providers have made in the last two years.

During the summer of 2016, Magellan's team visited Columbia again and met with local providers to discuss improvements in the services available in the City of Columbia. Several providers are advertising gigabit speeds, and through our research we've been able to validate gigabit service offerings and areas of availability, however, the bulk of the City is still waiting for new investments and faster broadband speeds. While advertised offerings can be misleading, portraying service availability citywide, it is well known that many providers will deploy upgrades and new services in limited areas, focusing on greenfield developments, and areas of higher density. This holds true in Columbia, as many new fiber based offerings are readily available on the "outskirts" of the City in new residential developments. In addition, many providers mentioned the difficulty in building in the downtown area as costs to construct are very prohibitive, which is common in more urban areas.

Many providers stated that assistance from the City in constructing in the downtown area would be welcomed and that it could advance the downtown buildouts. Some providers mentioned that the City could offer grants to offset some of the costs – however, this is a direct subsidy to building the provider's networks. Alternatively, the City could continue its

own fiber deployment, strategically overbuilding the downtown area, when an opportunity or business case presents itself, and making those new assets available for lease.

In closing, the City of Columbia and CW&L will continue to have a role in providing broadband capacity throughout the City. In instances where providers cannot "make the business case," the City can opt to take a longer-term investment approach, building necessary capacity strategically. In addition, with the coming of 5G and small cell DAS deployments, the City will have opportunities to provide additional fiber capacity in the dense areas, like downtown, and to provide "fill-in" capabilities where traditional tower siting and coverage is not optimal or possible. 5G deployment in areas like Columbia are forthcoming and are most likely already planned – this is a key area of potential revenue that the City should explore. Columbia should identify these opportuntieis and work to participate in using CW&L fiber and constructing new fiber when appropriate. The City should continue to evaluate expansion options continuing regular dialogue with area providers.

II. Project Background

During the Broadband Needs Assessment & Planning Study performed by Magellan Advisors in 2014, it was determined that although Columbia had a significant number of broadband providers in the area, segments of Columbia's business and residential communities and community anchors were not able to obtain the services required for their organizations due to either a lack of availability or prohibitively high costs. Businesses in many cases could not obtain the broadband services they needed to become more efficient, productive, and competitive – thus limiting their overall sustainability and growth in Columbia. Economic development organizations have a difficulty retaining business and attracting new business to the area due to a lack of affordable, available broadband. Community anchors including schools, MU, hospitals, and support organizations had significant plans for growth that require high-speed, reliable broadband; they were left questioning how they would be able to implement these programs without this type of next-generation broadband.

Stakeholders noted that connectivity in the downtown area is not consistent. The majority of buildings lacked direct access to fiber. Bottlenecks and lack of fiber in certain locations (e.g. downtown to the west and downtown to the south) were noted as areas with significant issues. Stakeholders consistently identified problems with speed/price, outages, and limited or uneven availability of broadband service. More than one stakeholder interviewee noted that investments and data center operations were being moved out of Columbia due to reliability, performance, and redundancy issues.

As part of the development of the Broadband Planning Study, Magellan Advisors met with area providers to understand the extent of their local infrastructure, the services provided, and plans for network/service expansion within the Columbia market. While most providers participated in the process and were very open and willing to share data, some decided to not participate due to the competitive nature of their business. Magellan Advisors has met again with area service providers to assess broadband capacity deployment progress by area service providers, and update the Private Broadband Inventory section of the Feasibility Study previously delivered.
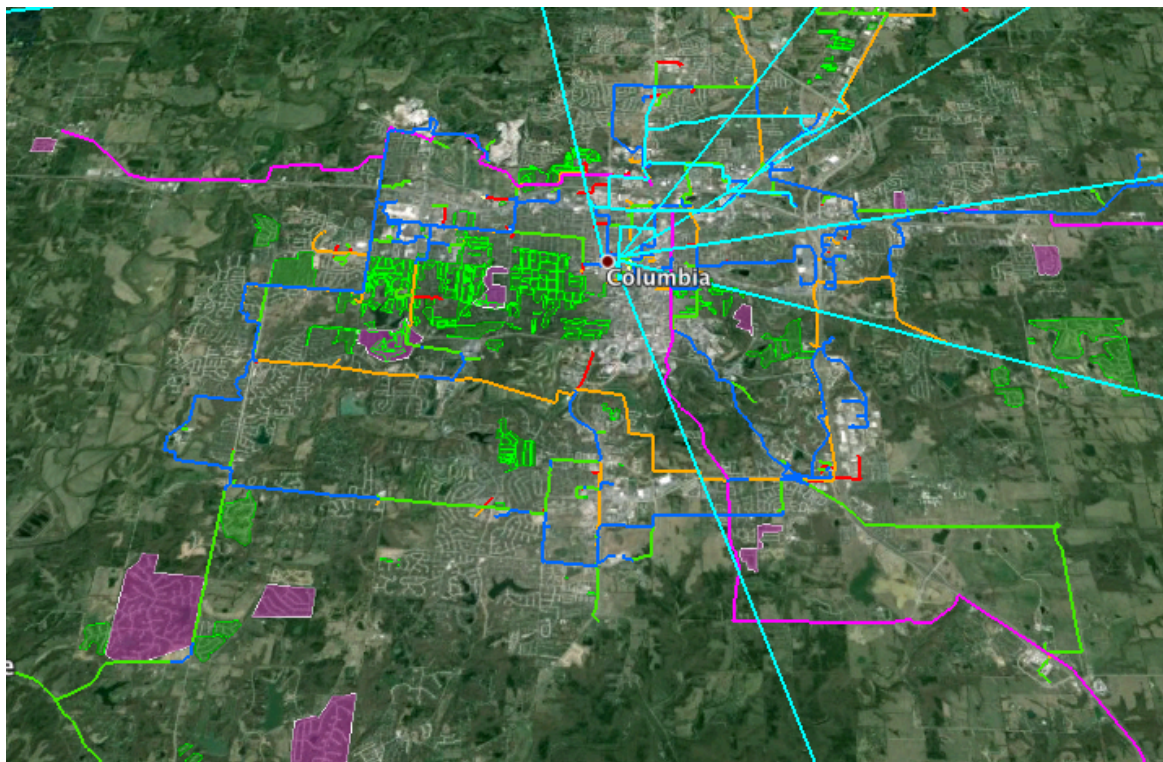
III. Updated Broadband Market Analysis

Magellan met with each identified provider to document the infrastructure changes that have occurred since the previous sets of meetings from the original Feasibility Study. The service provider discussions sought to document fiber infrastructure, facilities, data centers, and related infrastructure in Columbia to update how the community is being served with high-speed broadband Internet access today. In addition, we conducted field investigations to understand the extent of upgrades to the service providers' infrastructure.

Magellan Advisors' staff conducted field verifications in Columbia to determine the extent of the providers' ability to deliver fiber based gigabit services, as advertised. Spot checks were performed in areas that were identified by providers as fiber service areas to identify what technologies were being deployed. Structures such as equipment and splice cabinets, as well as specific fiber routes and supporting infrastructure assets were captured and documented.

These service provider meetings and field verifications allowed Magellan Advisors to evaluate the current state of broadband infrastructure in Columbia and to confirm that area providers are deploying fiber based services.

The broadband infrastructure in Columbia is composed of networks built by private companies such as the telephone and cable TV providers as well as the network built by the City's municipal electric and water utility, Columbia Water and Light (CW&L).

Figure 1: Fiber-optic Networks Within the City of Columbia (data provided)

Private Broadband Inventory

Several service providers own broadband infrastructure and provide retail services in the greater Columbia area. Magellan worked to obtain pricing and service details from the primary providers for Internet access for this update to the Study.
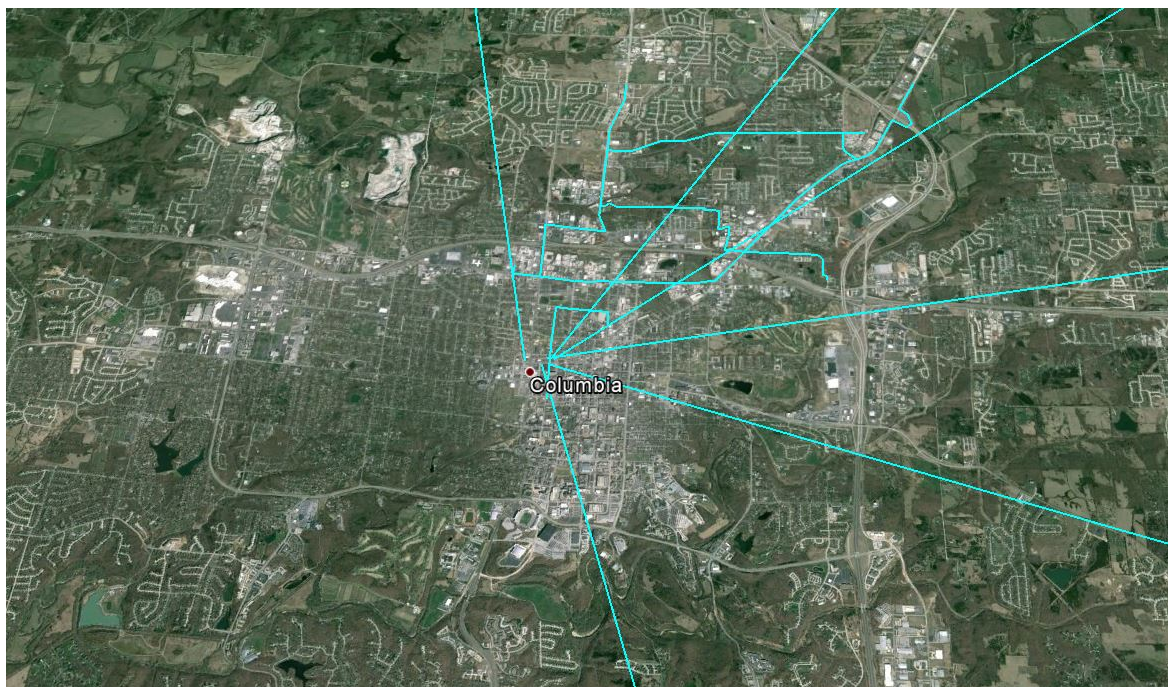
- Blue Bird Networks is headquartered in Columbia and operates extensive networks in Missouri and Illinois. Blue Bird Networks purchased the Spring Net Data Center located in Springfield, Missouri two years ago and has focused their growth in that area.

   Due to the right-of-way (ROW) fees charged by the City of Columbia, Blue Bird Networks is not investing in Columbia by building fiber segments, they are only leasing fiber. Blue Bird notes that ROW fees have not changed as there is a $1.91 per foot charge for ROW access for providers that do not offer telephone service. CW&L has made fiber strands available at competitive rates to Bluebird Networks.

   A program is in place which declares that if Bluebird pays to augment an area, all other providers can now use it, and pay for the usage. This has made it easier to work with the City. Bluebird likes the program, and has been able to sell services to several clients thanks to this cooperation with the City of Columbia.

A map depicting Blue Bird's broadband infrastructure was provided in support of this Study.

Figure 2: Blue Bird Network Fiber-Optic Diagram

- CenturyLink is the incumbent local exchange (LEC) provider holding certification from the Missouri Public Service Commission. The Columbia exchange was formerly owned and operated by General Telephone and Electronics Corp. (GT&E), which was later acquired by Verizon. As the incumbent LEC, CenturyLink provides both retail

services to consumers and wholesale services to other telecommunications providers.

CenturyLink reported that they are having issues getting to customers in currently developed areas and buildings. An example of this was the challenge getting services to NEWSY. CenturyLink had to lease dark fiber from the university to get into the building. All new subdivisions (greenfield opportunities) are being developed as FTTH capable, and new legacy copper deployments have been halted nationwide. CenturyLink reports that they are not utilizing much of the City's fiber network. CenturyLink stated that all existing aerial routes have been overbuilt with fiber – overbuild of aerial plant – and approximately 20% of the market has FTTH availability.
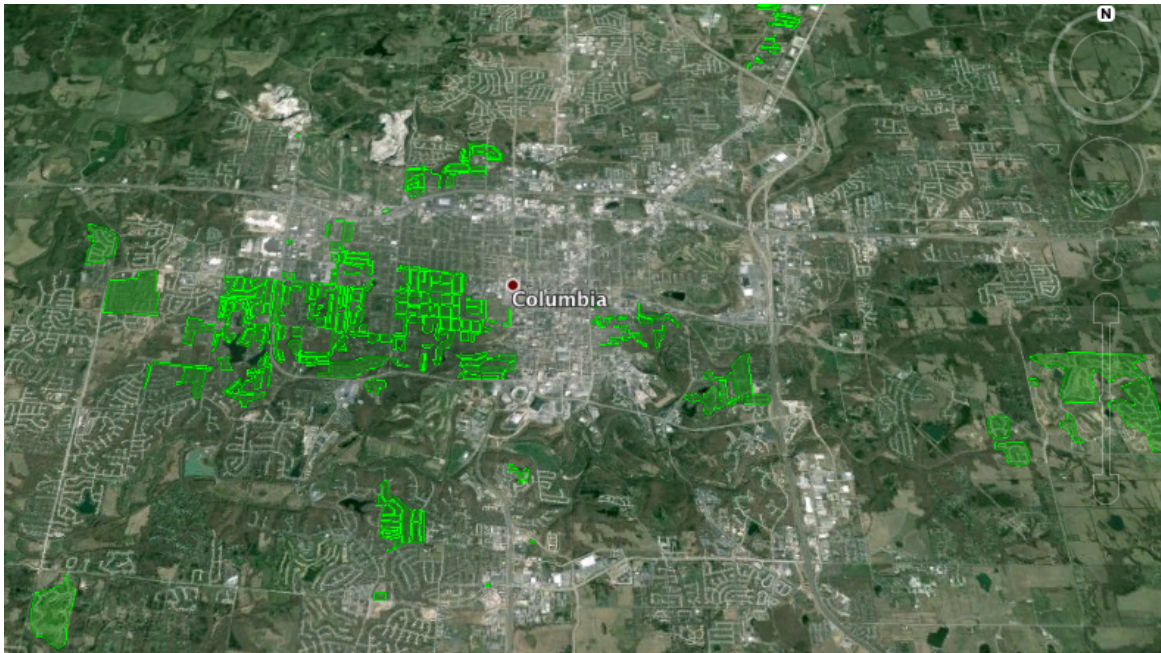
CenturyLink stated that all new subdivisions are deployed with FTTH – about a dozen new communities around town. CenturyLink reported that, "Dedicated fiber offerings are 100% available throughout Columbia. Getting access to customers – into buildings is the hardest part now." The statement regarding all new subdivisions being equipped with FTTH infrastructure is a consistent message Magellan heard across the industry with the exception of cable providers. Many LECs are deploying FTTH in greenfield deployments, however the overbuild of existing copper assets is much more strategic.

CenturyLink provided an updated scatter map showing customers and their contracted speeds on a map of Columbia. This is the same map provided in 2014, with updated customer data. When CenturyLink's customer map is analyzed and compared to previous versions, it is apparent that CenturyLink is providing Gigabit speed offerings in pockets of the City, namely around the outskirts where new neighborhoods have been developed and largely to the west of Downtown.

A map depicting CenturyLink's broadband infrastructure has been requested but was not provided. Instead, CenturyLink provided a scatter map showing customers throughout Columbia with the type of service offering depicted per customer. Magellan utilized the map provided by CenturyLink to map its current Gigabit offerings as displayed below in Figure 3.

Figure 3: CenturyLink current Gigabit service offering in Columbia

- **Charter Communications (Spectrum Business)** is a cable telecommunications provider serving Columbia and Boone County. The "New Charter" or Spectrum results from the recently consummated merger of Charter Communications, Time Warner Cable, and Brighthouse Networks. Charter has major fiber connectivity in the area while coaxial services are available on the outer rings of the City. Charter leases fiber strands from CW&L using the City's standard lease agreement.

  Charter mentioned "The City of Columbia downtown is challenging and cost prohibitive – very expensive to build." Spectrum is willing to lease dark fiber or conduit space if available.
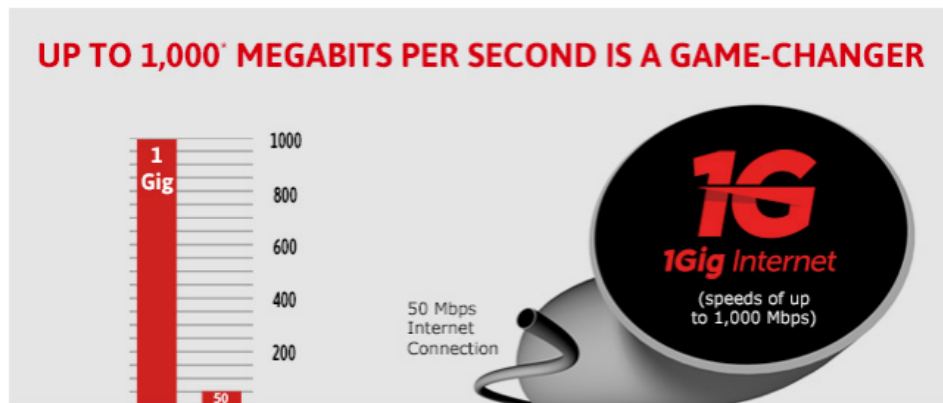
  Furthermore, it was also mentioned that ROW and permitting have been troublesome with the City, this has been an ongoing issue. "Management has told us to not focus on downtown Columbia." The City should identify these potential issues and determine if municipal requirements and codes are disincentivizing further investment.

  Charter and its recently acquired partners are in a state of flux right now as many management and organizational changes are occurring. This is likely to continue for several months.

  A map depicting Charter Communications broadband infrastructure has been requested but was not provided.

- Mediacom is the incumbent cable telecommunications provider serving Columbia. Mediacom serves the area south of I-70, north of the City, and is now advertising gigabit service to many areas of Columbia. MediaCom recently announced a $1 billion investment to expand 1 Gbps throughout all markets. They are currently providing 1Gps on DOCSIS 3.0 and are working to upgrade markets to DOCSIS 3.1. They recently brought completed 100 Gbps redundant fiber connections out of Columbia to Jefferson City.

Figure 4: Mediacom one gigabit (1Gig Interet) service offering

Mediacom mentioned that Missouri is the largest commercial market for Mediacom. Springfield is the top market, followed by Columbia. Mediacom reports that they have launched the 1 Gbps offering to all customers but the market research and validation did not reveal this to be the case. The Medicom representative mentioned "1,000Mbps/50 offering with 1 Tb data cap was launched in Sept 2015 and $149.95 a month is the price for a new customer." Calls to Mediacom sales revealed that 100Mbps/10Mbps was the fastest available speed to several residential addresses at a promotional rate of $49.99 a month. While gigabit offerings are available to many addresses in Columbia, it is not yet citywide as advertised. Documentation of the availability is noted below in the market analysis validation section.

Mediacom says there are no plans for fiber distribution, their 1 Gbps offering is delivered over copper. There are many areas of the City where MediaCom doesn't offer service such as in new residential communities. It was noted that it's a business case decision, and that they average 30% take rates. Even in greenfield deployments, MediaCom is not deploying fiber-optics, coaxial cable is the offering. Mediacom is evaluating community partnership options to deploy Wi-Fi services, and Columbia/Jeff City is one of the finalists (out of four). Mediacom reported operating a redundant 100 Gbps ring in Columbia/Jeff City.

A map depicting Mediacom broadband infrastructure has been requested but was not provided.

- Sho-Me Technologies provides fiber-optic networking throughout central and southern Missouri using both leased and owned fiber-optic facilities including fiber strands leased from CW&L and dark fiber from Fiber Path.
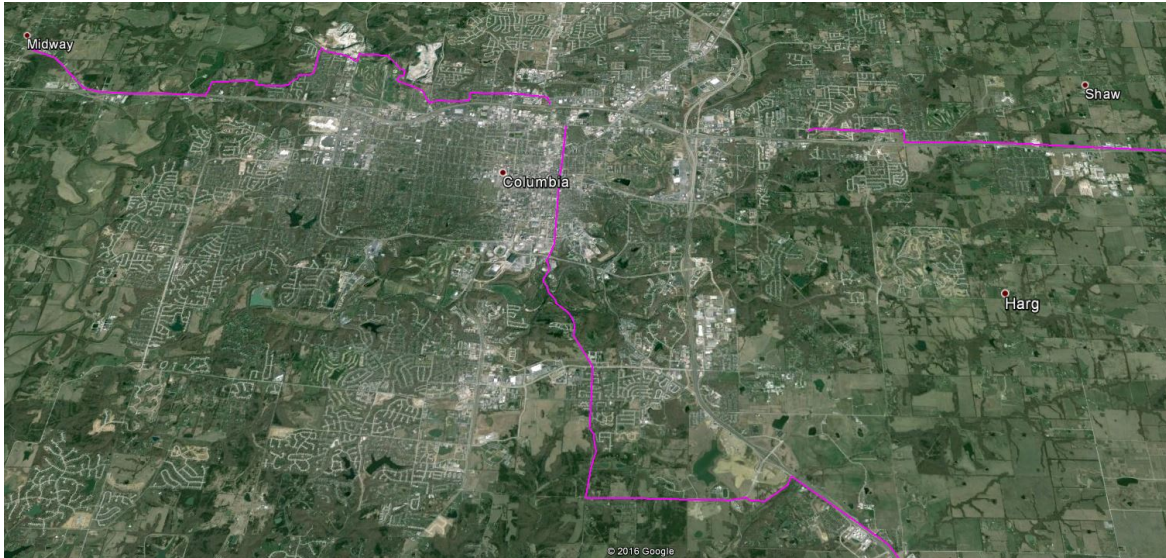
Sho-Me does not provide end-user services to residences, instead focusing on providing wholesale services and services to businesses such as Ethernet wide area

networks, point-to-point connections, dedicated Internet access, disaster recovery services, and other business-to-business and capacity services.

During our meeting with Sho-Me, it was communicated that Sho-Me's infrastructure has changed little since the previous report.

A map depicting Sho-Me Technologies broadband infrastructure was provided in support of this update to the Study and is shown below.

Figure 5: Sho-Me Network Fiber-Optic Diagram

- Socket Telecom is a local telecommunications company that was established in 1994. Socket Telecom has a colocation facility at 6th and Cherry in Columbia. Socket has been using a fiberhood model to identify areas of the City to build FTTH and has been deploying fiber last-mile using GPON and Active Ethernet services. Socket reported that the cost to build to customers in the downtown area is cost-prohibitive. It was recommended by Socket that assistance be provided from the City to get legal access across properties. Currently there are issues getting to clients in the downtown area that would require having to bore down an alleyway.
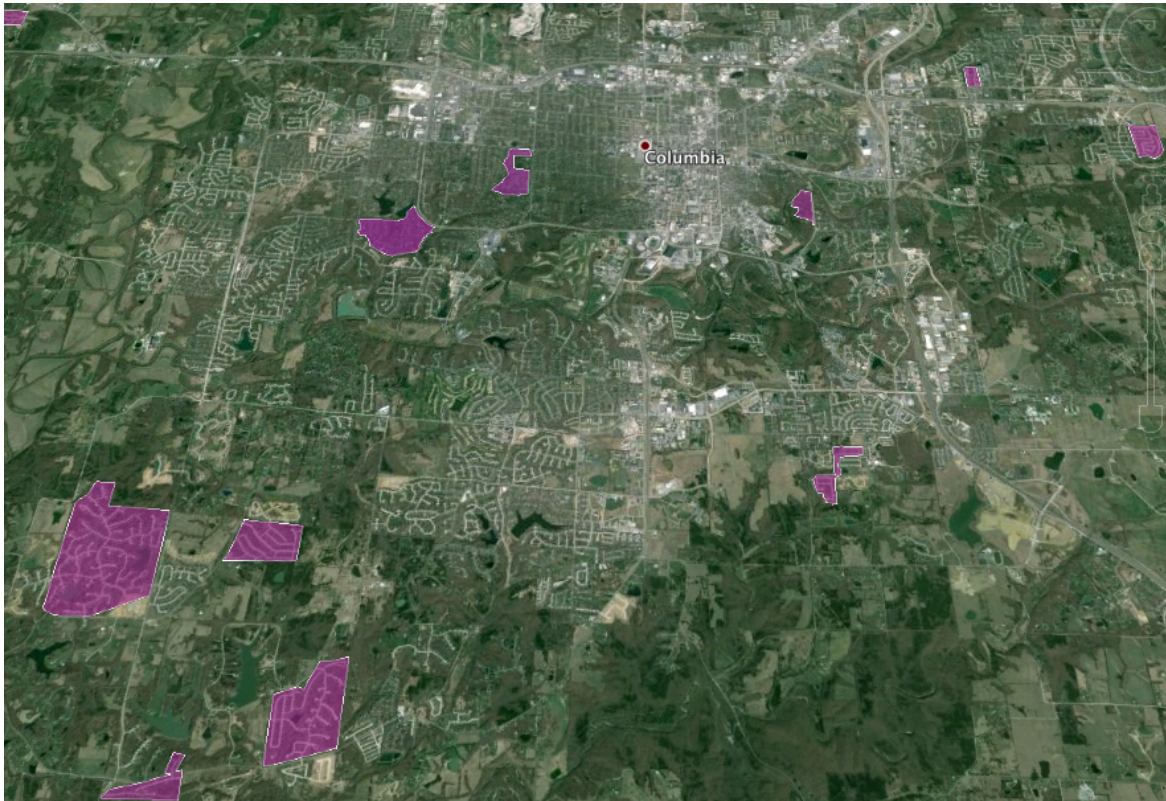
The City has streamlined the process to work to get pole permits, but not build new poles. Other utilities, such as Boon Electric, have built new poles, but Socket has not been successful. Socket provided a recent example where they were attempting to build "over a creek by I-70" and were denied.

A map depicting Socket's broadband infrastructure has been requested but was not provided, however it should be noted that Socket is rolling out FTTH services using a "fiberhood" demand aggregation deployment method. Socket's portal allows residential customers to place a deposit and contract for fiber services. Once the neighborhood, or "fiberhood," reaches a predetermined take-rate (uptake) then Socket will construct the network and provide the service. Socket has reported buildouts in several neighborhoods and continues to have new subscribers place deposits for service.

Figure 6: Socket "Columbia Fiberhood" marketing image

Figure 7: Socket fiberhood service areas

Market Analysis Verification

To verify actual services and pricing, our team randomly selected 10 residential and 10 commercial addresses scattered throughout the City of Columbia. Retail providers were contacted and available services and costs were requested for all locations. This process allows us to analyze what is being advertised throughout the community and online, vs. what actual subscribers are offered when they request service. For instance, one of the cable companies that serves Columbia advertises on a billboard as you enter Columbia, that Gigabit speeds are available throughout the City. However, when services and pricing are requested at these random locations, the gigabit offering was only available in a few areas, and had to be specifically inquired about. This issue is typical, where services are advertised in a specific community, however they are only offered in "select" areas.

Residential Market Analysis

Residential services available in Columbia include Fiber-to-the-Home (FTTH), cable, and DSL. There are multiple FTTH providers, although there is minimal direct competition between them. In addition, as noted below at 3604 Atwood Ct., the highest offered speed by CenturyLink is 10 Mbps/786 Kbps, speeds not meeting the FCC designated threshold of 25 Mbps/4 Mbps to be considered broadband.

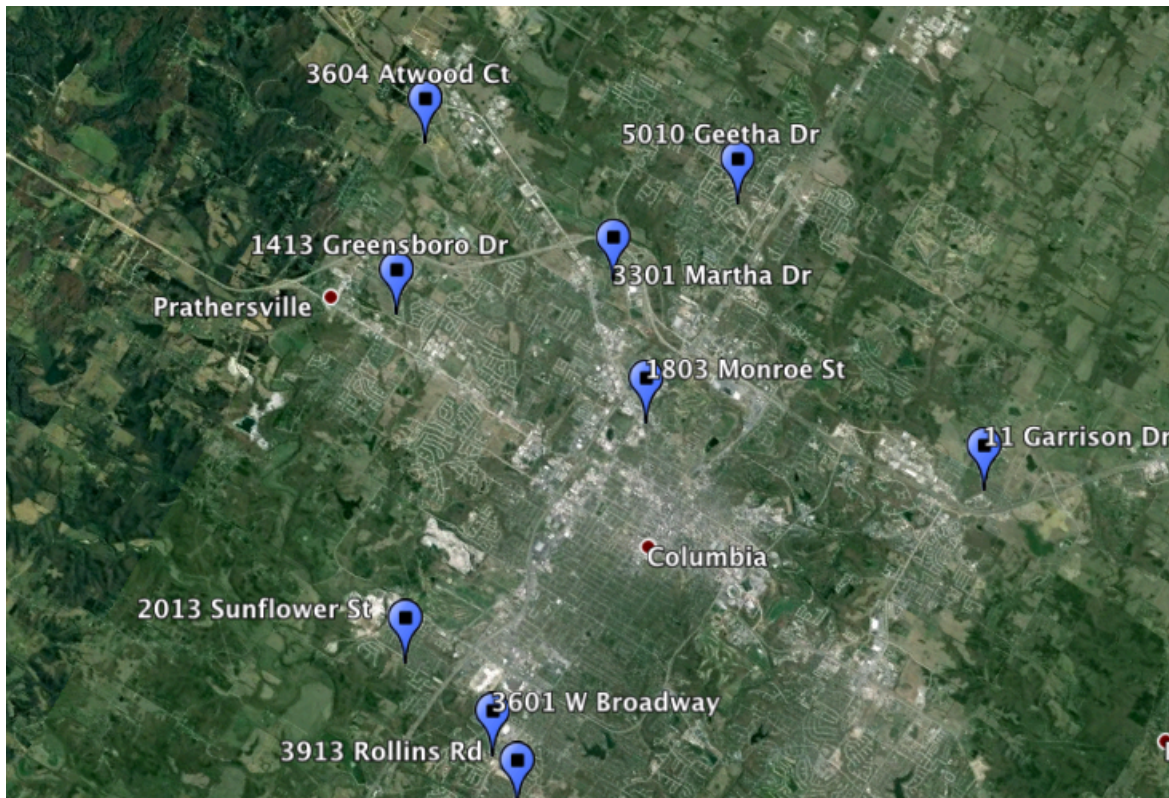*Figure 8: City of Columbia Residential Addresses*

Figure 9: City of Columbia Residential Market Analysis

Site Location	CenturyLink	Mediacom	Charter	Socket	Bluebird
3604 Atwood Ct.	10Mb/768Kb $34.95/mo. 1-year contract	100Mb/10Mb $69.99/mo. 1 year contract	Not Serviced	Premium Dial-up	Dial-up
3301 Martha Dr.	25Mb/2Mb $73.95/mo. 1-year contract	100Mb/10Mb $69.99/mo. 1 year contract	Not Serviced	6Mb/512Kb $40/mo. No contract	No Services/Pricing Provided
5010 Geetha Dr.	10Mb/768Kb $34.95/mo. 1-year contract	1Gb/30Mb $149.99/mo. No contract	Not Serviced	3Mb/512Kb $40/mo. No contract	No Services/Pricing Provided
11 Garrison Dr.	10Mb/768Kb $34.95/mo. 1-year contract	1Gb/30Mb $149.99/mo. No contract	Not Serviced	10Mb/1Mb $50/mo. No contract	No Services/Pricing Provided
1803 Monroe St.	25Mb/2Mb $73.95/mo. 1-year contract	100Mb/10Mb $69.99/mo. 1 year contract	Not Serviced	12Mb/1Mb $50/mo. No contract	No Services/Pricing Provided
1413 Greensboro Dr.	10Mb/768Kb $34.95/mo. 1-year contract	Not Serviced	100Mb/5Mb $99.99/mo. 1 year contract	Premium Dial-up	No Services/Pricing Provided
2013 Sunflower St. Apt A.	Not Serviced	100Mb/10Mb $69.99/mo. 1 year contract	Not Serviced	Premium Dial-up	No Services/Pricing Provided
3601 W. Broadway	40Mb/5Mb $73.95/mo. 1-year contract	1Gb/30Mb $149.99/mo. No contract	Not Serviced	12Mb/1Mb $50/mo. No contract	No Services/Pricing Provided
4907 Silver Cliff Dr.	20Mb/2Mb (Fiber-Optic) $76.90/mo. 1-year contract	1Gb/30Mb $149.99/mo. No contract	Not Serviced	Premium Dial-up	No Services/Pricing Provided
3913 Rollins Rd.	1Gb/1Gb $104.95/mo. 2-year contract	100Mb/10Mb $69.99/mo. 1 year contract	Not Serviced	12Mb/1Mb $50/mo. No contract	No Services/Pricing Provided

Commercial Market Analysis

Business or Enterprise connections are readily available throughout Columbia, although access and cost are many times prohibitive. Large organizations or community anchors typically have the means to contract for dedicated fiber services. However, for Columbia's small to medium sized businesses, fiber services are not readily available, especially in areas like downtown.

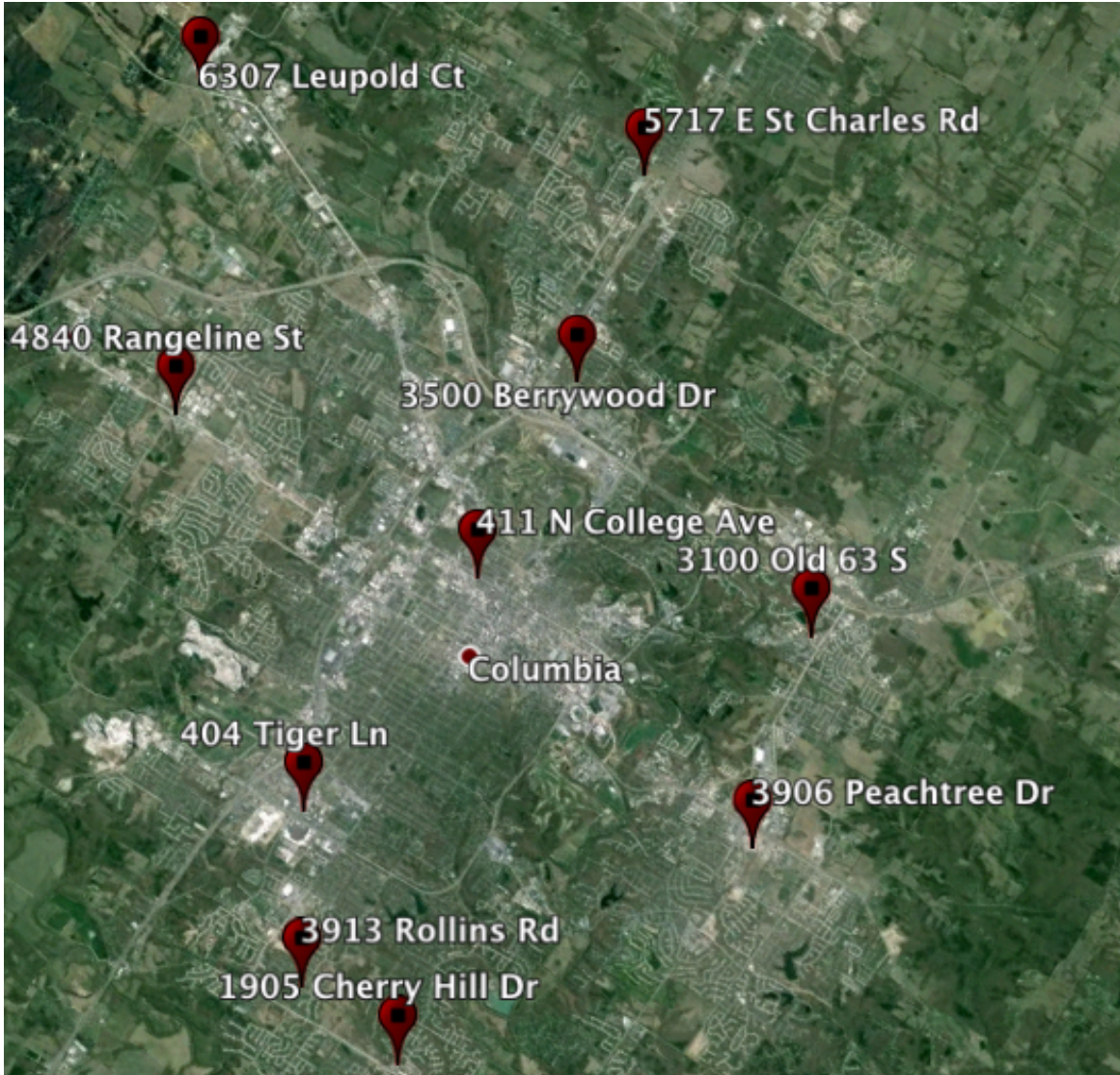*Figure 10: City of Columbia Commercial Addresses*

Figure 11: City of Columbia Commercial Market Analysis

Site Location	CenturyLink	Mediacom	Charter	Socket	Bluebird
404 Tiger Ln.	10Mb/1.5Mb $71.95 2-year contract	1Gb Fiber $2,500/mo. 5-year contract	Not Serviced	1Gb Fiber $2,600/mo. 3-year contract	No Services/Pricing Provided
5717 E St. Charles Rd.	40Mb/5Mb $84.99 2-year contract	250Mb/20Mb $349.95 3-year contract	Not Serviced	1Gb Fiber $2,600/mo. 3-year contract	No Services/Pricing Provided
3500 Berrywood Dr.	10Mb/1.5Mb $71.95 2-year contract	250Mb/20Mb $349.95 3-year contract	Not Serviced	1Gb Fiber $2,600/mo. 3-year contract	No Services/Pricing Provided
411 N College Ave.	1Gb/1Gb $254.99 2-year contract	250Mb/20Mb $349.95 3-year contract	Not Serviced	1Gb Fiber $2,600/mo. 3-year contract	No Services/Pricing Provided
1905 Cherry Hill Dr.	30Mb/2.5Mb $84.99 2-year contract	250Mb/20Mb $349.95 3-year contract	Not Serviced	1Gb Fiber $2,600/mo. 3-year contract	No Services/Pricing Provided
3100 S Old Hwy 63	30Mb/2.5Mb $106.95 2-year contract	Not Serviced	Not Serviced	1Gb Fiber $2,600/mo. 3-year contract	No Services/Pricing Provided
3906 Peachtree Dr.	25Mb/2Mb $106.95 2-year contract	250Mb/20Mb $349.95 3-year contract	Not Serviced	1Gb Fiber $2,600/mo. 3-year contract	No Services/Pricing Provided
6307 Leupold Ct.	10Mb/1.5Mb $71.95 2-year contract	Not Serviced	Not Serviced	1Gb Fiber $2,600/mo. 3-year contract	No Services/Pricing Provided
4840 N Rangeline St.	30Mb/2.5Mb $106.95 2-year contract	Not Serviced	Not Serviced	1Gb Fiber $2,600/mo. 3-year contract	No Services/Pricing Provided
4105 W Vawter School Rd.	25Mb/2Mb $106.95 2-year contract	1Gb Fiber $2,700/mo. 5-year contract	Not Serviced	1Gb Fiber $2,600/mo. 3-year contract	No Services/Pricing Provided

IV. Conclusion

While there have been significant increases in high-speed Internet in some areas of the City, there are still areas that are experiencing issues with availability. The majority of the FTTH offerings seems to be limited to outlying areas and new developments, with a large cluster to the west of downtown.

The field verification checks that were performed support the conclusion that there have been improvements of residential services but accessing clients in the downtown area continues to be a challenge for providers. This challenge is not unique to Columbia, as many downtown or urban areas can be challenging from a construction and restoration perspective. Costs to build in these areas are simply far greater due to the challenges of downtown infrastructure, roadways, and buildings. Columbia should identify opportunities to continue building infrastructure in the downtown area, either directly, or collaboratively with area providers.

Customers are receiving more bandwidth now due to incremental upgrades and new deployments. These increases have been across the board. Gaining access to the downtown area has been deemed too costly for providers and the fees and restrictions imposed by the City are viewed by service providers as cost prohibitive. ROW and permitting fees remain a point of contention with service providers, who stated that this has forced them to focus on areas outside of downtown Columbia.

Providers have expressed willingness to partner with the City to expand opportunities into problematic service areas. The City should evaluate the current process and associated fees required to access these areas and identify areas for improvement. A common suggestion from providers for the City was to take a portion of the money from fiber revenues and turn them into grant dollars for further deployment, a concept that would ultimately assist the providers in building out their assets and networks. The City could consider adding additional conduit and fiber capacity in downtown routes, making this new capacity available to private providers, while the City maintains long-term ownership of the assets.

The City and CW&L should develop a Broadband Business Plan that will outline how to move forward in creating the opportunities that make the most impact for business and residents in Columbia. The Plan should specifically focus on the downtown core, as it still continues to be the area that service providers have had the most difficulty expanding their services in, and provides a density of both businesses and residents. A Broadband Business Plan will provide the key strategies for the City to organize, implement, and manage any existing or proposed broadband infrastructure assets that it may own.

In closing, the City of Columbia and the Columbia fiber network have a role to play in expanding ubiquitous, readily available, high-speed broadband. It should continue to use smart public policy where possible and should seek opportunities to build new infrastructure.

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