

# Los Ranchos Master Plan

Public Meeting - Dec 4, 2018

~ Discussion Notes ~

## Subtopic: Telecommunications / Data Communications (Broadband), and “Smart Municipalities”

### General Comments

- “Broadband Services” are a key data communication topic to be discussed in the Master Plan(MP). Even cellular, while we think of it as “voice,” is now a data communication service.
- Virtually all service providers in the Village, wired and wireless, provide inconsistent coverage and varying service offerings across the topology of the Village. The reasons being: infrastructure limitations and the lack of economic incentive (subscription base/population density) to expand their “most capable” infrastructure into all areas.
- Xfinity (Comcast) currently has a monopolistic hold in parts of Los Ranchos for “realistically acceptable” broadband. Specifically, along the less dense corridors where CenturyLink has more or less ceded to Xfinity by not running the requisite Fiber backhaul to the twisted pair head-end boxes that serve sparsely populated neighborhoods.
- Fiber optic backhauls (CenturyLink/MCI) enabling 5G (multiple providers) will play an expanding role going forward. Cable (Xfinity) will remain competitive as DSL (CenturyLink) technology will likely see a reduced role in the Village.
- Point-to-Multipoint WiMAX Broadband exists over parts of Los Ranchos but local uptake, reliability, and value make this an uncertain competitor going forward. Roadrunner Wireless is one such local example.
- Home/Office based 802.xx Wifi will continue to play a role in local network service in those environments. It will evolve, become more robust, and it may take on some local role in “Internet Of Things (IOT)” communication alongside Zigbee, Z-wave, and 5G protocols. 5G will not likely replace common use of Home/Office WiFi within the MPP.
- TV Aside: Local Over-The-Air (OTA) television programming is available to all residents with home antennas pulling broadcasts from antennas on Sandia Crest. Xfinity offers cable TV in Los Ranchos as well as CenturyLink though their Direct TV satellite offering. DISH TV is also available via satellite.

### Fiber Optic based Broadband (Various Providers)

- FTTH (Fiber to the Home) is proving very costly and overkill for most households where deployed around the country. Cable based broadband, 5G, and the highest speed evolutions of DSL will continue to be adequate for most homes through the MPP.
- FTTP (Fiber to the Premise) for “commercial” (retail, medical, educational, technical, professional, etc.) IS a critical and essential part of **building a desirable corridor** for these activities in Los Ranchos through the MPP.
- FTT5G (Fiber to the 5G) or so called “deep fiber” will also be important for backhauls as and when a 5G build-out occurs. (Fiber already runs to all 4G/LTE towers servicing Los Ranchos.)

<https://www.cablinginstall.com/articles/print/volume-26/issue-7/features/design/the-role-of-fiber-in-5g-networks.html>

- Fiber to ALL CenturyLink field huts/units “serving the last mile” of DSL service would help the competitive environment for broadband in the Village in the near term.
- The adage “laying empty conduit is cheap insurance” should be a Village mindset. When streets are torn up and disruptions are already being endured is the time for forward thinking. No, fiber doesn’t have to be run everywhere immediately, but we should encourage taking “prep steps” for it when and where it makes sense.
- Lastly, the MP should address kindling public and private partnerships at municipal, state, educational, and even federal levels that could benefit our “semi-rural” broadband effort through combined initiatives, cost sharing, and grants. This is mentioned here because fiber optic backbones are the *enablers* of all our communications technologies and, since the very early days of the internet, public-private partnering around a common network infrastructure has been KEY to the data communications revolution we’ve experienced.

### **Coaxial Cable based Broadband (Xfinity/Comcast)**

- Currently the market leader in broadband for Los Ranchos residential use. Their broadband offerings are fully adequate for residential and small business use in most, if not all, of Los Ranchos. While the original franchise agreement might not have foreseen this evolution, it is now the case that Xfinity now operates much like a broadband monopoly within our Village.
- Xfinity will continue to advance their cable technology and this is currently only surpassed by the capabilities of fiber, although 5G could bring competitive challenges.
- Xfinity bundles a complete set of digital subscription services - voice, data, TV, security, local Wifi, and home automation. Some rumors suggest they might also try to enter the 5G space.

### **Twisted Pair DSL based broadband (CenturyLink, and resold by others)**

- CenturyLink owns the infrastructure that carries land line service over twisted pair wires to Los Ranchos.
- This same infrastructure also carries various permutations of DSL (Digital Subscriber Line) broadband service. Depending on the condition of the local wire plant and proximity of fiber backhaul infrastructure at the neighborhood/commercial zone CenturyLink IS able to deliver adequate broadband service in Los Ranchos. However, CenturyLink has resisted deploying the necessary field upgrades to bring “adequate broadband” to all Los Ranchos neighborhoods.
- Technologically “the best DSL” offerings are adequate where available, but long term it will not likely be able to remain competitive with Cable (DOCSIS) broadband, Fiber, or the best of 5G broadband. Most telcos that based their broadband business models on DSL are teeing up for 5G as their “last mile - Plan B” to compete with cable.
- CenturyLink DSL *could* be a relevant competitor in the near term, but as mentioned they just aren’t delivering in many parts of the Village. With the advent of 5G fixed broadband CenturyLink will likely take a “home broadband” back seat to national wireless players like Verizon, AT&T, and T-Mobile.
- With mounting competitive pressure from Xfinity on one side and national players on the other CenturyLink COULD become a more accommodating partner with the Village. Specifically in a build-out of Fiber backbone/infrastructure down important corridors, ironically all the 5G providers will need the fiber infrastructure.

## 5G – The next step in cellular communications, and it’s a big one...for the industry and for consumers.

- See attached section: “Just how many 5G cell locations might Los Ranchos require for full coverage?”
- Be aware of the marketing around 5G. Not every carrier’s 5G is going to initially come out using the most capable frequencies. T-Mobile for example is currently deploying 600mHz band antennas for 5G. These will have good range due to the lower frequency but they *will not* deliver the speed and data capacity that “5G over mmWave” (gHz band) is setting high expectations with in the media. (*Deployment strategy - “a lesser capable 5G” but lower frequency means higher range, fewer cell antennas, and faster deployment.*)
- **Technical advantages aside**, some possible questions around 5G involve:
  - Do we actually want (want to do) what it takes to get 5G (from an infrastructure standpoint, i.e. miles of “deep fiber”, basically meaning “fiber to the 5G” throughout our neighborhoods)?
  - Do we actually want the small, pole mounted, antennas and associated ground level power & fiber connection boxes within sight everywhere across the Village (even if disguised/camouflaged)?
  - Does the Village get to choose whether or not it wants 5G or fiber?
  - Should we be proactive in developing a plan for implementing 5G, coordinating with other cities, county and utility providers and evaluating franchise agreements?
  - Can we force infrastructure sharing between providers to minimize footprint & deployment disruption?
  - Are we going to prepare or incentivize to get 5G sooner and/or smoother, i.e.
    - Address 5G infrastructure (pole sharing etc.) in our franchise agreement with PNM now
    - Invite backhaul providers to start getting fiber (even dark fiber, or empty conduit) down certain corridors, commercial or otherwise,
    - Do a study or 5G “ballpark plan” to understand enough to know how we’d like to see it deployed and to know enough to “sort through the chaff” as providers table their proposals
    - Craft an appropriate permitting process with all our Village interests covered BEFORE providers show up and initiate the federally imposed “150 Day Stop Clock” for approvals

### “Mis-Communications”

*Viewscapes, Wires, Wireless (RF/EMF), and things that fly in Los Ranchos*

- Of importance to Los Ranchos is our viewscapes; obtrusive wires crossing or adjacent to private land tracts and public open spaces can be counter to any “low impact” objectives.
- Of importance to Los Ranchos, and the Albuquerque Metro as a whole, is being a welcoming venue for ballooning; wires crossing or adjacent to large private land tracts and public open spaces reduce options and pose landing risks for balloonists.
- Of importance to Los Ranchos, and the whole Middle Rio Grande Region, is being a safe refuge for flocks of large migrating birds; wires crossing or adjacent to large private land tracts and public open spaces pose flight and landing risks.

### “Smart Municipalities”

- There is a lot of “industry vibe” on this topic. However, it is worth noting that not all “smart” projects have evolved to be as cost advantageous as they could be. Many applications are often “silo-ed” solutions wherein the agencies/utilities/entities involved have not thought beyond their own walls (or the project at hand) to create the kind of “coordinated solution” that would piggy-back infrastructure and greatly benefit users of public or utility services at a reduced cost.

Case in point, the recent situation in some large cities today: multiple devices in the field talking different protocols, to different antennas/radios, atop different poles on the same street, connected to different backbone infrastructure trenched at different times down said street, talking to different servers, with different support staff that at the end of the day are all just running the same kind of system for pretty much the same kind of data.

To be fair, much of the problem in big cities is a consequence of hard to break silo mentalities, differing agendas/priorities/funding, and the state of various technologies. Going forward we can and should challenge every entity that operates *in and through* the Village to do things better for our citizenry.

- It would be in our interest to engage folks in the circles of systems & network planning at PNM, ABCWUA SEWER & WATER, and BERNCO PUBLIC SAFETY (i.e. traffic control, sensors, & cameras, shot triangulation equipment, etc.) in order to coordinate around a goal of co-locating or even co-deploying utility and municipal data communications infrastructure. This includes coordinating service providers for build outs of both fiber and 5G (we should shoot for a goal of “dig/drill once” and sharing conduit bundles, backhauls, and poles).

Such efforts could minimize unnecessary duplication of infrastructure and repeated disruptions involving utility SCADA/IOT expansions, antenna/radio platforms, traffic flow & control, streets, and subsurface utility paths within the Village. Each entity should not have to “roll their own at all levels” like might have been the case in the past. Cost effective municipal projects, security, and redundancy should be a common goal, not an excuse to “go it alone”.

- What about Los Ranchos being a test bed for system trials? Our small population and small municipal footprint combined with a *willingness to improve and operate with more environmental consciousness* might make us a prime candidate for trials involving anything “Smart”. PNM is currently surveying electricity customers regarding interest in “time-of-use utility rates”. The best practice for this involves deploying Smartmeters to track usage on 15 minute intervals such that your billing would more closely reflect the actual peak/off-peak pricing cycle of commodity electricity. Maybe we could *put it out there* that, as a Village, we are willing to try programs that are well planned, stable, and “just need a little tweaking”.
- As an aside: The whole “SmartCity” thing, and having a “robust + resilient broadband infrastructure”, is gaining ground in Albuquerque.

Quote: “While bound to franchise agreements to their providers, the city has expanded their technological portfolio all while making steps towards establishing a municipal fiber network and planning around future disruptions. “We’re not just chasing tech for tech’s sake,” Ambs said. “We’re looking at a whole new level of connectivity for the city.”-

<https://www.smartresilient.com/albuquerque-shows-municipal-broadband-smart-city-necessity>

## Just how many 5G cell locations might Los Ranchos require for full coverage?

*From a back-of-the-envelope calculation, even with conservative assumptions, ..."a lot"*

- If you "straight line" the rough edges & peninsulas of the boundary of Los Ranchos and calculate the area you end up with approximately 2600 sq acres. *This is lower than the actual but good enough to get an idea of scale.*
- The best 5G implementations (in terms of data rates and capacities) will be achieved over millimeter wave (mmWave) high-bandwidth wavelengths (i.e. 28GHz). This frequency does not travel far nor well through buildings or trees. Field trials to date suggest a 200-250 meter range as a reasonable industry expectation (some tests have shown 500m in favorable conditions, i.e. line-of-sight). Let's say 250m is the range (radius) but then let's scale that back to 200m to account for cells overlapping to insure full coverage and the fastest rates at the intersection of circles. *A lot of ballpark hand waving here.*
- So a circle with a 200m radius (400m diameter) encompasses just over 31 acres of land. *Converted to acres for familiarity.* Taking this through a *significant simplification* of what is required to analyze cell antenna deployment: **2600 sq ac / 31 sq ac per antenna = 84 cells**  
*Not modeling for population density, topography, open fields/line-of-sight, trees, buildings, equipment, other factors.*
- Even if this number is off +/-25% , the point is to contrast a 5G antenna deployment to the comparably sparse 4G/LTE towers people are familiar with. While 5G antennas are small in comparison, they are "on your street" numerous in comparison.
- **And the number of 5G cell antennas is only part of the story.** Among other things is having the appropriate utility poles, power, and most importantly... a fiber optic backhaul (*yes, to each antenna site!*)! With the possibility of miles of fiber to be run across the Village one can see a 5G project is a whole lot more involved than just placing antennas.

## Articles on various aspects of 5G

Addressing what we can expect from the technology, and the issues related to deployment, within the Master Plan Period (MPP). Implications on how we might plan, facilitate, and try to manage deployment as-when-and-where it makes sense.

<https://www.forbes.com/sites/washingtonbytes/2017/09/22/the-dawn-of-5g-will-wireless-kill-the-broadband-star/>

*"We explore the state of U.S. broadband competition and the likely impact of the fifth-generation ("5G") wireless technologies. Should cable companies be scared, and if so, how long will it take 5G to upset the competitive balance?"*

[http://www.bbcmag.com/2017mags/Mar\\_Apr/BBC\\_Mar17\\_5GNotAnswer.pdf](http://www.bbcmag.com/2017mags/Mar_Apr/BBC_Mar17_5GNotAnswer.pdf)

A pessimistic White Paper on 5G for rural applications. It was likely funded by "cable" as some of the technical assumptions are overly conservative to what cell providers have since substantiated in 5G test trials. Nonetheless valid points are made, not the least which is the challenges to deploying 5G infrastructure through a semi-rural municipality. The applicable aspect of "rural" in this case is not the "distance away from a large metro" but rather the rural layout, distances, low population density, and availability of existing infrastructure to "piggy back" (e.g. Fiber backhauls).

<https://www.cablinginstall.com/articles/print/volume-26/issue-7/features/design/the-role-of-fiber-in-5g-networks.html>

A good diagrammatic explanation of some of the infrastructure necessary for 5G

<https://www.zdnet.com/article/wiring-for-wireless-5g-and-the-tower-in-your-backyard/>

*"On a pleasant afternoon in early January 2018, at City Hall in Shreveport, Louisiana, a few dozen folks gathered to discuss the implications of a radical new infrastructure project. It would impact the landscape so distinctly that anyone standing within the city's boundaries, looking in any direction, would have to make an effort not to notice something peculiar."*

<https://www.verizon.com/about/news/one-touch-make-ready-taking-pole-position>

5G infrastructure deployment challenges & opportunities from a provider's standpoint. *"It can take six months to a year – and piles of paperwork – to put new broadband equipment on a utility pole."*

<https://www.nytimes.com/2018/03/02/technology/5g-cellular-service.html>

*"The future of cellular service is coming to a neighborhood near you. But who gets to decide when, where and how it gets delivered is still a heated fight."*