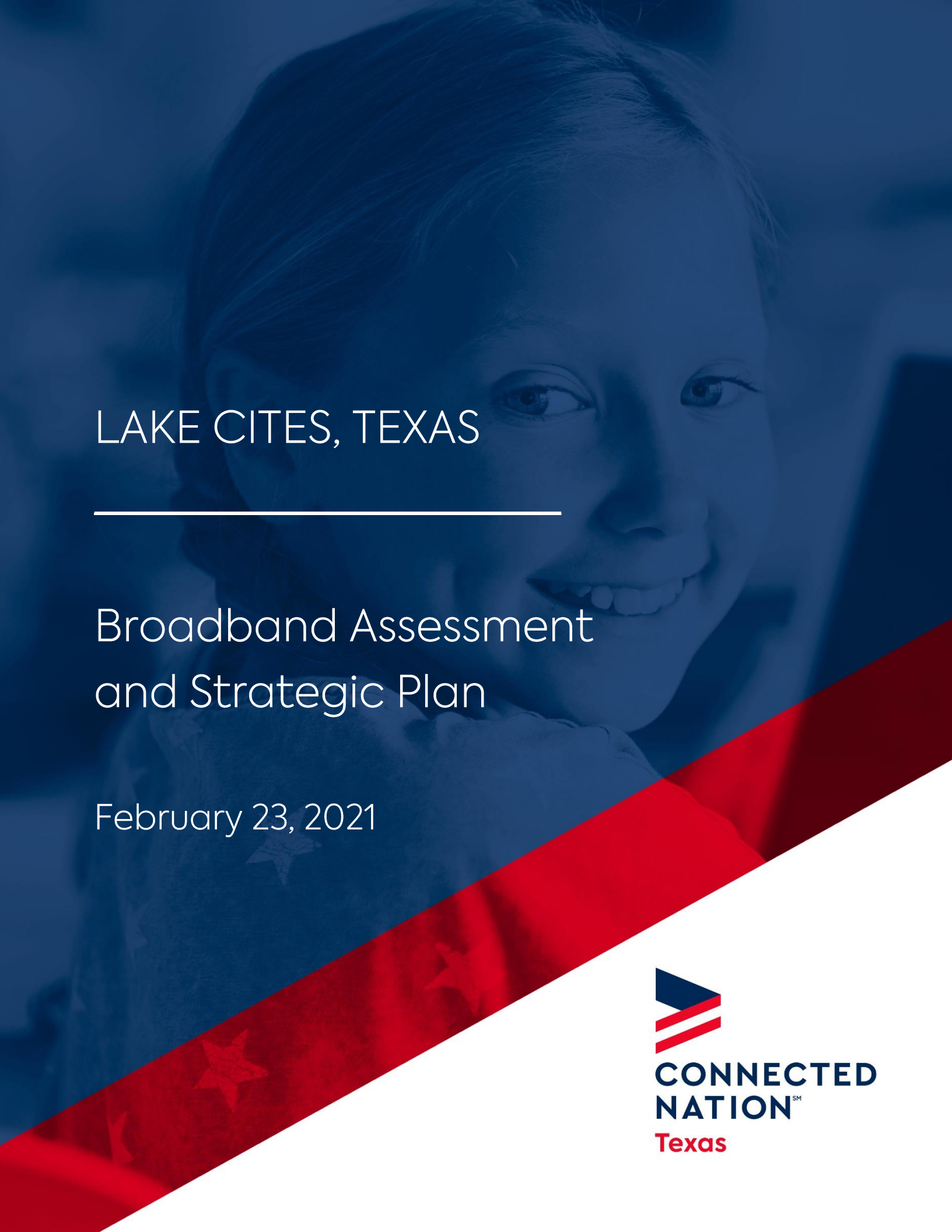


LAKE CITES, TEXAS

Broadband Assessment and Strategic Plan

February 23, 2021

CONNECTED NATION℠
Texas

Executive Summary

The vision of the Lake Cities Broadband Committee (the Committee) is to ensure their communities have access to sufficient broadband infrastructure and that no local citizen be left offline. This vision can only be realized by understanding the existing broadband landscape in each of the communities.

The Committee is comprised of local community leaders from the four Lake Cities communities: Corinth, Hickory Creek, Lake Dallas, and Shady Shores. Members include:

Ian Theodore; Chairman (Hickory Creek)
John Smith (Hickory Creek)
Paul Kenney; Councilman (Hickory Creek)
Charlie Price; Vice Chairman (Lake Dallas)
John Cabrales (Lake Dallas)
Steve Aughinbaugh; Secretary (Shady Shores)
Wendy Withers (Shady Shores)
Tom Muehlenbeck (Shady Shores)
Bob Hart (Corinth), Shea Rogers (Corinth)
Garrett Skrehart (Corinth)
Aaron Layman (Corinth)

The Committee members share a common mission: "Enhancing and expanding broadband **access, adoption** and **use** throughout the region for the benefit of residents and businesses."

In 2020, the Committee sought to understand whether their communities have access to broadband infrastructure (defined by the Federal Communications Commission as enabling internet speeds of at least 25 Mbps download and 3 Mbps upload), and to determine whether service with download speeds of at least one gigabit per second is, or would be, available in the region. If the latter proved to be outside the realm of probability from the private sector, the Committee wished to identify its available options, such as a municipal fiber-to-the-home network or public-private partnership.

In June 2020, the Committee contracted Connected Nation Texas (CN Texas) to conduct a comprehensive field validation of broadband infrastructure in the four communities as well as a demand survey to substantiate broadband demand / adoption and use among residents, businesses, and institutions. The initial responses to those surveys helped the Committee better understand the existing adoption and use of broadband technology in the Lake Cities region.

In February 2021, the Committee met to discuss the Lake Cities broadband assessment and prioritize near- and long-term goals and action items for implementation, which are

addressed in detail later in this document. These goals, and proposed pathways toward solutions, include:

- Identify how to best work with incumbent broadband providers
- Determine how to identify, contact, and secure potential broadband providers (including the issuance of an RFP/RFI/RFQ)
- Determine how to identify and secure potential wireless providers
- Explore the development of a dark fiber ring
- Implement an educational campaign to better inform residents and businesses of broadband service provisions, including home devices, provider package selection, and device selection
- Develop an additional targeted survey to capture specific residential service needs
- Identify and pursue infrastructure funding opportunities

The following document details findings from both the infrastructure analysis (the **access** component) and demand survey and identifies specific solutions to close gaps in access, adoption, and use in the community.

KEY FINDINGS: BROADBAND ACCESS AND ADOPTION

Today, technology plays a pivotal role in how businesses operate, how institutions provide services, and where consumers choose to live, work, and play. The success of a community has become dependent on how broadly and deeply the community adopts technology resources, which includes access to reliable high-speed internet networks, the digital literacy of its residents, and the use of online resources for business, government, and leisure.

Between August and October 2020, CN Texas conducted a comprehensive survey of broadband technology access and adoption across the four Lake Cities communities that collected responses from 1,214 different households. The survey includes a sample of 138 unique addresses responding in Lake Dallas, 130 responses in Shady Shores, 662 responses in Corinth, and 284 responses in Hickory Creek. Overall, the survey was designed to capture sufficient data to represent over 12,500 households across the four Lake Cities.

Community	Number of Households	Percent of Households	Median Age	Median Household Income	Residential Survey Responses	Percent of Responses
Corinth	7,239	57.4%	38.9	$96,670	662	54.4%
Hickory Creek	1,607	12.7%	45.7	$107,731	284	23.4%

Lake Dallas	2,843	22.5%	35.7	$67,908	138	11.4%
Shady Shores	923	7.3%	39.3	$106,719	130	10.8%

This assessment was designed to identify issues and opportunities to close the local Digital Divide. To do so, each community needs insights about the available broadband infrastructure; how residents are adopting and using broadband services; and what steps would have the greatest impact toward improving broadband access, adoption, and use across every sector.

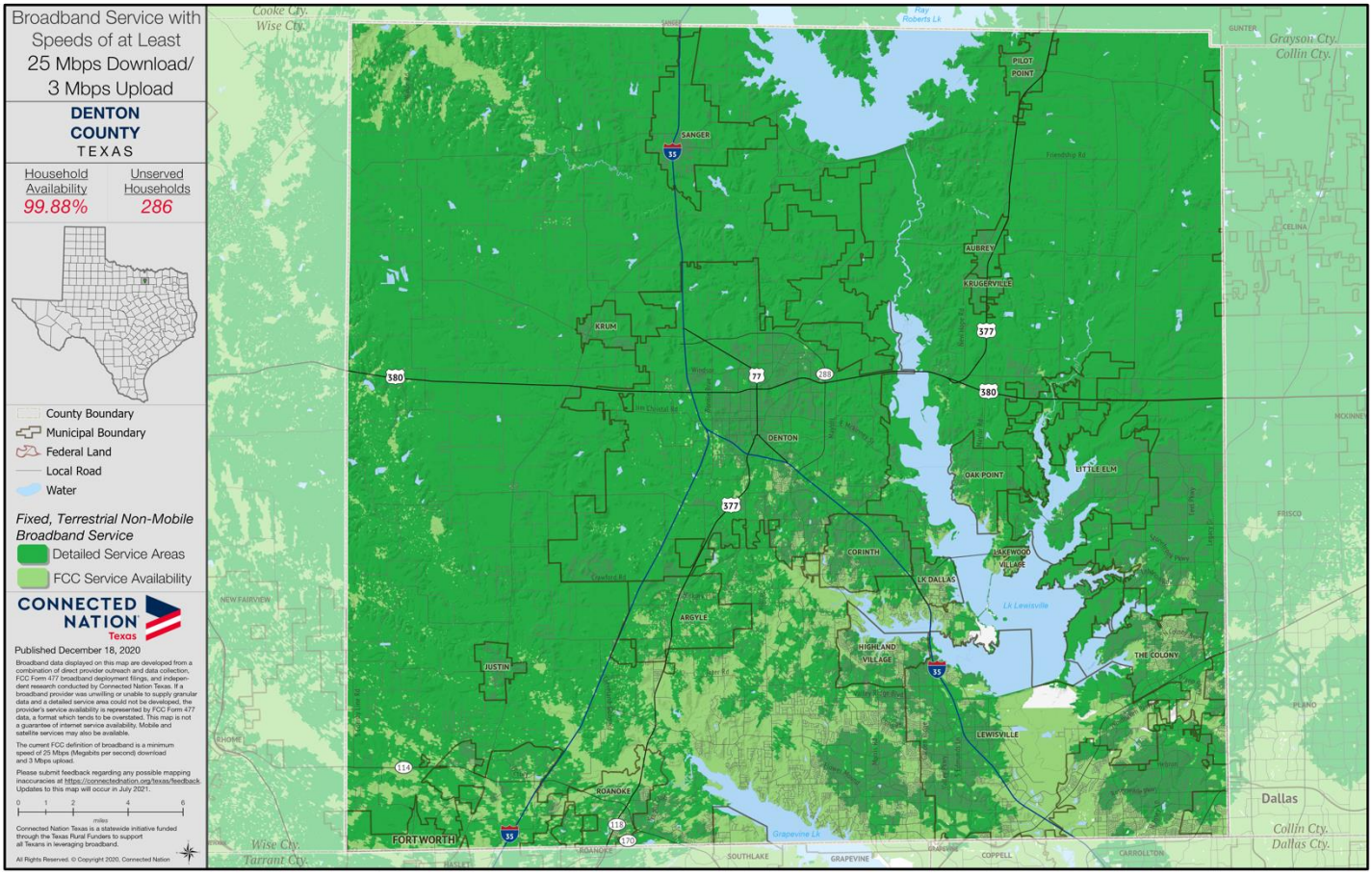
Among the key findings from these surveys:

- Across Denton County, 99.88% of households (primarily in areas with higher population densities) have access to internet service at speeds that the FCC defines as "broadband" (25 Mbps downstream and 3 Mbps upstream). This is higher than the 96.5% of households statewide that can access broadband at these speeds.
- 93.46% of households in the county have access to internet service at future-ready speeds (100 Mbps downstream and 10 Mbps upstream); by comparison, 88.6% of households statewide have internet access at this speed.
- Slightly less than 3% of responding households and 2% of Lake Cities businesses report that they do not subscribe to internet service. The majority of those who subscribe report that they have fixed broadband connections.
- When asked what prevents households from subscribing to home internet connections, the top barrier was the ability for respondents to access the internet someplace other than home, followed by a lack of availability.
- Nearly three out of five households in the Lake Cities area that subscribe to home internet service (59.5%) say that their current connections do not meet their current needs.
- More than two out of three responding households in the Lake Cities area (67.4%) say they subscribe to mobile internet service at home. For one out of every 20 Lake Cities households, mobile internet service is the primary (or only) internet service used in the home.

INFRASTRUCTURE

According to data published by CN Texas in December 2020, nearly all households in Denton County (99.88%) have access to broadband service at speeds of 25 Mbps downstream (to the household) and 3 Mbps upstream (from the household to the web); this is the current definition of broadband (high-speed internet) set forth by the FCC.

This level of service is primarily concentrated around the portions of the county with higher population densities.



Preliminary Research

To obtain a more granular assessment of the broadband infrastructure in Lake Cities than had already been provided by CN Texas through their state mapping efforts, CN Texas conducted a comprehensive field validation and outside plant audit exercise. Prior to commencing the field activities, CN Texas conducted preliminary desktop research to identity and isolate the network infrastructure components that may have existed within the Lake Cities region. The preliminary research included, but was not limited to, the following:

1. **Federal Communications Commission:** Form 477 broadband deployment data which was, at the time of the review process and outside plant audit, vintage December 2018. The FCC has released June 2019 and December 2019 public datasets of Form 477 since the initial review, with data available at: https://www.fcc.gov/general/broadband-deployment-data-fcc-form-477. A list of providers assembled from the December 2018 FCC Form 477 data included the following.

    a. *AMG Technology Investment Group (a.k.a. Nextlink)*
    b. *CenturyLink, Inc.*
    c. *Charter Communications (a.k.a. Spectrum)*
    d. *Frontier Communications (a.k.a. Verizon)*
    e. *Grande Communications (f.k.a. CoServe)*
    f. *Skybeam, Inc. (a.k.a. Rise Broadband)*
    g. *Southwestern Bell (a.k.a. AT&T)*
    h. *Speed of Light*

It should be noted a more complete and verified listing of the current providers in the Lake Cities communities is provided later in this document.

2. **FiberLocator:** This subscription-based, fiber optic service location program was used to examine commercially-available fiber optic providers and their respective fiber routes (see maps at **Appendix I: Fiber Routes)**. This list of long-haul providers (typically proprietary transport) and metro fiber providers (middle-mile dark and lit services) included:

    a. *Long-Haul*
        i. *AT&T*
        ii. *Hudson Fiber*
        iii. *Level 3*
        iv. *Telia Carrier*
        v. *Zayo Network*

b. *Metro Fiber*
    i. *CenturyLink*
    ii. *Grande Communications*
    iii. *Rail America*
    iv. *Unite Private Networks*
    v. *Zayo Networks*

3. **Universal Service Administrative Company (USAC):** An examination of the Connect America Fund (CAF) Deployment map (available at https://data.usac.org/publicreports/caf-map/) was used to determine if any portion of the communities, or nearby locations, had been subsidized by the federal government as part of the CAF program. These areas are generally considered to be deemed "high-cost remote and rural" by the FCC. Networks were required to be updated so that consumers would be able to receive internet services with speeds of at least 10 Mbps x 1 Mbps. *No evidence of CAF funding commitments was identified* (see map at **Appendix II: Connect America Fund Broadband Map**).

4. **Tower Coverage.com**: This website, used by wireless internet service providers (WISPs) to illustrate their coverage areas, was reviewed to determine if any WISPs, who were new to the area or that had failed to file their required FCC Form 477 data, were present in any of the market areas. The sole fixed wireless provider, offering service to the Lake Cities region, that was illustrated on this site was Speed of Light (see map at **Appendix III: Tower Coverage.com Map**).

5. **United States Department of Agriculture (USDA)**: A review of the Telecommunications Program Funded Service Areas Map indicated that none of the four communities had USDA funded projects in, or near, the town borders (see map at **Appendix IV: United States Department of Agriculture Telecommunications Funded Service Areas Map**).

6. **Additional FiberLocator Analysis:** Through its extended research of FiberLocator, CN Texas identified 21 buildings that appeared to be connected to fiber optic circuits. The interesting outlier within the group was MetroNet Fiber, who did not appear in either the long-haul or metro fiber results returned in step 2 (see map at **Appendix V: FiberLocator "Lit Buildings"**). These locations are included on the Lake Cities interactive map.

a. 4851 S. Interstate 35 E, Corinth (AT&T, Grande)
b. 5401 S. Interstate 35 E, Corinth (Grande)
c. 5800 S. Interstate 35 E, Corinth (AT&T)
d. 7701 S. Interstate 35 E, Corinth (AT&T)

e. 7801 S. Interstate 35 E, Corinth (AT&T)
f. 1200 N. Corinth Street, Corinth (AT&T)
g. 1500 N. Corinth Street, Corinth (AT&T, Grande)
h. 3500 Corinth Parkway, Corinth (Grande)
i. 3511 Corinth Parkway, Corinth (Grande)
j. 408 Bronco Circle, Shady Shores (MetroNet Fiber)
k. 413 Bronco Circle, Shady Shores (MetroNet Fiber)
l. 3100 S. Garrison St., Corinth (AT&T)
m. 3501 FM 2181, Corinth (Grande)
n. 3970 FM 2181, Hickory Creek (Grande)
o. 3971 FM 2181, Corinth (Grande)
p. 1035 Hickory Creek Blvd, Lake Dallas (AT&T)
q. 200 Swisher Road, Lake Dallas (AT&T)
r. 306 West Overly Drive, Lake Dallas (Grande)
s. 450 Main Street, Lake Dallas (Crown Castle)
t. 500 Water's Edge Drive # 113, Lake Dallas (Verizon, Comcast)
u. 1701 Lake Sharon Drive, Corinth (AT&T)

7. FCC Universal Licensing System: CN Texas also conducted research to determine the status of any potential of the 200+ Educational Broadband Service (EBS) licensees in the state of Texas, within the Lake Cities region, that may hold FCC spectrum authorizations. EBS spectrum holders included:

a. *Dallas College, formerly known as Dallas County Community College District* (WNC582; Channels A1 and A2) whose spectrum is leased to a subsidiary of Sprint doing business as NSAC, LLC (now T-Mobile because of their recent merger). This represents 11 MHz of spectrum (A1-A2 are 5.5 MHz wide on each channel).

b. *Richardson Independent School District* (WHR882; Channels A3 and A4) whose spectrum is leased to a subsidiary of Sprint doing business as Clearwire Spectrum Holdings III, LLC (now T-Mobile because of their recent merger). This represents 11.5 MHz of spectrum (A3 is 5.5 MHz wide while A4 is a 6 MHz channel).

c. *Richardson Independent School District* (WEF69; Channels B1, B2, B3 and B4) whose spectrum is leased to a Sprint subsidiary doing business as Clearwire Spectrum Holdings III, LLC (now T-Mobile because of their recent merger). This represents 22.5 MHz of spectrum (channels B1-3 are each 5.5 MHz wide while B4 is a 6 MHz channel).

d. *Hispanic Information and Telecommunications Network, Inc. doing business as HITN – Dallas Fort Worth, LLC* (WNC836; Channels C1, C2, C3 and C4) whose spectrum is leased to a Sprint subsidiary doing business as Fixed Wireless Holdings, LLC (now T-Mobile because of their recent merger). This licensee is based in New York and holds multiple authorizations across the U.S. and in Puerto Rico and may not be interested in a sub-lease. This represents 22.5 MHz of spectrum (channels C1-3 are each 5.5 MHz wide while C4 is a 6 MHz channel).

e. *Carrollton Farmers Branch Independent School District* (WNC990; Channels C3 and C4) whose spectrum is leased to a Sprint subsidiary doing business as Clearwire Spectrum Holdings II, LLC (now T-Mobile because of their recent merger). This represents 11.5 MHz of spectrum (C3 is 5.5 MHz wide while C4 is 6 MHz wide).

f. *Dallas-Fort Worth Hospital Council* (WND242; Channels D1, D2 and D3) whose spectrum is leased to a subsidiary of Sprint doing business as Clearwire Spectrum Holdings, LLC (now T-Mobile because of their recent merger). This represents 16.5 MHz of spectrum (D1-3 are each 5.5 MHz wide channels).

g. *Dallas-Fort Worth Hospital Council* (WLX843; Channels D4) whose spectrum is leased to a subsidiary of Sprint doing business as Clearwire Spectrum Holdings, LLC (now T-Mobile because of their recent merger). This represents 6 MHz (the channel width of D4).

h. *Dallas College, formerly known as Dallas County Community College District* (WHR830; Channels G1, G2 and G3) whose spectrum is leased to a subsidiary of Sprint doing business as NSAC, LLC (now T-Mobile because of their recent merger). This represents 16.5 MHz of spectrum (G1-3 are each 5.5 MHz wide channels).

i. *Catholic Community Education Services of Dallas, Inc.* (WHR831; Channel G4) whose spectrum is leased to a subsidiary of Sprint doing business as Clearwire Spectrum Holdings III, LLC (now T-Mobile because of their recent merger). This represents 6 MHz of spectrum (the channel width of G4).

EBS licenses underwent a transformation when, on July 29, 2004, the FCC released a Report and Order and Further Notice of Proposed Rulemaking (BRS/EBS R&O and FNPRM) that revamped the rules and policies governing the licensing of services in the 2500-2690 MHz MDS/ITFS band. In particular, the FCC adopted a new band plan that restructured the 2500-2690 MHz band into upper and lower-band segments for low-power operations (UBS and LBS, respectively), and a mid-band segment (MBS) for high-power operations.

Originally, EBS stations, once known as Instructional Television Fixed Service (ITFS), were licensed to transmit video signals only from a single transmission site (typically a tower or building rooftop) to specific "receive site" locations within a 35-mile radius, known as a protected service area. New stations were permitted to be licensed on the same channels or adjacent channels so long as they did not cause interference to the reception of an EBS signal at any other station's receive sites.

Under subsequent EBS rules adopted in 2005 by the FCC, EBS stations were transitioned to geographic area licenses, with each station having a Geographic Service Area (GSA), defined as a circle with a radius of 35 miles from the license's reference point. Because many EBS stations were originally licensed at transmitter sites that are less than 70 miles from other EBS stations operating on the same channels, the 35-mile radius GSA circles established in 2005 would have resulted in overlapping GSAs. To avoid that problem, the FCC created exclusive GSAs by splitting the overlap areas between or among the overlapping stations by a process often referred to as "splitting the football" (see Appendix VI: EBS GSA).

At the onset of this project, these EBS licensees were flagged as potential public-private partnership (P3) collaborators. There was, at that time, uncertainty regarding whether the FCC may require Sprint to divest itself of such spectrum holdings as a merger condition prior to finalizing an agreement with T-Mobile. The FCC did not levy this merger condition and now this spectrum may potentially be included as part of T-Mobile's 5G deployment.

While this spectrum is encumbered under lease agreements with Sprint, a conversation regarding a sublease may still be in order. The Lake Cities region is not likely considered a high-profile deployment area, as the initial rollouts have been in larger metropolitan areas, and the spectrum may continue to be underutilized in the region. Should the Lake Cities communities elect to consider licensed fixed wireless spectrum as a broadband delivery option, CN Texas can assist with introductions and lease negotiations.

8. 4G/5G Mobile Services: CN Texas reviewed maps from the four major carriers, AT&T, Sprint, T-Mobile, and Verizon, to determine if 4G/5G services were available in the Lake Cities region (see Appendix VII: 4G/5G Mobile Services). 4G/5G services are reported by three major carriers, post-Sprint/T-Mobile merger, and their interactive maps can be found at:

a. AT&T: https://www.att.com/maps/wireless-coverage.html; in this case, there is a pocket in Hickory Creek that only has 4G services reported on the map.
b. T-Mobile: https://www.t-mobile.com/coverage/coverage-map; in this case, Lake Dallas only has 4G services reported on the map.
c. Verizon: https://www.verizon.com/coverage-map/.

5G promises to offer massive capacity, high-speed data and extremely low latency. The capacity boost is expected to be four times faster than existing 4G and/or 50 times faster than Wi-Fi.

5G speeds may vary from one application to another and be different among devices; keeping in mind that true 5G devices are now only recently becoming available. With theoretical speeds anticipated at 20 Gbps, real-world speeds will initially be much slower. In September 2016, during a lab test conducted by T-Mobile and Ericsson, the duo reported speeds of 12 Gbps, whereas T-Mobile's average 4G data rate is 13 Mbps.

Widescale 5G rollouts are a realistic expectation for the year 2021, although true 5G handsets are now only beginning to permeate the market. *Note:* 5G testing could not be conducted at the time of the *Field Research – Outside Plant Audit*, as such handsets were not available (see next section).

9. Land Development Codes: The entire Lake Cities region should consider including a "Dig-Once" policy, among other such ordinance revisions that could be more "broadband friendly." No evidence could be identified, through an online search of city ordinances, that the towns are already taking affirmative action regarding a "Dig Once" policy.

   a. Corinth has an extensive Code of Ordinances, including Section 95.247 that discusses "Registration" as part of the rights-of-way permitting process.
   b. Hickory Creek has an extensive Code of Ordinances, including Section 13.06.016 that discusses "rights-of-way."
   c. Lake Dallas has a similar set of Code of Ordinances, including Section 90-114 that discusses "rights-of-way."
   d. Shady Shores Code of Ordinances includes Article 3.08, but references to "telecommunications" seem to be limited to Towers and Antennas.

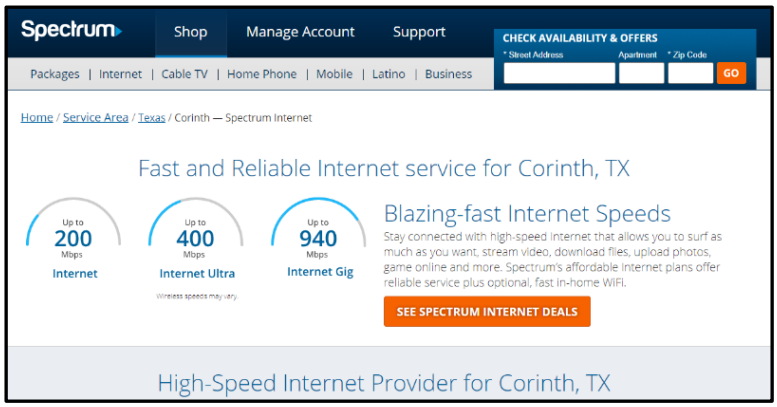
With the number of rear-easement services in the communities, a Dig-Once policy may streamline broadband network expansion while mitigating home-owner frustration (e.g., having property dug up multiple times).

Field Research – Outside Plant Audit

From July 8-18, 2020, CN Texas conducted a "boots-on-the-ground" infrastructure audit of the Lake Cities region. This included locating and mapping the aerial and underground distribution routes for cable internet (also known as Data Over Cable Service Interface Specifications or "DOCSIS"), digital subscriber line (DSL) services offered by the incumbent local exchange carriers (ILECs) or competitive local exchange carriers (CLECs) over copper

lines, fiber-to-the-home (FTTH) networks offered by the ILECs, as well as conducting spectrum analysis of the fixed wireless providers, locating vertical assets (such as water tanks and towers), and attempting to determine the status of 5G deployments or small cell densification in the Lake Cities region.

CN Texas discovered that, in its best estimate, 95% of the homes in the Lake Cities region had access to both DOCSIS and DSL (see **Appendix VIII: Existing Infrastructure**).



Based on FCC Form 477 data, Spectrum reports speeds of up to 940 Mbps x 35 Mbps available in the Lake Cities region. This also appears to be consistent with their online advertising (although advertised speeds may not be widely known in the region by the local consumers and speeds may be subject to exact location or level of consumer subscription).

During the field audit, CN Texas routinely found fiber optic lines, over-lashed onto existing distribution cable, along with hybrid fiber coaxial (HFC) fiber nodes across the Lake Cities region. ***In many instances, the fiber lines appeared to be relatively new and recently installed. This may also contribute to the disparity between the levels of dissatisfaction that had been reported by local consumers to the broadband taskforce as compared to what was discovered by CN Texas during the exercise.*** Essentially, CN Texas arrived shortly after a network upgrade in a region where consumers had been receiving services far below these currently advertised speeds.

The same may hold true regarding CenturyLink. Advertised speeds, combined with anecdotal information[1], indicate that CenturyLink's DSL speeds typically seemed to be limited to 40 Mbps x 2 Mbps for residential DSL in Corinth, Hickory Creek, and Lake Dallas, while speeds of 3 Mbps x 512 Kbps were more common in the eastern portion of Shady Shores and speeds of 40 Mbps x 2 Mbps were common in the western half of the town.

Only a small portion of the homes in the Lake Cities region, estimated at less than 5%, had access to FTTH (also see **Appendix VIII: Existing Infrastructure**).

Based on its initial research, CN Texas only expected to find limited FTTH deployments from Frontier (also known as Verizon) in the extreme northwest part of Corinth, with anticipated locations including Hidden Oaks Circle, Marbellas Court, Pine Hills Lane, Wentwood Drive, and

[1] ***EXAMPLES:*** Discussions with homeowners located at 106 Golden Meadows (Shady Shores), 24 Hidden Lakes Drive (Hickory Creek), etc.

Woodlake Drive. However, CN Texas also identified recent FTTH deployments on Alloway Drive, Demarsh Lane, Evans Lane, Rosegill Drive, Stanhill Drive, Tolthaven Road, Wellington Lane, and Westerly Circle – located in the town of Corinth and operated by CenturyLink – as well as Arabian Lane, Clydesdale Lane, Colt Lane (South), Derby Lane, Equestrian Road, Hackberry Lane, Magnolia Lane, Manor Lane, Mulberry Lane, Oakwood Lane, Omaha Drive, Palomino Drive, Pimlico Drive, Saratoga Drive, Shadow Creek Lane, Shady Glen Drive, Stallion Lane, Thoroughbred Drive, and Traveller Street – located in the town of Hickory Creek and operated by CenturyLink – all within close proximity to a CenturyLink central office (CO) where fiber transport lines had recently been installed (see Appendix VIII: Existing Infrastructure: Composite FTTH Route illustrations).

This evidence suggests CenturyLink is beginning an investment in FTTH deployments in the Lake Cities region and supports an improvement in speeds across their DSL network, most likely vectored VDSL2+. When combined with the proliferation of transport fiber identified in the Lake Cities region, CN Texas is of the opinion that private sector FTTH networks may be a near-term reality.

One street, Harrison Court, was identified in Shady Shores that was void of broadband providers entirely. Another location, consisting of upper scale homes on Golden Meadow Drive, Moonlit Path Drive, Shadow Lane, and Sunrise Meadow, only had service from CenturyLink, despite the fact that the subdivision is surrounded by Spectrum distribution cable (see Appendix IX: Single Provider Service – Greenfield or Brownfield?). The Mansions at Hickory Creek only received service from Spectrum (as verified with property manager), as did the new subdivision located at Pointe Vista Road and Whaley Lane (including Nix Drive, Ginger Lane, Virginia Lane, and Preston Road) in Hickory Creek. These locations could represent greenfield or brownfield opportunities for the private sector or for a municipal broadband deployment, however, these locations could not be isolated and serviced independently, but rather would need to be a part of a larger network. Locations such as these should be initially shared with the private sector broadband providers to determine their level of interest and availability for filling the gaps. Such measures should certainly be taken before serious consideration is given to developing a municipally owned network.

CN Texas also conducted speed tests (see Appendix X: Sample Speed Tests) whenever possible, to determine the delivery speeds at each location. This exercise attempted to align delivery speeds against subscription speeds and found that, in most cases, there was a close match. This often proves to be an imperfect exercise, especially when using a Wi-Fi connection or in a location when multiple users are actively online.

CN Texas unexpectedly discovered (rear-easement) DSL infrastructure owned by Nortex Communications along Wentwood Drive (Corinth) with possible service to portions of State School Road.

CN Texas also concluded that the fixed wireless services (offered by NextLink, Skybeam and Speed of Light) have much less actual coverage than is represented in the illustration at Appendix VIII: Existing Infrastructure (Fixed Wireless Service – As Reported Under FCC Form 477). This coverage disparity is due to several factors related to "line-of-site" from the transmit location to the end user. Foliage is a natural impediment and Lake Cities has its fair share of dense hardwood and native pine trees, which — when combined with the low-power, unlicensed frequencies often used by a WISP — makes service delivery problematic. Fixed wireless receive antennas were identified in the Lake Cities region, although fewer than 100 could be accounted for. This is not to indicate that fixed wireless isn't a viable option but rather that the FCC-reported coverage data is simply overstated.

Lake Dallas Independent School District

On December 3, 2020, Chip Spann, Director of Engineering and Technical Services, CN Texas, spoke with Mike Dabney, Director of Technology, Lake Dallas Independent School District, regarding the history and status of the Lake Dallas Independent School District (Lake Dallas ISD) internet network. The following summarizes the key points of that discussion.

Lake Dallas ISD neither owns nor operates the internet network that it utilizes. The current internet service provider (ISP) is Education Service Center Region XI (https://www.esc11.net/) and the owner of the network is the Zayo Group (www.zayo.com). Presently, interconnection circuits between campus buildings are leased from Grande Communications.

As of this report, Education Service Center Region XI (Region XI) has a multi-year contract with Lake Dallas ISD but historically Region XI has not been the sole ISP. ISPs are selected through a competitive bidding process, typically under a request for proposal, and the services delivered by the ISP must meet eligibility requirements administered under the Universal Service Administrative Company (USAC); the ISP must possess a USAC-issued service provider identification number (SPIN). ISPs receive a portion of their payment through federal E-rate funds. The Schools and Libraries (E-rate) Program provides discounts of up to 90 percent to help eligible schools and libraries in the United States obtain affordable telecommunications and internet access. Eligible participants include public and most nonprofit K-12 schools, as well as all public and many private libraries. Program participants must carry out a competitive bidding process to select the most cost-effective companies to provide the goods and/or services requested.

According to Mr. Dabney, there have been three ISPs during his tenure, generally fulfilling contract terms for five years at a time, and the progression of required capacity reveals an interesting trend. Without regard to specific contract dates, premised on the fact that the history begins fifteen plus years ago, Mr. Dabney recalled:

1. Region XI was awarded a five-year contract to provide T-1 circuits to Lake Dallas ISD campus buildings. *Note:* A T-1 circuit could transmit up to 24 telephone calls simultaneously over a single transmission line of copper wire and/or could deliver data rates of 1.544 Mbps.
2. The next RFP released by Lake Dallas ISD was for a district-wide upgrade and sought 100 Mbps circuits. This five-year contract was awarded to Grande Communications.
3. During the latter contract period, Lake Dallas ISD determined that the next network connectivity upgrade would be for circuits capable of delivering 300 Mbps. Mr. Dabney recalls that Grande Communications indicated it would be their preference not to move forward as their (Grande's) network was already being stretched thin and that such an upgrade would be disruptive. Subsequently, a contract as awarded to CenturyLink for the next five-year period. Some network capacity improvements may have been made during the CenturyLink contract period, such as migration to 1 Gbps capacity.
4. Most recently, a five-year contract was once again awarded to Region XI for the delivery of 10 Gbps circuits.

Zayo, the network owner, may have executed a form of contract known as an Indefeasible Right of Use (IRU) with Region XI. An IRU is a long-term, non-voidable contract between the owner of a fiber or cable line and a customer of that fiber or cable system. This form of contract is often preferred over a typical leasing arrangement as it guarantees the customer (Region XI) the right to use a certain amount of capacity of the fiber system for a specified number of years and to sell their services to whomever they choose. Recent conversations with Zayo suggest that the IRU is for the use of dark fiber (transport).

Lake Dallas ISD's internet connectivity contract with Region XI secures a 10 Gbps circuit to each campus originating from Zayo's fiber ring and, where Region XI (through Zayo) does not have a terminating fiber, Lake Dallas ISD leases dark fiber from Grande Communications to deliver a 10 Gbps circuit. The contract between Grande Communications and Lake Dallas ISD expires in 2023. The Lake Dallas ISD is unable to take full advantage of the 10 Gbps circuits, however, since much of their legacy equipment at each campus is still limited to 10/100 Mbps throughput delivery. This ultimately requires Lake Dallas ISD to upgrade its network hardware (e.g., switches, routers, etc.) to accommodate the faster speeds.

Recently, Lake Dallas ISD was also able to make bulk purchases of mobile hotspots (e.g., Verizon Jetpack MiFi) using CARES Act funds. Mr. Dabney was pleased to use the CARES Act money as it was generally less restrictive than E-rate funds and was an unplanned financial windfall.

Finally, Mr. Dabney indicated that, to the best of his knowledge, the Denton Independent School District is also a hub location through Region XI and that Denton ISD may have some proprietary fiber lines or links that originated from a 2004 bond package.

Private Sector FTTH Versus Municipally Owned/Operated FTTH

CN Texas is often asked to discuss its position on municipal broadband networks. To be clear, CN Texas is neither for nor against the operation of broadband service by municipal entities. CN Texas does, however, recommend exercising caution and conducting structured and methodical due diligence before making the decision to enter the arena. CN Texas believes that if the private sector has not already made the investment, the return on investment may not be there.

As previously referenced in the section titled *Field Research – Outside Plant Audit*, brownfield and greenfield opportunities certainly exist in the region. There are also opportunities for collaboration at high-traffic locations where no current broadband infrastructure exists. This includes locations that are either entirely void of a broadband provider such as the Hickory Creek Campground, the camping/overnight facilities at Oakland Park and Westlake Park, and Willow Grove Park, or locations that only have a single service option such as the Destiny Dallas RV Resort (Wi-Fi only).

Many considerations are overlooked when a municipality begins its journey toward becoming a municipal broadband provider. A specific list of questions should be answered first, such as:

1. What is required to run a 24x7x365 call center?
2. Who is the ideal target audience and why?
    a. Have socioeconomics been considered?
    b. Have financial and demographic evaluations been made?
        i. Is the trailer park located near 1500 Turbeville Road a target location?
        ii. What halted the progress on Crescent Estates?
    c. Has a return-on-investment (ROI) model that illustrates success been fully vetted?
        i. Is there a package of service affordably priced to suit everyone?
        ii. How is the network connecting to the internet and at what cost?
        iii. What services can be delivered?
3. Current Texas law prevents municipal networks from offering voice and video services but can provide internet access to households.
4. Is a muni fiber network the best approach?
    a. Has beta testing of pricing and service assumptions been considered?

b. What about using a hybrid fixed wireless and fiber approach to deploy a more cost-effective network?

5. What applicable federal, state, or local laws should be considered or that could have a positive or negative impact on the broadband landscape or on the proposed municipal network?

a. In a February 18, 2020 article reported by KXAN, 60 cities filed suit against the state of Texas over a new telecom law (Senate Bill 1152) that would change the fees paid by telecom companies for the use of rights-of-way.
b. The city of Lake Dallas imposed a local sales tax on telecommunications service (October 1, 1987).
c. The city of Corinth imposed a local sales tax on telecommunications service (January 1, 2003).
d. Other examples include understanding the impacts of recent bills such HB 1446, HB 2422, and SB 5.
e. Would the services be exempt from such local sales taxes under the Internet Tax Freedom Act?

State laws can often include a tangled list of hard-to-find (and sometimes unique) impediments. A few examples include:

- Required referendums for approvals and funding
- Certificates of Necessity
- Triple Play restrictions
- Prohibition against use of taxes or bonds to build a network
- "Ready, Willing and Able" provisions[2]
- Population base requirements
- Public study requirements
- Code cities
- Profitability requirements
- Proof of necessity
- If-Then, Minefield, or Total Bans

Fiber construction costs can range from less than $5,000 per mile (roughly $0.95 a foot) to more than $72,000 per mile, depending on the population density, soil composition, cost of permits, right-of-way issues, obstacles, and potential trenching issues (such as rock). In at

[2] California: If a city builds its own network and a private company (i.e., ISP) indicates it is "ready, willing, and able to acquire, construct, improve, maintain, and operate broadband," the city must either lease the network or turn it over to the private company.

least one instance, a cost of $100,000 per mile ($100 million on a 1,000-mile fiber optic network) was reported in the state of Illinois. Connecting a new customer to an FTTH network typically costs between $1,200 and $2,000, depending on whether the network is a gigabit passive optical network "GPON" or an active optical network "AON" due to the labor costs of connecting the drop wire to the house, from the pole or pedestal, fiber or ethernet wiring to bring the connection inside, and the electronic devices indoors (such as the optical network terminal and modem) to receive the signal from the central office.

An average residential subscriber will consume approximately $28 worth of content per month. What price point is necessary to pay off just the connection cost before that customer can begin contributing a profit for the network owner? Turning a profit inside of five years is rare.

Municipal broadband failures are commonly attributed to poor decision making. CN Texas suggests reviewing both success stories and failures to glean a few critical "lessons learned" that are important for consideration. CN Texas included a few samples for review, outside of the well-known fiber project in Mont Belvieu, or the lesser-known projects in Dayton and Lucas, Texas.

Success Stories:

Burbank, CA: Water and Power leases dark fiber to other organizations within the city boundaries to promote economic development. Charges are based on a multiple of well thought out "link distance" and "contract length" parameters.

Vernon, CA: Recovered its estimated project costs two years after inception of operation. The town, however, had an incredible advantage for its ROI model: 1,800 businesses and only 100 residences. Not a typical FTTH system.

New Hampshire: The state of New Hampshire spent $63 million to build 865 miles of fiber optic network that puts 12,000 (25%) of the state's business entities within 3 miles of a fiber backbone. Again, not a typical FTTH model. The success here relies entirely on the business community.

Failures:

Provo, UT: After its 2006 completion, it was not long before the negative option charges, levied against consumers and businesses, in the iProvo project should have been a visible red

flag to many. Households were levied a $5.35 per month tax[3] and business taxed $10 per month, whether they subscribed to services or not, to try and help pay for the initial build-out cost of the network of $39.5 million and subsequent operating losses[4]. Five years after its launch, city officials admitted to failure and began seeking an immediate exit strategy. In a riveting move, Google acquired the network for a staggering price of $1.00[5].

Burlington, VT: A second similar negative option system was located here. After borrowing $33.5 million from CitiBank to underwrite project costs, the municipality soon discovered that its citizens were not as prone to adopt service as had been previously projected. A subscription rate of less than 12% led the city to borrow an additional $17 million to try and keep the network operating. CitiBank subsequently sued Burlington and reached a settlement in which the network was sold to a private company for $6 million in financing.

Groton, CT: Built its own broadband network and was forced to unload it for a $30 million taxpayer loss.

Monticello, MN: Construction costs, estimated at just under $17 million, were acquired through a series of bonds. An additional $9.6 million in bonds were needed for "related expenses." Rather than generating ample cash to manage its debt service, the network found itself with a half million dollar a year deficit and less than a 10% subscription rate. FiberNet Monticello received nearly $3.5 million in additional "loans"[6] to change the tide. Unfortunately, the debt load ultimately drowned the project resulting in an estimated $4 million loss of tax-payer money and a $5.75 million settlement agreement[7].

Pursuing a municipally owned and operated FTTH network would be the least probable, most expensive, and highest risk option for the Lake Cities region. Given the current legislative limitations for municipal networks in the state of Texas, entering the market as an additional competitor seems unlikely if the only service option is the delivery of broadband. Without the ancillary income from other services (voice, entertainment television, security, etc.) the ROI model seems highly skewed against such an endeavor.

[3] Against a $66.7 million series of bond placements (amortized over 20 years at $278k/month).
[4] Estimated at $10 million.
[5] And assumption of remaining bond payments.
[6] Funded through the local government.
[7] To Wells Fargo Bank (the bond trustee) and local bond holders.

Infrastructure Summary

The Lake Cities are primarily served by seven internet service providers (ISPs) offering a variety of advertised speeds and platforms. Both Nortex Communications and Frontier Communications were excluded from the chart (below) due to their extremely limited service areas.

PROVIDER	TECHNOLOGY	MAXIMUM DOWNLOAD SPEED (Mbps)	MAXIMUM UPLOAD SPEED (Mbps)	LAKE CITIES SERVED
Nextlink Residential	Fixed Wireless	50	30	Corinth Hickory Creek Shady Shores
CenturyLink	DSL, Fiber	1,000	1,000	Corinth Hickory Creek Lake Dallas Shady Shores
Charter Communications	Cable	940	35	Corinth Hickory Creek Lake Dallas Shady Shores
Grande Communications	Cable, Fiber	1,000	1,000	Corinth Hickory Creek Lake Dallas Shady Shores
Rise Broadband	Fixed Wireless	50	50	Corinth Hickory Creek
AT&T Southwest	DSL	1,000	1,000	Corinth Hickory Creek Shady Shores
Speed of Light Broadband	Fixed Wireless	50	10	Corinth Hickory Creek Lake Dallas Shady Shores

CN Texas developed an interactive map, for use by the Lake Cities Broadband Committee and local citizens, showing broadband access, survey question responses, and infrastructure available to improve broadband build-out. To see these data and more, navigate to the interactive map found at: https://connectednation.org/texas/lakecities/interactivemap.

CN Texas uncovered evidence in the Lake Cities region demonstrating that the vast majority of the residential homes in the communities have access to at least two broadband providers (in any combination) and, in most cases, three broadband providers (excluding access to

mobile broadband and satellite). Private sector investment and leveraging of state and federal funds (e.g., CAF-I and CAF-II, the Texas Universal Service Fund for high-cost remote and rural areas, E-rate, etc.) have resulted in the installation of hundreds of miles of copper, cable, and fiber optic lines. The wireline and mobile networks appeared to be robust, subscription rates appeared reasonable, and service levels were in-line with communities of similar size and composition.

The COVID-19 virus outbreak raised awareness on the importance of residential broadband as consumers, who may have limited their internet use to the workplace, now found themselves working from home. Supply chain delays resulted in extended installation periods and many consumers gravitated to using their mobile phone as a Wi-Fi hotspot.

Students, whether K-12 or college, discovered that virtual learning was becoming the new normal. CARES Act funds were distributed across the state of Texas and bulk purchases of mobile hotspots and cellular multiplexers (e.g., CradlePoint units) were commonplace. Both instances led to a broadband paradigm shift as consumers began to take advantage of 4G networks with (pre) 5G speeds and were less concerned with wireline services.

Wireline services, on the other hand, thrived like never before. This has been especially true in rural areas where mobile service was less reliable. Cable and telephone companies have found it difficult to keep up with the demand for new services and to constantly maintain their existing network.

While the number of installation requests have gone up, so too did the number of troubles calls. Networks that had been nearing their saturation point began to stretch to their limits. In many cases, this was less a "last mile" infrastructure problem and more of a "capacity" problem. In other words, the demand exceeded the supply and broadband operators began increasing their backhaul capacity to satisfy local demand.

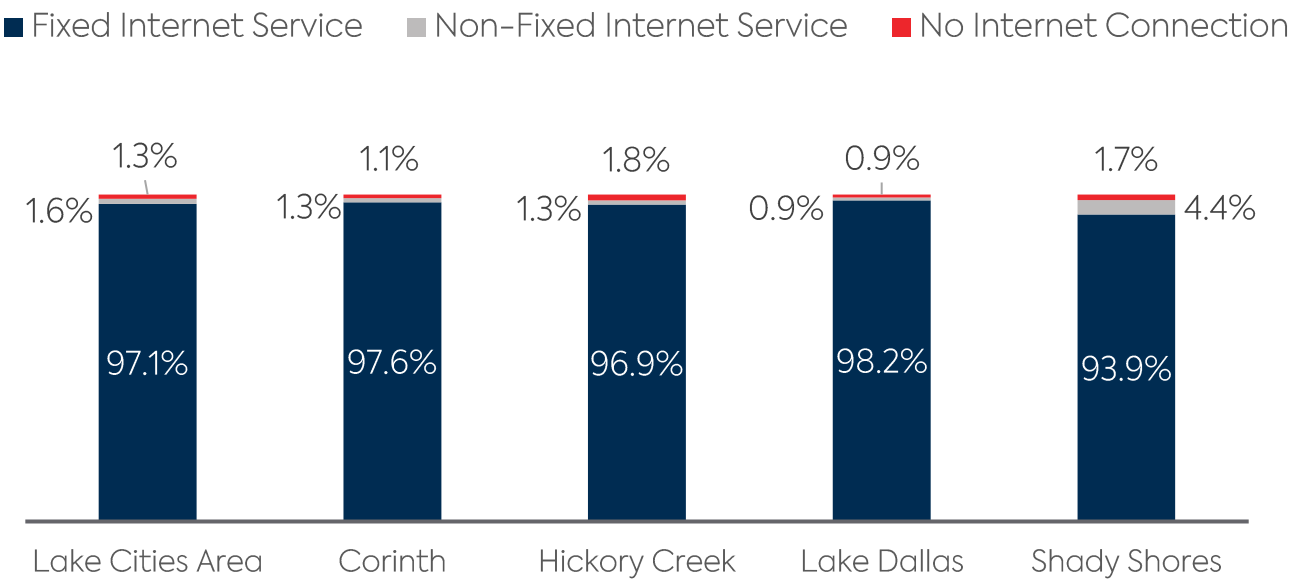
Two FCC auctions have ended since this feasibility study began – Auction 105: Citizen's Band Radio Service (CBRS) and Auction 904: Rural Digital Opportunity Fund (RDOF). The results of Auction 105 are difficult to pinpoint, however, it is likely that more of the CBRS spectrum will be deployed in the near term across much of Denton County. The results of Auction 904 are clearer; one winner emerged in the area: LTD Broadband LLC. This company was the sole bidder on the Oakland Park Block Group: 481210214034 and are obligated to deploy gigabit level services (see **Appendix XI: Map of RDOF Winners in the Lake Cities Region**). LTD Broadband is based in Nevada and does not have a presence near Lake Cities nor anywhere in the state of Texas currently.

DEMAND SURVEY FINDINGS

Between August and October 2020, CN Texas received completed surveys from 1,214 different households in the four Lake Cities communities, along with responses from schools, businesses, libraries, and other sectors.

Respondents provided insights into their internet connectivity, or lack thereof. Data from the Lake Cities region are compared to findings from dozens of other rural communities across Michigan, Ohio, Texas, and Pennsylvania that participated in the Connected program to benchmark and identify areas for improvement. These graphs show responses from each of the four Lake Cities communities individually, as well as data from across all four cities combined.

Home Internet Adoption

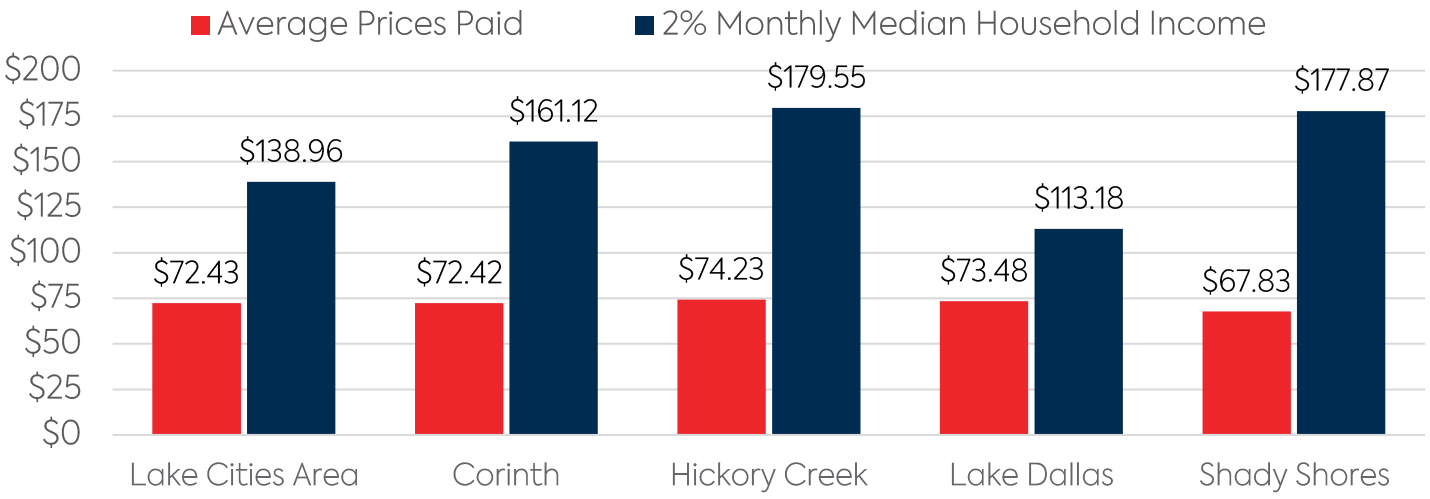


Most households in the Lake Cities area that responded to the survey (97%) — and knew what type of home internet service they had — subscribe to fixed internet service at home. Fixed service is delivered via a cable, DSL, fiber, or fixed wireless technology. This figure ranges from a low of 93.9% households in Shady Shores to a high of 98.2% of respondents in Lake Dallas. Just under 2% of respondents indicate that their internet service is delivered via dial-up, satellite, or a mobile wireless service. This leaves approximately 1% of households without internet access at home.

By comparison, as of January 2021, 63% of households across all Connected communities reported that they subscribe to fixed broadband service at home.[8]

Connection Details

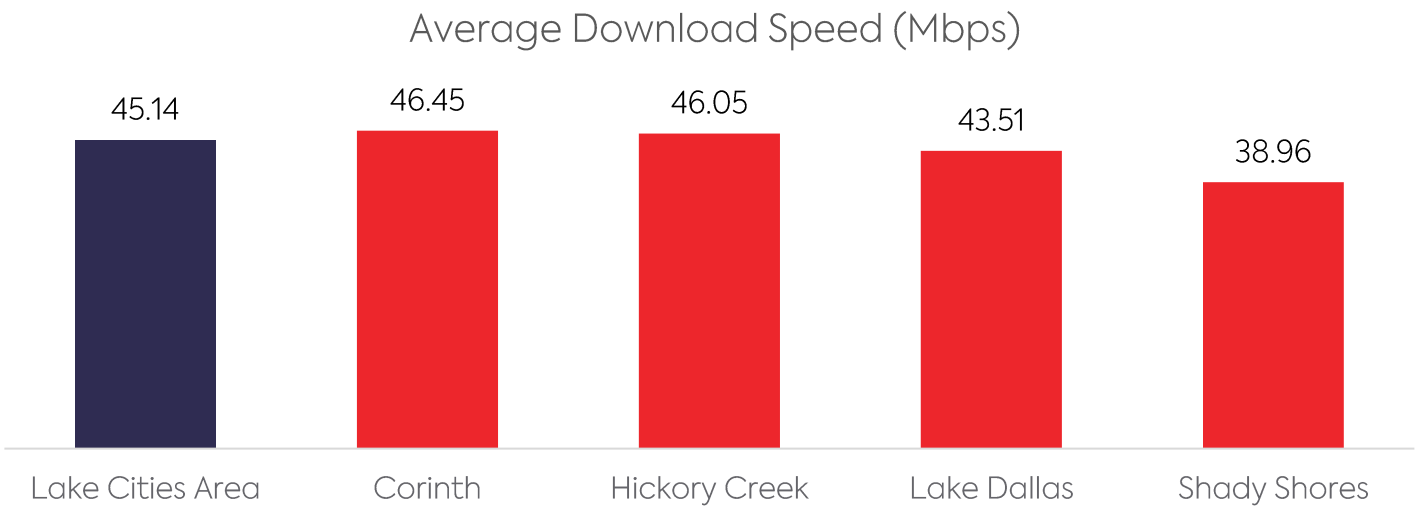
Two percent of monthly income is a recognized standard for measuring the affordability of a home internet connection. Lake Cities respondents indicate that, on average, their internet connection costs slightly less than $72.50 per month, which is more than the average monthly costs reported in other communities ($69.22).



Two percent of the median household income in Denton County is $138.96 per month. These results show that the average cost paid for service in Lake Cities is below that average, though for the more than 6,000 households making less than this median household income, this cost may remain too expensive.

Respondents in Shady Shores report having the lowest average download speed at 38.96 Mbps, while those in Corinth report the fastest average speed at 46.45 Mbps.

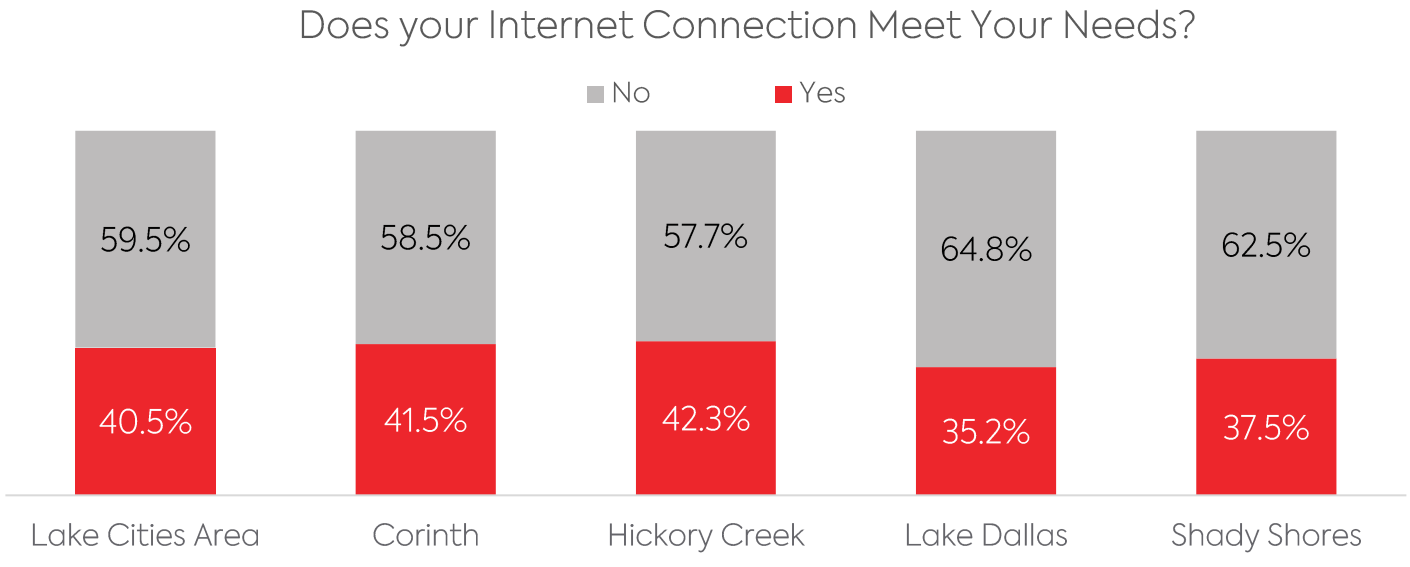
[8] Data for all Connected communities represent responses from households in participating communities from January 2017 through January 2021.



Meanwhile, businesses in the Lake Cities area report paying an average of $100.97 per month for service with an average download speed of 42.02 Mbps.

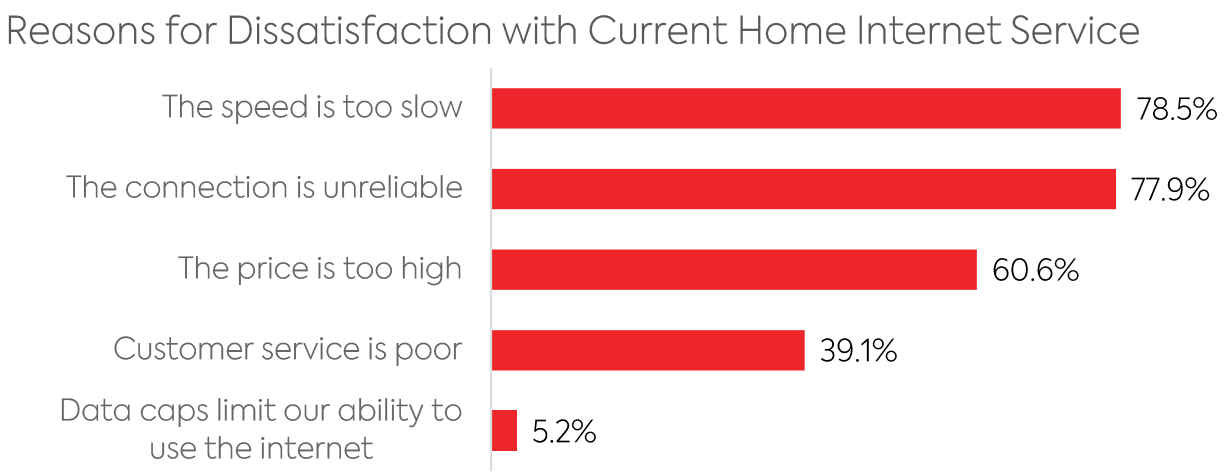
By comparison, the average download speed reported by households across all Connected communities is 36.7 Mbps, less than what is reported in the Lake Cities.

Still, there is demand for better internet service in the Lake Cities. Slightly more than three out of five households in the area (59.5%) say that their current internet service does not meet their needs.

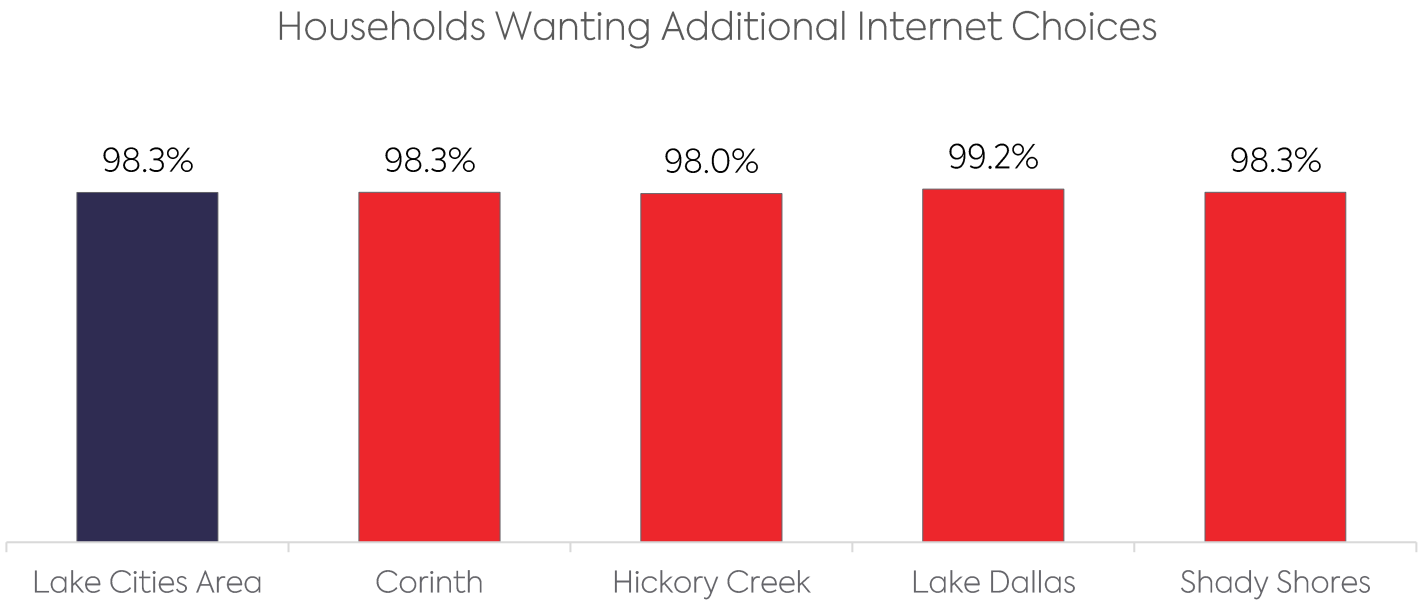


This rate of satisfaction is slightly lower than the average of 42% of households across all Connected communities that say they are satisfied with their current internet service.

Among those who said that their current service does not meet their needs, the issues that were cited most-often were that their current internet speeds are too slow and the service was not reliable. The monthly cost of internet service was also cited by more than one-half of dissatisfied households. Poor customer service and data caps were reported by a smaller percentage of respondents.

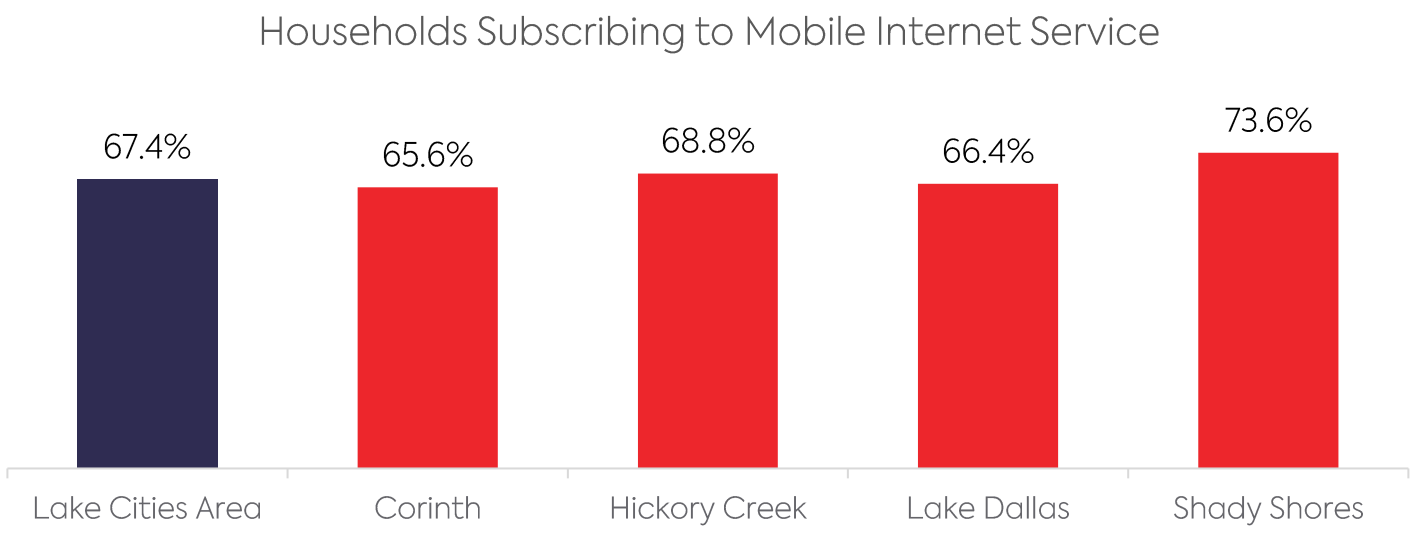


As a result, across all the Lake Cities, nearly all residents say they want more internet options than they currently have.



Mobile Connectivity

Slightly more than two out of three Lake Cities households (67.4%) report that they subscribe to mobile internet service, which they access via a smartphone or similar mobile device. This is slightly lower than in other Connected communities, where 74% of households subscribe to a mobile connection. One out of 20 households (5% of all households, or 7% of those that subscribe to mobile internet service) say that their mobile connection is their primary (or only) means of connecting to the internet at home.



CHALLENGES AND RECOMMENDATIONS

The Lake Cities communities face unique challenges, and those challenges differ from community to community. None of these challenges, though, is insurmountable. To address these challenges, each of the Lake Cities communities will need to focus on their own unique situation, but a combined effort between Corinth, Hickory Creek, Lake Dallas, and Shady Shores will provide opportunities and resources that would not be available to any one community. As a result, there are several steps that the Lake Cities can take to close the Digital Divide in the area.

Near-Term Goals and Action Items

CN Texas recognizes that making changes, particularly those that involve the improvement of infrastructure, policy changes, or ongoing digital literacy training, cannot happen overnight. These changes reflect long-term policy decisions and often take time to

implement. At the same time, there are several steps that local leaders can take to rapidly begin improving technology access, adoption, and use in the community.

- Work with incumbent providers
- Identify, contact, and attract potential broadband providers
- Develop a broadband education campaign

Long-Term Goals and Action Items

In addition to the priority efforts described above, CN Texas surveys and infrastructure analyses show that there are several long-term goals that the Lake Cities can target. The following is a list of important tasks that may take longer for the communities to carry out but will help grow and sustain broadband connectivity in the long run:

- Become a Digital Ready Community
- Develop Public-Private Partnerships to deploy broadband service
- Develop a telehealth partnership
- Identify options to improve download speeds at local libraries
- Develop a locally funded broadband grant program
- Fund the development of a municipal dark fiber ring
- Follow through and institute changes based on the efforts that the communities pursue as part of the short-term efforts listed above

Challenges

Every community is unique, and each one will have its own unique challenges with regard to broadband connectivity. There is no single solution that will close the Digital Divide in every community. Experience shows, though, that any community can take steps, given the right tools, toward improving broadband connectivity.

Based on an analysis of the access data as well as the information gleaned from the surveys, the following challenges have been identified for Lake Cities:

- Dissatisfaction with current broadband choices – While broadband adoption rates are high in the Lake Cities, many customers are not satisfied with their current internet service. This may represent a lack of information about different services being offered or might be the result of local providers not being aware of or not addressing the changing needs of these communities. Network upgrades, as previously discussed, were occurring

simultaneously to the survey distribution. Many residents may be unaware of those activities which, in part, may have contributed to service disruptions.

- Demand for better service – The top reasons for dissatisfaction reported by households in the Lake Cities are the need for faster, more reliable service. This may be because service is not offered at the desired speeds, faster service plans are too expensive, or customers may be unaware of services that are available with higher speeds. Network upgrades, as previously discussed, were occurring simultaneously to the survey distribution; this led to service being down for a week or more to some areas due to service lines being cut, changed, or upgraded. The inability to access faster broadband speeds, combined with the unreliability of the services currently being offered, lead to frustration for many residents.
- Competition – Three out of five internet-subscribing households are dissatisfied with their current internet service, and nearly every respondent (99%) is interested in more choices for internet service at home. This indicates that there is demand for more broadband options in the area. However, there is no evidence to support that a new provider (or network) would be profitable.
- Community Involvement – Broadband expansion in all four Lake Cities will require ongoing work and dedication from all sectors in the community to successfully improve broadband access, adoption, and use.

Recommendations

To overcome these challenges, the Lake Cities will need to take decisive steps. The following pages contain recommended projects with details on their implementation that address the identified challenges. These recommendations are presented to assist the Lake Cities in expanding broadband access and adoption throughout all four communities.

CN Texas developed an interactive map that displays the routes of each broadband service provider, and their respective platform types. The map can be accessed at https://connectednation.org/texas/lakecities/interactivemap.

Certain areas within the Lake Cities region may only have access to a single wire-line provider (e.g., Terrace Oaks, The Orchards, etc.) and can be categorized as "underserved." Consumers in these locations may be seeking alternative service options, may be dissatisfied with their current provider, or could be unhappy with the limited-service packages available. Incumbent providers may be unaware of the rapid housing construction activities and could be interested in expanding their infrastructure into the underserved gaps. To help facilitate broadband expansion, the Lake Cities Broadband Committee members may need to engage in discussions with the local incumbents to better understand potential limitations

(e.g., return on investment models, ILEC exchange boundaries, cable franchising restrictions, lack of adequate backhaul infrastructure, etc.) as well as greenfield/brownfield opportunities.

The next several sections will offer recommended action items that can be utilized in the Lake Cities region to address this subject.

WORK WITH INCUMBENT BROADBAND PROVIDERS

GOAL: To develop trusted, lasting relationships with the incumbent provider community that result in improved broadband access across the Lake Cities region.

DESCRIPTION: Gone are the days when large incumbent broadband providers employ local general managers, plant managers, customer service departments and have decision making staff engaged in the local community. Over the years, these companies were subject to a litany of federal or state regulations/deregulations, mergers, acquisitions, and the need to increase their profit margin. Streamlining and consolidation became a necessity, and it became more common for "local staff" to be relegated to service technicians and bills are now often paid online (or at a drop box). The trade-out meant that the staffing infrastructure turned from "local" to "regional" or even state level management. The local service technicians can serve as a source to identify the appropriate regional or state management team in charge of the decision-making process.

Once the appropriate contact is identified, CN Texas recommends that open dialogue is often the best strategic principle.

ACTIONS:

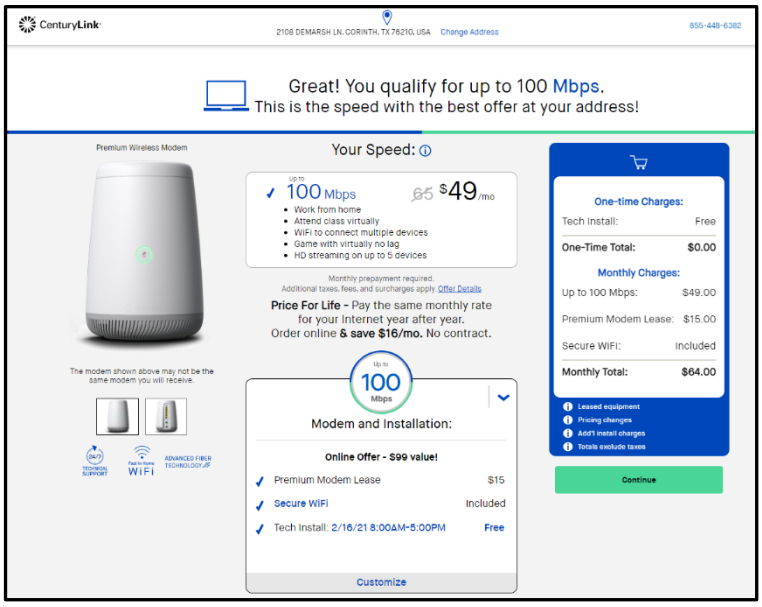
1. Developing an agenda of discussion topics
2. "Invite" participation: do not "demand" participation
3. Provide the discussion items in advance of the meeting
4. Stick to a stringent timeline like any other structured public meeting
5. Level set expectations - no one feels comfortable walking into a meeting unprepared

RESPONSIBLE PARTIES:

- Lake Cities Broadband Committee
- Community and business leaders
- Civic leaders and organization members

- Community Anchor Institutions
  - Public Safety
  - Libraries
  - Schools

RESOURCES:



The discussion topics should focus on presenting factual data, not anecdotal input, and should be quantitative whenever possible. This serves to move discussions toward a final resolution and eliminates "emotional bias." For example, it is a fact that Terrace Oaks is currently limited to one wire-line provider (CenturyLink) and that the fastest advertised speed on the CenturyLink website is 100 Mbps. It is also a fact that when CN Texas contacted CenturyLink (855-234-5729) on February 12 at 4:20 p.m. the CSR (Ashanti) informed CN Texas that the address of 2108 Demarsh Lane, Corinth, Texas, 76210 is limited to 100 Mbps FTTH and that no other packages are available.

What is unknown is whether CenturyLink is technically capable of upgrading service, whether the speed in this subdivision is limited due to backhaul constraints or if there are other issues preventing the upgrade of this network. After presenting the facts to CenturyLink, let's assume that the final conclusion is that, as willing as they might be to accommodate your requests, they simply cannot do so. What next?

Invite another provider to the table for discussion (e.g., Spectrum). In this example follow the same factual format. When CN Texas conducted the outside plant audit there were 99 homes in the subdivision (a fact) and the residential surveys in the same subdivision state that residents do not believe their Internet needs are being met (a fact). The Lake Cities Broadband Committee should then present the aggregated facts to Spectrum and ask if their return-on-investment (ROI) model suggests that Terrace Oaks can become brownfield opportunity and, if so, by what estimated date? If the response is "no" ask for a few details "why?". What you may learn through the exchange may help provide facts for the next discussion.

Continuing to draw on this example, let's assume that Spectrum informs the Lake Cities Broadband Committee that the cost of trenching, permitting, installation labor and materials exceeds their reasonable 3- to 5-year ROI model. The model requires a certain number of subscriptions, per (example) every 10 homes passed, and in this case, the number is too small for such a large infrastructure investment.

Now, the Lake Cities Broadband Committee, rich with factual data, can invite another wire-line, or fixed wireless, provider to the discussion table — or this wealth of data can be transferred to the narrative of a competitive bidding instrument such as an RFP or RFQ.

But what about the target audience? How can potential providers be identified, and what is the best way to get their attention?

INDENTIFY PROVIDERS PRIOR TO ISSUING AN RFP or RFQ

DESCRIPTION: Once the Lake Cities Broadband Committee has held open discussions with the incumbent providers, the issuance of a request for information (RFI) may be inefficient. The incumbent broadband providers may have expressed why they are unable, or unwilling, to expand/improves services. Companies do not wish to expend significant staff hours preparing responses to RFIs given the fact that they rarely result in a selection or a contract award. Therefore, the issuance of a request for proposal (RFP) or request for quote (RFQ) may be a necessary step to improve the broadband infrastructure or increase connectivity options.

ACTIONS: A request for proposal (RFP) or request for quote (RFQ) should focus the majority of its attention on stating the facts, addressing the desired outcomes, timelines for issuance, questions and answers, deadlines for receipt and forms of receipt, acceptable formats, scoring criteria, etc., and should refrain from being overly "prescriptive." Legal requirements should be included but should be positioned in the document after the narrative discussing the rationale for the request.

Additionally, the RFP should be clear regarding potential city-owned assets that are, or can be, made available for use in the process, along with any commitments/obligations related to permitting, rights-of-way or other "in-kind" contributions that the city is willing to provide to encourage and advance the plan.

RESPONSIBLE PARTIES:

- Lake Cities Broadband Committee

- Legal Counsel
- Community and business leaders
- Community Anchor Institutions

RESOURCES: There are numerous resources that can be used to identify potential providers (see the example list below). In addition, CN Texas can provide a list of broadband providers within Denton County (or adjacent counties) as well as companies that have expressed an interest related to such expansion opportunities.

Texas Cable Association Member Companies located at: https://www.txcable.com/about-2-2/member-companies/

Texas Public Utilities Commission Market Directories – Communication Companies Serving Texas located at:
https://www.puc.texas.gov/industry/communications/directories/Default.aspx

Texas Statewide Telephone Cooperative, Inc. Member Companies located at:
https://www.tstci.org/tstci-members

Texas Telephone Association Member Companies located at:
http://tta.org/members/companies/

The Wireless ISP Association Member Directory (Find A WISP) located at:
https://members.wispa.org/members/directory/search_bootstrap.php?org_id=WISP

A recent RFP, issued by the city of Victoria, Texas, can be found at https://www.victoriatx.gov/785/Broadband. CN Texas was engaged by the city of Victoria to assist with several aspects of their RFP.

CN Texas' list of Providers by County can be located at: https://connectednation.org/texas/wp-content/uploads/sites/19/2020/12/TX_BroadbandProviders_ByCounty_2020_12_18.xlsx

HOW TO IDENTIFY AND SECURE POTENTIAL WIRELESS PROVIDERS

NOTE: See previous sections "Working with Incumbent Broadband Providers" and "Identifying Providers Prior to Issuing an RFP or RFQ."

Fixed wireless Internet service providers (WISP), in most cases, have less restrictive environments, lower infrastructure costs, do not require wire-line infrastructure to pass every home, may have different attributes in their ROI model, but generally cannot provide the same speeds associated with DOSCSIS or FTTH platforms. Fixed wireless service is not "mobile", should not be confused with Wi-Fi, and is no less secure than their wire-line counterparts.

There are limitations to speeds, depending on several factors, such as whether the end user has a dedicated link (referred to as a point-to-point connection) or has a shared framework (referred to as point-to-multipoint). Additional considerations would include the type of spectrum being used (e.g., unlicensed bands, licensed and regulated bands, the width of the channel or aggregated channels used, distance, modulation schemes, etc.).

Gigabit delivery, over fixed wireless, is possible through the use of unique spectrum bands such as millimeter-wave, although the limitations for this delivery type is highly subject to distance and "line-of-site"). Broadband speeds, as defined by the FCC as 25 Mbps download and 3 Mbps upload) are common among fixed wireless providers, and speeds can be achieved in excess of this benchmark. Speeds of 50 – 100+ Mbps are regularly obtainable.

Fixed wireless providers often invest their own money in their networks and, in some cases, receive state or federal grants, loans or subsidies. Because of their own privately funded investments, wireless internet service providers (WISPs) seek access to reasonably priced (if not free) vertical structures. This is one area where Lake Cities may be able to offer significant "in-kind" contributions to a broadband expansion project. There are numerous water tanks, that may be owned by the municipality, as well as towers and land. The towers and land may come in the form of structures located at local law enforcement agencies, fire departments, as well as municipally owned light or utility poles.

Lake Cities could also consider making an investment in erecting additional vertical infrastructure such as lattice or monopole tower sites or the strategic placement of tall utility poles that could be utilized by WISPs.

An RFP or RFP that may be written to entice a WISP to bring fixed wireless broadband may be quite different than one written for a wireline broadband provider. Local regulations, such as

home-owner-association covenants, were addressed by the Federal Communications Commission to remove barriers and ensure access to fixed wireless services. Information can be found at https://www.fcc.gov/media/over-air-reception-devices-rule.

CN Texas employs RF engineers capable of assisting with this task and have helped author numerous RFPs/RFQs across the U.S. In CN's home state of Kentucky, for example, testimonials can be found at https://www.ntia.doc.gov/legacy/broadbandgrants/comments/7DC5.pdf

DISCUSS AND EXPLORE THE DEVELOPMENT OF A DARK FIBER RING

Many towns across the Lone Star state, and across the U.S., are investing in, encouraging, or developing through public-private-partnership, dark fiber rings around their community. Some of these initiatives include partnerships with the local school districts and, in times like these, such collaborative partnerships are paying unexpected dividends.

Fiber optic cables are constructed of numerous strands of glass fibers, approximately equal in diameter to the size of a human hair, that transmit data via light at high speed. Dark fiber cable strands can be leased to individuals or companies to establish all kinds of connections. Clients can lease unused strands to create their own privately operated network and can tailor the network to adapt to the service platform of their choice.

In Texas, state laws prevent municipal networks from offering voice and video services, but they can still provide Internet access to households. These laws bar municipalities from offering specific types of telecommunication services to the public directly or through a private telecom company. ***The state law does allow some provisions for communities without any private telecom companies presently offering broadband service to residents.*** Other portions of the Texas Utilities Code seem to lean towards dark fiber as being "acceptable" for municipalities. For example:

Sec. 54.2025. LEASE OF FIBER OPTIC CABLE FACILITIES. Nothing in this subchapter shall prevent a municipality, or a municipal electric system that is a member of a municipal power agency formed under Chapter 163 by adoption of a concurrent resolution by the participating municipalities on or before August 1, 1975, from leasing any of the excess capacity of its fiber optic cable facilities (dark fiber), so long as the rental of the fiber facilities is done on a nondiscriminatory, nonpreferential basis.

Added by Acts 1999, 76th Leg., ch. 1212, Sec. 17, eff. Sept. 1, 1999.

A few recent examples of dark fiber networks, from within the state of Texas, are provided herein for reference followed by discussion points on the pros and cons.

- Bastrop, Texas: "The City of Bastrop, located approximately 30 miles southeast of Austin, is the county seat of Bastrop County, Texas, and part of the Greater Austin metropolitan area. The mission of Bastrop is to provide efficient, innovative and proactive services that enhance the quality of life of its residents and foster ongoing progress and continuous economic growth." https://www.fiberlight.com/resources/success-stories/expanding-network-capacity-in-bastrop-tx/

- San Antonio, Texas: "San Antonio Leverages Its Fiber Infrastructure to Extend School Networks to 20,000 Students in Need." https://muninetworks.org/content/san-antonio-leverages-its-fiber-infrastructure-extend-school-networks-20000-students-need
    - "San Antonio Finds Opportunities To Close Digital Divide During Coronavirus Pandemic". - https://www.tpr.org/technology-entrepreneurship/2020-05-20/san-antonio-finds-opportunities-to-close-digital-divide-during-coronavirus-pandemic

- Wichita Falls, Texas: "Progress: WFISD improvements save taxpayers thousands of dollars." https://fallsfuture.com/progress-wfisd-improvements-save-taxpayers-thousands-of-dollars/

PROS: The P3 model leverages the best of both the public and the private sectors. Municipalities finance and build basic infrastructure, manage rights-of-way, and maintain infrastructure every day. Why not benefit, socially and financially, from a dark fiber network that can underscore a "Smart Cities" initiative, be used as a supervisory control and data acquisition (SCADA) network, connect municipal offices, hospitals and health care facilities, libraries, public safety agencies, as well as the local school districts?

The private sector is allowed to do what they already do well: operate the day-to-day business functions market the product, provide customer service, facilitate installations and network diagnostics, not to mention network repair.

This model represents a scalable option for local communities that lack the expertise to operate a communications network (note we did not say telecommunications) but want to own and control the assets as a means of ensuring access to additional network capacity.

Dark fiber is one of the most efficient ways to move large amounts of data. Because it enables, for example, local government to appropriate individual strands of fiber for their exclusive use and enables local government(s) to share information directly from point to point, as opposed to sharing information via the internet. Using dark fiber can also provide an excellent layer of redundancy, thereby supporting continuity of services by the government during times of crisis.

The supplier might not have an obligation to provide strand maintenance, does not have to offer a warranty and typically is not required to offer refunds if their contracts are structured as an IRU (see definition below).

CONS: The number one downside to dark fiber is the high upfront cost. Negotiating pole attachment agreements can be burdensome, especially when the poles are owned by local incumbent broadband providers trying to run their network. The most expensive part of a network is not the number of fibers in the cable – it's the labor for trenching and hanging the fiber on the poles and the recurring pole attachment fees.

The network model may not scale easily due to the difficulty in anticipating the fiber count needed to meet current and future demands.

Most strand leases are for infinite capacity over a long period through a contract known as an indefeasible right of use (IRU). An IRU usually does not include a right to terminate by either party.

Obviously, a municipality should ask themselves "what happens when there is a physical break in the network?" Municipalities must consider having trained staff on hand, or having a contractor on emergency retainer, to immediately repair any broken (unleased) strands in the event that the fiber optic cable is physically severed.

EDUCATIONAL CAMPAIGN

GOAL: To create a more informed and educated consumer by providing easy-to-understand information regarding high-speed internet (broadband) connections including but not limited to: a) informing residents and businesses of broadband service provisions; b) provider package selection; c) device selection and understanding the devices in the home; d) troubleshooting common issues regarding speed and lost connections; e) how to verify consumers are getting what they've paid for; and f) when to call their provider versus the city.

DESCRIPTION: As it's important to have a quality broadband connection, it's important to understand what makes a good connection, meets your needs, and ensures we're doing our part to ensure a quality connection.

Educating and informing the general population about connectivity, how to trouble shoot their connections, and ways to maximize their own Wi-Fi networks is just one way that a community can help with broadband networks and the perceived quality of those networks.

The community will work to determine several outreach items to include handouts, videos, social media posts, and other items to be used locally to educate and inform the public of high-speed internet connections and common connectivity issues. These materials should help consumers with understanding and selecting broadband services, how to troubleshoot common issues, and how to assess the quality of the services that they subscribe to.

Community leaders will determine the most effective formats for materials and outreach, and work with a team to develop those resources. Once those resources have been created, a "blitz" style media launch should be deployed to ensure that members of the public become aware, are educated, and have access to the created materials. Working with local media outlets, utilities, public agencies, and or other local businesses, will also be a significant way to help distribute and educate the community.

ACTIONS:

1. Develop a communications plan.
2. Identify local spokesperson, to assist with voice overs and videos.
3. Determine communication types that will best meet the needs of the community.
4. Develop communications collateral.
    a. Fact Sheets
    b. Website Updates
    c. Utility Bill Inserts
    d. Video Scripts
    e. Social Media posts
    f. Blog posts
5. Launch all communications through a "media blitz."
6. Monitor and support community questions, and potentially develop additional materials in response to community feedback.

RESPONSIBLE PARTIES:

- Community and business leaders
- Civic leaders and organization members

- Community Anchor Institutions
- Local Media
- Libraries
- Schools
- Local businesses

RESOURCES (state or local examples):

https://www.prospertx.gov/broadband-service-improvements/

An example of an easy to customize FAQ is shown below:

Internet Quick Fix Tips and Tricks

We've all dealt with internet issues from time to time. It can be a real headache if you work from home, or your son or daughter is trying to get homework done.

Or, let's be real, you're actually trying to watch the next episode of Game of Thrones on your streaming device and the internet isn't performing to your satisfaction. That's why the City of _____ wants to make it easier for you to fix the problem fast—without waiting to hear back from a technician or sitting on hold for part of your day. We've consulted with some experts, including Connected Nation Texas, a national nonprofit that works to identify innovative solutions to expand and improve broadband (high-speed internet) to all communities, and we've gathered some "quick fix" tips and tricks to try before your call your local provider (or the city) when your connection drops or your speed slows down. Here are just a few:

Tips for Restoring Lost Connections

1) Power-cycling: Unplug the power from router, wait 60 seconds, plug it back in so it can reset and recalibrate. After plugging it back in and ensuring that all physical cables and connections are securely in place, check the lights on the router. They should all be green. If one is amber, there is a connection loss somewhere along the network or within your home. Each light should be labeled so, if you do need to call your broadband provider, be sure to tell the customer service representative which light is amber when you call to report your problem.
   If that doesn't immediately solve the issue, repeat the process with the device that is having problem.
2) If your router (or wireless routers) is more than 5 years old you should probably replace it. It's likely not capable of delivering the maximum speed that you may be subscribing to.
3) Check to ensure that Wi-Fi on your device is turned on. If it's not, it's equivalent to putting your phone in and out of airplane mode.
4) Check the wired connections going into your router, modem, your television and your computer. Sometime, these connections come loose and simply need to be "plugged in" again in order to solve the problem.

Tips for Improving Your Internet Speed

1) Check for malware or viruses on your devices regularly. There is free software available to keep your device clean such as Avast, AVG, Microsoft Windows Defender, Sophos, etc.) as well as subscription or fee-based software (e.g. Norton, MacAfee, Kaspersky, Bitdefender, Malwarebytes, etc.)
2) Change the settings on your ancillary devices to improve speeds on your primary devices. Devices like Roku, Fire TV Stick, or even a gaming headset can be set to lower data consumption without losing quality. Check the manufacturer's website for additional "how to" tips.
3) Protect your internet network so no one else can use it. Most routers come out of the box with no log-in or password security enabled, or may even have the same generic log-in and password until you add your own. Make sure to add a password that is not easy for someone else to figure out. Avoid using your birthday, anniversary, your dog's name, and so on, and try to create a password that combines unique numbers and symbols that can be easy to remember (e.g. I'm57&forgetful!) although we strongly advise that you write these down and store them in an easy to remember location. Also, avoid using the same password for everything.

If those tips or fixes did not solve your problem, do not worry. We have got a whole list of simple solutions with even more details that will save you time and trouble. Just head over to (insert the City's FAQ link here) and check them out. We have included a printable pdf to keep in case you lose your connection. (be sure to post the printable pdf on the city Internet FAQ's page)

THE RATIONALE FOR ADDITIONAL RESIDENTIAL SERVICE SURVEYS

The initial residential surveys, conducted by CN Texas, uncovered a series of issues that would require additional clarification to properly effectuate some of the Lake Cities Broadband Committee's goals and action items. While the initial residential survey answered many questions, it also identified more questions that need to be asked. An additional survey can help the Lake Cities Broadband Committee understand the answers to questions like:

Example of additional questions.

How old is your wireless router? What type of wireless router do you have?

Are any of your connected devices using an Ethernet cable?

Do all of your devices connect to Wi-Fi?

Did your wireless router come from the broadband provider or did you buy and install it yourself?

If broadband were made available what speeds would you be interested in subscribing to?

a. 25Mbps/3Mbps
b. 100Mbps/10Mbps
c. 500Mbps/25Mbps
d. 1000Mbps/100Mbps
e. Other

What would you expect to pay for 100Mbps? What would you be willing to pay for 100 Mbps?

What do you expect to pay for 1000Mbps? What would you be willing to pay for 100 Mbps?

Does anyone telework from your household? [If yes] What is your necessary bandwidth to telework? Does this include video conferencing? Are you a "power user"?

Do you have any school aged children? [If yes] How many? Are they involved in distance education due to COVID?

Do you use your Internet connection for streaming television services? [If yes] On how many televisions?

Would you be interested in managed services, managed Wi-Fi, security, phone, etc.

How many devices would you expect to be connected to your internet connection?

Questions such as those listed above can help formulate RFP/RFQ requirements, desired outcomes, and help the community understand with precision the desired needs and potential barriers. Results could prove that there are unrealistic expectations related to services and costs, which the community could work to address, while working to bring a provider to that area. Similarly, the answers to these questions will assist the incumbent broadband providers with their respective ROI models. Not only do these answers help inform the decision-making process on deployment, they also contribute to communications and marketing, necessity for network upgrades, service level packages, etc.

Geographically targeted surveys (neighborhood or rural community) begin to provide even higher levels of information about the households in a subset of your community. The kind of information gathered in these types of surveys provides the community and potential services providers insight into the makeup of these areas, and how they might best service that area.

The Lake Cities Broadband Committee can work with hyper-local contacts, homeowners associations, local school districts, and others to get the word out and get the surveys gathered. *This could include the distribution of paper copies for those households that do not have access to an Internet connection but want their opinions registered.* Such distribution can occur in collaboration with the local ministerial alliances, can include inserts into the local newspapers, can be on pizza box-tops, can be distributed at local post offices and so on.

The community can understand their collective willingness to subscribe to services, what kind of speeds are desired, and the willingness to pay for such services. This information when shared with a provider can be instrumental in helping a provider make the determination of whether they can service that location, or what else might be needed in a partnership to help serve those locations.

INDENTIFYING FUNDING OPPORTUNITIES

Funding opportunities come in all shapes and sizes and come and go on various cycles. The most extensive funding comes from the federal level in the form of grants, loans, and or subsidies made available from numerous federal agencies and programs that support the expansion of broadband in unserved and underserved communities.

The NTIA maintains a list of these funding mechanisms at the site below: https://broadbandusa.ntia.doc.gov/new-fund-search

As with any funding source, it is very important to become acquainted with the funding program, and often it is good to develop relationships with the funding agency or organization. A great example is to develop a relationship with the Telecom General Field Representative from USDA. GFR's work extensively with communities and providers on the various funding programs that USDA offers: https://www.rd.usda.gov/contact-us/telecom-gfr

Periodically unique, yet limited, broadband grant opportunities surface that could benefit the Lake Cities region. One such example is the Truist Expanding potential In Communities (EPIC) Grant program (https://www.internetsociety.org/grants/epic/).

In November 2018 CN Texas produced a document titled "Texas Broadband Funding Guide" and it can be found at https://connectednation.org/texas/wp-content/uploads/sites/19/2019/01/Texas-Broadband-Funding-Guide-Nov-2018-FINAL.pdf

It is also important to continue to follow what is happening at state level. While there is not currently funding at the state level for broadband, the 2020 Texas Governors Broadband Development Council report, stated: *"The Council also believes that the following action could benefit the broadband landscape in Texas and therefore recommends its continued study: Develop a state broadband funding program to incentivize deployment in unserved areas."*

And as of the delivery of this report, Broadband has been made an emergency issue by the Governor for the 2021 legislative cycle.

It is also important to develop relationships with local philanthropies, and potential private funders. Since the onset of COVID-19, connectivity has become exponentially more important to nearly every facet of life, and groups and organizations that would not have previously considered funding broadband projects, may now see connectivity in a different light, as they continue to seek ways to provide services and support their mission in your community and region.

BECOME A DIGITAL READY COMMUNITY

GOAL: Provide a framework through which a community can demonstrate that they are a "Digital Ready Community" that has streamlined policies, cleared barriers, and is committed to making broadband infrastructure deployment in the community a priority. Benefits: 1. Provides the community with the opportunity to identify their requirements and make it easier for the community to assist and work with a provider who seeks to expand services. 2. Gives providers a centralized location to identify necessary regulations, and the opportunity to work with a local jurisdiction to address those regulations in an effective manner. 3. Through the Community Broadband POC, a liaison is established through whom providers and the community can more easily work with one another and cuts down on the opportunity for poor communication.

DESCRIPTION: Unfortunately, local community policies and a lack of local coordination are often major hurdles to broadband providers, as they work to expand their networks and advance access to broadband services. This solution seeks to streamline this process, by eliminating unnecessary policies, consolidating information, and appointing a single point of contact that can ensure that the community is working as efficiently as possible with providers and gaining access to the networks and services that are needed. All community stakeholders, local governing bodies, agencies, utilities, etc. should meet and identify all the local policies, regulations, and permits required of a telecommunications provider. These disparate elements should be organized into a set of requirements, and a website established with all necessary forms available electronically and capable to be electronically signed. This group will also appoint a single point of contact (SPOC) for all telecommunications infrastructure development projects. This individual be the community liaison with providers and assist both the community and the provider through any necessary communications and working through any necessary issues as a commitment to this process, the local governing body/s should pass language that requires the agreed-upon times for responses to provider outreach, permit approval times, and authorizes the SPOC."

ACTIONS:

1. Conduct an initial meeting of involved parties, with a request that any needs/concerns they have related to broadband be brought to this formative meeting.
2. Hold a second meeting of this group and others who were identified during the first meeting to review the local regulations and requirements and to discuss any new requirements that may have been thought of.
3. Hold a 3rd meeting to review the final list of local regulations and ensure that the responsible bodies have the necessary action items to amend those requirements/policies and to identify the Community Broadband POC candidates.

4. Pass the necessary language in the governing bodies to amend any necessary regulations or policies, as well as authorizing the SPOC according to local law.
5. Publish the list of requirements along with the necessary electronic documentation as well as the contact information for the SPOC.
6. Promote the Digital Ready Community site and SPOC and apply for Certification by completing the application and submitting all necessary documentation.

RESPONSIBLE PARTIES:

- Local government
- Utilities
- Planning commissions
- Zoning boards
- Other right-of-way managers

RESOURCES:

- Boonville IN: Broadband Ready Certification: Includes POC, and resolution https://www.iedc.in.gov/programs/capital-access-program/broadband-ready-communities-development-center/home/Download/ea6f2e9c-34ce-6748-857a-ff0000c19905/
- Model Ordinances/Resolutions from various states: MN Telecommuter Forward: https://mn.gov/deed/assets/telecommuter-forward-application-model-resolution-word_tcm1045-413760.docx
- Indiana Broadband Ready: https://www.in.gov/indianabroadband/2632.htm
- Tennessee Broadband Ready: https://www.tn.gov/content/dam/tn/ecd/documents/broadband/Broadband_Ordinance_SAMPLE.PDF
- Georgia Broadband Ready: https://broadband.georgia.gov/media/4/download

DEVELOP PUBLIC-PRIVATE PARTNERSHIPS TO DEPLOY BROADBAND SERVICE

GOAL: Leverage existing community assets in partnership with private-sector carriers to expand broadband network deployment.

DESCRIPTION: Public-private partnerships take many forms, limited only by the imagination and legal framework in which the municipality operates. Some communities issue municipal bonds to fund construction of a network, which they lease to private carriers, with the lease payments covering the debt service. Others create nonprofit organizations to develop networks in collaboration with private carriers or provide seed investment to jumpstart construction of networks that the private sector is unable to cost-justify on its own.

ACTIONS:

1. Determine Priorities: Competition, enhanced service, equity and service to all, public control over infrastructure, risk avoidance, redundancy, etc.

2. Examine models of partnership:
   - Model 1: Private Investment, Public Facilitation: Make available public assets like fiber and conduit, share geo- graphic information systems data, streamline permitting and inspection processes, offer economic development incentives to attract private broadband investment.
   - Model 2: Private Execution, Public Funding: Identify revenue streams that can be directed to a private partner, issue RFP for private turnkey execution.
   - Model 3: Shared Investment and Risk: Evaluate using assets to attract private investment, evaluate funding new assets to attract private investment, evaluate building new fiber assets to businesses and/or homes for leasing to private ISPs.

3. Understand key legal considerations for localities looking to build a broadband partnership: Review authority issues, understand the legal tools and instruments that could shape the partnership, negotiate the agreement.

RESPONSIBLE PARTIES:

- Local units of government
- Broadband providers
- Community anchor institutions
- Residents and businesses

RESOURCES:

- The Urban Land Institute's Ten Principles for Successful Public-Private Partnerships: https://bit.ly/2KKZqUv
- Building rural broadband from the ground up: http://bit.ly/2dx4MBw.
- United States Department of Agriculture: https://bit.ly/2yUGikq
- FCC Rural Health Care Program – https://bit.ly/2KQuGl4

PERFORM AN ANALYSIS OF LOCAL TELECOMMUNICATION POLICIES AND ORDINANCES

GOAL: Ensure that local policies and ordinances are conducive to wired and wireless broadband build-out.

DESCRIPTION: High capital investment costs, including permit processing, pole attachment costs, and lack of effective planning and coordination with public authorities, negatively impact the case for deployment. For example, the FCC's National Broadband Plan concludes that, "the rates, terms, and conditions for access to rights-of-way [including pole attachments] significantly impact broadband deployment." The costs associated with obtaining permits and leasing pole attachments and rights-of-way is one of the most expensive cost functions in a service provider's plans to expand or upgrade service, especially in rural markets where the ratio of poles to households goes off the charts. Furthermore, the process is time consuming. "Make ready" work, which involves moving wires and other equipment attached to a pole to ensure proper spacing between equipment and compliance with electric and safety codes, can take months to complete., Community and provider collaboration to problem solve around local pole attachment and other right-of-way issues is one of the most effective opportunities to encourage faster, new deployment of infrastructure.

ACTIONS:

1. Speak with providers and determine barriers they face at a local and county level.
2. Review local policies, ordinances, and other barriers to broadband deployment and consult with community leaders, providers, utilities, and other members of the community to ensure that they are supporting policies (local ordinances, pole attachments, rights-of-way) that are conducive to broadband build-out., Develop an awareness campaign targeting local government leaders to inform them of the benefits of broadband to the entire community.
3. Compare local policies to those in other communities where broadband build-out has been more successful.
4. Continue to review best practices regarding broadband build-out policies to determine that your community remains up to date on its policies.

RESPONSIBLE PARTIES:

- Local units of government, particularly planning and zoning officials
- Broadband providers
- County government, particularly road commissions
- Utility companies and pole owners
- Others with right-of-way jurisdiction

RESOURCES:

Broadband Competition and Innovation Policy: http://www.broadband.gov/plan/4-broadband-competition-and-innovation-policy/

The Importance of Telecommunications and Telecommunications Research: https://www.nap.edu/read/11711/chapter/3

An In-Depth Guide to Municipal Broadband: https://www.otelco.com/resources/a-municipal-broadband-guide/

COMPETITIVE APPLICATION PROCESS – GRANT PROGRAM

GOAL: Create a grant pool, to provide financial incentive/support to broadband providers willing to expand their networks. A competitive grant program would allow the selection of project(s) that create the most value by satisfying the needs of the consumers within high demand, underserved or unserved areas. Grant funding often changes the dynamics of a provider's ROI model and can be the catalyst that makes a difference for local broadband providers.

DESCRIPTION: The Lake Cities region would develop a funding source and subsequent grant application protocol. Broadband providers apply for grant funding and each application is graded, based on its merits, and winning applicants are awarded funds to be reimbursed upon successful completion of construction and activation of the broadband network. Scoring rubrics would be developed to include such parameters as proposed locations, service and pricing levels, project scalability, community support, technical capabilities of the applicants, proof of financing, budget, and sustainability. An open public comment period, which occurs following the application submissions, allowing interested parties to contest and/or protest an applicant/application. Such protests might be filed by consumers or by companies claiming that the proposed service area is already adequately served by a broadband provider.

ACTIONS:

1. Develop a grant development and review committee
2. Develop the Grant application, and guidelines
3. Promote the Grant within the region and among provider associations.
4. Grant:
    a. Open the application window
    b. Review applications
    c. Open the public comment period
    d. Award Grants
5. Grant oversight and reporting.

RESPONSIBLE PARTIES:

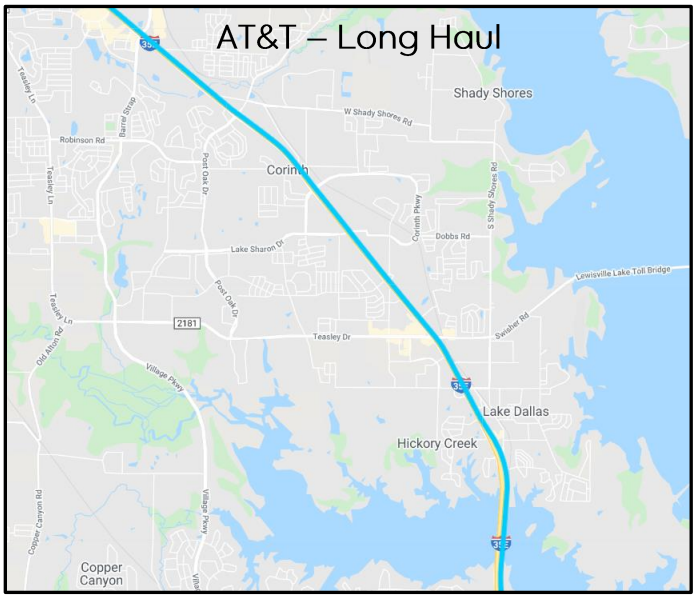
- Community and business leaders
- Civic leaders and organization members
- Citizens
- Local Government
- Broadband Providers

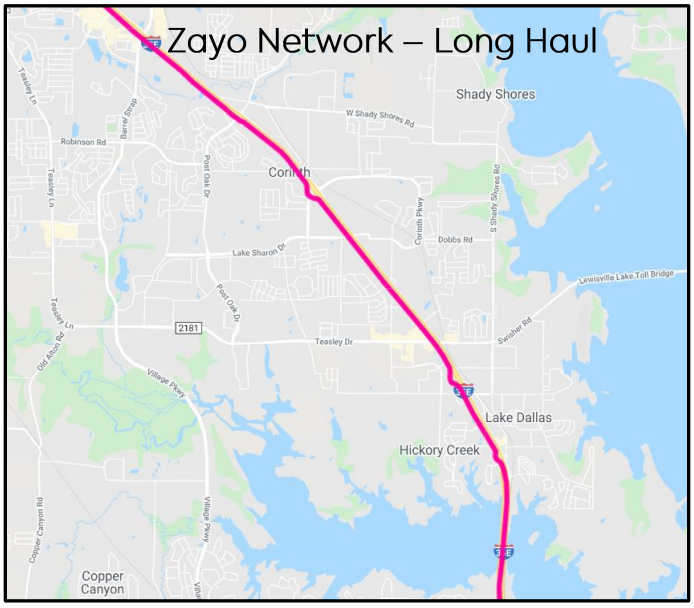
- Community Anchor Institutions

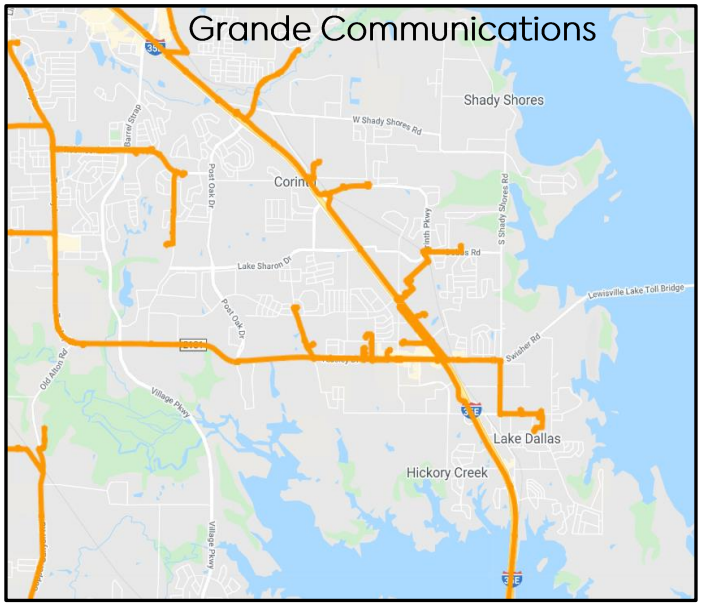
RESOURCES (state examples):

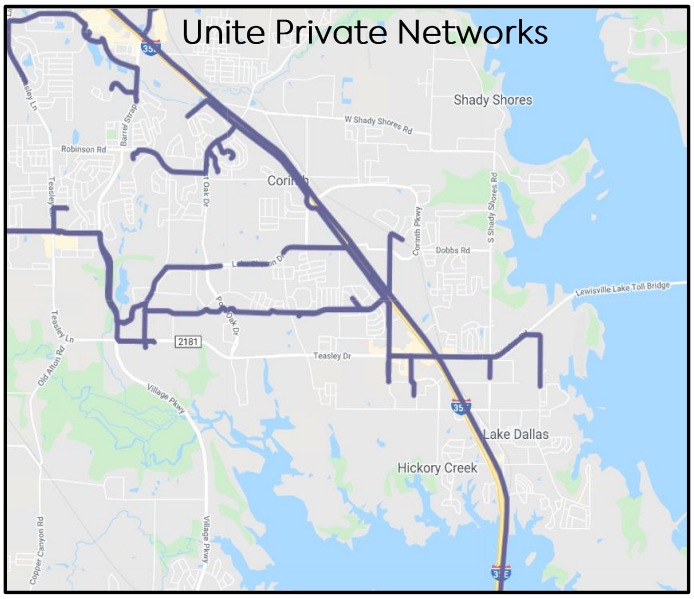
- Connecting Michigan Communities, Michigan: https://www.michigan.gov/dtmb/0,5552,7-358-82547_56345_91154---,00.html
- Border-to-Border Grant Program, Minnesota: https://mn.gov/deed/programs-services/broadband/grant-program/
- Broadband Accessibility Grants, Tennessee: https://www.tn.gov/ecd/rural-development/tennessee-broadband-grant-initiative/tnecd-broadband-accessibility-grant.html

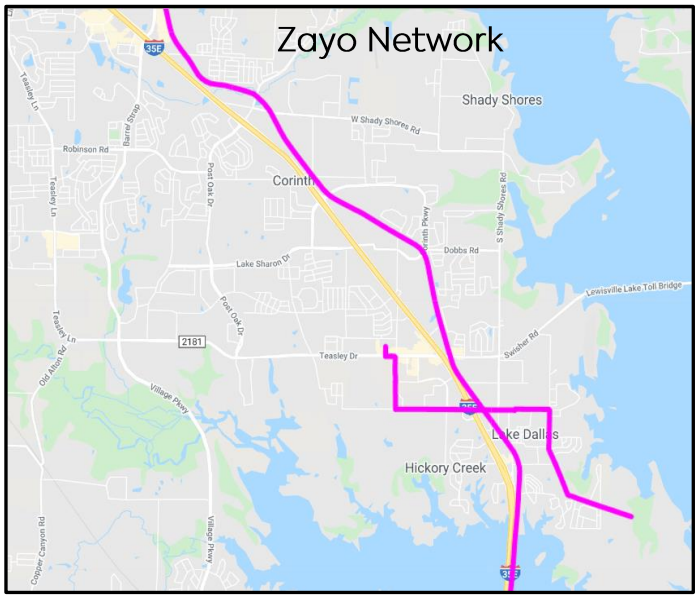
APPENDIX I: FIBER ROUTES



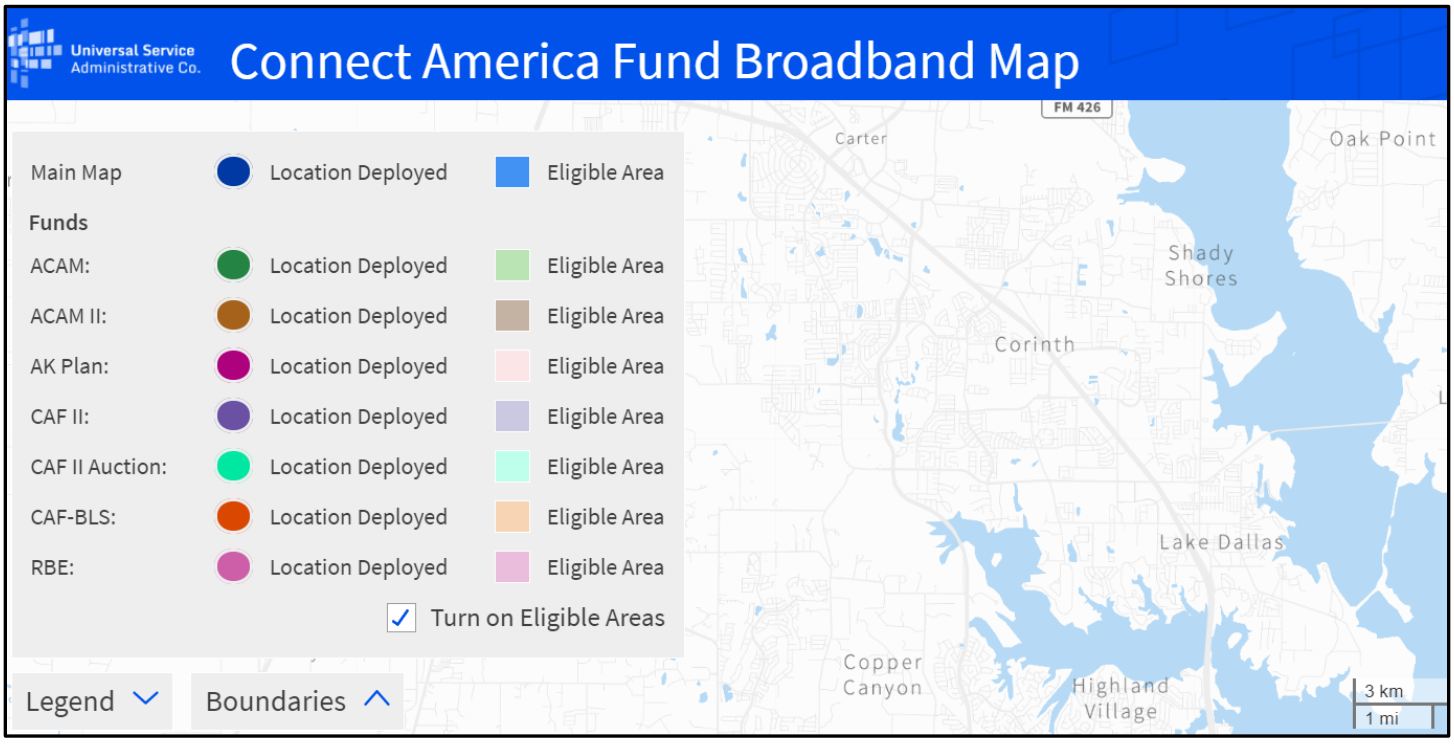

Zayo Network – Long Haul
Shady Shores
Lake Dallas
Hickory Creek
Copper Canyon


Grande Communications
Shady Shores
Lake Dallas
Hickory Creek

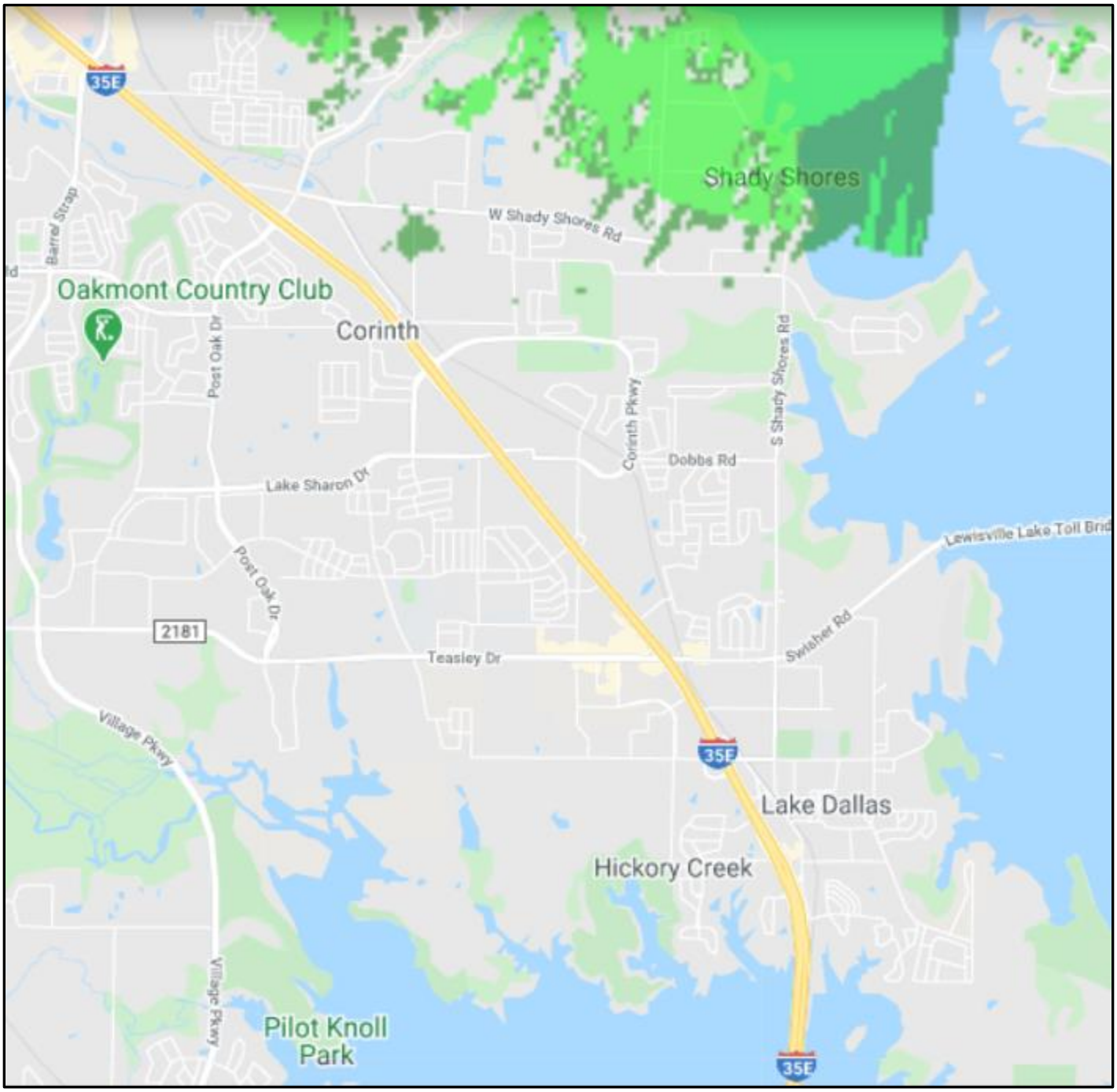

Unite Private Networks
Shady Shores
Lake Dallas
Hickory Creek


Zayo Network
Shady Shores
Hickory Creek

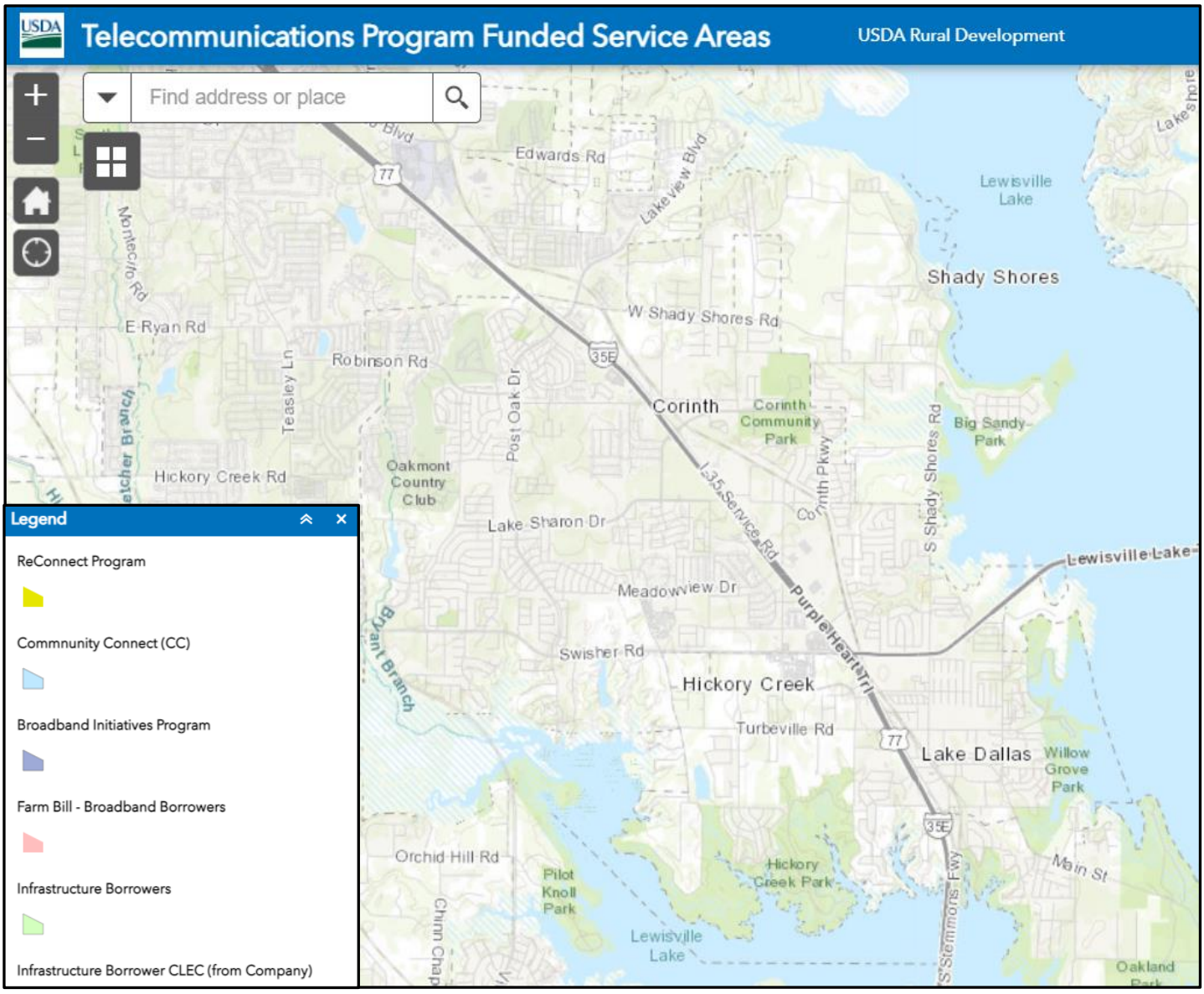
APPENDIX II: CONNECT AMERICA FUND BROADBAND MAP



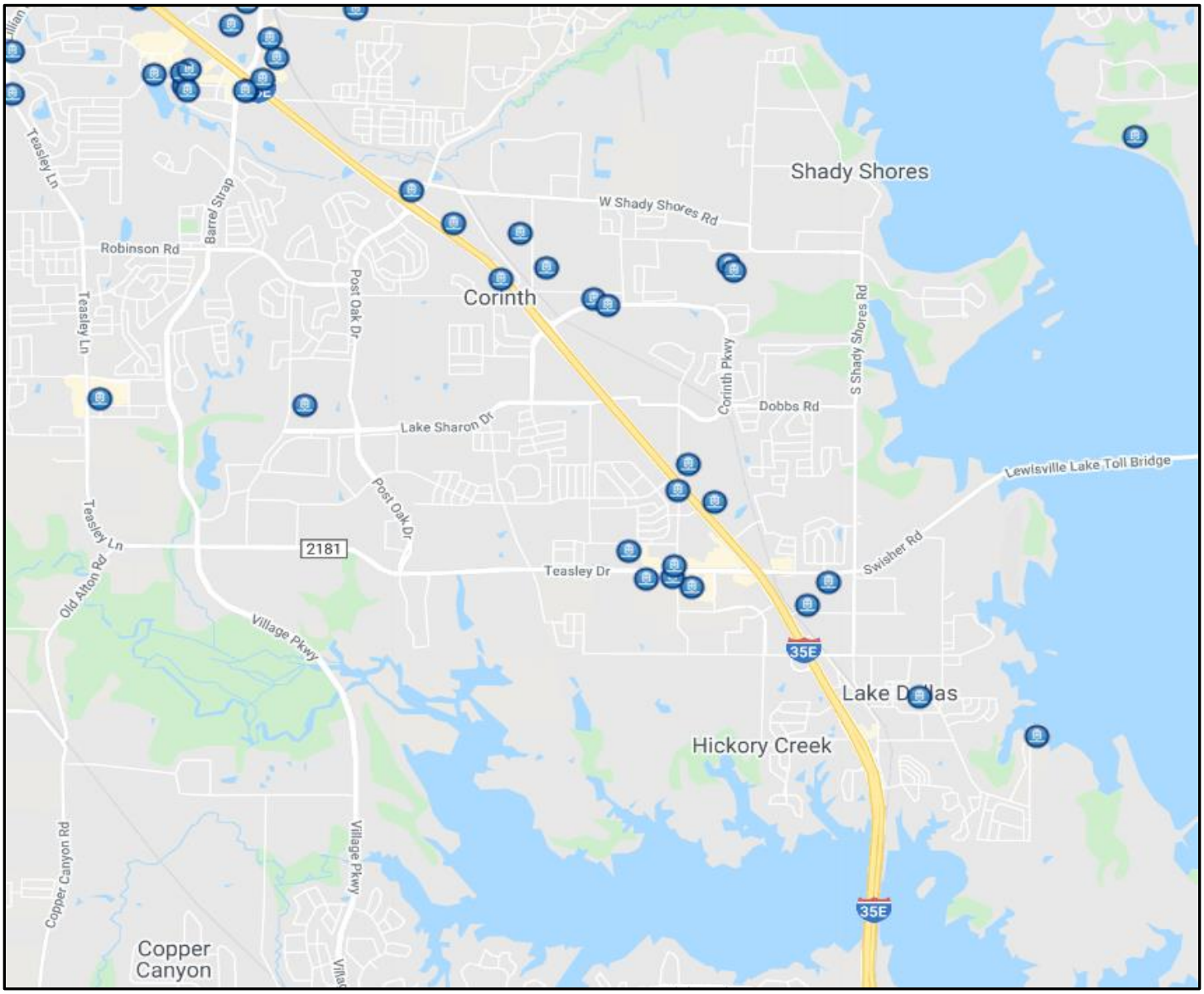
APPENDIX III: TOWER COVERAGE.COM MAP



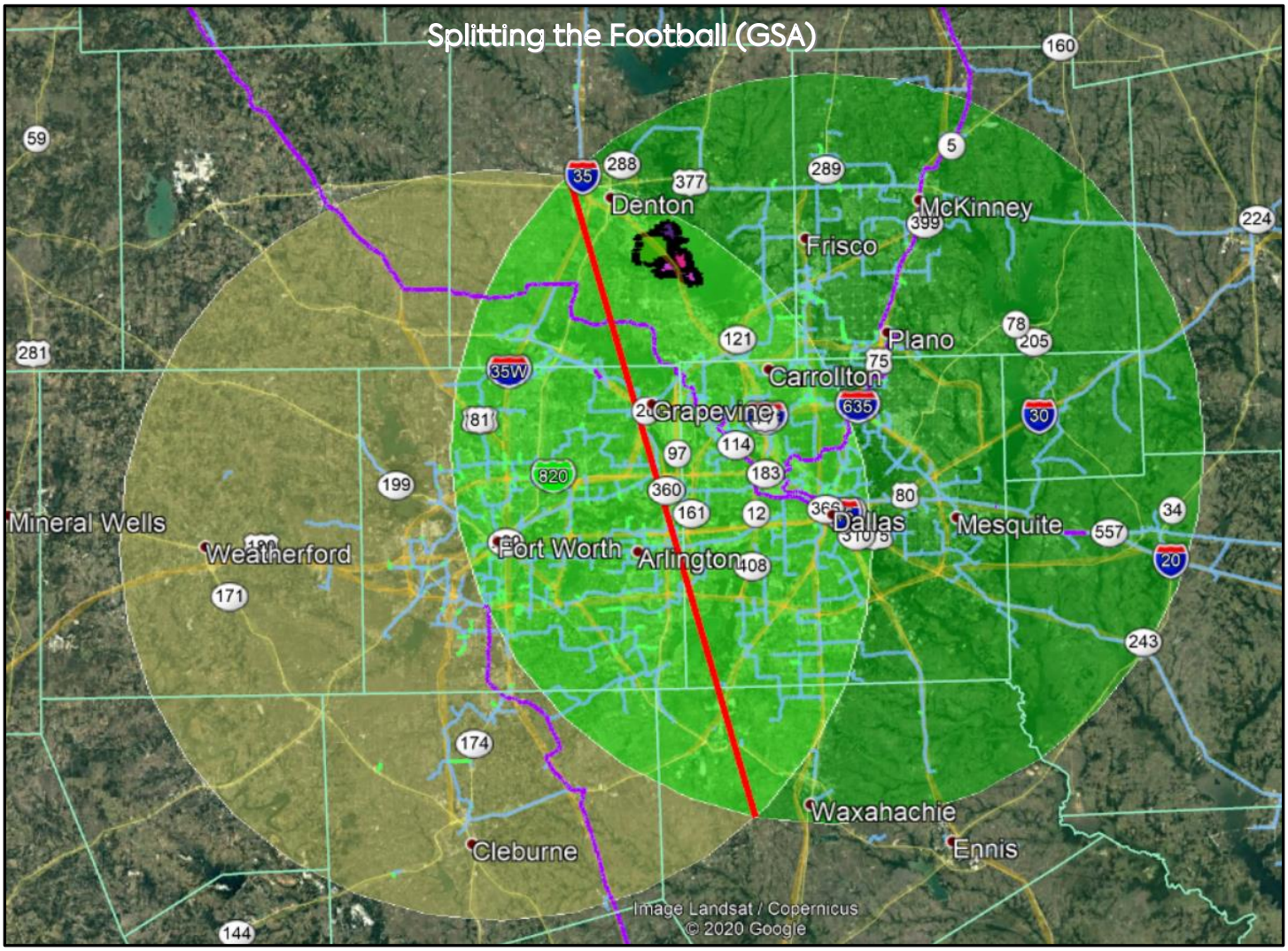
APPENDIX IV: USDA TELECOMMUNICATIONS FUNDED SERVICE AREA MAP



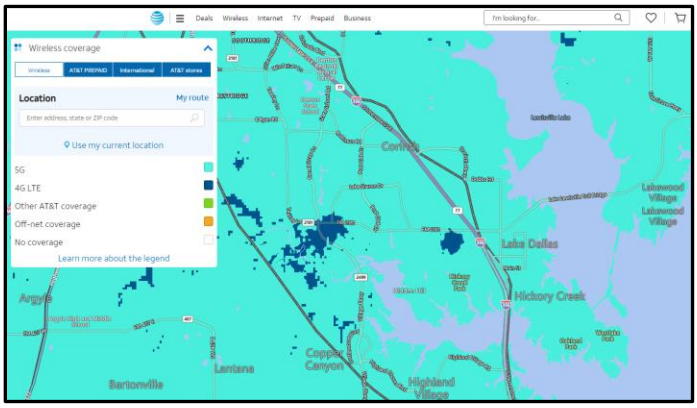
APPENDIX V: FIBERLOCATOR LIT BUILDINGS

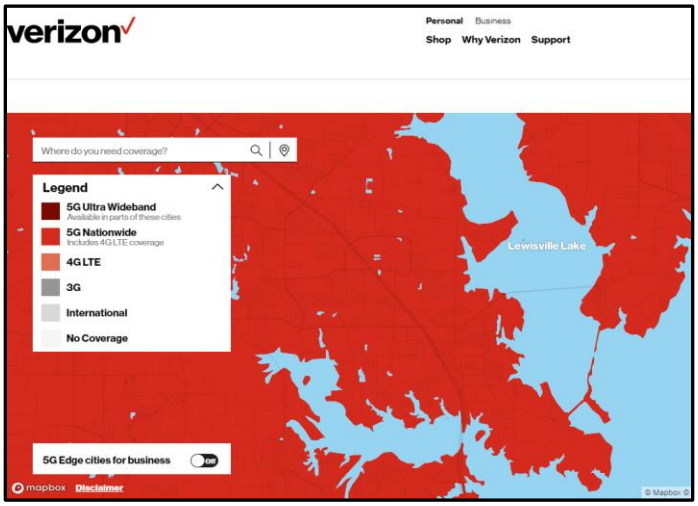


APPENDIX VI: EBS GSA



APPENDIX VII: 4G/5G MOBILE SERVICES

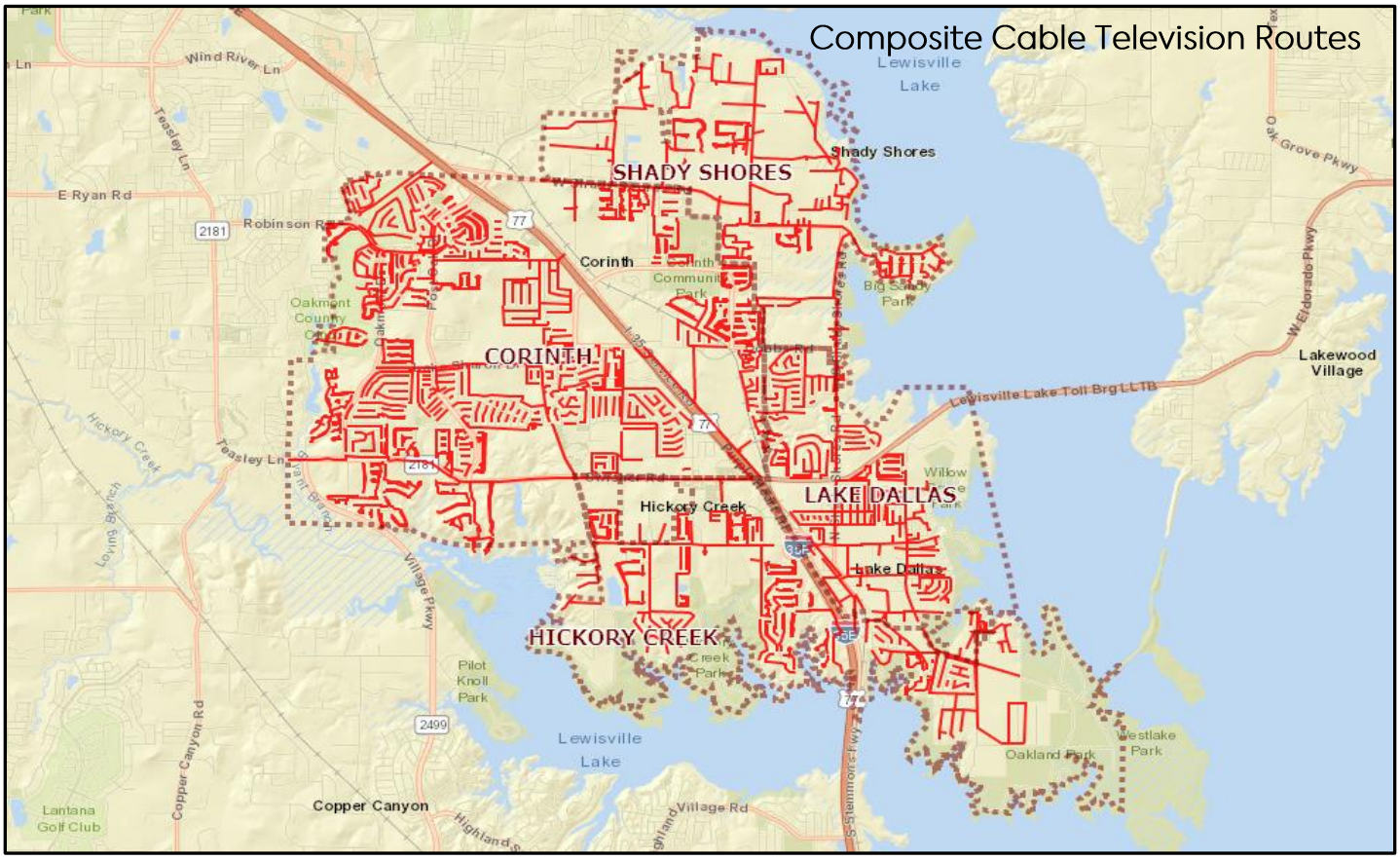


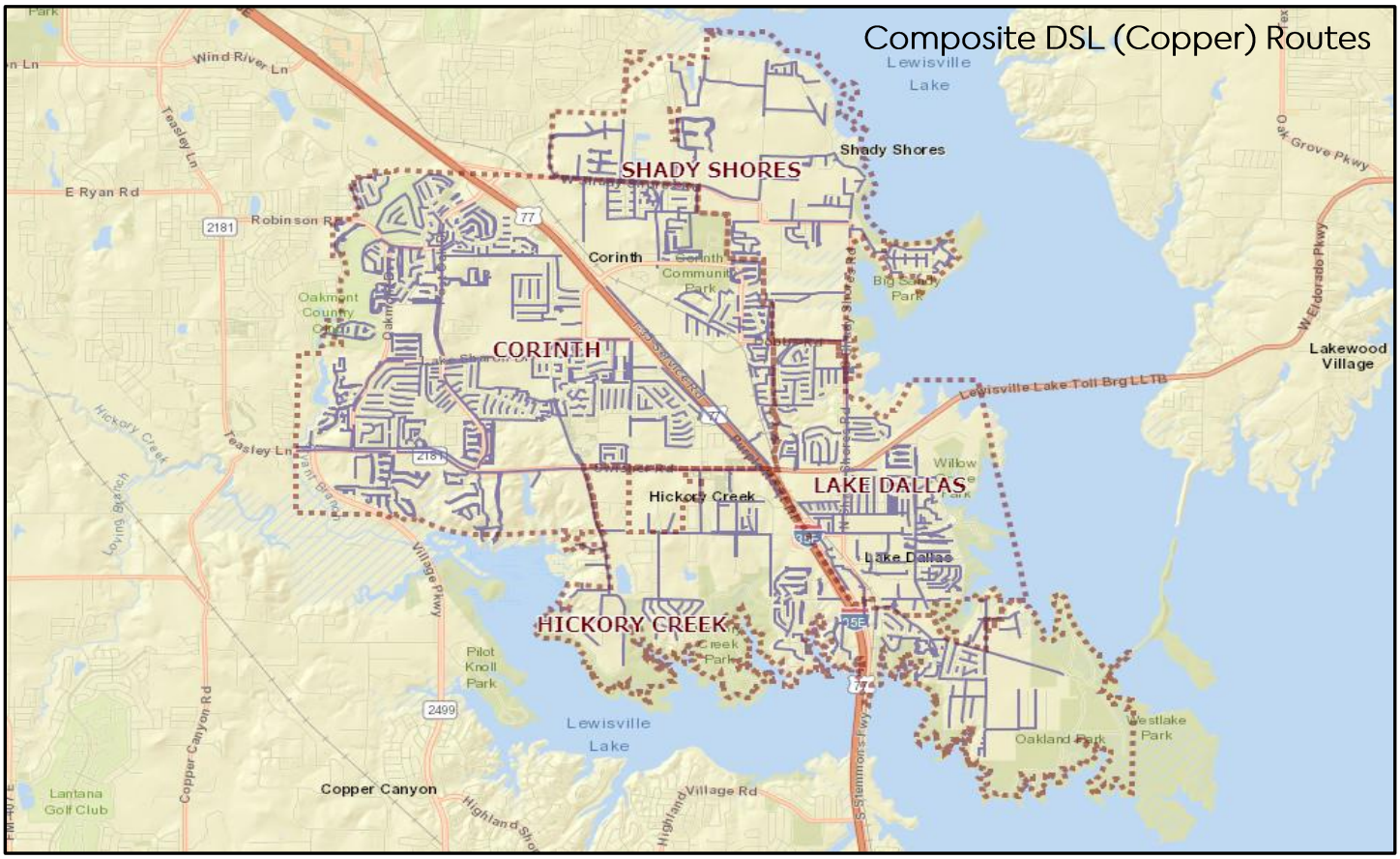


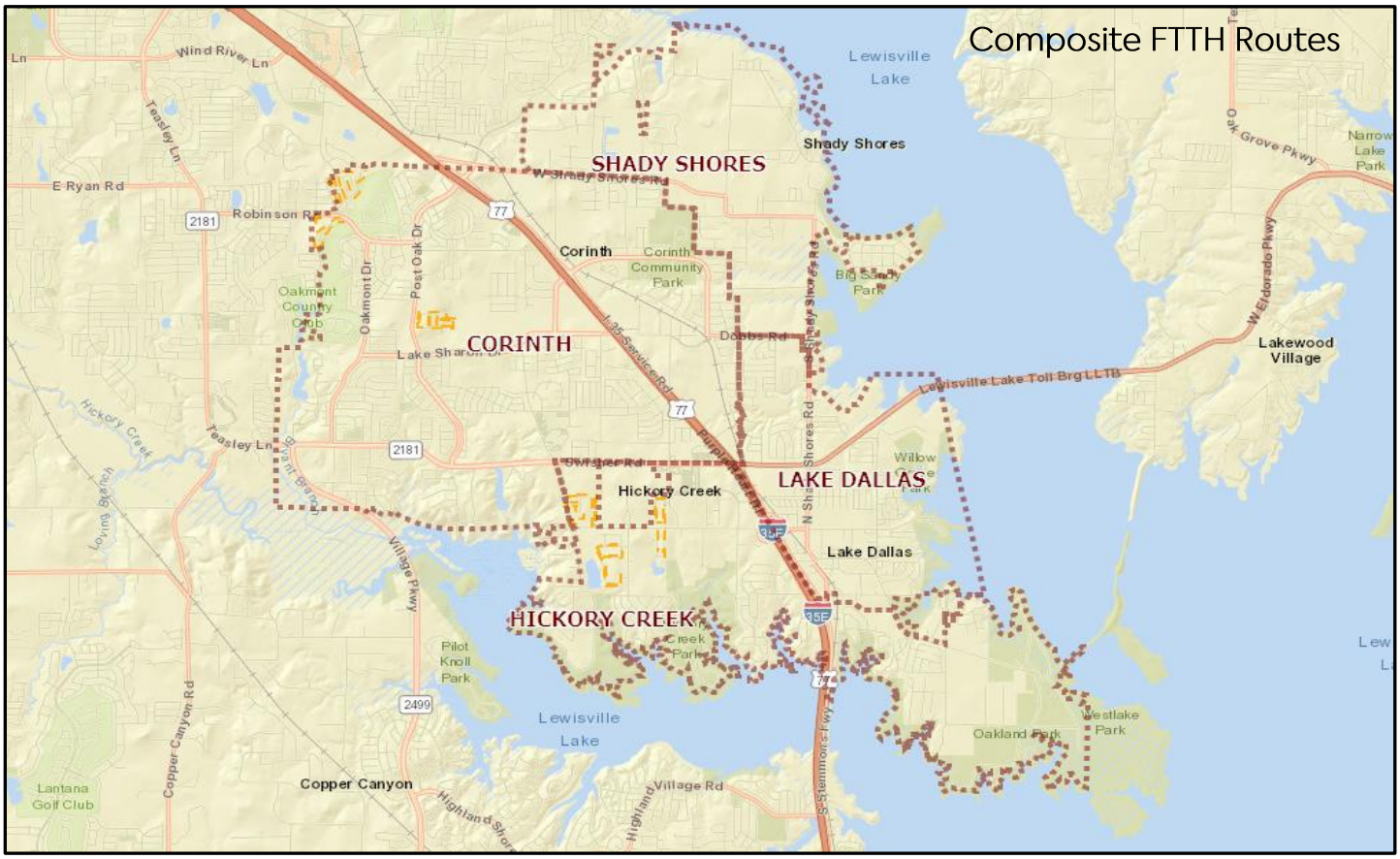
Small Cell Deployment – Hickory Creek

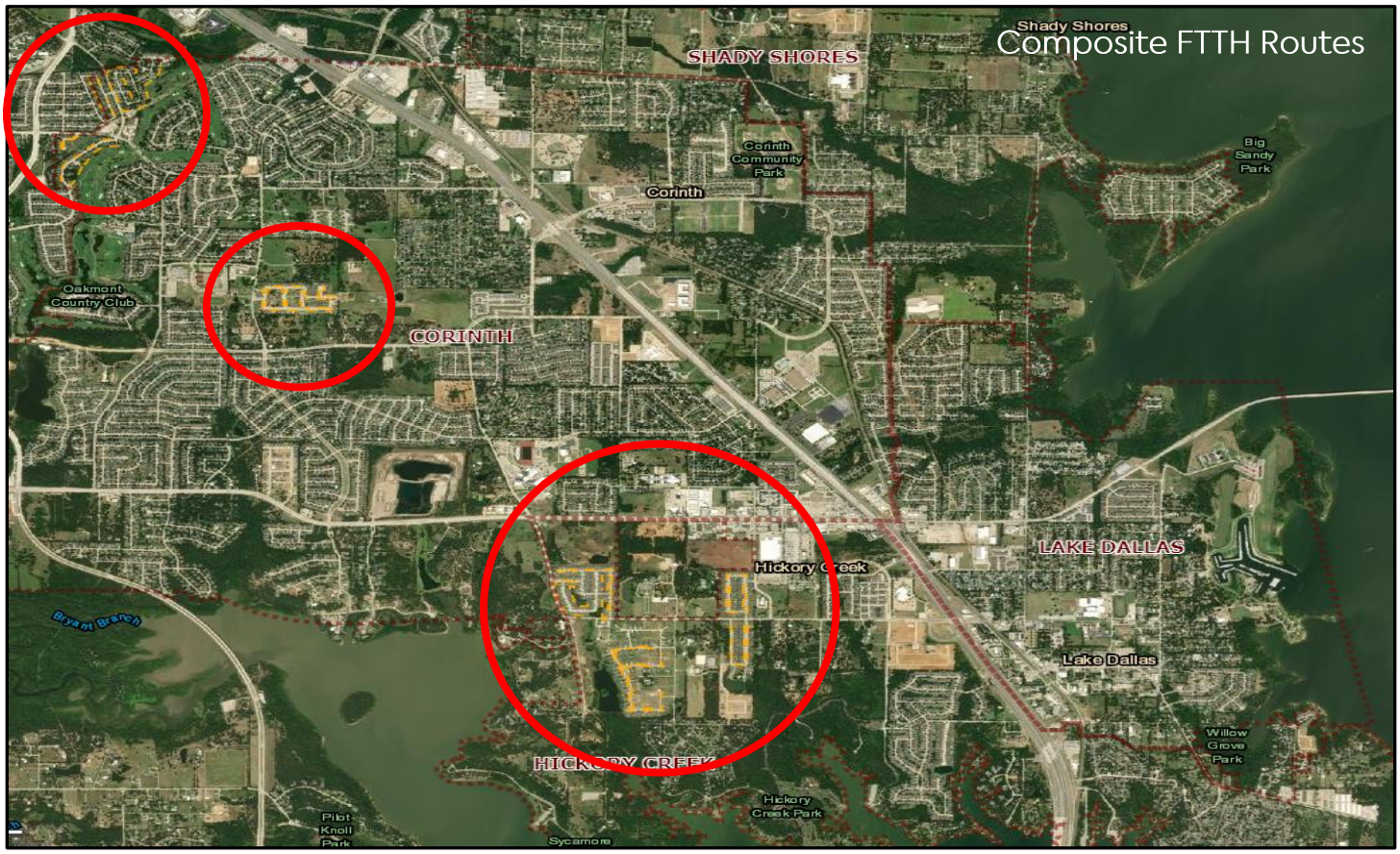
Camouflaged 4G/5G Mobile Cell Site – Corinth

APPENDIX VIII: EXISTING INFRASTRUCTURE

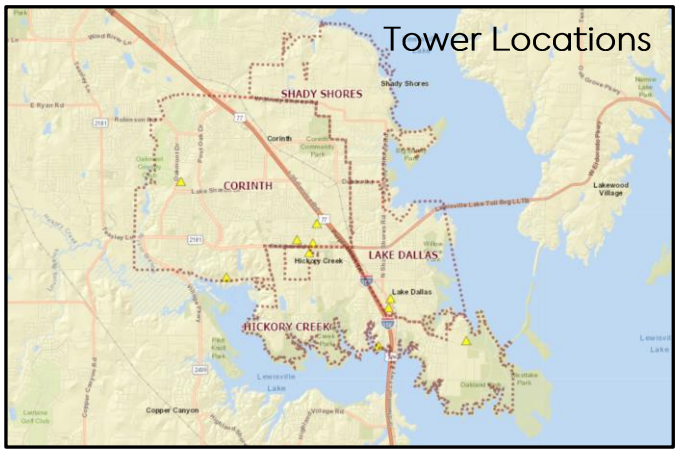


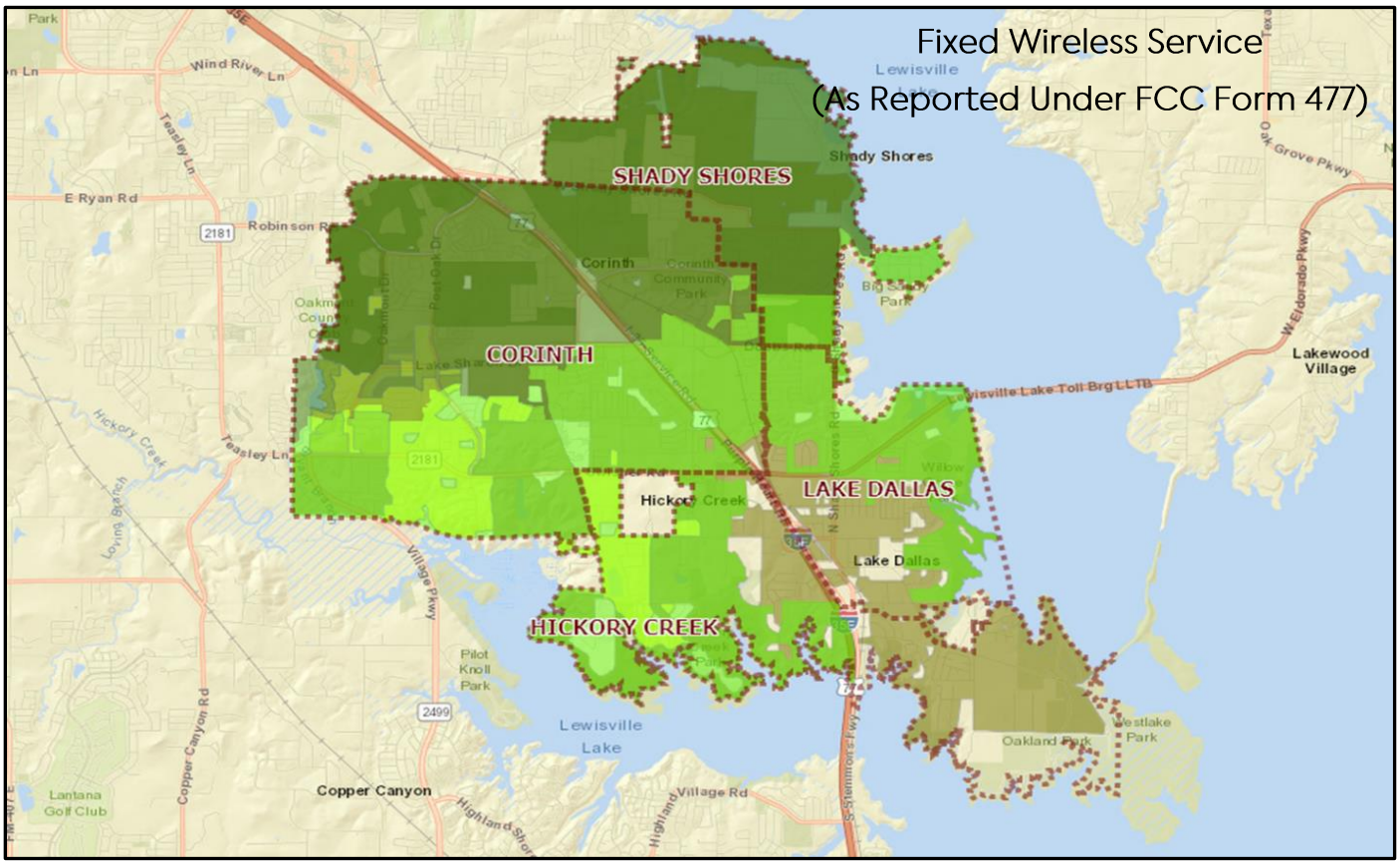

Composite DSL (Copper) Routes
SHADY SHORES
CORINTH
LAKE DALLAS
HICKORY CREEK
Lewisville Lake
Shady Shores
Corinth
Hickory Creek
Lake Dallas
Copper Canyon
Lakewood Village
Lantana Golf Club
Pilot Knoll Park
Oakland Park
Westlake Park
Wind River Ln
Teasley Ln
E Ryan Rd
Robinson Rd
Village Pkwy
Copper Canyon Rd
Village Rd
Oak Grove Pkwy
W Eldorado Pkwy
Lewisville Lake Toll Brg LLTB
2181
2184
2499
77
35E


Composite FTTH Routes
SHADY SHORES
CORINTH
LAKE DALLAS
HICKORY CREEK
Lewisville Lake
Shady Shores
Corinth
Corinth Community Park
Big Sandy Park
Oakmont Country Club
Lake Sharon Dr
Dobbs Rd
Lewisville Lake Toll Brg LLTB
Lakewood Village
Hickory Creek
Lake Dallas
Pilot Knoll Park
Copper Canyon
Lantana Golf Club
Oakland Park
Westlake Park
Narrow Lake Park
Wind River Ln
Teasley Ln
E Ryan Rd
Robinson Rd
Post Oak Dr
Oakmont Dr
I-35 Service Rd
Shady Shores Rd
N Shady Shores Rd
Oak Grove Pkwy
W Eldorado Pkwy
Swisher Rd
Village Pkwy
Copper Canyon Rd
Highland Village Rd
S Stemmons Fwy
2181
2499
77
35E


Shady Shores
Composite FTTH Routes
SHADY SHORES
Corinth Community Park
Corinth
Big Sandy Park
Oakmont Country Club
CORINTH
LAKE DALLAS
Hickory Creek
Bryant Branch
Lake Dallas
Willow Grove Park
Hickory Creek Park
Pilot Knoll Park
Sycamore

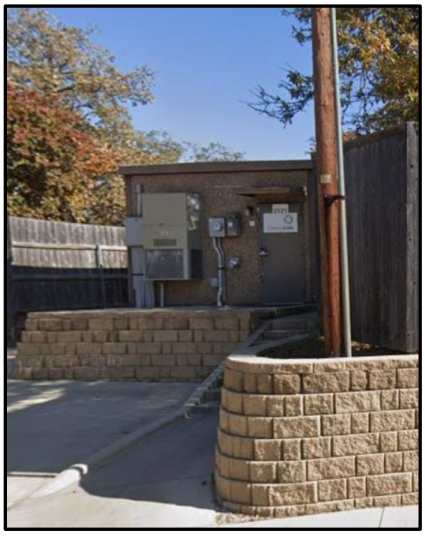

Water Tank Locations
SHADY SHORES
CORINTH
LAKE DALLAS
HICKORY CREEK


Tower Locations
SHADY SHORES
CORINTH
LAKE DALLAS
HICKORY CREEK


Fixed Wireless Service
(As Reported Under FCC Form 477)
SHADY SHORES
CORINTH
LAKE DALLAS
HICKORY CREEK
Lewisville
Shady Shores
Corinth
Lakewood Village
Lake Dallas
Hickory Creek
Lewisville Lake
Copper Canyon
Wind River Ln
E Ryan Rd
Robinson Rd
Teasley Ln
Post Oak Dr
Oakmont Country Park
Corinth Community Park
Big Shady Park
Oak Grove Pkwy
W Eldorado Pkwy
Lewisville Lake Toll Brg LLTB
Hickory Creek
Loving Branch
Village Pkwy
Pilot Knoll Park
Copper Canyon Rd
Lantana Golf Club
Highland Shores
Village Rd
Oakland Park
Westlake Park
2181
2499

Samples of Infrastructure Located During the Outside Plant Audit

CenturyLink CO



Grande HFC Node

Zayo Fiber Cabinet

Verizon Fiber Marker

Nortex Cable Marker

Mobile Equipment on Tank

Network Interface Devices

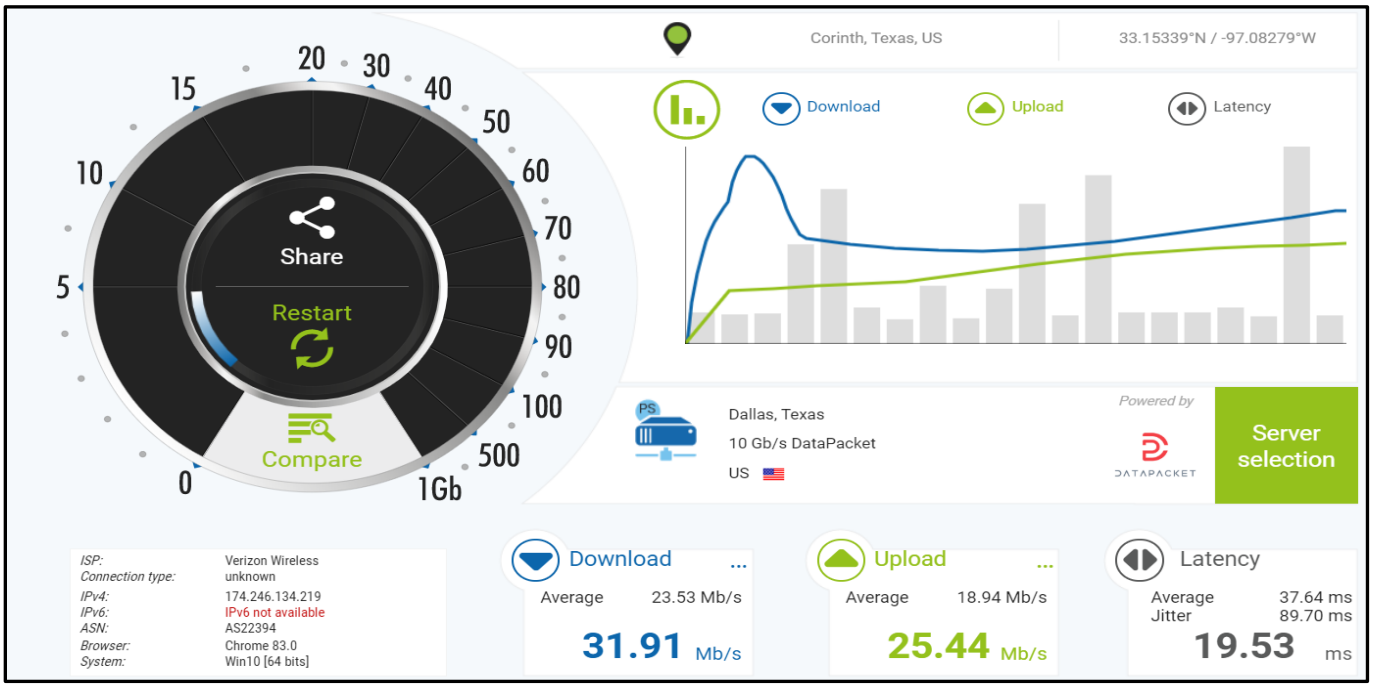
Top Center – Spectrum Cable – DOCSIS

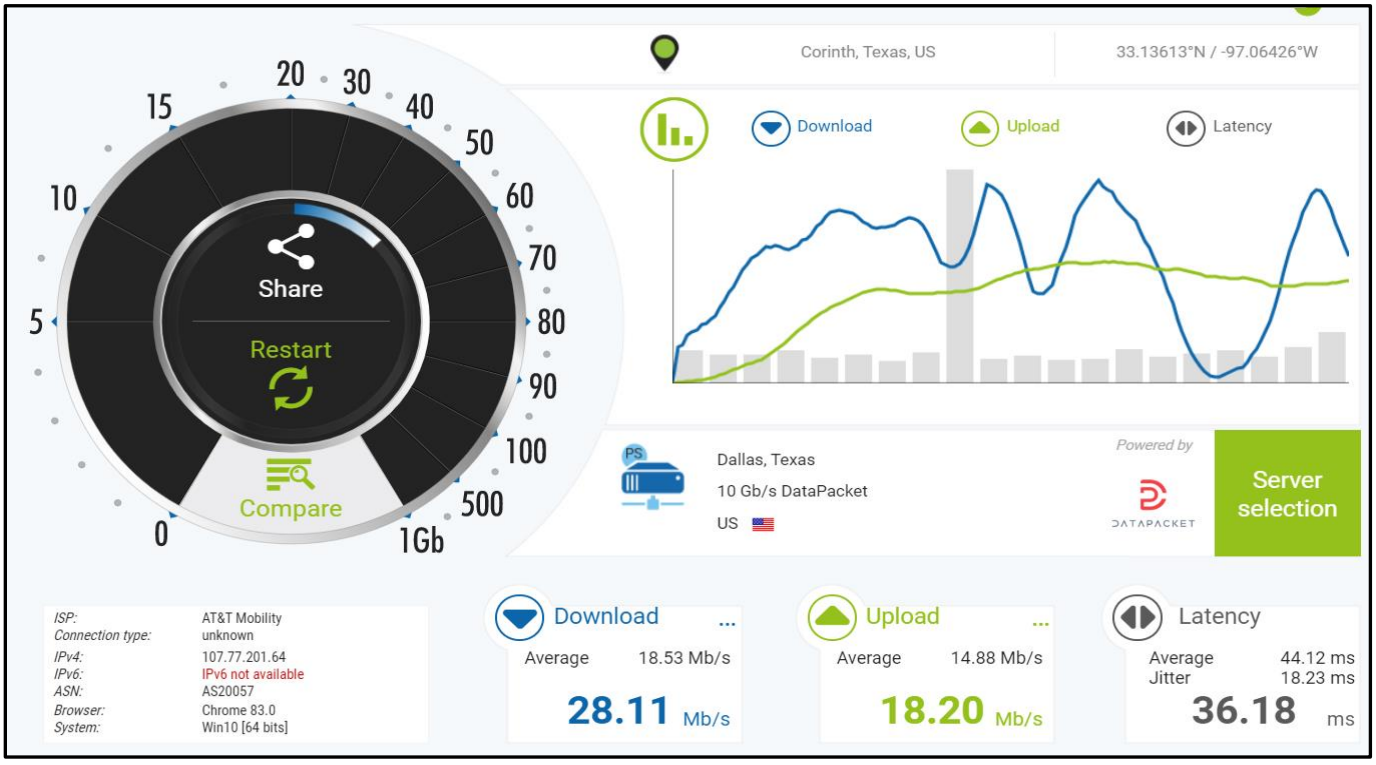
Lower Left – Grande (CoServe) DSL

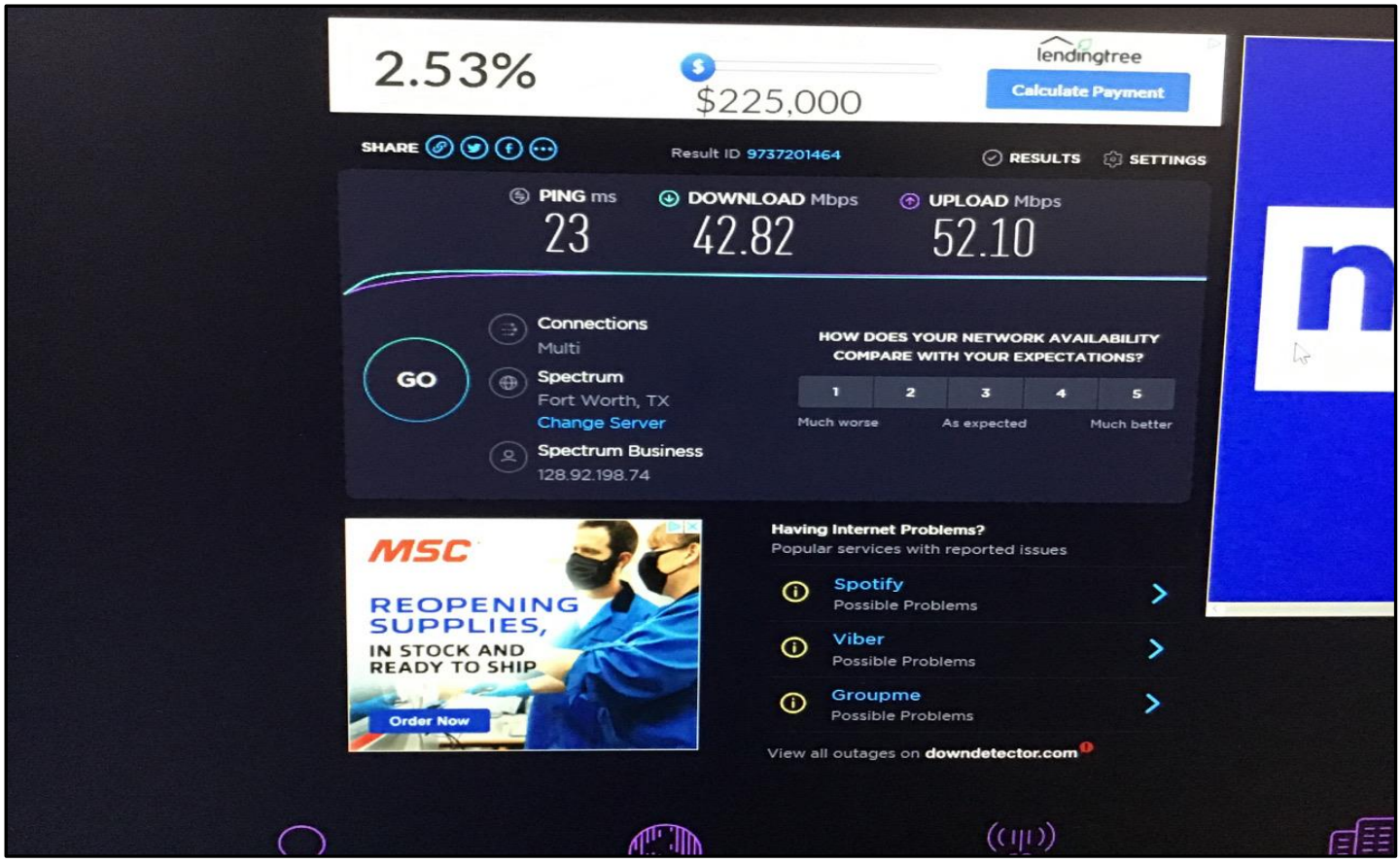
Lower Right – Frontier (Verizon) FTTH

APPENDIX IX: Single Provider Service – Greenfield or Brownfield?

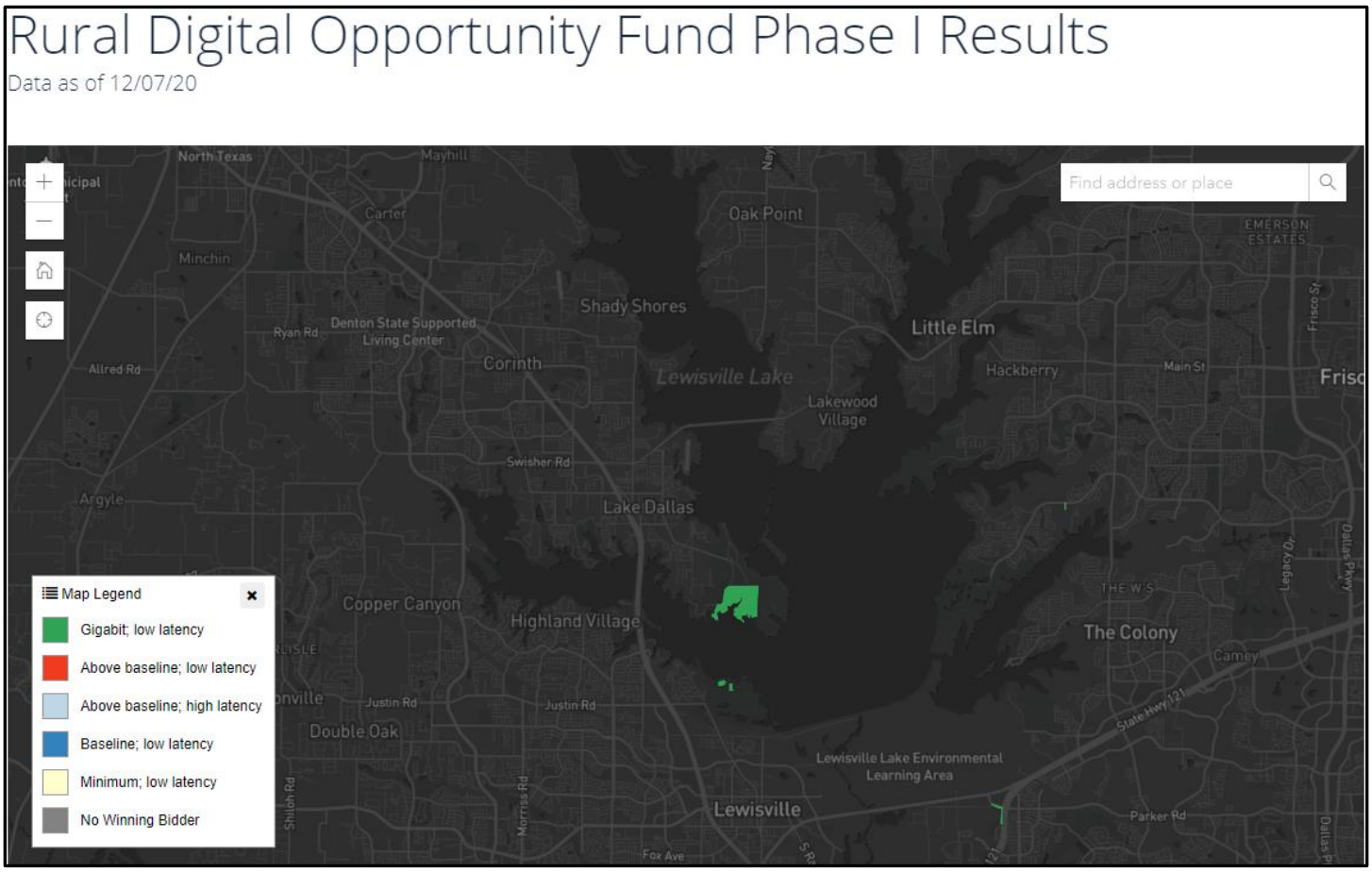
APPENDIX X: Sample Speed Tests






2.53%
$225,000
lendingtree
Calculate Payment
SHARE
Result ID 9737201464
RESULTS
SETTINGS
PING ms
23
DOWNLOAD Mbps
42.82
UPLOAD Mbps
52.10
GO
Connections
Multi
Spectrum
Fort Worth, TX
Change Server
Spectrum Business
128.92.198.74
HOW DOES YOUR NETWORK AVAILABILITY COMPARE WITH YOUR EXPECTATIONS?
1
2
3
4
5
Much worse
As expected
Much better
MSC
REOPENING SUPPLIES,
IN STOCK AND READY TO SHIP
Order Now
Having Internet Problems?
Popular services with reported issues
Spotify
Possible Problems
Viber
Possible Problems
Groupme
Possible Problems
View all outages on downdetector.com

APPENDIX XI: MAP OF RDOF WINNERS IN THE LAKE CITIES REGION



APPENDIX XII: BROADBAND GLOSSARY AND TABLE OF UNITS

The following is reproduced from a resource provided by the National Telecommunications and Information Administration (NTIA)

Numbers

3G: The term for the 3rd generation wireless telecommunications standards usually with network speeds of less than 1 Mbps.

4G: The term for 4th generation wireless telecommunications standards usually with network speeds greater than 1 Mbps.

5G: The term for emerging 5th generation wireless telecommunications standards usually associated with network speeds of up to 1 Gbps or more.

A

ADSL (Asymmetrical Digital Subscriber Line): A form of internet service communications technology that delivers constantly accessible data transmissions over copper telephone lines. ADSL is a common version of DSL and has download speeds between 2 and 6 Mbps and upload speeds reaching 512 Kbps.

Asymmetrical Bandwidth: A connection in which the maximum transfer rate is different for download and upload speeds.

ATM (Asynchronous Transfer Mode): A transmission method where information is re-structured into packets. It is asynchronous due to the fact that the recurrence of packets from an individual user is not necessarily periodic.

B

Backbone: A major high-speed transmission line that strategically links smaller high-speed internet networks across the globe.

Backhaul: The portion of a broadband network in which the local access or end user point is linked to the main internet network.

Bandwidth: The capability of telecommunications and internet networks to transmit data and signals.

Bit: The base unit of information in computing. For our purposes, also the base unit of measuring network speeds. A single piece of information is equal to 1 bit. Network speeds tend to be measured by bits per second—using kilo (1,000), mega (1,000,000), and giga (1,000,000,000). A bit is a part of byte; they are not synonyms. Bit is generally abbreviated with a lower-case b.

Broadband: The term broadband commonly refers to high-speed internet access that is always on and faster than traditional dial-up access. Broadband includes several high-speed

transmission technologies, such as fiber, wireless, satellite, digital subscriber line, and cable. For the Federal Communications Commission (FCC), broadband capability requires consumers to have access to actual download speeds of at least 25 Mbps and actual upload speeds of at least 3 Mbps.

Broadband Adoption: The use of broadband in places where it is available, measured as the percentage of households that use broadband in such areas.

Burstable: Authorizes a connection to exceed its specified speed, normally up to a set maximum capacity for a period of time.

Burst Speed: A method which momentarily allots additional bandwidth to consumer's services for short periods of time.

C

Cable Modem System: Cable television companies have offered internet access via their cable system for more than a decade. The network architecture uses a loop that connects each subscriber in a given neighborhood, meaning they all share one big connection to the internet.

Central Office: A telecommunication company's building where consumers' phone lines are attached to equipment that connects a consumer to other consumers in that central office or other central offices across the globe.

Community Anchor Institutions: Schools, libraries, medical and health care providers, public safety entities, institutes of higher education and other community support organizations that provide outreach, access, equipment, and support services to facilitate greater use of broadband service by the entire population and local governments.

Conduit: A reinforced tube through which cabling runs. Conduit is useful both to protect fiber optic cables in the ground and because one can place the conduit underground when convenient and later "pull" the fiber cabling through the conduit.

D

Dark Fiber: Fiber that is in place but not being used for broadband services. ("non-lit" fiber, also see "Lit Fiber").

Digital Divide: The gap between those of a populace that have access to the internet and other communications technologies and those that have limited or no access.

Digital Equity: Recognizes that digital access and skills are now required for full participation in many aspects of society and the economy. Digital Equity links Digital Inclusion to social justice and highlights that a lack of access and/or skills can further isolate individuals and communities from a broad range of opportunities.

Digital Inclusion: Implies that individuals and communities have access to robust broadband connections; internet-enabled devices that meet their needs; and the skills to explore, create, and collaborate in the digital world.

Digital Literacy: The ability to leverage current technologies, such as smartphones and laptops, and internet access to perform research, create content, and interact with the world.

Digital Skills: Any skills related to operating digital devices or taking advantage of digital resources.

DOCSIS (Data Over Cable System Interface Specification): The international telecommunications standard for cable signaling data and spectrum sharing. DOCSIS standards evolve over time. DOCSIS Standard 3.1 is the most recent version.

DSL (Digital Subscriber Line): A form of technology that utilizes a two-wire copper telephone line to allow users to simultaneously connect to and operate the internet and the telephone network without disrupting either connection.

E

EDGE: Enhanced Data Rates for GSM Evolution: An upgraded 2G mobile standard offering faster data transfer speeds. Connections may fall back on this if 3G or 4G aren't available—on smartphones it will usually be indicated by an 'E' next to the signal meter.

E-Government Services: The government's use of web-based and information technology resources to connect with citizens and provide online services and resources.

F

Fiber (Also referred to as Fiber Strand): A flexible hair-thin glass or plastic strand that is capable of transmitting large amounts of data at high transfer rates as pulses or waves of light.

FTTH or FTTP (Fiber to the Home or Fiber to the Premise): The delivery and connection of fiber optics directly to a home or building.

Fixed Broadband: High-speed data transmission to homes and businesses using technologies such as T1, cable, DSL, fiber, and fixed wireless. Excludes mobile broadband and non-terrestrial services.

Fixed Wireless Broadband Access: The use of wireless devices/systems in connecting two fixed locations, such as offices or homes. The connections occur through the air, rather than through fiber, resulting in a less expensive alternative to a fiber connection.

I

Internet Service Provider (ISP): A company that provides users (individuals or businesses) with access (a
connection) to the internet and related services.

Interconnection: The linking of numerous telecommunications networks to exchange user traffic.

L

Last Mile: The technology and process of connecting the end customer's home or business to the local network provider.

Lit Fiber: An active fiber optic cable capable of transmitting data.

LMDS (Local Multipoint Distribution Service): A wireless broadband service that uses microwave signals to render communications service—voice, data, internet—to customers within the last mile.

Loan: The giving of money or property in exchange for payment of the principal amount plus interest.

Local Area Network (LAN): A group of connected network devices that are on a high-speed connection and typically within the same building or location.

LTE (Long Term Evolution): A 4G wireless broadband technology that provides speeds up to 100 Mbps download and 30 Mbps upload.

M

Middle Mile: The connection between a local network, also called a "last mile" connection, and the backbone internet network.

Mobile broadband: A type of internet connection designed for use "on-the-go" with seamless connectivity from one geographic location to the next.

N

Network Infrastructure: The hardware and software components of a network that provide network connectivity and allow the network to function.

O

Open Access Network: Networks that offer wholesale access to network infrastructure or services provided on fair and reasonable terms with some degree of transparency and nondiscrimination.

P

Point of Presence: The particular place or facility where local internet service providers connect to other networks. Distance from the Point of Presence can affect service availability and pricing.

Public Computer Center (PCC): A facility that is open to the public and provides broadband access, education, support, and training relevant to community needs. PCC locations include, but are not limited to, community colleges, libraries, schools, youth centers, employment service centers, and centers in public housing developments, among many others, that provide broadband access to the general public or specific vulnerable populations, such as low-income, unemployed, older adults, children, minorities and people with disabilities.

R

Rights-of-Way (ROW): ROW are legal rights to pass through property owned by another. ROW are frequently used to secure access to land for digging trenches, deploying fiber, constructing towers and deploying equipment on existing towers and utility poles.

S

Service Area: The entire area within which a service provider either offers or intends to offer broadband service.

SDSL (Symmetrical DSL): A technology that permits the symmetrical transfer of data over copper telephone lines. The transmission bandwidth for uploads and downloads is equal.

SONET (Synchronous Optical Network): An American National Standards Institute standard for the simultaneous transmission of data over optical fiber.

Spectrum: A conceptual tool used to organize and map the physical phenomena of electromagnetic waves. These waves propagate through space at different radio frequencies, and the set of all possible frequencies is called the electromagnetic spectrum.

T

Tier 1 Internet Network: A network of internet providers that form a superhighway that allows users access to every other network on the internet.

Tier 2 Internet Network: A network of smaller internet providers that allow users to reach some portion of the internet but that still purchase IP transit.

Telecommunication Services or Services: Includes regulated and unregulated services offered to customers for the transmission of 2-way interactive communication and associated usage. A telecommunication service is not a public utility service (from the Michigan Telecommunications Act).

Telemedicine: The use of high-speed, high-capacity internet to support long-distance health care services, patient and provider education, and enhanced health care administration.

V

VoIP (Voice over Internet Protocol): A technology that allows users to send and receive voice calls using an internet connection instead of a phone line.

W

Wi-Fi (Wireless Fidelity): A technology that uses radio transmissions to enable electronic devices to connect to a wireless local area network (LAN).

WISP: An ISP that provides service through a wireless network.

Table of Units

Units Associated With Broadband	
Bit	Smallest unit of digital information
Byte	Equal to 8 bits
Bps	Bits per second
Kbps	Kilobits per second (1000 bits per second)
Mbps	Megabits per second (1 million bits per second)
Gbps	Gigabits per second (1 billion bits per second)
Tbps	Terabits per second (1 trillion bits per second)