

Broadband Critical Infrastructure Report for Chisago County

conducted by
Hometown Fiber

Version 1.0
April 6, 2022

HOMETOWN FIBER, LLC
18457 Gladstone Blvd N | Maple Grove, MN 55311
[763.299.5900](tel:763.299.5900) | knowmore@yourhometownfiber.com
yourhometownfiber.com

This page intentionally left blank

Table of Contents

| | |
|---|-----------|
| Introduction | 4 |
| Catch up with—get ahead of—broadband demand..... | 6 |
| Report Highlights | 8 |
| Observations | 9 |
| Goals, Priorities, Dreams & Possibilities Observations..... | 9 |
| Strengths..... | 9 |
| Opportunities..... | 10 |
| Field Study Technical Observations | 10 |
| Fiber optics | 11 |
| Television/Cable Modem (Coaxial) | 12 |
| Telephone lines/DSL (twisted pair, copper, DSLAM) | 13 |
| Wireless | 14 |
| Broadband Technologies Compared | 16 |
| Speed in context | 17 |
| Review, Analysis..... | 18 |
| Conclusions..... | 19 |
| Recommendations..... | 21 |
| Priority Recommendations | 21 |
| General Recommendations | 24 |
| The Hometown Fiber Way | 24 |
| Take control of Chisago County’s internet future | 25 |
| Fiber optics’ (affordable) value..... | 26 |
| Cost..... | 26 |
| Timeline | 26 |
| County’s responsibilities | 26 |
| Participating ISPs | 26 |
| Grant Program Essentials..... | 27 |
| Exhibits..... | 28 |
| Appendices | 28 |

Introduction

It has been our pleasure to serve as Chisago County's broadband consultant.

The fallout from the COVID-19 pandemic proves that reliable, affordable, fast internet is critical infrastructure. Families and businesses without it are left behind. Almost overnight, Americans became dependent on home internet service for school, work and often health care.

The added demand revealed that the current infrastructure does not meet the needs of residents and businesses today.

We hope you see the tremendous short- and long-term benefits of the incredible data and recommendations in this report. We look forward to discussing our findings and helping Chisago County leaders continue to prioritize next steps.

Until now, broadband consultants focused mostly on how to convince an ISP the community is worth serving.

This strategy created winners and losers even within a single community. And it left community leaders without any control.

The tables are turning, as federal and state governments invest billions of dollars in broadband infrastructure. County, city and township leaders now have resources and control.

Goals, Partnerships

This report provides the information you need to make confident decisions as you guide the investment of public funds. It demonstrates how the County can work in partnership with cities, counties, schools, ISPs and others to make some improvements soon, and also areas where ISPs will likely develop on their own without public funding.

Our recommendations are based on the assets already in the ground in Chisago County, as well as steps the County can take to ensure dollars invested today continue to serve the community for at least a decade in some areas, and more than 30 years in others.



WHAT KIND OF INTERNET DO
WE NEED 20, OR EVEN JUST 5 OR 10
YEARS FROM NOW?

THE TRUTH IS NO ONE KNOWS.

THAT'S WHY IT'S WISE FOR
COMMUNITIES TO FOCUS ON
INFRASTRUCTURE THAT HAS THE
CAPACITY TO EXPAND EASILY TO
MEET FUTURE NEEDS, WHATEVER
THEY MAY BE.

Aligned recommendations

Hometown Fiber commends County leaders for taking on the broadband challenges facing your residents and businesses. We also want to acknowledge your willingness to understand approaches that are different from the way things have always been done. There isn't one solution that will meet the needs in all areas of the County. Each recommendation in this report stems from our mission to help communities solve the broadband challenges they face and end the industry's endless construction and update cycles, and the need for ongoing government subsidies. Based on data from our field study, we recommend the least expensive ways to achieve reliable, affordable, fast internet that serves residents and businesses for 20 to 30 years.

Finally, we thank the County Board of Commissioners, County Administrator Chase Burnham, Housing & Redevelopment Authority - Economic Development Authority Executive Director Nancy Hoffman, Chisago Lakes Chamber of Commerce Director Kate Malchow and past community survey participants for their guidance and insight. We look forward to continuing our work together.

Regards,

A handwritten signature in blue ink, appearing to read "Kyle Moorhead".

Kyle Moorhead, president

Hometown Fiber

[763.299.5900](tel:763.299.5900) | kyle@yourhometownfiber.com

yourhometownfiber.com

Catch up with—get ahead of—broadband demand

Almost overnight in 2020, internet service went from really nice to have to essential for daily living. Many of us quickly became familiar with products such as Zoom, Google Classrooms, Microsoft Teams and Google Meets in order to work and attend school, worship services, public meetings and medical appointments.

This dramatic shift put the spotlight on not only reliability and download speeds, but also captured the importance of the often-overlooked upload speed. On the internet, download speed is how quickly we get what we want. Upload speed is productivity. It determines how quickly we can send and respond. Reliability and upload and download speeds either make life easier or add to daily frustration.

It seems almost everything requires an internet connection these days. It's how we watch tv, play games, turn in homework, buy groceries, communicate with a doctor, see grandchildren, start meals, secure our property, light up a room, share photos and videos—even make morning coffee. Yet today's needs pale in comparison to what's ahead.


Self-driving cars, autonomous manufacturing robots, remote medical devices that allow people to get diagnosed, treated and monitored from home are all possible when their devices are connected to networks. In fact, research by technology experts at [Ericsson](#) predict in 2022 there are around 29 billion of these devices connected to the internet around the world.

The good news? Many of the appliances and devices on their way to the Internet of Things (IoT) require reliability but not a lot of speed or capacity.

The bad news? Anything using a camera is essentially a bandwidth black hole. Home security systems, baby monitors, video doorbells, trail cameras and other video-driven devices require bandwidth, dependability and speed. Today—even before turning on a computer—a property with just six high-quality security cameras is already using 25 Mbps. That's equal to the current state and federal definition of broadband (minimum download speeds 25 Mbps, upload 3 Mbps.)

Yet the most astonishing changes ahead will come from augmented reality. This process allows a user to experience in real-time 3D an idea, thought or concept when an image appears on clear glass, goggles or smart glasses. These tools are not only for entertainment, but will be used daily in work and school. In a few short years, farms and other businesses, schools and homes will need speeds well beyond 1 Gbps.

The events beginning in 2020 made it clear that high speed internet you can depend on is critical infrastructure. It is just as important to a community's future as electricity, water, sewer and roads. Communities without reliable internet are left behind.

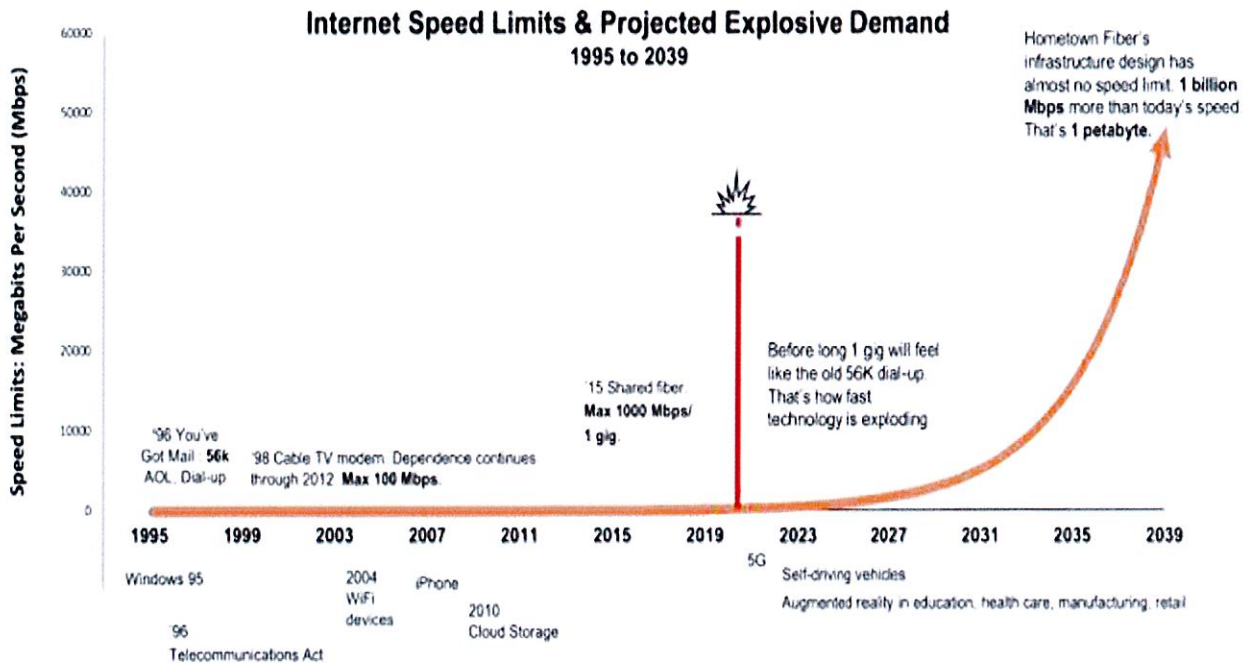


**REMOTE MEDICAL DEVICES
THAT LET DOCTORS DIAGNOSE
PATIENTS AND EVEN CARRY OUT
SURGERY ARE ALL POSSIBLE DUE
TO THESE NETWORKS OF
CONNECTED THINGS.**

Bernard Marr, [Enterprise Tech](#), [Forbes](#)

How much is enough for today & tomorrow?

What kind of internet do we need 20, even just 5 or 10 years from now? The truth is no one knows. That's why it's wise for communities to focus on infrastructure that has the capacity to expand easily to meet future needs, whatever they may be. Hometown Fiber recommends prioritizing broadband construction projects as critical infrastructure and building out directly connected fiber networks.



Report Highlights

This Broadband Critical Infrastructure Report provides the information County leaders need to make informed decisions as they work to improve broadband throughout the County. Hometown Fiber begins with an exclusive, extensive field study. This boots-on-the-ground approach documents what you have today. Our technical recommendations align with the County's goals, priorities and dreams. In all, Hometown Fiber rated nearly 24,000 properties (undeveloped parcels were not rated.)

Observations

Hometown Fiber's on-the-ground observations identified 15,158 broadband infrastructure data points throughout the County. Data collected include the type of technology described below, along with other components that make the technology work. Technicians also document the owner, condition of the equipment and any concerns they see in the field.

The Field Study Technical observations begin on Page 10 with existing fiber optics and internet service networks. The field work findings for coaxial (service through a cable modem) and twisted pair/DSL (service through a telephone line) follow the fiber optics inventory.

Observations also include details from interviews, a commissioner survey and previous surveys along with state and federal information. The observations are the foundation of the goals, priorities, dreams and possibilities section.

Review & Analysis

Once data are collected and photographed, telecommunications experts review each data point to ensure the field label is accurate. Often companies do not mark their equipment. It takes an experienced analyst to understand the technical circuitry that feeds the area—not just what is possible, but what is practical as well. We look for bottlenecks, levels of maintenance, condition of equipment and capacity, all of which factor into reliability, speed and possibilities.

Conclusion

Once the review and analysis are complete, each developed parcel in the County is rated. These ratings provide guidance on high priority areas, and also show where public subsidies are not necessary. See Exhibit 1 for township-by-township and city-by-city analyses of the service.

Recommendations

Field Study results and Chisago County's goals and priorities drive Hometown Fiber's practical, actionable recommendations.

Observations

Chisago County has a community-by-community goal to improve internet service throughout the county. Broadband is essential for growth and prosperity. In fact, “broadband” is mentioned 65 times in the 2017 Chisago County 10-Year Comprehensive Plan. Broadband was at the top of the list of concerns in a recent survey that also showed almost unanimous consensus on the need for more business in the county, and better broadband is necessary for business growth to happen.

Long before COVID-19 catapulted internet challenges into everyday conversations, the 2015 Chisago County “Got Internet” resident survey showed the opportunities provided with high-speed internet. Since that survey, millions of dollars have been invested to improve service and guide the work.

Communities across the County have waited for years for internet service providers to determine if the unserved and underserved areas of the county are worth their investment. The county has discussed the need to “fill in” where ISPs have determined it is not profitable to build out. County leaders have already started working with cities, townships and school districts to figure out how to best use available funds for internet.

Hometown Fiber’s technical observations in the field and details from interviews, a commissioner survey and previous surveys along with state and federal information are the foundation for the goals, priorities, dreams and possibilities below.

Goals, Priorities, Dreams & Possibilities Observations

When Chisago County residents have reliable, affordable, fast internet—no matter where they live in the County—they will be able to:

- Work without having to commute
- Start a business
- Take college courses from home
- Get health care online
- Stream movies, sports and other entertainment
- Have consistent cell phone service
- Take advantage of technical breakthroughs

Strengths

Areas within the County have benefited from broadband grants in the past. As one survey respondent mentioned, some communities have strong broadband advocates—including decisionmakers—and some communities do not. With federal American Rescue Plan funds now available County leaders hope to implement a plan that is coordinated with all cities and townships and will lead to greatly improved service where it is most needed.

In addition, there is an understanding in the County that competition is good for the residents and businesses. There is a need for competitive pricing and reliable service. As new technology is launched almost every day, County leaders noted a high priority is to ensure whatever investments they make today will result in a system that services the community for many, many years and can be easily upgraded

Finally, when COVID-19 struck, the school purchased many hotspots to try help students that did not have good service—any service—at home. And the library still has hotspots for the community to check out as needed as an interim service as well. These quick actions solved immediate problems, and now it's time to fix the internet problems for good.

Opportunities

Chisago County participates in the Blandin Broadband Communities. As part of that work, a survey showed 60% of the people surveyed are not happy with speed or reliability of their current internet service. Blandin ranks Chisago County broadband 58 out of 87 Minnesota counties. The ranking is based on access to the state's 2026 broadband goal of 100 Mbps download and 20 Mbps upload speed.

Yet as county leaders point out, broadband needs are far beyond just speed. If the service is not reliable, it is not valuable. Hometown Fiber field study observations highlighted below show several areas where this critical infrastructure is at risk.

County leaders also point to the lack of improvement over the years, despite constant effort. Chisago County faces the same barriers to growth as other communities where the broadband industry's current model creates winners and losers. ISPs have expressed interest, but community leaders report little improvement in service or effective efforts to close gaps in access. Good internet service is a top priority as people shop for places to live. If it's not available, people look elsewhere. Excellent internet is essential as the County works to strengthen the community where people shop locally, volunteer locally and drive less.

The greatest need County leaders identified is a formal improvement plan and actionable recommendations to implement that plan.

Field Study Technical Observations

Hometown Fiber observed the technology infrastructure currently in the ground and overhead throughout all 442 square miles of Chisago County. These observations reflect the current status as of Nov. 30, 2021, throughout the County's 10 cities and nine townships.

All four categories of internet service technology—fiber optics, coaxial, digital subscriber loop (DSL) and wireless—serve Chisago County residents and businesses today. There are variations within each category, and we explain all of it below.

See Exhibit 1 for township-by-township, city-by-city conclusions. County leaders have an interactive map of this information as well. The online maps also include the relevant devices, towers and indications where devices appear to be damaged.

Making the internet work outside the County

At the highest level, Chisago County's internet service connects to Duluth's Twin Ports Internet Exchange and the Minnesota Technology Center in Minneapolis Internet Exchange (called the 511 Building) where it goes around the globe.

Other ISPs either lease from or link to the main fiber optic line to get to the internet exchanges. Several companies have main fiber lines along the Internet 35 corridor, which offer inexpensive options for ISPs. Chisago and Pine counties are fortunate to have connections to two internet exchanges. That's not the case in many areas of the state.

Fiber optics

Large sections of Chisago County have fiber optic service available, which is owned by CenturyLink, Frontier, Midco, Enventis, Arvig and Windstream. Below we describe four ways fiber is used in the County.

1. Fiber optics: Trunk lines that makes the internet work

Lines from each company's central office to some of the large neighborhoods are called trunk lines. They are fiber optic strands that deliver broadband to neighborhoods, cell towers, etc. Once the trunk lines reach a neighborhood, the fiber service is tied into the old home telephone or cable TV technologies to get internet into a home. Most of the fiber optics running throughout the County connect local service locations to the greater internet exchange points in Minneapolis and Duluth. Throughout the County, most of this infrastructure is built well and has been updated and maintained.

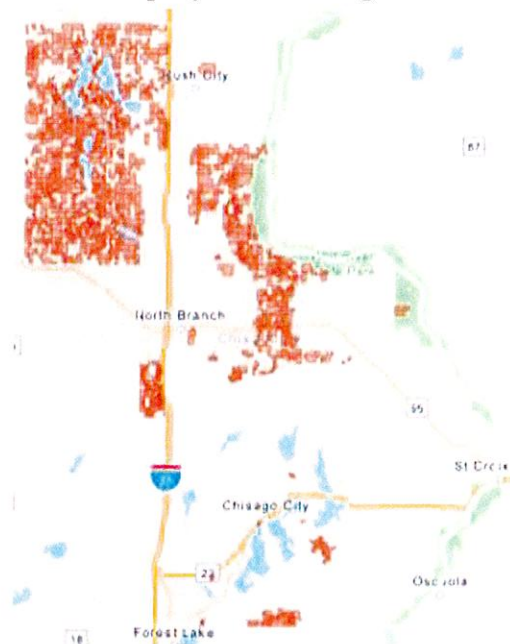
2. Shared fiber: PON in service

Passive optical networks (PON) are shared fiber optics, just like homes in other parts of the community share television cable (coaxial, cable modem). PON, as the industry calls it, can deliver upload and download speeds up to 940 Mbps. PON service starts at the internet company's office and goes to cylinders, usually in newer developments. From that device, a strand of fiber could be split thousands of times, depending on when it was installed. (Newer installations usually split 32 to 64 depending on the network design.)

As a shared technology, its speeds declines the more times the fiber strand is split. Speed also changes based on the number of people using the service at the same time. Unlike today's individual, directly connected fiber optics with proven speeds beyond 10 billion Mbps, shared fiber currently does not have the capacity to expand beyond speeds of 940 Mbps.

This technology is usually installed in conduit from a company's internet office to the neighborhood. But from the edge of a neighborhood to a subscriber's home, the fiber optics are generally toe-kicked. Toe-kicked fiber is under the lawn but not protected in conduit, which opens up the service to reliability issues. This is widespread practice in the industry. The company saved a little money per foot in installation cost, but left the technology in danger of cuts from landscapers, snowplows, any digging, etc. When the fiber line is cut, it can't be fixed with a wire nut like old phone lines or television cable. The entire line from the home to where the service starts must be replaced, adding to company maintenance costs and customer inconvenience.

In about 10 years, PON technology will need to be replaced when its capacity no longer meets consumer demands. About 15% or 4,100 properties in Chisago County appear to have PON service available. The details are in Exhibit 1.



More than 4,100 properties have access to shared fiber optic service.

3. Shared fiber: PON for the future

As we mentioned earlier, fiber optic technology is found throughout much of Chisago County. That's not unusual, since today most internet companies prop up outdated coaxial and twisted pair technology with fiber optics. There are just a few areas in the county where it appears PON service is in the ground and almost ready to serve homes. But the company owning the fiber optics continues to use twisted pair copper technology for internet service connected to the home.

About 31 properties have PON near their property. Later, Hometown Fiber offers recommendations on how to get PON service to residents. PON is better than unreliable and slow service experienced today through telephone lines.

4. Individual fiber: the best you can get

Directly connected, point-to-point fiber optic strands serve industry, government, education and cellular towers (wireless providers.) We did not observe any residential service with directly connected individual fiber optics. But if installed in sensible, cost-effective ways, the enormous capacity of fiber optics becomes achievable over time.



Properties near Harris that have shared fiber optics 50% installed

Television/Cable Modem (Coaxial)

People who get internet service through coaxial cable television lines share the network with anyone else in the neighborhood who has the service. When many people are using the system at the same time, speed slows. In addition, Minnesota's freeze and thaw cycles are hard on coax systems. Most of the coax service observed in the community is backed by fiber optics. In this design, fiber runs from the company's internet facility to a neighborhood. Once in the neighborhood, internet is connected to the home by coax lines. There is evidence of fiber-backed coax service in areas around Rush City, Harris, North Branch, Stacy, Wyoming, Chisago City, Lindstrom, Center City, Shafer and Taylors Falls. This service has the capacity to provide download speeds close to that of PON (940 Mbps.) Unlike PON where the upload and download speed are the same (symmetrical), coaxial upload capacity is only about 50Mbps.

This technology, too, will be obsolete before long (about five to 10 years) and will struggle to meet market demand. However, ISPs usually have fiber optics feeding the coaxial networks in the area, so it won't be too difficult or expensive for ISPs to expand to fiber-to-the-home without public subsidy.

Midco owns the coaxial technology in Chisago County.



Cable modem (coaxial) internet service technology in Chisago County. About 14,700 properties have access to cable modem service.

Telephone lines/DSL (twisted pair, copper, DSLAM)

If internet comes into your home through the phone line, you have what's called DSL (Digital Subscriber Line) service. But all DSL service is not alike. If you are too far away from a digital subscriber line access multiplexer (DSLAM), you are likely to experience slow and unreliable broadband service.

Many companies use fiber optics to support part of the phone wire system. Fiber runs from the company's internet facility to a neighborhood. Once in the neighborhood the fiber connects to the telephone line to reach the home. This combination squeezes the last bit of speed out of the copper wires but doesn't solve the bottlenecks in service. Chisago County has both old-telephone-wire from the 1930s, and DSLAM, fiber supported DSL.

Those DSLAMs repurpose Ma Bell's technology for internet use. Starting in 2009 and continuing through 2018, the federal government started giving billions of dollars to ISPs to improve internet service throughout the country. The funding awards didn't include accountability measures, and speed requirements were just 10 Mbps down and 1 Mbps up. Unfortunately, some companies that received money built to the lowest standards. This is why some people still have poor service, even with recent updates.

Twisted pair technology in Chisago County is owned by Frontier, CenturyLink, Windstream, Enventis and Arvig.

Can the phone lines just be fixed get higher speeds?

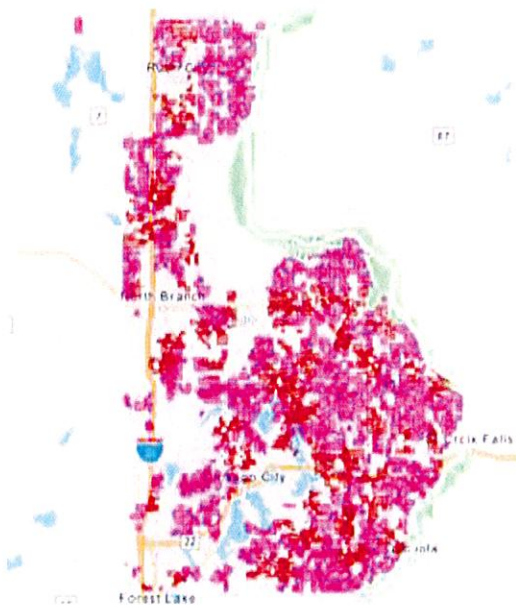
Can the copper telephone lines be fixed to get better service? Why don't I get the full 20 Mbps download speeds I pay for? The answer is physics. Twisted pair copper attenuates signals greater than optical cable. Copper's challenges include:

- **Distance.** In perfect conditions, data will go about 1.2 miles before equipment needs to be added to repeat the signal. Devices (DSLAMs) along the road help strengthen the service. You'll see network distribution devices along the roads. The closer a home is to the DSLAM or a central office, the better the signal.
- **Resistance.** As electrons flow through copper, they hit resistance. In comparison, light flows through fiber optics with little resistance.
- **Interference.** Electric power lines, squirrels eating through casing, ice, trees, magnetic fields and more cause interference with copper.

This is why neighbors experience various levels of reliability and speed even when they buy the same DSL service from the same ISP.



The DSLAM technology above gives old telephone phone lines a boost to make the data travel farther.



DSL (twisted pair) internet service technology in Chisago County. About 5,000 properties have this service

Wireless

The word “wireless” is something of a misnomer. At a certain level, the convenience of wireless still requires wires. Whether it’s 4G or 5G cellular, traditional geosynchronous earth orbit (GEO) satellite or new low earth orbit (LEO) satellites, wireless technologies all require wire to work. Cellular towers need fiber optics, and satellites unload data to locations supported with fiber.

The wireless technologies have two other challenges in common: low reliability and marginal bandwidth. The infrastructures are shared, and that slows down service. A clear line-of-sight is required for them to work, and that means trees, clouds, thunderstorms, wind, snow, buildings and rain affect the technologies’ availability and reliability.

The biggest benefit of wireless is it allows mobility and is almost universally available. It is great for uses where wireline service is not possible, such as in an airplane, train, vehicle, ship, walking, etc.

When you have no other options, wireless can provide service to fixed locations such as homes, businesses, and buildings. However, the best combination for fixed locations is to connect the facility to a wireline service then provide a wireless hot spot such as Wi-Fi or in-home 5G so the user can enjoy the convenience of wireless while experiencing the reliability and speed of wires.



**WHY ARE CELLULAR COMPANIES SO
EXCITED ABOUT 5G?**

**EACH SITE CAN HANDLE ONE
MILLION DEVICES, COMPARED TO
4G’S 100,00- DEVICE CAPACITY.**

Cellular (Mobile Wireless)

- 4G cellular service downloads speeds are usually 10 Mbps or less; upload speeds are around 5 Mbps. In theory, the 4G technology is reported to have the ability to reach 150 Mbps down and 50 Mbps up, but there isn’t much evidence of that level of service on the ground. 4G networks have the capacity to serve 100,000 devices per site.
- 5G is often mentioned as the solution for getting internet service in homes, and then enabling hot spots. This service has two frequency bands. The lower frequency can travel longer distances *but it’s at the speed of 4G*. The higher frequency carries the promised bandwidth of 5 gig. *But*, in order to get that much speed, the user has to be close to the antenna and there can’t be anything in the way—a clear line of sight without obstruction.

Chisago County has good cellular coverage. No dead zones have been observed.

Fixed Wireless

Fixed wireless service is evident in Chisago County. Its download speed limit can be up to 115 Mbps in the right conditions. Fixed wireless is point-to-multi-point topology. It connects two fixed locations, such as a tower to a building, with a radio frequency link in-between. The technology requires a clear line of sight from the home/business to the tower. It's common for fixed wireless provider to "hop" signals, which creates bottlenecks and fail points that slow bandwidth and limits how many subscribers can connect.

When no other service is available, fixed wireless is better for most users than poor DSL, traditional satellite service or no service at all. It is a short-term solution and does not meet the capacity requirements of most broadband grant programs. Its capacity—and therefore its longevity—is limited.

As with many other wireless technologies, fixed wireless has some interesting products available and in development. Price points for updated fixed wireless technologies are cost prohibitive for most Wireless Internet Service Providers (WISPs) to deploy without significant (90% or higher) subsidy.

Satellite

Satellite internet works by beaming data from a base station on Earth, up to a satellite in the sky, then back down to the internet user. When no other service is available, satellite is better for most users than no service at all.

Traditional satellites

Traditional, or Geosynchronous Earth Orbit (GEO), satellites are located 22,236 miles above Earth. They move at a matched speed with the rotation of Earth providing a fixed point in space from the ground. While the same satellite serves an individual, the time it takes for the signal to go up, turn around and come back down is unacceptable to most users. Companies also cap the amount of data available to a subscriber. This technology works for email or looking at social media. Data caps prevent most streaming. Satellites must have clear line-of-sight between the user and satellite, so storms, trees, buildings, etc. block service. Traditional satellite service in Chisago County is shared with users across the United States, Canada and Mexico. Satellite internet services were observed in the field. Service is advertised with download speeds of 25 Mbps to 100 Mbps. In a December 23, 2021 article [Forbes](#) reports HughesNet achieves median speeds of 19.30Mbps down and 2.54 up. Viasat achieved speeds of 18.75Mbps down and 2.96Mbps up.

Low Earth Orbit satellites

Low Earth Orbit (LEO) satellites are closer to Earth than traditional satellites—200 to 1,200 miles above Earth. This means the time it takes to send a signal from Earth to the satellite and back is acceptable to most internet users. This is the satellite technology Elon Musk's SpaceX is deploying. Unlike traditional satellites, LEO satellites are moving past the earth's surface at over 17,000 miles per hour. Traveling at this speed, each satellite is visible to a ground location for about nine minutes. To provide continuous coverage with LEO satellites, SpaceX is requesting FCC permission to orbit 30,000 satellites in order to provide consistent internet services at greater than 100Mbps. According to a February 25, 2022 article, [SpaceNews.com](#) reported SpaceX has 1,970 LEO satellites in orbit (6.56% of their goal). Like traditional satellite service, data caps often limit internet use. LEO Starlink advertises download speeds between 100 Mbps and 200 Mbps. As more users have been added, tech experts at [Tom's Guide](#) report user download speed tests have dropped from 97.23 to 87.25 Mbps. Forbes indicated Starlink's upload speed at 13.54Mbps. All of these numbers will continue to fluctuate as SpaceX adds more satellites and Starlink adds more customers around the world.

Starlink recently increased its prices for both the kit and monthly service. The kit price increased from \$499 to \$549 for those who are now on the waiting list and \$599 for all new orders. In addition, the Starlink monthly service price jumped from \$99 to \$110.

Broadband Technologies Compared

| Technology | Type | Download Capacity | Upload Capacity | Context |
|---|----------|-----------------------------|-----------------------------|---|
| Fixed Wireless | Wireless | 1 to 100 Mbps | 1 to 50 Mbps | Speed drops with distance. Wind, snow, rain, trees, hills interrupt service. |
| Cellular 5G | Wireless | 100 Mbps to 1 Gbps | 25 to 700 Mbps | 100+ Mbps down and 50 Mbps up requires user be within 3,000 feet of the cell site and have a direct-line-of-sight. (No trees, hills, buildings) |
| GEO Satellite | Wireless | 1 to 25 Mbps | 756 Kbps to 3 Mbps | Moves with the Earth, so service is consistent unless weather interferes. The challenge for most people is the delay (latency) in sending data. |
| LEO Satellite | Wireless | 1 to 80 Mbps | 1 to 14 Mbps | 1 satellite or "bird" is 9 minutes of service. 12,000 birds needed for consistent service; just 1,800 in place today |
| DSL | Wired | 500 Kbps to 80 Mbps | 256 Kbps to 10 Mbps | Through telephone lines. Speed, reliability depends on how close customer is to DSLAM equipment, quality of the line, maintenance. |
| Coaxial | Wired | 1 to 980 Mbps | 5 to 50 Mbps | Through cable TV service. Speed depends on how many customers share service. Reliability depends on construction, maintenance. |
| PON Fiber Optics | Wired | 50 Mbps to 5 Gbps | 50 Mbps to 5 Gbps | Shared. The more addresses that share, the more bottlenecks and the shorter the lifespan. Most capacity is 1 Gbps. Some PON extends to 5 Gbps. |
| Direct Connect, Individual Fiber Optics | Wired | 50 Mbps to almost unlimited | 50 Mbps to almost unlimited | Lasts decades; easy, inexpensive upgrades with no community disruption. Secures, improves municipal operations, utilities. |

Speed in context

Peter Christiansen at highspeedinternet.com explains speed in plain language. Here's how the speed you have changes your experience online. The time it takes to download different media varies.

| | Dial-up 50 Kbps | 25 Mbps (State 2022 download goal) | 100 Mbps (State 2026 download goal) | Gigabit 1,000 Mbps |
|--|--------------------|--|---|-----------------------|
| War and Peace (3 MB) | 8.0 min. | 1.0 sec. | 0.24 sec. | 0.02 sec. |
| The Beach Boys Pet Sounds (1.2 GB) | 2.2 days | 6.4 min. | 96.0 sec. | 9.6 sec. |
| Lord of the Rings Trilogy – Special Edition (61 GB) | 113.0 days | 5.4 hrs. | 81.3 min. | 8.1 min |
| Grand Theft Auto V (70 GB) | 130.0 days | 6.2 hrs. | 93.3 min. | 9.3 min |
| Library of Congress Digital Collections (74 TB) | 375.4 years | 274.0 days | 68.5 days | 6.9 days |

Source: [How Fast Is Fiber? | HighSpeedInternet.com](https://highspeedinternet.com)

Review, Analysis

In addition to on-the-ground observation, data regarding internet service came from Chisago County, Broadband Now, State of Minnesota Office of Broadband Services and the Blandin Foundation. Technical data were collected from areas that include municipalities, school districts, a college, medical care facilities, emergency services, electrical companies and state-owned facilities including parks and trails.

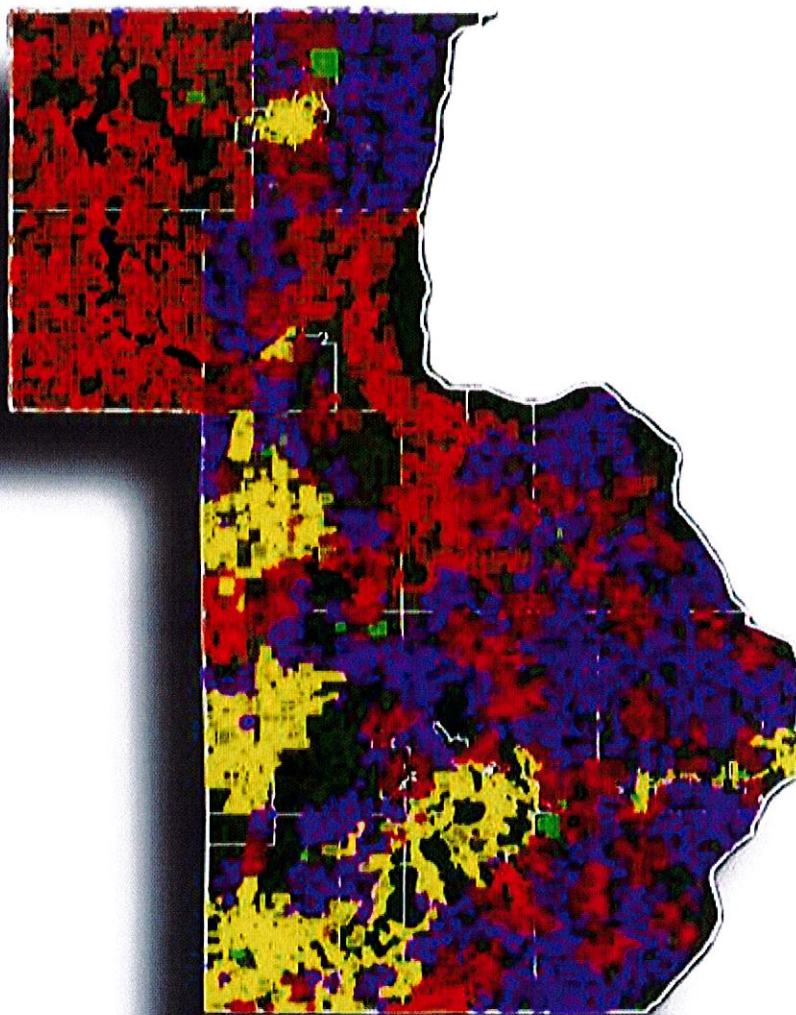
The 2017 Chisago County 10-Year Comprehensive Plan provided additional context as it relates to the county's vision for the future.

In some ways, broadband infrastructure is a lot like your vehicles. If your vehicle is well built—and you take care of it—it lasts a long time. The same is true with broadband. Unfortunately, the twisted pair broadband infrastructure throughout the County hasn't been maintained.

Current infrastructure, condition

- DSL service in the County is mostly backed with fiber optics. Reliability is poor, and in many places, maintenance is almost nonexistent. This technology was installed up until 2020. Unfortunately, even service that was mostly recently built isn't meeting resident and business demand. It is engineered for 10 Mbps download speeds.
- Coaxial service was designed and installed starting in the 1980s. This cable modem internet service uses technology designed for analog TV service. It has more capacity than twisted pair telephone wires and is still viable for internet, especially when the coaxial technology is backed with fiber optics and is well built. It requires a lot of maintenance to ensure service. Fortunately, coaxial networks in Chisago County are well built and maintained, though much is aerial which creates additional reliability risks. With continued maintenance, we expect market demand will exceed coaxial capacity in five to 10 years for most families. Most areas in Chisago County served with coaxial technology are in towns with enough population for ISPs to upgrade service without government subsidies.
- Passive Optical Network (PON) service is shared fiber optics service operating in a large part of the County. Some sections were built with reliability in mind, and the fiber optics are safe in conduit. Other areas appear to have been built as inexpensively and quickly as possible. Even fiber optic technology doesn't solve problems unless it's built with reliability in mind.
- "PON future" networks were installed to provide service somewhere else but pass by homes. Yet the company architected the network in a way that makes the homes ready to hook up. Despite claims and maps to the contrary, PON service isn't available to the homes that it passes by.
- Directly connected, point-to-point fiber optics serves just a few organizations or businesses. It appears well built and is maintained and offers the most reliability and highest speeds.
- Cellular wireless service is strong in the County, especially along the Interstate 35 corridor. The fiber optic technology serving some of the towers is well built and maintained, except for one tower in Rush City.
- Satellite technology was observed, but its unreliability makes it a service of last resort.

Conclusions



| Technical Assessment Map Color Code | | |
|-------------------------------------|------------|---|
| Code | Assessment | Technology |
| Purple | Worst | Twisted Pair (DSL) only, No Coax, No Fiber, greater than 1.25 miles from a DSLAM |
| Red | Bad | Twisted Pair (DSL) only, No Coax, No Fiber, within 1.25 miles of a DSLAM |
| Yellow | Good | Coax (Cable Modem) with or without Twisted Pair, No Fiber |
| Orange | Better | Shared Fiber (PON), with or without Coax, with or without Twisted Pair, No Direct Fiber |
| Green | Best | Direct Fiber or Private Fiber, with or without Coax, with or without Twisted Pair |

Appendix A features city-by-city, township-by-township view

Purple, Red

Areas shaded in purple and red have the worst service in the County. They are already behind market demand. Every year it gets worse as the maintenance on the technology decreases and market demand increases. In some instances, these are the costliest areas to get wireline service to, and fixed wireless providers may be a service option. Purple properties are DSL services that are more than 1.2 miles away from fiber optic support. Red properties are within one and a half miles. The good news is that there are fiber optics to the townships, along with fiber pedestals and power. The fiber capacity already in these neighborhoods can support the buildout of direct fiber-to-the-home.

Yellow

Areas shaded in yellow have coaxial service today that is backed by fiber optics. If continual maintenance is performed, the service will likely meet most demand for speed and reliability for five to 10 years. The population density in these areas make it attractive for ISPs to upgrade service on their own, so public incentives for service and maintenance aren't needed.

Orange

Areas shaded in orange are where the ISPs provide passive optical network (PON) fiber optic service. Market demand is being met today in these areas and will continue to meet demand for at least 10 years. At this time there are no subsidies required in these areas.

Areas marked with **broken orange line** are the County's "lowest hanging fruit." These are areas where the telecommunications company planned ahead. Up to 50% of the work to install shared fiber optics to residents is already done. About 31 homes north of Harris are not connected, but all that's left to do to get fiber optic service is to connect the property to the service in the right-of-way.

Green

Areas shaded in green are served by directly connected private fiber. The service in these areas will meet speed demands for more than 20 years. No subsidies are needed in these areas. However, the condition of the infrastructure in two areas caused concerns that was reported to County administration.

Recommendations

Hometown Fiber uses the following principles as we develop recommendations.

- **Reliability.** If it's not reliable, it's not valuable. Reliability is essential for school, work and home-based medical care that is more and more common.
- **Longevity.** Money invested now must serve the community for decades to come. System architecture must be flexible for use in the future and must be viable to maintain without ongoing subsidy. When the technology no longer meets demand, the system must be easy to upgrade without tearing up roads and streets.
- **Capacity.** The system that supports local broadband must be able to support the recommendation. The trunk lines and backbone must have ample capacity, or even fiber-to-the-home won't solve the problems.
- **Speed.** The actual speed must exceed current demand. In real world use, what speeds can users reasonably expect?
- **Accountability.** We consider past performance and recommend the County hold providers responsible for construction, maintenance and service.

Priority Recommendations

If not repaired already, two critical areas need maintenance: The fiber optics feeding both the County's building in Center City and a cell tower site in Rush City.

The cell tower site in Rush City at Interstate 35 needs to be protected. The equipment on the ground is open to the elements and severely damaged. All the cell carriers in the area use that tower to provide service. See Exhibit 5 for more detail.

The county building in Center City is fed by aerial fiber optic cables. The fiber is entangled in trees. Basic maintenance is needed. See Exhibit 4 for more detail.

These two examples demonstrate the need for design/build approaches that eliminate aerial technology whenever possible, and to pay special attention to the placement of critical infrastructure so it is not in the way of snow plows.



Fiber entangled in trees in Center City.



In Rush City, damaged fiber optic infrastructure feeds a cell tower.

Hook up unserved properties in areas rated Orange; Finish shared fiber installation in areas with broken orange lines. There are two opportunities get fiber optic service to unserved properties in Orange areas and those with Orange broken lines.

First, hook up the 31 properties noted on Page 12 with broken orange lines. These properties have shared fiber optics nearby that are almost ready to be hooked up. The first option is for the County to hire ISPs that own the current technology to set equipment in the field (cabinets, switch gear, etc.) and install and splice the new fiber optics from homes to the existing system. Hometown Fiber considers subsidy requests under \$2,000 per property to be reasonable. Subsidy requests greater than \$2,000 per property require justification. If the ISPs decline to work in partnership with Chisago County, this recommendation remains the lowest hanging fruit. The County could work with a competitive local exchange carrier (CLEC) to accomplish the same goal. CLEC is Plan B. The first option is to approach the ISPs.

There are also properties rated orange where shared fiber optic service is already available in the right of way, but it is not connected to the homes. It is cost prohibitive for many property owners with long driveways to get drop cables connected to the service. ISPs will often connect truly short distances without charge, but not long driveways.

The County has options to get that conduit and fiber optics from the right-of-way to the homes for service. To make the available dollars stretch, the County could:

- Subsidize the ISPs to finish the job they started. Provide a grant to homeowners with long driveways to pay the drop cable charges from the right-of-way to their home.
- Bid the drop cable work out to a utility contractor, writing bid specifications that ensure a high level of reliability. This could be less expensive than what an ISP would charge.
- For property owners who would prefer to do their own excavating, the County could provide specifications and instruction.

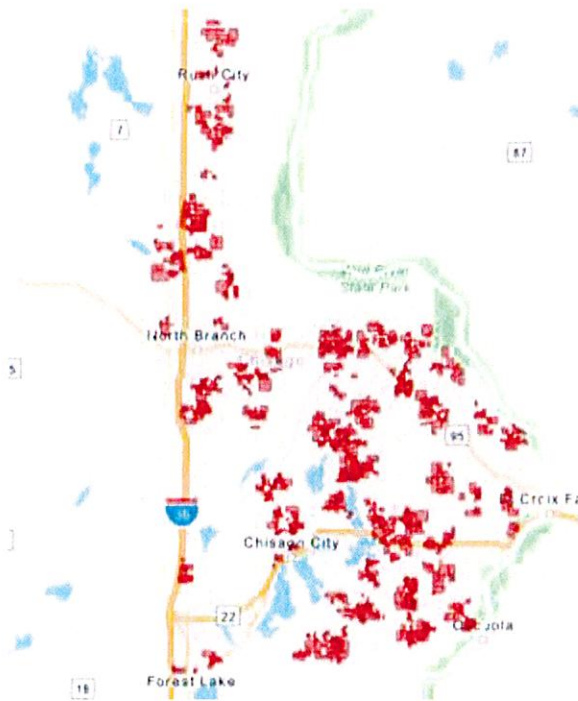


Above, in addition to getting 31 properties near Harris hooked up to shared fiber optics, the County could provide grants to homeowners who already have access, but can't pay the expense to connect homes with long driveways, at right.

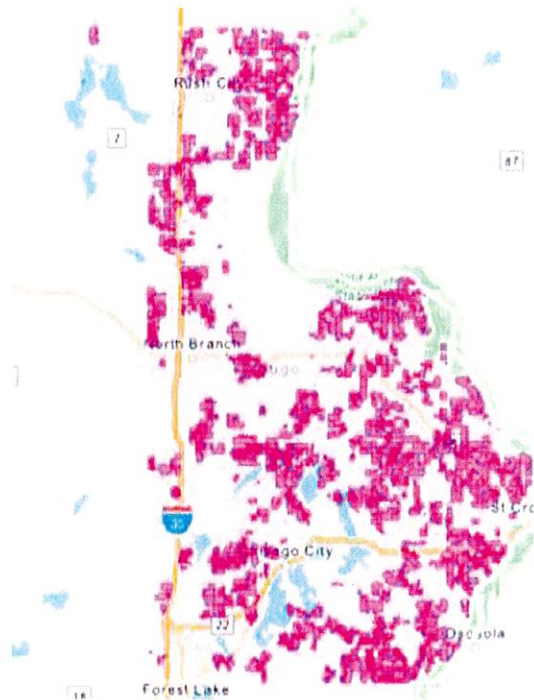
Parcels rated Purple and Red are the highest priority for subsidy. These areas are appropriate for the County to build fiber optic infrastructure where providers will not. A lot of excavation is needed to get to homes that are unserved and replace the homes' twisted internet pair lines. Here again, the County can use the options listed above to stretch dollars and assist homeowners with long driveways get service to their homes.

The work would be done in phases. Hometown Fiber recommends that to get the most value from public funds, priority should be given to areas where other infrastructure work such as roads, streets, water and wastewater is planned in the purple and red areas. This is our "dig once" philosophy, explained more below.

Hometown Fiber's propriety fiber optic network design and build is appropriate for properties in the purple and red area. The cost is about \$4,000 per property. Anything over \$4,000 needs to be justified.



Chisago County properties rated Bad.



Chisago County properties rated worst.

Explore fixed wireless service. As Hometown Fiber and the County finalize plans for the purple and red rated areas, fixed wireless providers may be an option to get service quickly to unserved areas. It's essential that any wireless service provider requesting subsidy follow the criteria outlined in the grant program essentials highlighted below. These requirements are necessary to ensure the most reliable service possible for about five years.

General Recommendations

Hometown Fiber recommends Chisago County invest public funds in areas where the service does not have the capacity to meet Minnesota's 2026 broadband speed goals and where wired service isn't available. The lowest priority areas for public funding are locations where ISPs find it profitable to build service on their own, especially where more than one ISP has installed fiber optics in the area.

- **Require any ISP request for subsidy to include a parcel-by-parcel GIS map of proposed service area.** That map will then be compared to the Broadband Infrastructure Report Field Study GIS maps to ensure the ISP's plan aligns with the community's needs. Hometown Fiber's analysis of ISP grant applications in other communities showed more than 100 instances where the proposals requested subsidy for properties that already met the state's 2026 goals.
- **Adopt Easement Management Policies.** Hometown Fiber recommends the County adopt easement management policies which specify handholes, conduits and overall architecture so these systems are "plug and play" for uses in the future. This ensures any money invested today serves the community long term.
- **Adopt a Dig Once policy.** The most expensive part of a broadband project is excavation and directional drilling. A dig once policy can cut project costs in half. Municipalities that adopt dig once policies commit resources to outreach, coordination and planning with any government entity, utility, developer, business or anyone else that would put wires, conduit, etc. into the ground. Coordinating who is digging where, when and why lessens disruption for residents and businesses and makes broadband construction less expensive and more efficient. Appendix A is Dakota County's commitment to dig once.

The Hometown Fiber Way

Hometown Fiber's proprietary broadband network design makes sure Chisago County is not in the same predicament 10 years from now that it is in today. The Hometown Fiber Way puts an end of ongoing government subsidy and ensures reliable, affordable fast internet service for decades. The directly-connected design allows communities solve other challenges through the capacity of broadband.

Although the words broadband and internet are often interchangeable, fiber optic broadband can get communities much more than fast internet service. These networks improve reliability and lower operational costs for public resources like water towers, water pumps, water and wastewater operations. SCADA systems and city buildings can have a secure private network with dedicated fiber optics.



**COMMUNITIES WOULDN'T
SUBSIDIZE A ROAD FOR JUST
FED-EX DELIVERIES SO WHY
SUBSIDIZE AN INTERNET ROAD
FOR JUST ONE ISP?**

Take control of Chisago County's internet future

The infrastructure on which the internet runs is the foundation to meeting explosive demand. That infrastructure is what makes or breaks the service for internet users now and for years to come.

Hometown Fiber studied ways to ensure that the investment a community makes today in internet infrastructure gets residents and businesses what they need in the years ahead. The answers created a way to nearly “future proof” a community’s internet service. We don’t use the term “future proof” lightly. The design includes both economic and technical models that are vastly different from what the industry uses today. The Hometown Fiber Way makes three major changes by:

- Separating the broadband infrastructure from the internet and other service it provides.
- Approaching broadband as critical infrastructure, designed to ensure decades of reliable service with minimal maintenance and almost no speed limit.
- Providing multiple ISPs the opportunity to serve Chisago County. ISPs won’t be responsible for investing in infrastructure or maintaining it. This change frees up ISP finances to invest in the latest equipment and customer service necessary to compete for customers.

These three changes make a lot of things possible. Chisago County residents in the purple and red areas will have the best internet access in the world once their new network is operating. Benefits include:

| Benefits for Residents/Businesses | Benefits for the County/Cities | Benefits for ISPs |
|---|---|---|
| ISP choice. We bring multiple ISPs to your community. | Local control. Projects align with community priorities, goals. | Access to customers without building expensive infrastructure. |
| Amazingly fast speed. Almost unlimited. | Financing options, including ongoing revenue. | Provide service on a world class network with unheard of reliability and speed. |
| Reliable service that works—all the time. | Secure utilities, improved operations. | Only pay based on the customers you earn, not on the available market. |
| Easy upgrades—no tearing up the streets again. | One-time investment for each phase. No expensive upgrades. | No need to maintain a fiber optic network. |
| | Easy locates | Ability to invest in product development & customer service, not maintenance. |
| | Professional network operation at no additional cost to the County. | |
| | Internet problems solved! Market demands met for decades. | |

In addition, we help reduce a community’s financial risk as much as possible. We work closely with public financing experts to model financial plans and keep track of grants that can help pay for some of the work. Federal grants that are available today won’t be around forever so it’s important to do the work the right way today to meet your community’s tomorrow.

Fiber optics' (affordable) value

The most cost-effective technology in the market today is fiber optics. Starting around 2013, it became feasible for this technology to serve neighborhoods. It is positioned to be the leading technology for generations to come.

Prior to 2013, fiber was mostly used by big technology companies, other large businesses, military and other government functions since the 1980s. It is rock solid, meeting demand with ease withstanding water, freezing, ice, lightning—everything but a blade.

When designed, engineered, built and operated as critical infrastructure, it ensures service for decades. A single fiber optic strand has the capacity to provide speeds of more than 10 billion Mbps.

Of course, today no one needs 10 billion Mbps. But it won't be long before 1 Gbps feels like yesterday's dial-up.

Cost

Hometown Fiber and our partners will work with Chisago County to design and build the network as efficiently as possible. The financing model we recommend is to obtain half the funds through state and federal grants. The other half, in this example, is generated through public bond sales. Bond payments are made by network operations. In this scenario, pre-engineering work estimates the cost between \$3,000 and \$4,000 per property.

Timeline

It's expected that supply chain problems will fix themselves as COVID-19 subsides. With much of the planning work complete, construction could be completed within one fiscal year (construction season) that the funding is secured.

County's responsibilities

Hometown Fiber operates the network once it is in and works directly with ISPs. The County or cities are responsible for managing the easements, locates and communicating any questions or complaints to Hometown Fiber. ISPs are responsible for serving their customers just as they are today, without having to maintain the network.

Participating ISPs

Today Minnesota has more than 90 licensed ISPs and there are many more across the country. Before construction begins, ISPs will sign service level agreements with Hometown Fiber. County leaders will know what ISPs are interested, what they will offer and at what cost. It's one of the ways Hometown Fiber de-risks the project as much as possible. Incumbent providers are sometimes resistant because it means their geographic dominance in the area could end. On the other hand, incumbent ISPs with failing networks quickly understand the value of the Hometown Fiber Way because this economic model is far less expensive for ISPs over time.

Grant Program Essentials

If the County chooses to implement a grant program, Hometown Fiber recommends components designed to do everything practical and possible to ensure reliability, longevity, speed and accountability.

The recommended grant program requires:

- Network demarcations attached to the customers' structures
- Design that solves critical bottleneck challenges
- Network design and build proposals that ensure reliability
- Network design and build proposals that improve affordability
- An estimate of the number of properties unserved and underserved that will be served, not just passed.

Hometown Fiber recommends Chisago County:

- **Set speed requirements.** If the speed proposed is 100 Mbps symmetrical, the capacity must be at least 1 Gbps. If symmetrical 100 Mbps service is not practicable, 100/20 Mbps will be considered with a detailed explanation as to why 100 symmetrical is not practical at this time, and an estimate (time and financial resources) of when the service will reach at least 100 Mbps symmetrical.
- Require an explanation of ways the applicant is designing, building and maintaining the proposed network to **ensure reliable service**.
- Require grantees to **sign a service level agreement (SLA)** to ensure residents, businesses and taxpayers of Chisago County receive the level of service described in the application.
- Require Wireless Internet Providers (WISPs) to provide forward-thinking architecture that will **meet market demand for at least five years**. Subsidies for WISPs should be focused on the areas of Chisago County that are currently underserved (red and purple within Hometown Fiber's GIS map). We do not recommend subsidies for WISPs in population centers. Subsidies should be limited to fiber optic backed multi-point antenna locations. This eliminates subsidy to multi-point sites that are dependent on wireless backhaul links for bandwidth. Hometown Fiber recommends WISPs use actual communication towers for their multi-point antennas. Any subsidy should be careful to avoid funding multi-point antennas that use structures not designed for telecommunications such as silos, grain elevators, etc. Chisago County can work with tower owners in the area to help local WISPs gain access. Note: To be competitive, WISPs must meet the same reliability standards as cellular providers.

Exhibits

Exhibit 1. Township-by-Township, Town-by-Town Broadband Rating

Exhibit 2. 2022 Minnesota Border to Border Broadband Grant Program Scoring Criteria

Exhibit 3. Minnesota Office of Broadband Chisago County Broadband Map

Exhibit 4. Maintenance Needed in Center City

Exhibit 5. Repairs Needed in Rush City

Appendices

Appendix A. Broadband Principles, Dig Once Policy. Example from Dakota County

Appendix B. Individuals Can Get Help Paying for Broadband

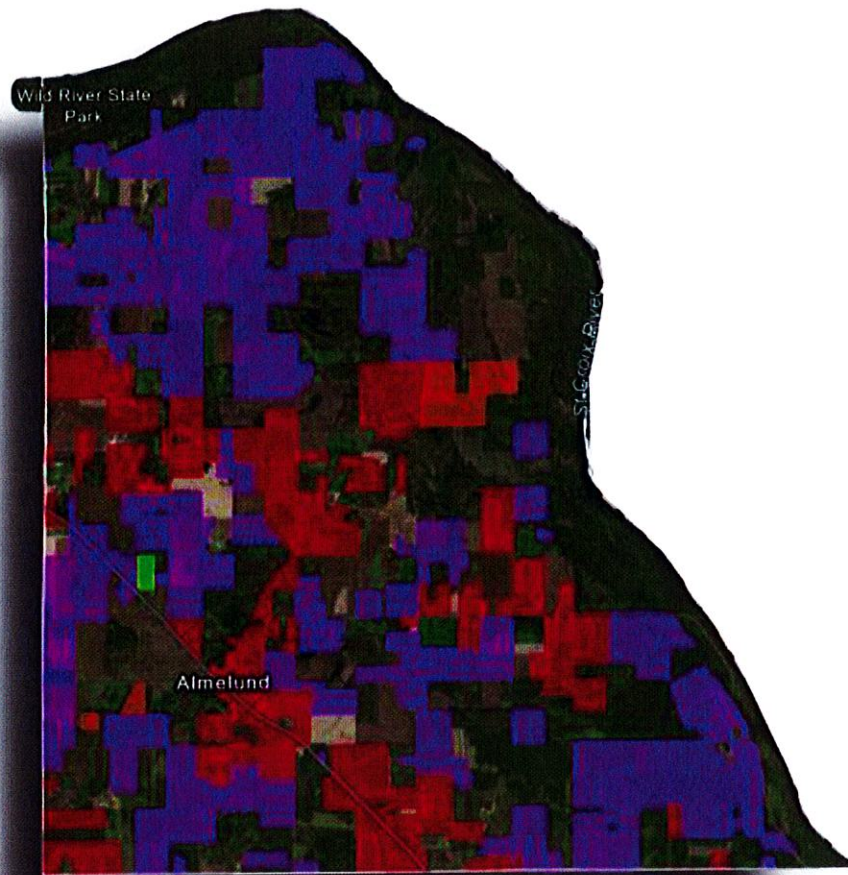
Exhibit 1

Broadband Critical Infrastructure Report for Chisago County

conducted by
Hometown Fiber

April 6, 2022

Amador Township Internet Service



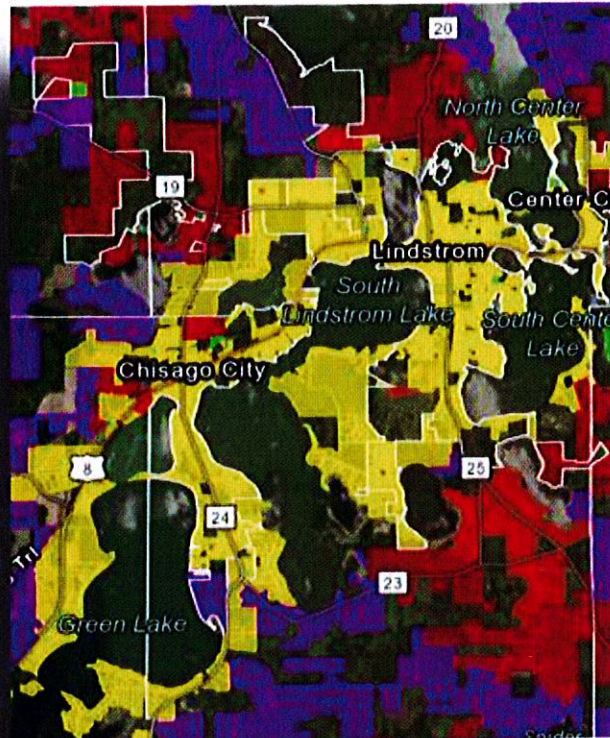
| Map Color | Score | Description | Properties |
|-----------|--------|--------------------------------------|------------|
| Purple | Worst | Failing to meet demand | 205 |
| Red | Bad | Struggling to meet demand | 180 |
| Yellow | Good | Meeting demand for at least 5 years | 0 |
| Orange | Better | Meeting demand for at least 10 years | 6 |
| Green | Best | Meeting demand for 20+ years | 2 |

Center City Internet Service



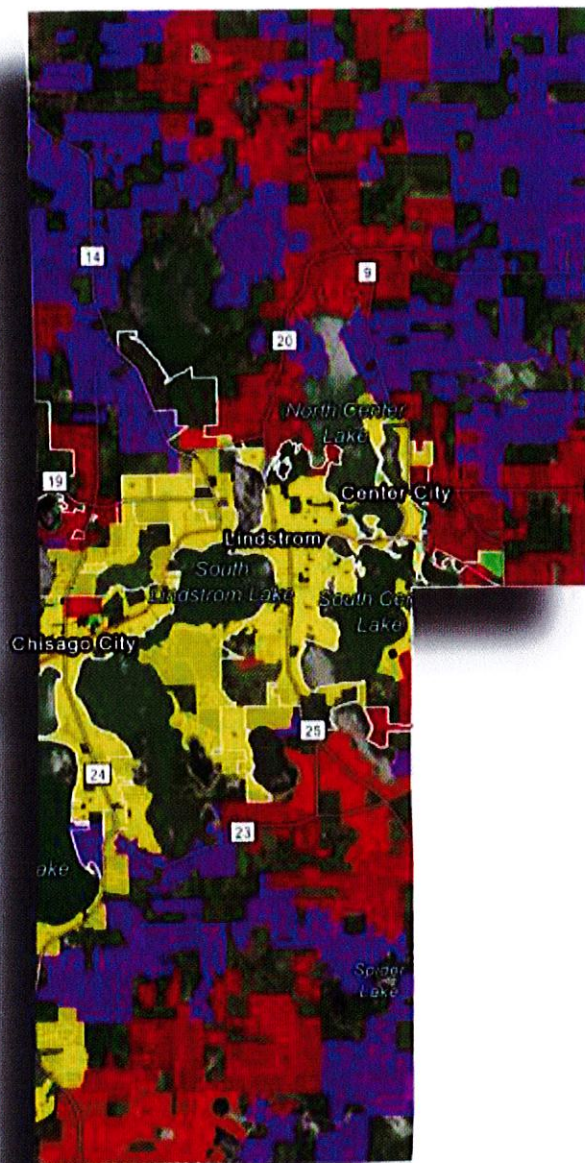
| Map Color | Score | Description | Properties |
|-----------|--------|--------------------------------------|------------|
| Purple | Worst | Failing to meet demand | 0 |
| Red | Bad | Struggling to meet demand | 4 |
| Yellow | Good | Meeting demand for at least 5 years | 322 |
| Orange | Better | Meeting demand for at least 10 years | 0 |
| Green | Best | Meeting demand for 20+ years | 3 |

Chisago City Internet Service



| Map Color | Score | Description | Properties |
|-----------|--------|--------------------------------------|------------|
| Purple | Worst | Failing to meet demand | 107 |
| Red | Bad | Struggling to meet demand | 100 |
| Yellow | Good | Meeting demand for at least 5 years | 2,100 |
| Orange | Better | Meeting demand for at least 10 years | 45 |
| Green | Best | Meeting demand for 20+ years | 7 |

Chisago Lake Township Internet Service



| Map Color | Score | Description | Properties |
|-----------|--------|--------------------------------------|------------|
| Purple | Worst | Failing to meet demand | 778 |
| Red | Bad | Struggling to meet demand | 506 |
| Yellow | Good | Meeting demand for at least 5 years | 613 |
| Orange | Better | Meeting demand for at least 10 years | 232 |
| Green | Best | Meeting demand for 20+ years | 0 |

The township image may show the city properties. Numbers in table reflect the township ratings.

Fish Lake Township Internet Service



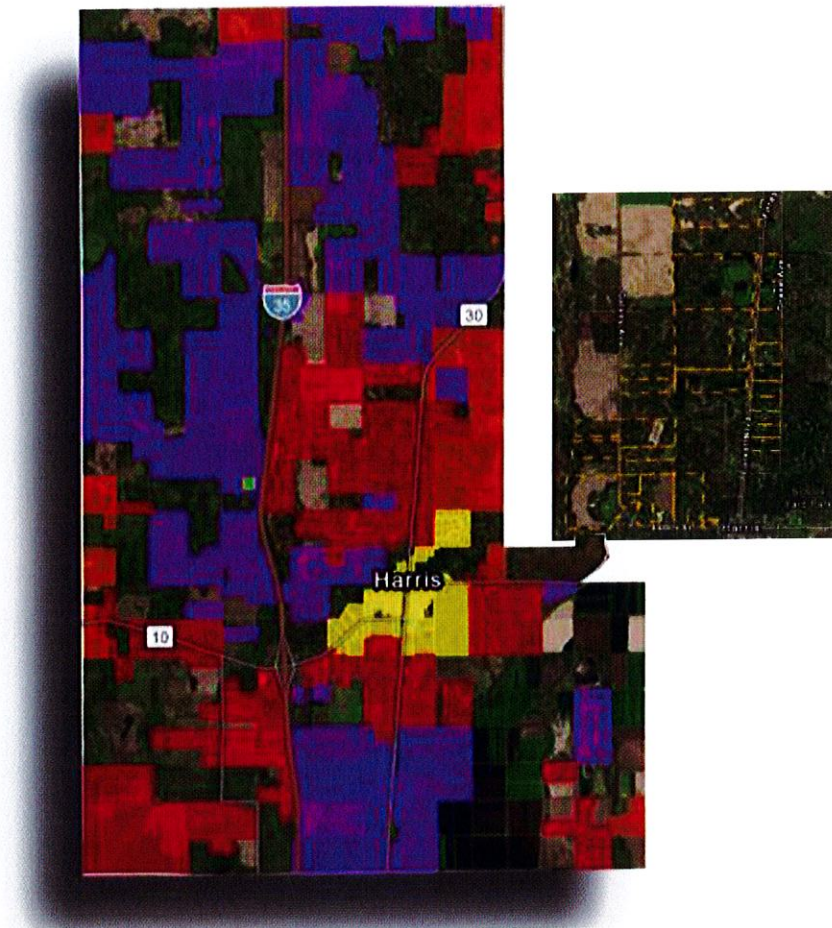
| Map Color | Score | Description | Properties |
|-----------|--------|--------------------------------------|------------|
| Purple | Worst | Failing to meet demand | 0 |
| Red | Bad | Struggling to meet demand | 0 |
| Yellow | Good | Meeting demand for at least 5 years | 0 |
| Orange | Better | Meeting demand for at least 10 years | 1,300 |
| Green | Best | Meeting demand for 20+ years | 0 |

Franconia Township Internet Service



| Map Color | Score | Description | Properties |
|-----------|--------|--------------------------------------|------------|
| Purple | Worst | Failing to meet demand | 526 |
| Red | Bad | Struggling to meet demand | 247 |
| Yellow | Good | Meeting demand for at least 5 years | 4 |
| Orange | Better | Meeting demand for at least 10 years | 0 |
| Green | Best | Meeting demand for 20+ years | 5 |

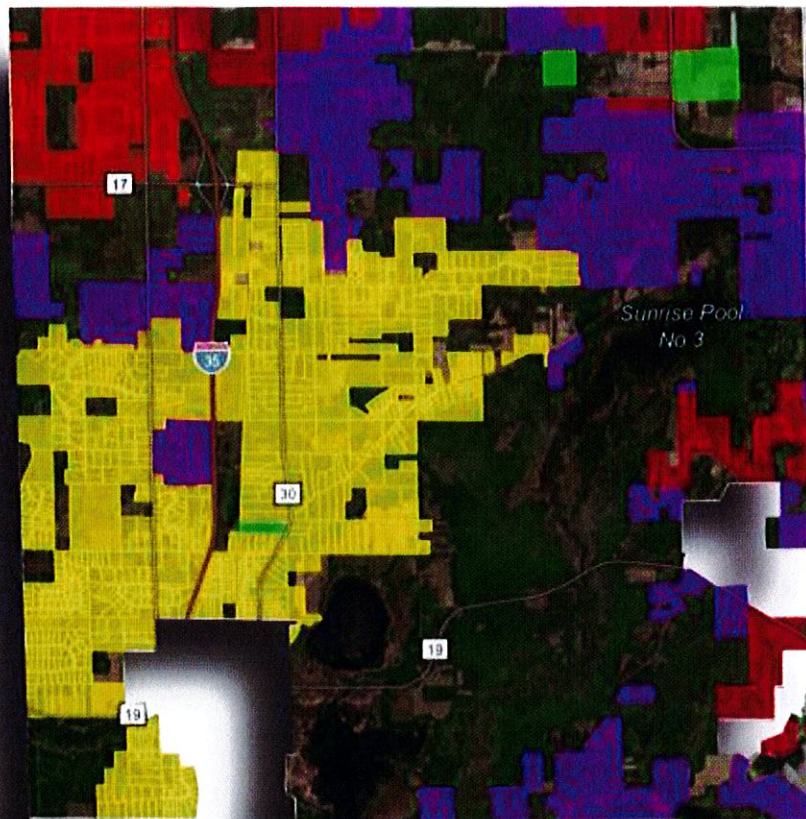
Harris Internet Service



| Map Color | Score | Description | Properties |
|-----------|--------|--------------------------------------|------------|
| Purple | Worst | Failing to meet demand | 186 |
| Red | Bad | Struggling to meet demand | 129 |
| Yellow | Good | Meeting demand for at least 5 years | 197 |
| Orange | Better | Meeting demand for at least 10 years | 34 |
| Green | Best | Meeting demand for 20+ years | 1 |

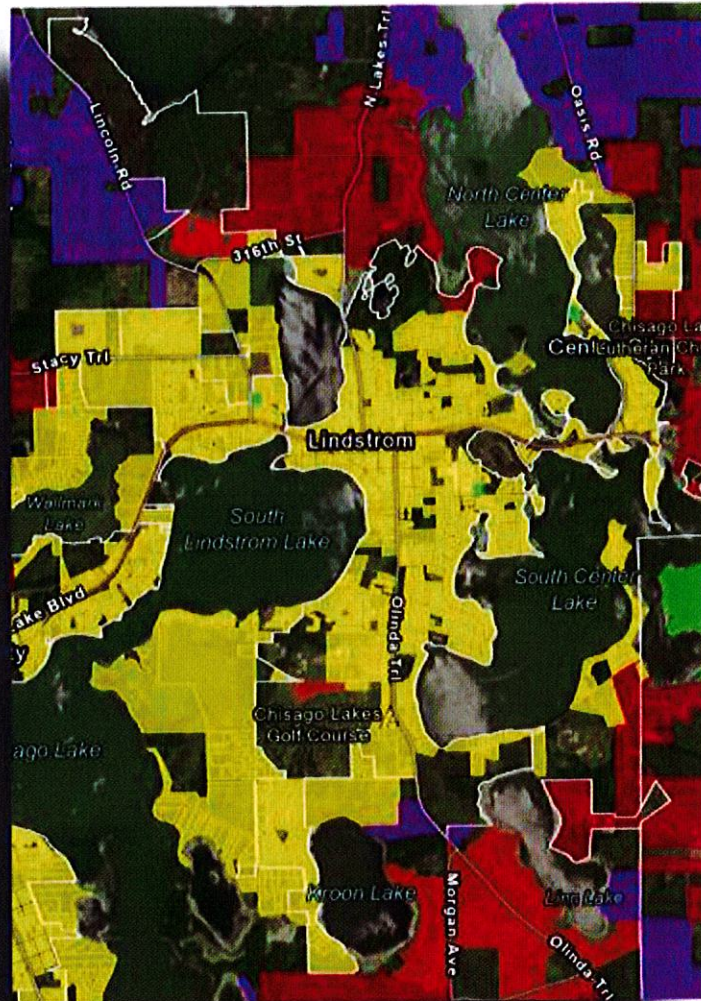
Photo insert shows the **orange broken line detail**. This area north of Harris has shared fiber installation that is about 50% complete. There are 31 properties in this area that are purple or red now and could quickly move up from having some of the worst internet service in the County.

Lent Township Internet Service



| Map Color | Score | Description | Properties |
|-----------|--------|--------------------------------------|------------|
| Purple | Worst | Failing to meet demand | 257 |
| Red | Bad | Struggling to meet demand | 81 |
| Yellow | Good | Meeting demand for at least 5 years | 764 |
| Orange | Better | Meeting demand for at least 10 years | 106 |
| Green | Best | Meeting demand for 20+ years | 3 |

Lindstrom Internet Service



| Map Color | Score | Description | Properties |
|-----------|--------|--------------------------------------|------------|
| Purple | Worst | Failing to meet demand | 0 |
| Red | Bad | Struggling to meet demand | 3 |
| Yellow | Good | Meeting demand for at least 5 years | 2,000 |
| Orange | Better | Meeting demand for at least 10 years | 108 |
| Green | Best | Meeting demand for 20+ years | 3 |

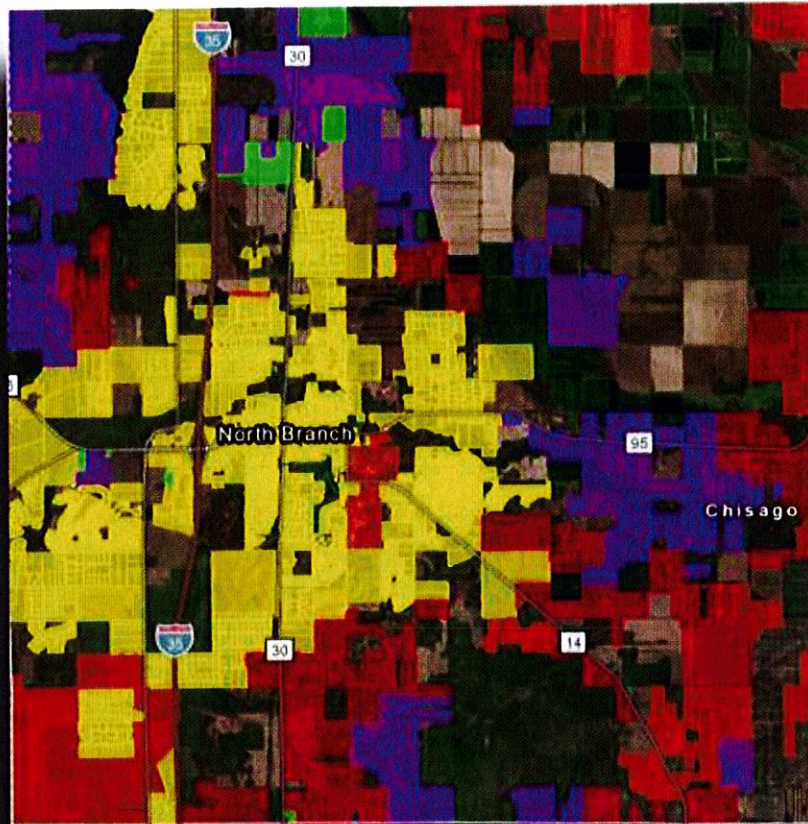
The city image may show the township properties. Numbers in table reflect the city ratings.

Nessel Township Internet Service



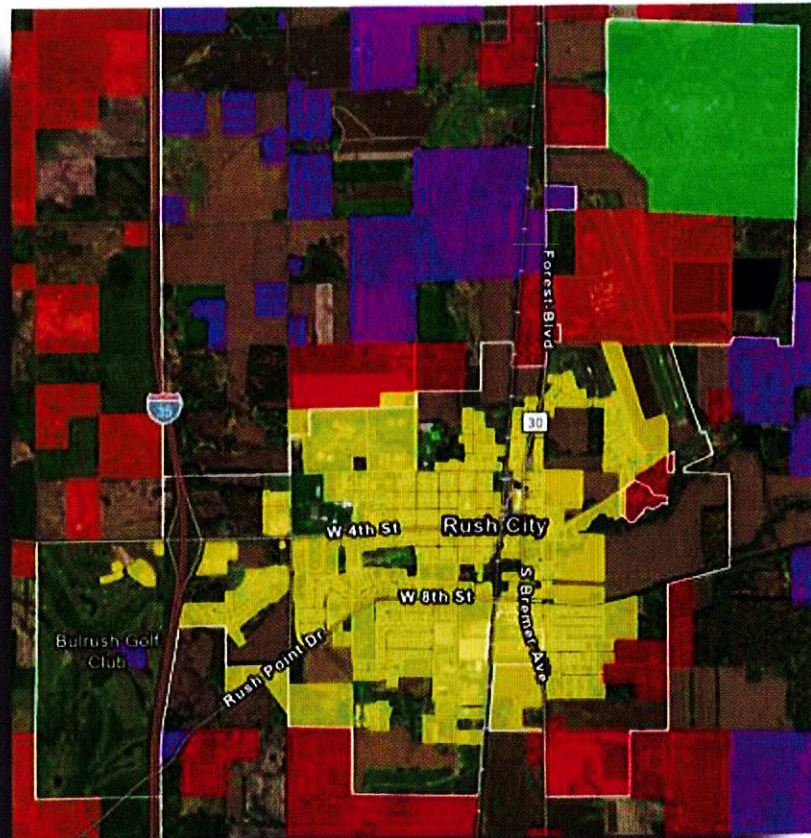
| Map Color | Score | Description | Properties |
|-----------|--------|--------------------------------------|------------|
| Purple | Worst | Failing to meet demand | 6 |
| Red | Bad | Struggling to meet demand | 0 |
| Yellow | Good | Meeting demand for at least 5 years | 0 |
| Orange | Better | Meeting demand for at least 10 years | 1,300 |
| Green | Best | Meeting demand for 20+ years | 1 |

North Branch Internet Service



| Map Color | Score | Description | Properties |
|-----------|--------|--------------------------------------|------------|
| Purple | Worst | Failing to meet demand | 242 |
| Red | Bad | Struggling to meet demand | 142 |
| Yellow | Good | Meeting demand for at least 5 years | 3,500 |
| Orange | Better | Meeting demand for at least 10 years | 250 |
| Green | Best | Meeting demand for 20+ years | 7 |

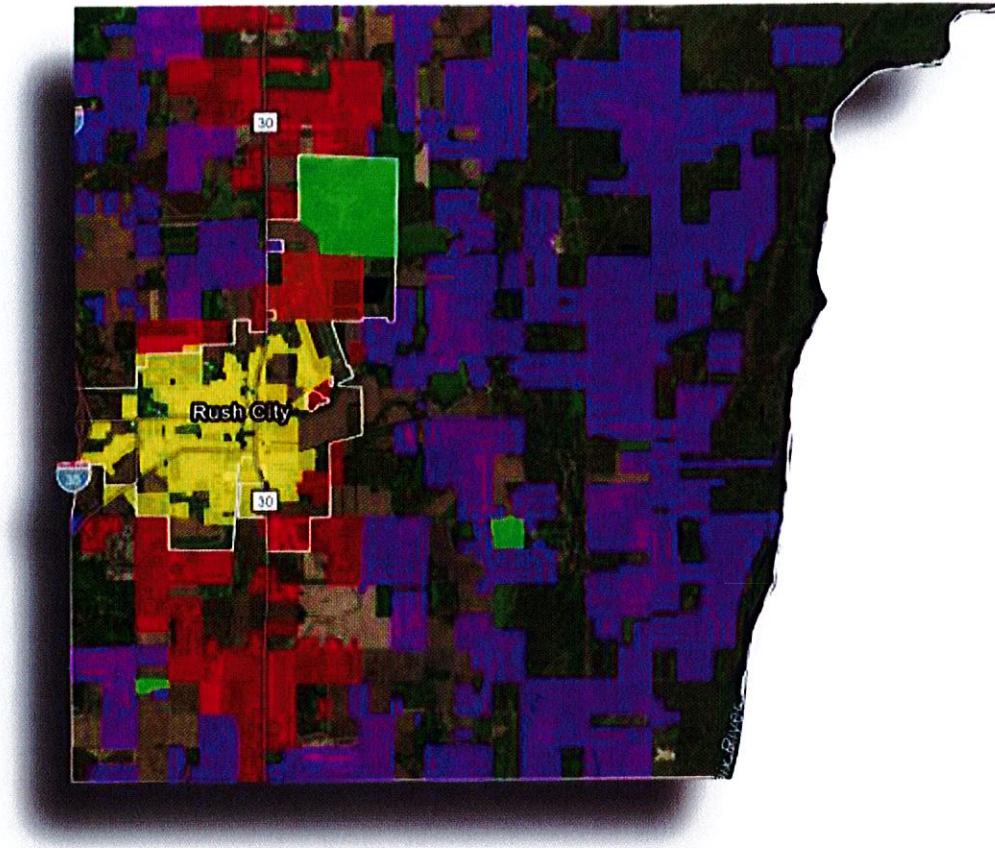
Rush City Internet Service



| Map Color | Score | Description | Properties |
|-----------|--------|--------------------------------------|------------|
| Purple | Worst | Failing to meet demand | 14 |
| Red | Bad | Struggling to meet demand | 8 |
| Yellow | Good | Meeting demand for at least 5 years | 989 |
| Orange | Better | Meeting demand for at least 10 years | 1 |
| Green | Best | Meeting demand for 20+ years | 2 |

The city image may show the township properties. Numbers in table reflect the city ratings

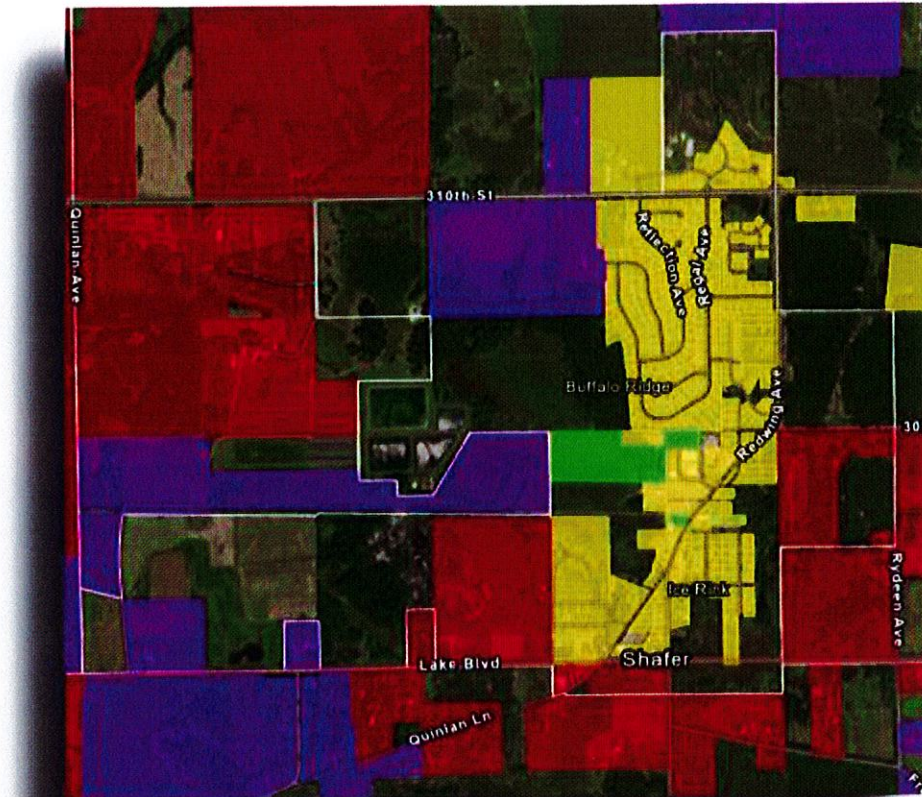
Rushseba Township Internet Service



| Map Color | Score | Description | Properties |
|-----------|--------|--------------------------------------|------------|
| Purple | Worst | Failing to meet demand | 271 |
| Red | Bad | Struggling to meet demand | 62 |
| Yellow | Good | Meeting demand for at least 5 years | 16 |
| Orange | Better | Meeting demand for at least 10 years | 0 |
| Green | Best | Meeting demand for 20+ years | 2 |

The township image may show the city properties. Number in table reflect the township ratings.

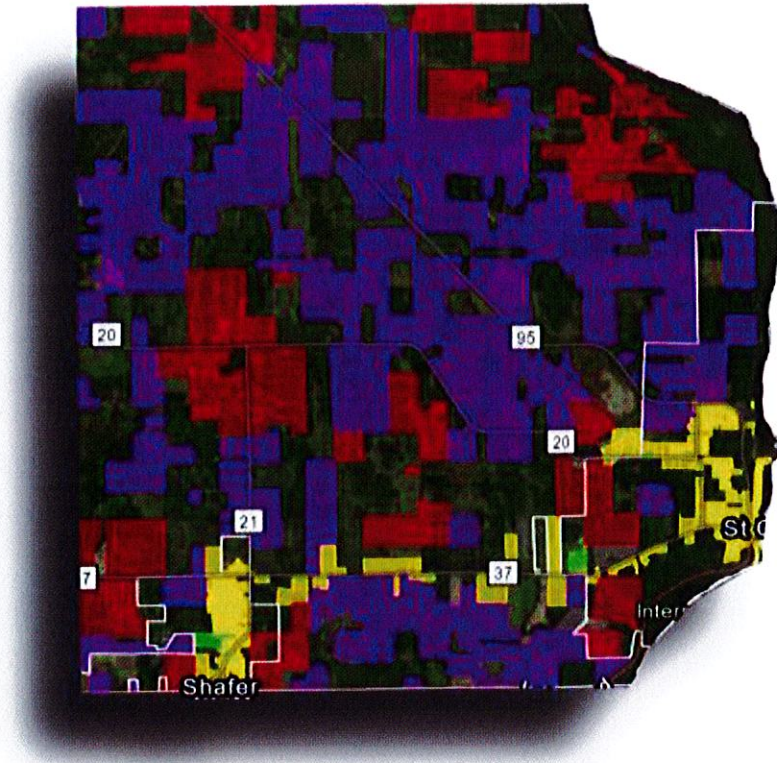
Shafer Internet Service



| Map Color | Score | Description | Properties |
|-----------|--------|--------------------------------------|------------|
| Purple | Worst | Failing to meet demand | 5 |
| Red | Bad | Struggling to meet demand | 11 |
| Yellow | Good | Meeting demand for at least 5 years | 411 |
| Orange | Better | Meeting demand for at least 10 years | 0 |
| Green | Best | Meeting demand for 20+ years | 3 |

The city image may show the township properties. Numbers in table reflect the city ratings.

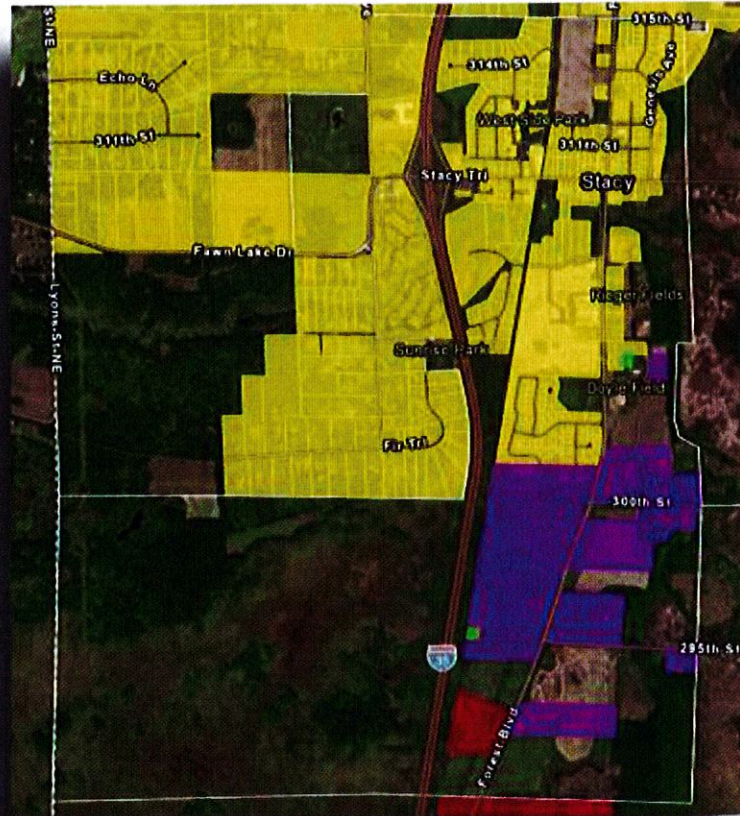
Shafer Township Internet Service



| Map Color | Score | Description | Properties |
|-----------|--------|--------------------------------------|------------|
| Purple | Worst | Failing to meet demand | 295 |
| Red | Bad | Struggling to meet demand | 132 |
| Yellow | Good | Meeting demand for at least 5 years | 39 |
| Orange | Better | Meeting demand for at least 10 years | 0 |
| Green | Best | Meeting demand for 20+ years | 0 |

The township image may show the city properties. Number in table reflect the township ratings.

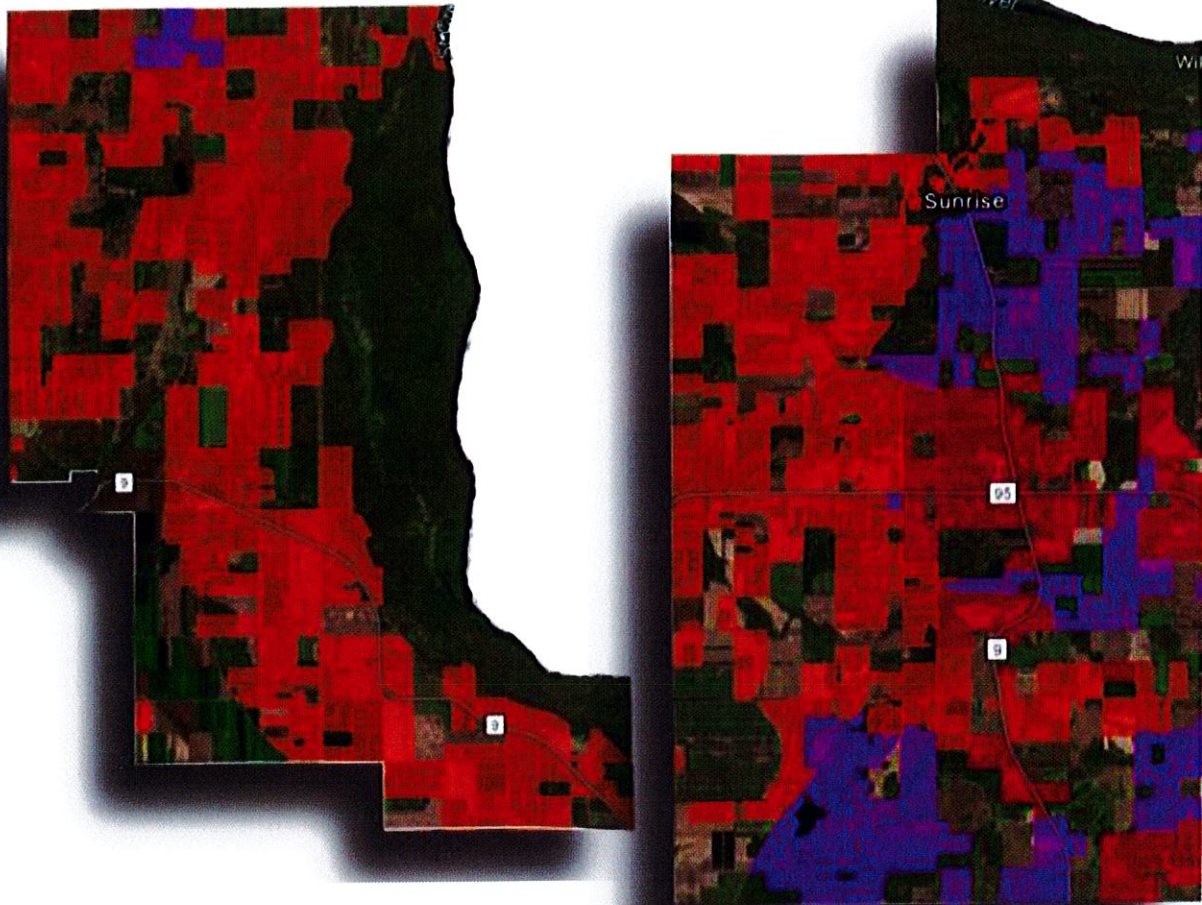
Stacy Internet Service



| Map Color | Score | Description | Properties |
|-----------|--------|--------------------------------------|------------|
| Purple | Worst | Failing to meet demand | 31 |
| Red | Bad | Struggling to meet demand | 1 |
| Yellow | Good | Meeting demand for at least 5 years | 463 |
| Orange | Better | Meeting demand for at least 10 years | 0 |
| Green | Best | Meeting demand for 20+ years | 2 |

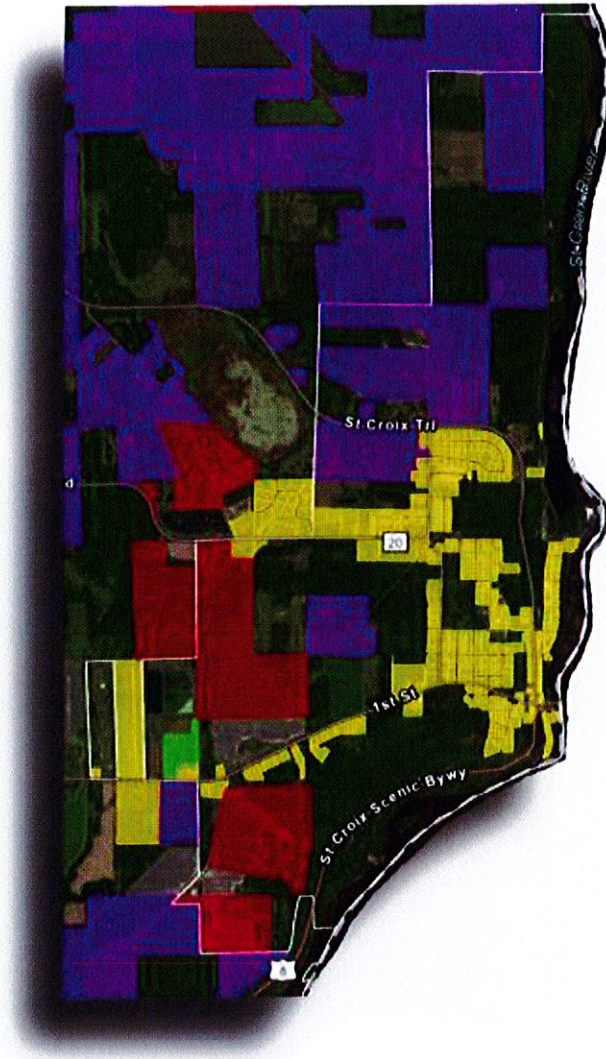
The city image may show the township properties. Numbers in table reflect the city ratings.

Sunrise Township Internet Service



| Map Color | Score | Description | Properties |
|-----------|--------|--------------------------------------|------------|
| Purple | Worst | Failing to meet demand | 139 |
| Red | Bad | Struggling to meet demand | 76 |
| Yellow | Good | Meeting demand for at least 5 years | 0 |
| Orange | Better | Meeting demand for at least 10 years | 646 |
| Green | Best | Meeting demand for 20+ years | 0 |

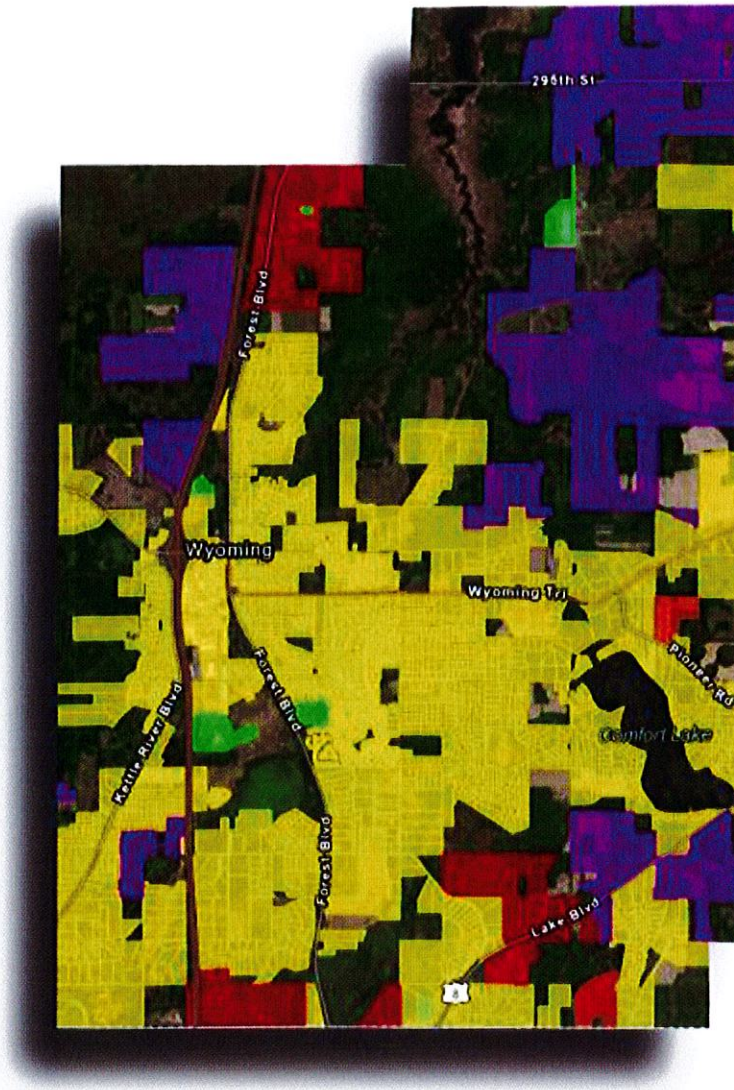
Taylors Falls Internet Service



| Map Color | Score | Description | Properties |
|-----------|--------|--------------------------------------|------------|
| Purple | Worst | Failing to meet demand | 16 |
| Red | Bad | Struggling to meet demand | 9 |
| Yellow | Good | Meeting demand for at least 5 years | 477 |
| Orange | Better | Meeting demand for at least 10 years | 0 |
| Green | Best | Meeting demand for 20+ years | 1 |

The city image may show the township properties. Numbers in table reflect the city ratings.

Wyoming Internet Service



| Map Color | Score | Description | Properties |
|-----------|--------|--------------------------------------|------------|
| Purple | Worst | Failing to meet demand | 157 |
| Red | Bad | Struggling to meet demand | 61 |
| Yellow | Good | Meeting demand for at least 5 years | 2,700 |
| Orange | Better | Meeting demand for at least 10 years | 47 |
| Green | Best | Meeting demand for 20+ years | 10 |

The city image may show the township properties. Numbers in table reflect the city ratings.

Exhibit 2

Broadband Critical Infrastructure Report for Chisago County

conducted by
Hometown Fiber

April 6, 2022

FY2022 BROADBAND GRANT APPLICATION SELECTION AND AWARD PROCESS

Introduction to Scoring and Award Process

DEED will award grants to projects that provide the highest return in public benefits for the public costs incurred and that meet all of the statutory requirements. To evaluate the applications for public benefits with respect to the costs incurred, state and federal law specifies certain priorities that DEED must consider.

To fulfill this requirement of reviewing applications in an objective and fair manner, applications will be reviewed and evaluated by a team composed by DEED. This team will use the following criteria and associated point values to assist in systematically scoring grant applications. To ensure that your application receives the best possible score, please be sure to provide complete and comprehensive responses to all information requested in the application.

FY2022 Selection Criteria and Grant Scoring Categories 120 points possible

Anticipated Broadband Improvements: 0 to 20 points possible

Unserved or underserved total passings potentially served by project:

- Anticipated improvements in broadband speed offerings from pre-existing broadband service levels to proposed service levels – project must reach or exceed 2026 state speed goals (speed now vs. speed after) and federal requirements
- Number of total passings potentially served (# of passings)
- Total passings include households, businesses, farms, and community anchor institutions
- If project includes both unserved and underserved passings, each will be scored separately, and the resultant scores averaged

Anticipated Broadband Improvements Scoring Table

| # of Passings | Speed Now: | <25/3 | <25/3 | <100/20 | <100/20 |
|---------------|--------------------|--------|--------------------|---------|--------------------|
| | Speed After Build: | 100/20 | 100/100 or greater | 100/20 | 100/100 or greater |
| 0-100 | Points Awarded: | 15 | 19 | 9 | 13 |
| 100+ | | 16 | 20 | 10 | 14 |

Grant Funding Request Amount: 0 to 10 points possible

Percent of state grant request compared to total eligible project costs:

- Applicant matching funds of 55% or more will result in a higher application score for this category
- Any funding partner contributions are included in Applicant matching funds for points

Grant Funding Request Amount Scoring Table

| Percent of eligible project costs requested | Points |
|---|--------|
| 30% or less | 10 |
| 31 to 35% | 8 |
| 36 to 40% | 5 |
| 41 to 45% | 3 |
| 46 to 50% | 0 |

Critical Need/Community Participation: 0 to 15 points possible**Additional scoring points will be awarded for the following:**

- Project applications must identify why there is a critical need for the proposed project as it relates to access, affordability, reliability and/or consistency (in addition to being a scoring factor, applicants that do not address the critical need for their project may be disqualified from consideration)
- Verified financial commitment to the project from any qualified community partner(s)
[Community partner may be any public, private, non-profit, or philanthropic entity – this would include a business, county, township, city, tribal entity, or community coalition]
- Projects that propose to serve or partially serve federally recognized tribal lands, and the associated tribal entity has provided application documentation of project support
- Project applications that provide substantive evidence of community support for the project

Project Readiness: 0 to 25 points possible**Applicant has concretely demonstrated a comprehensive knowledge of – and detailed preparation for – the proposed project. Applicant has provided evidence of being fully prepared to build, implement, and operate the project:**

- All budget material is provided in detailed, yet clearly understandable manner, sources and uses of funds is realistic, all grant eligible elements are included, all funding partners are secured
- Other broadband infrastructure requirements are included – certified engineering design and diagrams, documentation of scalable equipment, and all preconstruction requirements are identified and included in the project schedule
- Project implementation requirements are provided – proposed speed tiers and service pricing, 5 year service commitment, and proposed marketing strategies
- Complete project schedule and financial requirements are provided

Project Sustainability: 0 to 25 points possible**Applicant has demonstrated strong internal capacity to effectively support and sustain its broadband infrastructure proposal:**

- Demonstration of technical expertise – specific prior experience in providing broadband services
- Organizational support evidence provided – extent of organization and how organizational strength will sustain broadband service delivery and maintenance
- Financial statements provided – most current year's audited financial statements, and supporting documentation where applicable, to demonstrate overall financial viability

Economic Development & Community Impact Review: 0 to 15 points possible**Applicant has demonstrated the economic development and community enhancement potential of the proposed project:**

- Applicant has identified businesses, farms and agricultural use customers, community anchor institutions, and educational facilities in the proposed project area
- For businesses, farms and agricultural use customers, Applicant has identified how improved broadband speeds and coverage will enable the project area to become and/or remain competitively viable
- For community anchor institutions, Applicant has identified how improved broadband deployment will be incorporated into specific community programs

- For educational locations, Applicant has identified the proposed impact on e-learning
- For health and public safety locations, Applicant has identified the proposed impact on telemedicine
- If project area is in an economically distressed area, Application has demonstrated that the proposed project area has unemployment, poverty or population loss levels significantly greater than statewide average (Application may reference median household income or percent of students eligible for free or reduced school lunches for proposed project area)

Broadband Adoption Assistance: *0 to 10 points possible*

Additional scoring points will be awarded for the following:

- Will technical support or training on broadband be offered?
- Are broadband adoption activities planned for the project?
- Describe how the broadband service that will be offered is affordable to the target markets in the proposed service area. Is there a low-income broadband assistance program offering? (At a minimum, grant recipients will be required to participate in the FCC's Affordable Connectivity Program. Additional efforts by the applicant to address affordability will be awarded additional points.)

Exhibit 3

Broadband Critical Infrastructure Report for Chisago County

conducted by
Hometown Fiber

April 6, 2022

2021 Provider Broadband Service Inventory

Chisago County

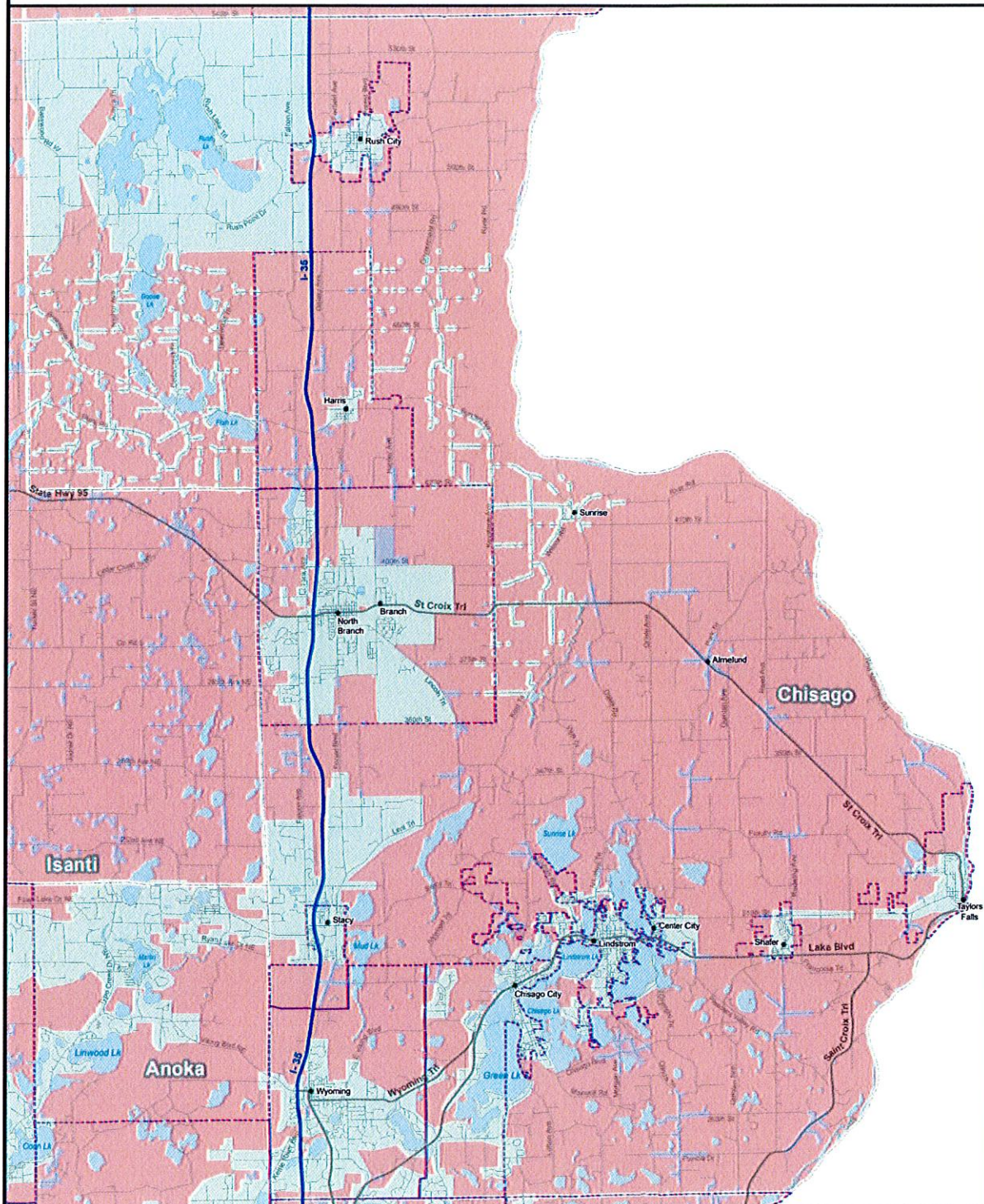
Minnesota

Created October 31, 2021

mn EMPLOYMENT AND
ECONOMIC DEVELOPMENT
OFFICE OF BROADBAND DEVELOPMENT

Border-to-Border
Broadband
Development
Grant Program

Unserved, Underserved
and Served Broadband
Areas



- Interstate
- US Road
- Local Road
- Municipal Boundary
- County Boundary
- ~ Water

- Wireline Broadband of at Least 100M/20M
- Underserved Area
(Wireline Broadband of at Least
25M/3M but less than 100M/20M)
- Unserved Area
(No Wireline Broadband of at Least
25M/3M)



0 0.75 1.5 3
miles

This map was prepared by Connected Nation under contract with the Minnesota Department of Employment and Economic Development. The map represents areas of broadband service availability based on provider data submitted to and analyzed by Connected Nation. This release reflects updates received as of October 2021.

Additional maps and data are available at <http://mn.gov/deed/programs-services/broadband/maps>. Upon request, this information can be made available in alternate formats for people with disabilities by contacting the DEED Office of Broadband Development at 651-296-7810.

Submit questions or recommended changes to: DEED.broadband@state.mn.us

© Copyright 2021, State of Minnesota, St. Paul, MN

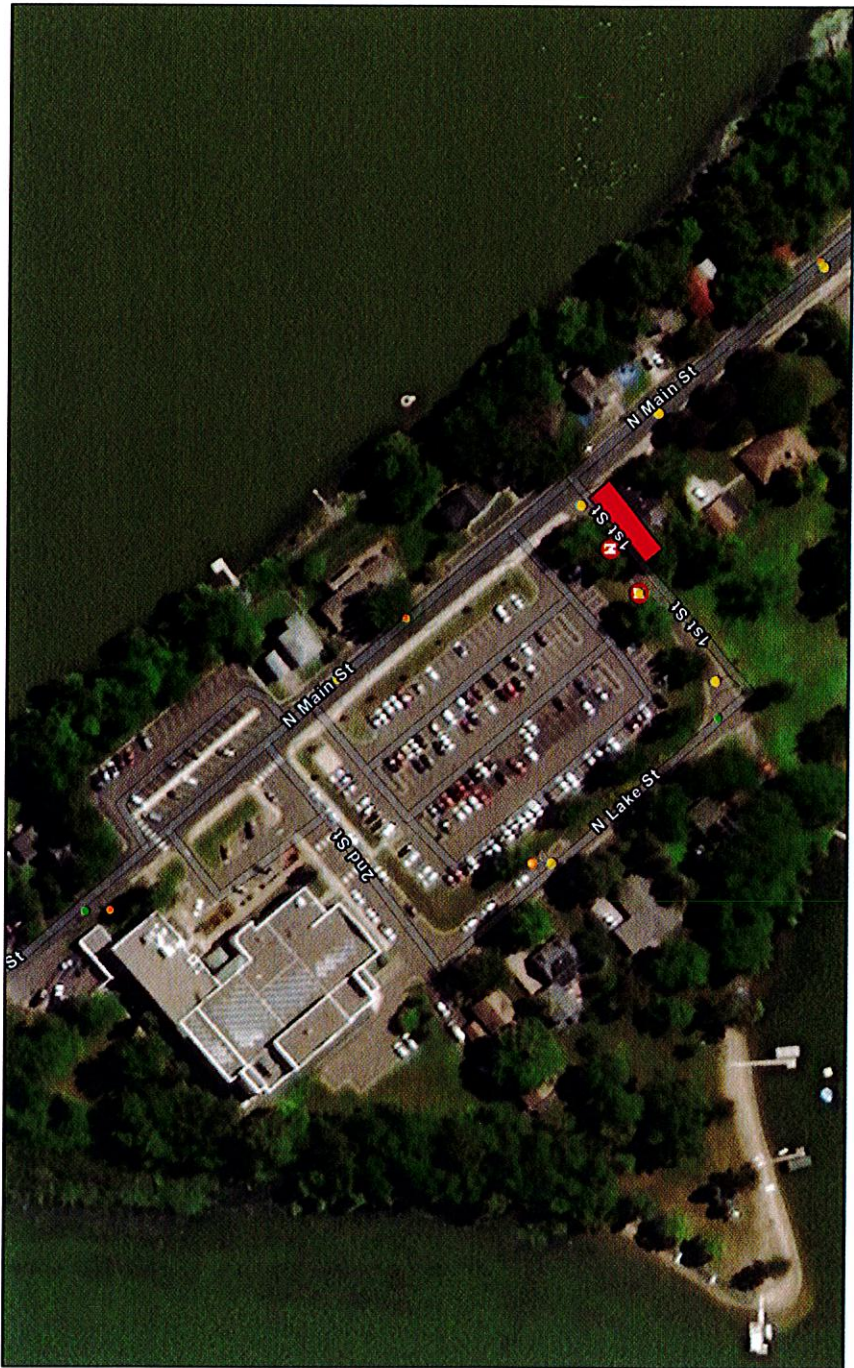
Exhibit 4

Broadband Critical Infrastructure Report for Chisago County

conducted by
Hometown Fiber

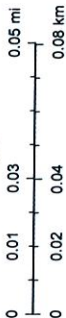
April 6, 2022

Chisago County Field Map



12/2/2021

1:2,257



Eri Community Maps Contributors, County of Polk, WI, Metropolitan Council, University of Illinois

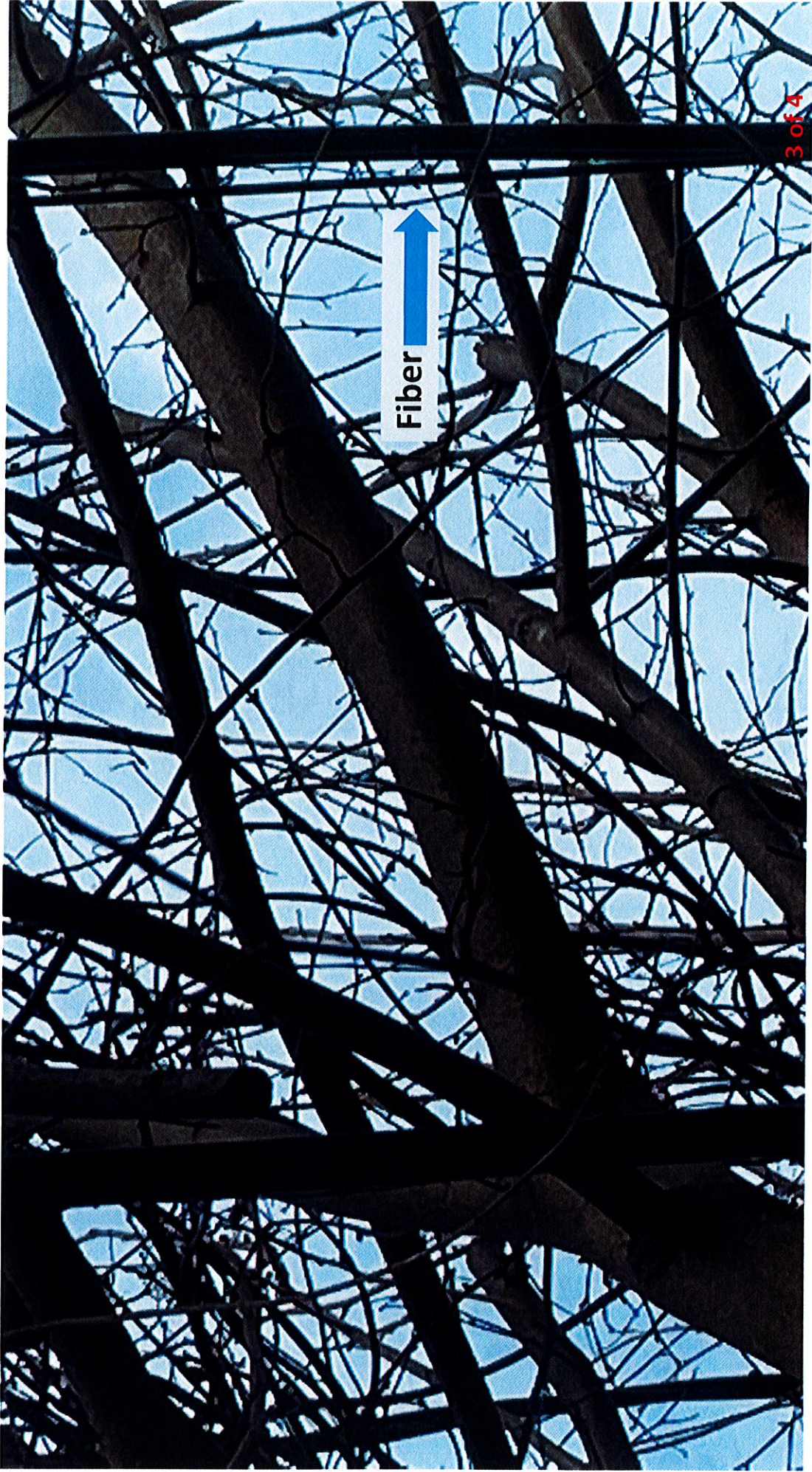
Maintenance Recommended

This county building is fed by aerial fiber optic cables at the Southwest corner of North Main Street and 1st Street.

Basic maintenance of this aerial cable is recommended at this time. If the service provider will not clear it, it is advised the County clear it to avoid potential damage.

See photos on pages 2 to 4.







Coaxial amplifier



Fiber



Exhibit 5

Broadband Critical Infrastructure Report for Chisago County

conducted by
Hometown Fiber

April 6, 2022



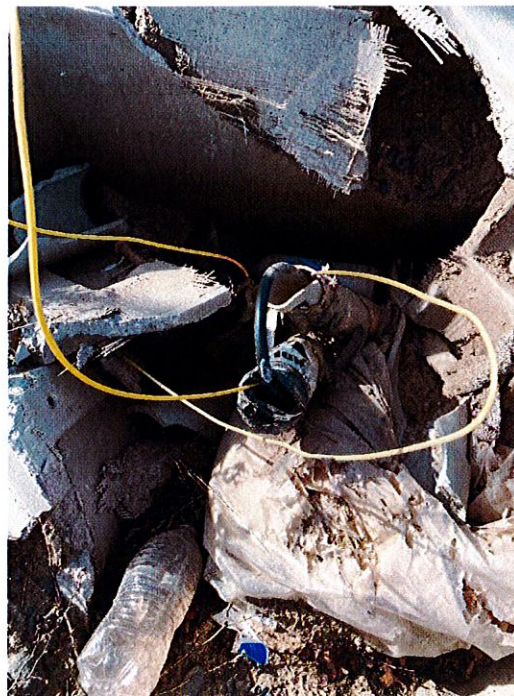
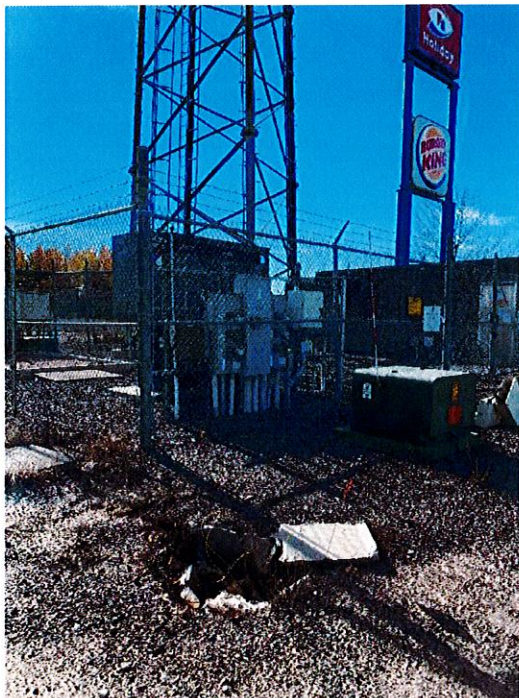
Sent via email, Nov. 9, 2021

Cell tower fiber optics need repair

Field technicians came across damaged fiber optics feeding a cell tower fiber, All cellular carriers in the area use this tower in Rush City at 35. Hometown Fiber recommends bollards be placed at the site. It needs to be protected from the snow that gets pushed there and the plows.

We will identify the owner of the equipment and alert them to the condition of the condition. But they won't get to it before snow flies. The tower itself is owned by American Tower but they don't own the damaged equipment.

Note: Hometown Fiber worked with CenturyLink, the owner of fiber in the area. A representative from the company visited site that day. He did not believe CenturyLink owned the fiber feeding the cell tower.



Appendix A

**Broadband Critical
Infrastructure
Report
for
Chisago County**

conducted by
Hometown Fiber

April 6, 2022

8.1 - Approval To Implement Guiding Principles For Dakota County Broadband Projects

Meeting Date: 6/7/11
Item Type: Regular-Action
Division: OPERATIONS, MANAGEMENT, AND BUDGET
Department: Information Technology
Contact: James Strommer Telephone: 651-438-4285
Prepared by: James Strommer
Reviewed by: N/A N/A

Fiscal/FTE Impact:

- ☐ None
☐ Amount included in current budget
☐ Budget amendment requested
☐ FTE included in current complement
☐ New FTE(s) requested
☒ Other

PURPOSE/ACTION REQUESTED

Approval to implement guiding principles for the development of broadband infrastructure projects involving Dakota County.

SUMMARY

Since 1998, Dakota County has developed a fiber optic cable network infrastructure to connect state, county, city, and school locations within Dakota County. The development of this network has occurred through several methods, including the use of cable franchise agreements, and leveraging partnerships with entities that mutually benefit from the installation and use of this infrastructure. This has allowed Dakota County to develop a broadband infrastructure at a relatively low cost, and encouraged widespread participation in its use. It has not, however, provided a clear picture for future expansion of the network.

Dakota County Information Technology proposes the adoption of principles to guide future development of County installed broadband networks. These principles cover four general areas.

- 1) How Dakota County is involved in, and promotes collaboration with public entities.
- 2) Development of a Commercial network (C-Net) to promote economic development, and to provide for appropriate private partnerships.
- 3) Installation of conduit in conjunction with County highway and County parks projects. This will provide for less expensive fiber deployment in these areas in the future.
- 4) Promote the development of Wi-MAX and other wireless broadband infrastructures.

The principles outlined are consistent with broadband discussions ongoing between Dakota County Information Technology and the Dakota County High Performance Partnership (HiPP) Dark Fiber Sub-Committee.

EXPLANATION OF FISCAL/FTE IMPACT

Each project will be evaluated individually regarding partners, and shared costs between them. Funding for projects requiring County contribution will be submitted via the Building CIP process, and be subject to Board review as part of the CIP process. All spending on projects involving > \$50,000 of County funds will require additional board approval.

Supporting Documents:

Attachment A: Guiding Principles for Dakota County Broadband Projects

Previous Board Action(s):

-
-
-
-
-

RESOLUTION

Approval To Implement Guiding Principles For Dakota County Broadband Projects

WHEREAS, there is a continuing need to develop a broadband networks within Dakota County; and

WHEREAS, there is interest in developing broadband collaboratively with other public entities as well as private partnerships; and

WHEREAS, there is currently no defined framework for the development of broadband networks within Dakota County.

NOW, THEREFORE, BE IT RESOLVED, That the Dakota County Board of Commissioners hereby adopts the methods described in "Guiding Principles for Dakota County Broadband Projects" as guidelines for the development of County developed broadband networks as presented to the Administration/Finance/Policy Committee of the Whole on June 7, 2011.

Administrator's Comments:

- ☒ Recommend Action
- ☐ Do Not Recommend Action
- ☐ Reviewed--No Recommendation
- ☐ Reviewed--Information Only
- ☐ Submitted at Commissioner Request

Brandt Richardson
County Administrator

Reviewed by (if required):

- ☒ County Attorney's Office
- ☒ Financial Services
- ☐ Risk Management
- ☐ Employee Relations
- ☐ Information Technology

☐ _____

Guiding Principles for Dakota County
Broadband Projects

Developed by Dakota County Department of Information Technology

March 1, 2011

Guiding Principles for Dakota County Collaborative Broadband Projects

Purpose

Dakota County I.T. is charged with the development of broadband infrastructure to connect County buildings with a high speed data infrastructure. The development of this infrastructure will be done in a cost effective manner, and in partnership with other public entities within Dakota County, to allow the partners to leverage each other's investment. This document outlines the guiding principles governing the process for the development of this infrastructure, cost sharing with partners, disposal and revenue sharing of unused fiber, and methods of introducing public/private partnerships in the delivery of Internet service to Dakota County with the intent to promote economic development for business and residents of Dakota County.

Principle 1: Collaboration for the development of fiber optic networks

1. In general, for all fiber projects, the following steps are taken:
 - a. Sponsor requests fiber connection
 - b. I.T. reviews the current fiber install, to determine the nearest connect point
 - c. Search for public entities near the area to identify potential partners
 - d. Create initial design
 - e. Request initial quote based on design
 - f. Identify cost sharing opportunities based on the design path
 - g. Contact potential partners to determine interest
 - h. Begin Joint powers agreement discussions
 - i. Negotiate costs between partners
 - j. Decide on number of fiber strands
 - k. Meet with Dakota County Management (I.T.)
 - l. Submit CIP budget request for the County's portion of the project
 - m. Begin work with State Office of Enterprise Technology to refine the design
 - n. Finalize negotiations for cost sharing
 - o. Write a bid document if necessary (>\$50,000)
 - p. Finalize JPA
 - q. Write RBA to request authorization for Contract, JPA
 - r. Write contract, involve our Attorney's office
 - s. Obtain City, County and/or State Right of Way permits if needed
 - t. Order project materials
 - u. Obtain signatures on contracts
 - v. Install the fiber,
2. Cost sharing for I-Net collaborative projects generally follow these guidelines:
 - a. After a project scope has been defined, and interested partners identified, an initial quote for the cost of the project will be solicited by Dakota County I.T.

- b. Each segment will be identified as being of shared benefit, or of benefit to a subset of partners.
 - c. Maintenance costs for each segment will be negotiated with the collaboration partners;
 - i. State OET is the preferred partner to monitor the fiber infrastructure as they can leverage their 24 x 7 help desk for this.
 - ii. Relocation maintenance costs are to be shared among the collaboration partners
 - iii. Gopher State One-Call support shall be negotiated among the collaboration partners with the State being the preferred partner to provide this support.
 - d. Partners identified for each segment will contribute a fair share of financial capital for that segment.
3. After initial costs are identified for each participant, Dakota County I.T. will review the project with the County Administrator for additional input in the negotiation process.
 4. Communication on all active projects will be provided quarterly to the County Administrator
 5. Most projects will be funded via County Building CIP; however, CIP funding approval is not necessarily approval to move ahead with the project.
 6. If CIP funding is denied for a particular project, I.T. will continue to find additional partners, and additional cost saving measures to reduce the County cost for the project, and re-apply for CIP, or find other funding sources.
 7. The Installation of a fiber optic network lays the foundation for additional technologies to be deployed within Dakota County such as Wi-Max. The installation of these add-on technologies will be based on the required need and application of these technologies, with appropriate review and approval by County administration.
 8. The design of the fiber network will allow for reasonable over-capacity for future use. A minimum of 32 strands of fiber are to be installed in all future projects.

Principle 2: Development of a Commercial Network (C-Net)

1. Collaboration partners will form a working committee under the auspices of a JPA to participate in the formation of a C-Net for the purpose of leasing some unused fiber optic assets for the purpose of private commercial use.
2. The working committee will meet periodically to provide oversight of the C-Net, and will be tasked with:
 - a. Determining the fiber assets available to contribute to the C-Net
 - b. Determine the method of obtaining maximum value for the asset
 - c. Formulate how revenues are to be distributed fairly to participating collaboration partners.
 - d. Partner participation in the C-Net will be based on ownership of the fiber optic path used, and weighted by the linear feet of fiber optic cable owned that is used by the C-Net.
3. Partners will be recruited from existing participants in I-Net projects within Dakota County

4. Participating partners will inventory unused assets, and where possible, contribute two unused fiber strands to be used for the C-Net.
5. The Joint Powers Agreement, and any agreement entered into for the lease of fiber assets are to be reviewed by the County Attorney's office.

Principle 3: Installing conduit along county highway and parks projects

There is a possibility for cost savings by installing conduit in conjunction with planned County highway and parks projects. For this reason, Dakota County I.T. proposes the following:

1. Dakota County Information Technology will arrange an annual review of County highway projects and County parks projects in the County's adopted capital improvement program for the purpose of evaluating cost and usefulness of installing conduit in conjunction with these projects. The evaluation will determine how well the path fits into future fiber development plans, and establish the additional cost to the project to install the conduit, as well as determining the potential cost savings if fiber is installed along this path.
2. Dakota County I.T. proposes the establishment of a fund to pay for conduit installation for approved projects, with expenditures reviewed by County Administration and the County Board as part of the RBA process for each Highway or Parks project. The amount put into the fund will be determined by the annual evaluation of highway and parks projects.
3. Dakota County I.T. will be responsible for locating and relocating the unused conduit as necessary, including the costs required for this work. Additional funding will be required to maintain this asset.
4. Dakota County department of Information Technology will be responsible for arranging the funding for the additional cost of conduit, additional labor costs associated with the installation of the conduit, additional material costs (hand holes, locate poles, etc.), managing the costs and payments for conduit installation, and inspecting the installation for completion. Dakota County I.T. will be responsible for any locate, relocation, and maintenance costs associated with the conduit. Dakota County I.T. in collaboration with parks or transportation will provide design details for the conduit installation. Dakota County transportation or parks (depending on which department is leading the construction project) will be responsible for integrating the conduit installation into the overall project plan, and overseeing the physical installation of the conduit.
5. Dakota County Information Technology will also collaborate with cities located within Dakota County to coordinate similar efforts to install conduit along city roads concurrent with city road construction projects.

Typical fiber optic cable installation projects have a cost component for digging a trench that averages over 80% of the cost of a project. This fact has led to the suggestion that there may be substantial cost savings if conduit can be installed in conjunction with County highway and parks trail projects. Our experience indicates that there may be some projects where this is true, but this does not hold true for all projects. In some cases, if an area of highway is being worked on, and utilities are being relocated, there may be an opportunity to share trenching costs with other utility providers. In some cases, a trench must be dug for other new utilities and we may be able to take advantage of this. However, if a project does not involve digging a trench, then there is no financial advantage to placing conduit as part of the project.

The placement of conduit should be evaluated for every highway and parks trail project by the Information Technology department, with a cost analysis performed indicating the cost savings

introduced by placing conduit in conjunction with the project. This analysis will be reviewed by the project manager (from Parks or Transportation), I.T. Management, and County Administration.

Principle 4: Wi-Max Infrastructure development in conjunction with C-Net

1. The establishment and promotion of Wi-Max wireless technology shall be the responsibility of the C-Net collaborative, as the successful deployment of Wi-Max requires an established fiber infrastructure to back-haul the data transmitted by Wi-Max access points.
2. Wi-Max is a technology best developed and distributed by private industry, and is already established in parts of Dakota County by private industry. Private entities have already secured the licensed radio spectrum required to deploy Wi-Max.
3. The C-Net collaborative shall make the C-Net infrastructure available to private entities to promote the expansion of their Wi-Max infrastructure.

Projected infrastructure roadmap

To better coordinate and take advantage of opportunities for infrastructure development, Dakota County I.T. will maintain a map that indicates existing fiber optic Infrastructure, as well as planned infrastructure construction 5 years into the future. A link to this map is here:

<http://dcworks/projects/broadband/Project%20Management>

Guiding Principles for Dakota County

Broadband Projects

Developed by Dakota County Department of Information Technology

March 1, 2011

Guiding Principles for Dakota County Collaborative Broadband Projects

Purpose

Dakota County I.T. is charged with the development of broadband infrastructure to connect County buildings with a high speed data infrastructure. The development of this infrastructure will be done in a cost effective manner, and in partnership with other public entities within Dakota County, to allow the partners to leverage each other's investment. This document outlines the guiding principles governing the process for the development of this infrastructure, cost sharing with partners, disposal and revenue sharing of unused fiber, and methods of introducing public/private partnerships in the delivery of Internet service to Dakota County with the intent to promote economic development for business and residents of Dakota County.

Principle 1: Collaboration for the development of fiber optic networks

1. In general, for all fiber projects, the following steps are taken:
 - a. Sponsor requests fiber connection
 - b. I.T. reviews the current fiber install, to determine the nearest connect point
 - c. Search for public entities near the area to identify potential partners
 - d. Create initial design
 - e. Request initial quote based on design
 - f. Identify cost sharing opportunities based on the design path
 - g. Contact potential partners to determine interest
 - h. Begin Joint powers agreement discussions
 - i. Negotiate costs between partners
 - j. Decide on number of fiber strands
 - k. Meet with Dakota County Management (I.T.)
 - l. Submit CIP budget request for the County's portion of the project
 - m. Begin work with State Office of Enterprise Technology to refine the design
 - n. Finalize negotiations for cost sharing
 - o. Write a bid document if necessary (>\$50,000)
 - p. Finalize JPA
 - q. Write RBA to request authorization for Contract, JPA
 - r. Write contract, involve our Attorney's office
 - s. Obtain City, County and/or State Right of Way permits if needed
 - t. Order project materials
 - u. Obtain signatures on contracts
 - v. Install the fiber,
2. Cost sharing for I-Net collaborative projects generally follow these guidelines:
 - a. After a project scope has been defined, and interested partners identified, an initial quote for the cost of the project will be solicited by Dakota County I.T.

- b. Each segment will be identified as being of shared benefit, or of benefit to a subset of partners.
- c. Maintenance costs for each segment will be negotiated with the collaboration partners;
 - i. State OET is the preferred partner to monitor the fiber infrastructure as they can leverage their 24 x 7 help desk for this.
 - ii. Relocation maintenance costs are to be shared among the collaboration partners
 - iii. Gopher State One-Call support shall be negotiated among the collaboration partners with the State being the preferred partner to provide this support.
- d. Partners identified for each segment will contribute a fair share of financial capital for that segment.
 3. After initial costs are identified for each participant, Dakota County I.T. will review the project with the County Administrator for additional input in the negotiation process.
 4. Communication on all active projects will be provided quarterly to the County Administrator
 5. Most projects will be funded via County Building CIP; however, CIP funding approval is not necessarily approval to move ahead with the project.
 6. If CIP funding is denied for a particular project, I.T. will continue to find additional partners, and additional cost saving measures to reduce the County cost for the project, and re-apply for CIP, or find other funding sources.
 7. The installation of a fiber optic network lays the foundation for additional technologies to be deployed within Dakota County such as Wi-Max. The installation of these add-on technologies will be based on the required need and application of these technologies, with appropriate review and approval by County administration.
 8. The design of the fiber network will allow for reasonable over-capacity for future use. A minimum of 32 strands of fiber are to be installed in all future projects.
- d. Partner participation in the C-Net will be based on ownership of the fiber optic path used, and weighted by the linear feet of fiber optic cable owned that is used by the C-Net.
 3. Partners will be recruited from existing participants in I-Net projects within Dakota County
 4. Participating partners will inventory unused assets, and where possible, contribute two unused fiber strands to be used for the C-Net.

Principle 2: Development of a Commercial Network (C-Net) – To promote economic development

1. Collaboration partners will form a working committee under the auspices of a JPA to participate in the formation of a C-Net for the purpose of leasing some unused fiber optic assets for the purpose of private commercial use.
2. The working committee will meet periodically to provide oversight of the C-Net, and will be tasked with:
 - a. Determining the fiber assets available to contribute to the C-Net
 - b. Determine the method of obtaining maximum value for the asset
 - c. Formulate how revenues are to be distributed fairly to participating collaboration partners.

Principle 3: Installing conduit along county highway and parks projects

There is a possibility for cost savings by installing conduit in conjunction with planned County highway and parks projects. For this reason, Dakota County I.T. proposes the following:

1. Dakota County Information Technology will arrange an annual review of County highway projects and County parks projects in the County's adopted capital improvement program for the purpose of evaluating cost and usefulness of installing conduit in conjunction with these projects. The evaluation will determine how well the path fits into future fiber development plans, and establish the additional cost to the project to install the conduit, as well as determining the potential cost savings if fiber is installed along this path.
2. Dakota County I.T. proposes the establishment of a fund to pay for conduit installation for approved projects, with expenditures reviewed by County Administration and the County Board as part of the RBA process for each Highway or Parks project. The amount put into the fund will be determined by the annual evaluation of highway and parks projects.
3. Dakota County I.T. will be responsible for locating and relocating the unused conduit as necessary, including the costs required for this work. Additional funding will be required to maintain this asset.
4. Dakota County department of Information Technology will be responsible for arranging the funding for the additional cost of conduit, additional labor costs associated with the installation of the conduit, additional material costs (hand holes, locate poles, etc.), managing the costs and payments for conduit installation, and inspecting the installation for completion. Dakota County I.T. will be responsible for any locate, relocation, and maintenance costs associated with the conduit. Dakota County I.T. in collaboration with parks or transportation will provide design details for the conduit installation. Dakota County transportation or parks (depending on which department is leading the construction project) will be responsible for integrating the conduit installation into the overall project plan, and overseeing the physical installation of the conduit.
5. Dakota County Information Technology will also collaborate with cities located within Dakota County to coordinate similar efforts to install conduit along city roads concurrent with city road construction projects.

Typical fiber optic cable installation projects have a cost component for digging a trench that averages over 80% of the cost of a project. This fact has led to the suggestion that there may be substantial cost savings if conduit can be installed in conjunction with County highway and parks trail projects. Our experience indicates that there may be some projects where this is true, but this does not hold true for all projects. In some cases, if an area of highway is being worked on, and utilities are being relocated, there may be an opportunity to share trenching costs with other utility providers. In some cases, a trench must be dug for other new utilities and we may be able to take advantage of this. However, if a project does not involve digging a trench, then there is no financial advantage to placing conduit as part of the project.

The placement of conduit should be evaluated for every highway and parks trail project by the Information Technology department, with a cost analysis performed indicating the cost savings

introduced by placing conduit in conjunction with the project. This analysis will be reviewed by the project manager (from Parks or Transportation), I.T. Management, and County Administration.

Principle 4: Wi-Max infrastructure development in conjunction with C-Net

1. The establishment and promotion of Wi-Max wireless technology shall be the responsibility of the C-Net collaborative, as the successful deployment of Wi-Max requires an established fiber infrastructure to back-haul the data transmitted by Wi-Max access points.
2. Wi-Max is a technology best developed and distributed by private industry, and is already established in parts of Dakota County by private industry. Private entities have already secured the licensed radio spectrum required to deploy Wi-Max.
3. The C-Net collaborative shall make the C-Net infrastructure available to private entities to promote the expansion of their Wi-Max infrastructure.

Projected infrastructure roadmap

To better coordinate and take advantage of opportunities for infrastructure development, Dakota County I.T. will maintain a map that indicates existing fiber optic infrastructure, as well as planned infrastructure construction 5 years into the future. A link to this map is here:

<http://dctworks/projects/broadband/Project%20Management>

Appendix B

Broadband Critical Infrastructure Report for Chisago County

conducted by
Hometown Fiber

April 6, 2022



HOMETOWN FIBER

Let residents know about how they can get help paying for internet

Some households can get help paying for internet service if their internet service provider participates.

The Affordable Connectivity Program funded through the federal government allows families who qualify to get \$30 to \$75 off their internet bills each month. While it's not a program the County needs to support financially, it's essential all residents know about the program.

This ongoing funding offers:

- \$30 each month toward a family's internet service bill
- Up to a \$75 a month if the household is on qualifying Tribal lands
- A one-time discount of up to \$100 for a laptop, tablet or desktop computer (if offered by the ISP)

A household is eligible if a member of the household meets at least one of these criteria:

- Is at or below 200% of Federal Poverty Guidelines
- Participates in SNAP, Medicaid, Federal Public Housing Assistance, Supplemental Security
- Income, Women, Infants & Children Special Supplemental Nutrition Program or Lifeline
- Participates in Tribal-specific programs including Bureau of Indian Affairs General Assistance, Tribal Temporary Assistance for Needy Families (TANF) program, or Food Distribution Program Indian Reservation
- Receives benefits under the free- and reduced-price school breakfast/lunch program
- Received a Federal Pell Grant during the current award year
- Meets the eligibility criteria for a participating ISP's existing low-income program

Find out if an ISP participates in the Affordable Connectivity Program at [fcc.gov/acp](https://www.fcc.gov/acp)

Source: These details come from the Federal Communications Commission Affordability Connectivity Program website. More details at [fcc.gov/acp](https://www.fcc.gov/acp)