

City of Greenfield



Internet Report 2020



October 2020

Produced by the Greenfield Internet Task Force
Greenfield, Minnesota

Revision 6 Oct 2020

Disclosures

This document is based upon the information provided to us by a number of parties, including the residents of Greenfield, Internet and Cable TV vendors, and the Internet Task Force's best efforts to understand the technical issues presented in this report. The Greenfield Internet Task Force has done and will continue to do their best to ensure that all information is accurate and relevant, however, we are not to be held liable if additional information changes the statements, conclusions, facts of any individual statement, or relevant laws surrounding this report. The accuracy of the information and analysis included in this report is dependent upon the accuracy and completeness of the information provided and determined by the above. The Greenfield Internet Task Force is not making a warranty of any kind as to the completeness, accuracy, outcome of any work done by it, or any error or omission with respect to the conclusions and suggestions that come out of this report.

Internet service is a quickly changing and fluid technology, as such, this report is valid for only the time it was presented.

This report does not include any opinion as to certainty of outcomes that may result from the implementation of any alternative listed in this report.

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Data Collection Methods

Resident data in this report was primarily captured by two surveys. In both cases the City of Greenfield mailed postcards asking residents to go online to complete a set of questions about their internet service and experience. The first survey was short and generalized, the second survey asked residents to supply specific data, including location and provider information. The first survey saw a completion rate of approximately 40%, the second survey approximately 30%. The target response rate was 10%. The second survey response was 300 of 1000 (estimated) residents, exceeding the 278 responses required for a 95% confidence level and 5% margin of error. Some responses were removed for not being part of the sample set (not in Greenfield), duplicates, or provided invalid data.

The second survey focused questions into three areas of interest: current and expected internet usage, current provider experience, and future demand for internet services. It was conducted in September 2020.

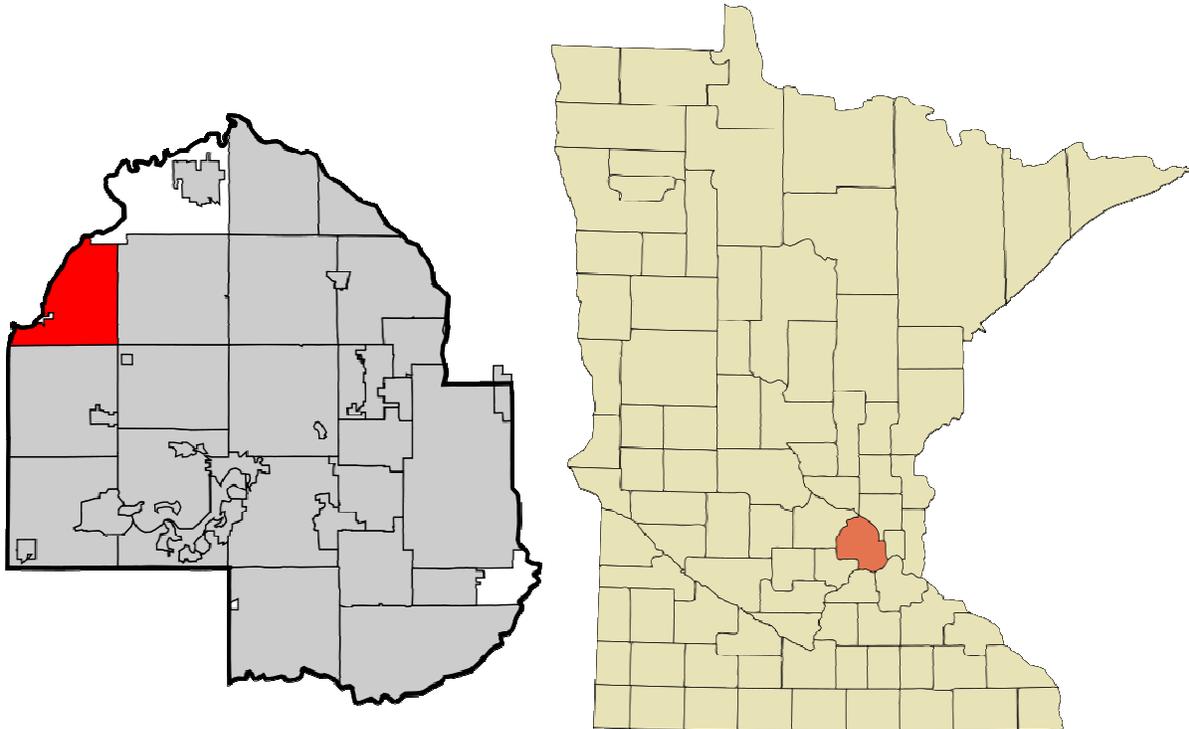
Additionally, information about current internet services and infrastructure were determined by direct conversation with providers, in-person inspection of equipment, and interpolation of survey data.

Greenfield Internet Task Force

This report and the data therein is a product of the Greenfield Internet Task Force, an unfunded city-sanctioned team of network and technology experienced Greenfield residents with no ties to internet service providers.

CITY GEOGRAPHY & DEMOGRAPHICS

Greenfield, Minnesota is an approximately 1,000 home rural city covering 21.55 square miles. Situated on the very northwestern border of Hennepin County, Greenfield is about 35 miles west of Minneapolis.

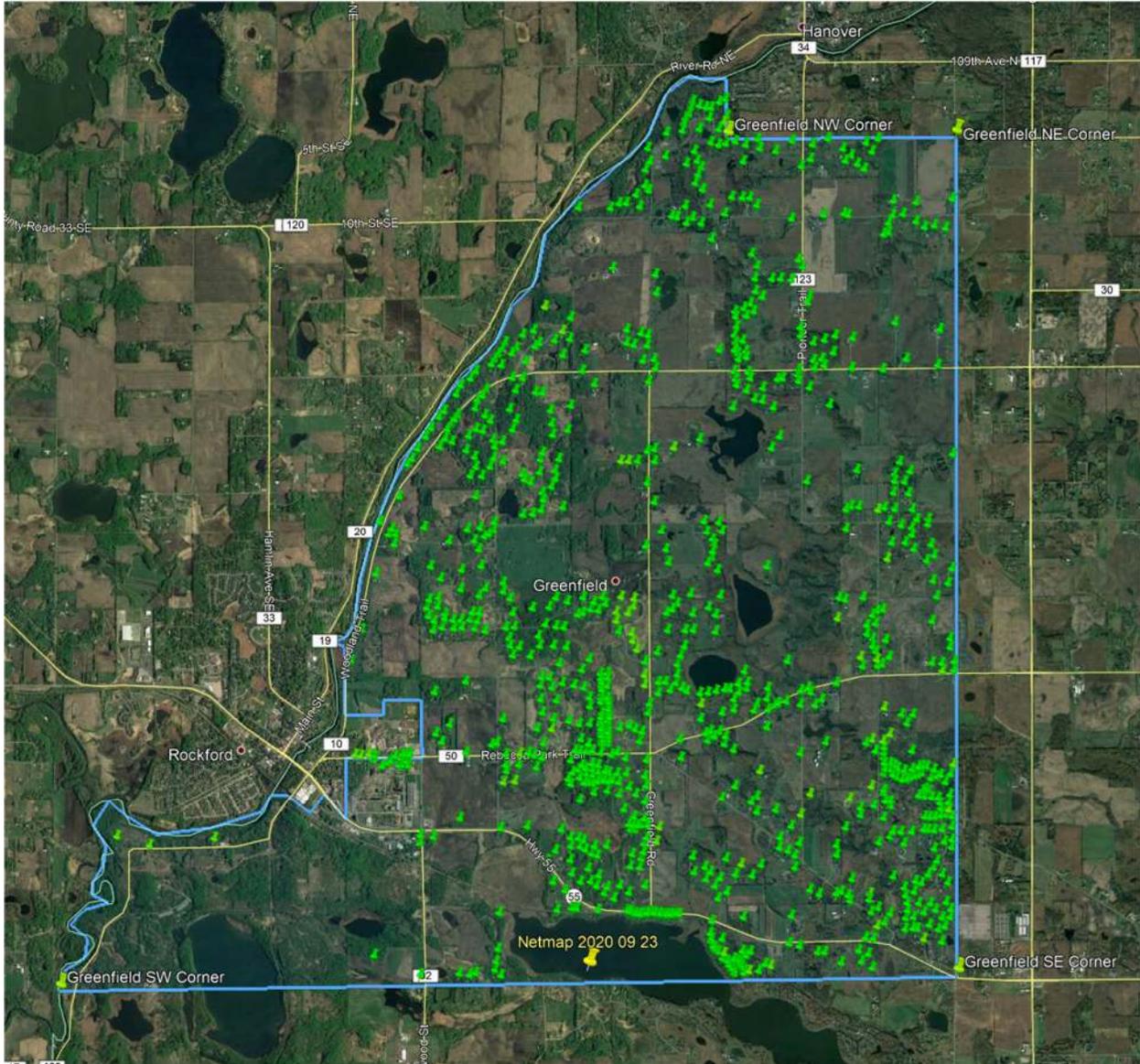


Wikipedia

Currently there are 2,956 people in 994 homes. Home values range from \$150,000 (undeveloped parcel) to several million dollars with a median home value of \$461,000 (zillow.com). The average household income in Greenfield is \$155,247.

Greenfield is a rural city comprised of farmland and rural residential homes. Most homes have private water and sewer; power is available to all and natural gas is available to some.

Home count estimates in this report are based on a rounded 1,000 homes in the city.



Google Earth/Greenfield Internet Task Force

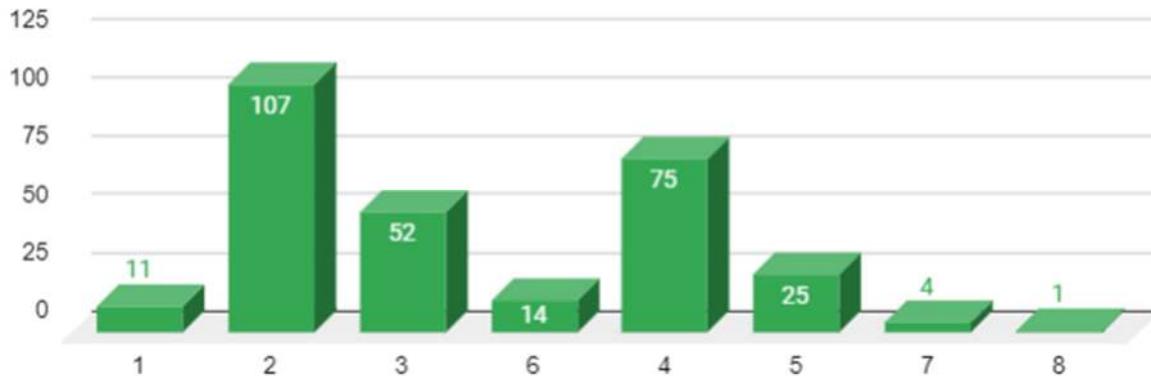
Homes in Greenfield are shown above in bright green. Population density varies by region in the city with several clusters of closely spaced homes.

56% of Greenfield is of working age 25-65. 40% of households have children.

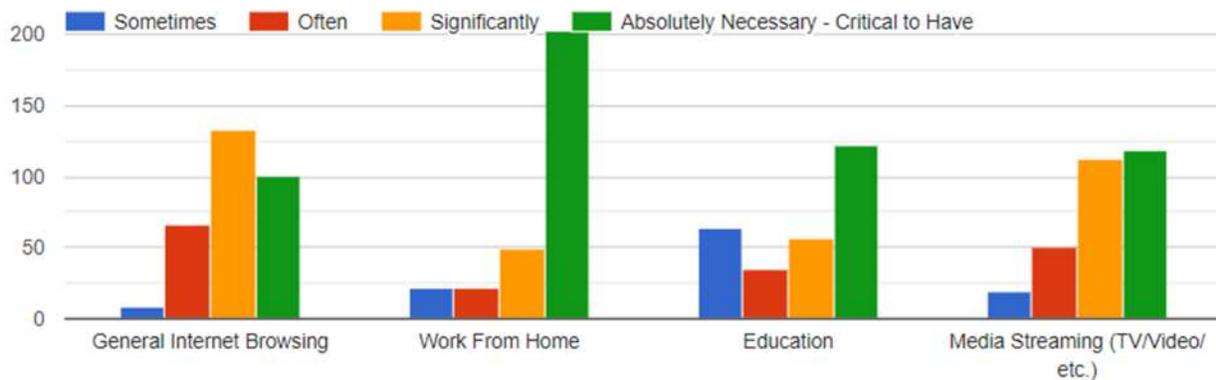
36% of Greenfield's households are 2 people.

57% of Greenfield's homes have more than 2 people, inclusive of children.

Users Per Home Survey Responses



Internet Use Case and Importance Survey Responses



The survey asked residents to rate how important four categories of internet usage was to them. “Significantly” and “Absolutely Necessary” are counted together:

Usage Type	Survey Percentage	Estimated Homes
Work from Home	93%	930
Education from Home	59%	590

68% of homes responded that Work from Home is Absolutely Necessary - Critical to Have, indicating an above national average (37%, University of Chicago) number of remote workers in Greenfield. This suggests Greenfield’s residents are primarily white-collar information workers with remote-work capable jobs.

CITY INTERNET

Greenfield has one majority internet provider, the incumbent telephone operator, CenturyLink.

Smaller regions of Greenfield are serviced by Frontier, another telephone operator for some regions.

Satellite is in use from Hughes and Viasat.

LTE hotspots are in use, primarily from the few regional towers surrounding the city. There are no cell towers inside of Greenfield.

There is one wireless broadband provider, Nextera, which has two towers outside the city that services a small portion of Greenfield.

PRIMARY PROVIDER



69% of Greenfield

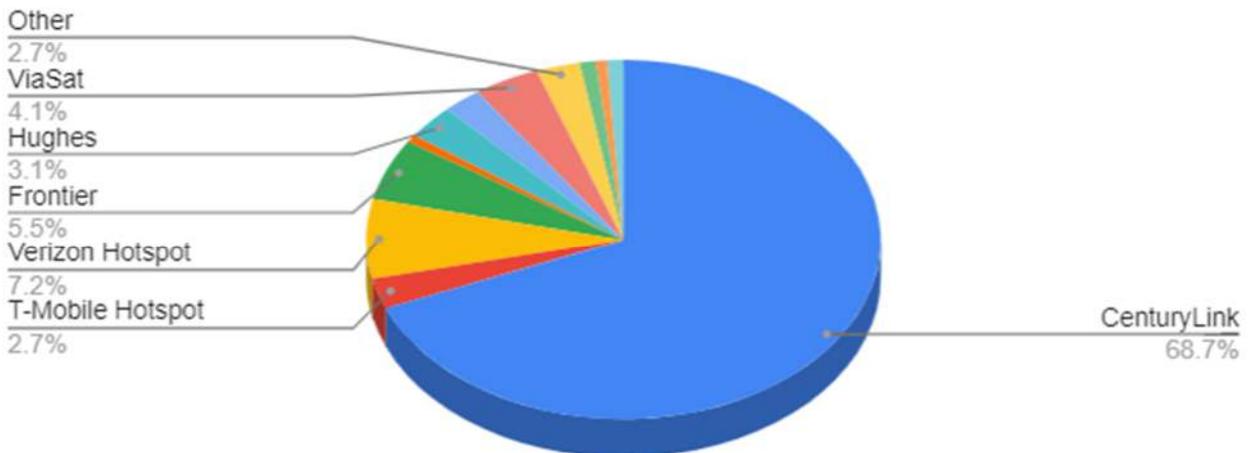
TECHNOLOGY



VDSL 2 < 25Mb/s

83% of CenturyLink users report less than 25Mb/s

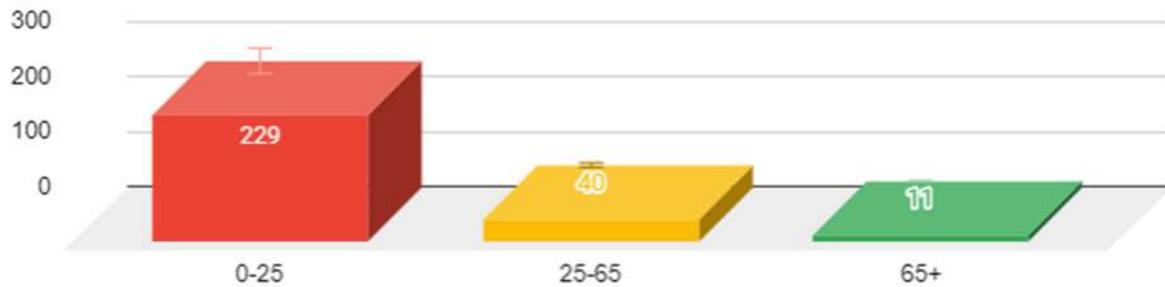
Internet Service Providers Survey Responses



Provider/Technology	Survey Percentage	Estimated Homes
CenturyLink DSL	69%	690
Frontier DSL	16%	160
LTE Hotspot	13%	130
Satellite	7%	70

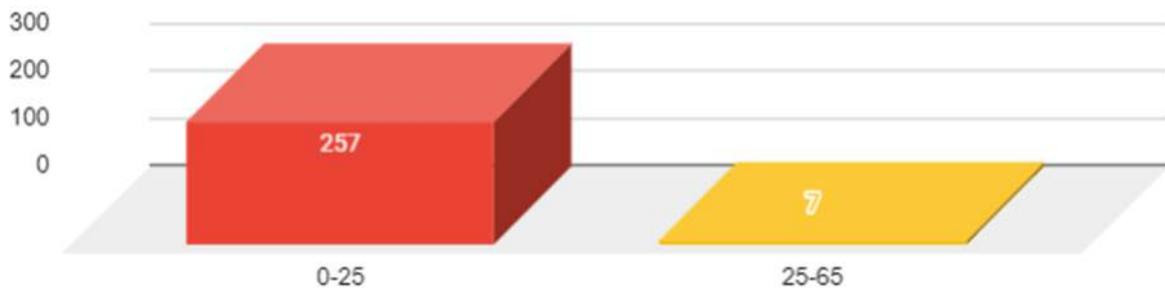
The Greenfield Survey 2 asked users to take internet speed measurements from common internet speed testing sites (eg, *speedtest.net*)

Download Speed Survey Responses



Speed	Survey Percentage	Estimated Homes
0-25 Mb/s	76%	760
25-65 Mb/s	13%	130
65+ Mb/s	3.7%	37

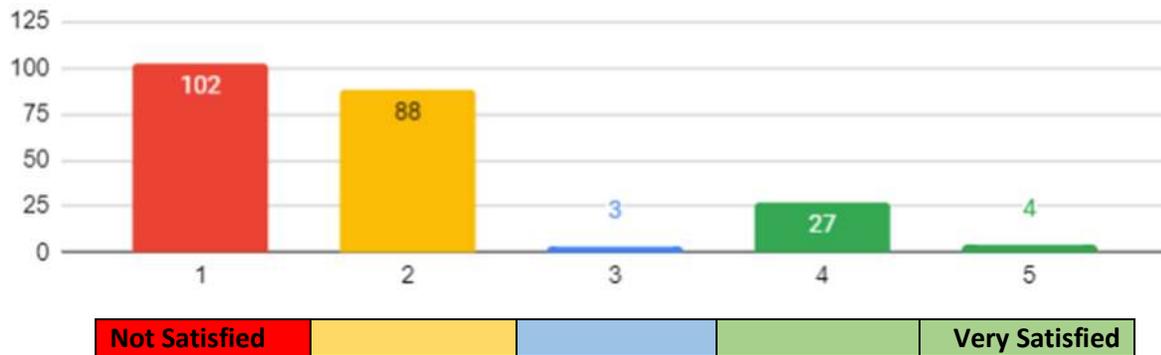
Upload Speed Survey Responses



Speed	Survey Percentage	Estimated Homes
0-25 Mb/s	86%	860
25-65 Mb/s	2.3%	23
65+ Mb/s	0	0

Residents were asked to rate their satisfaction with the internet service they currently receive.

Service Satisfaction Survey Responses



Satisfaction	Survey Percentage	Estimated Homes
1 – Not Satisfied	34%	340
2	29%	290
3	1%	10
4	9%	90
5 – Very Satisfied	1.3%	13

Residents were asked to report their cost per month for their internet service. The average Greenfield home spends \$97 per month on their internet service.

CONCLUSIONS

The majority of internet service in Greenfield is 0-25Mb/s download and 0-25Mb/s upload, with the majority of the upload speeds in the 0-1Mb/s segment (see CenturyLink DSL Detail). Users have reported that the requirements of corporate VPNs, video conferencing, and solid connectivity supporting Work from Home is sorely lacking. As a community that derives much of its economic productivity from Work from Home, Greenfield is not suited for this work paradigm. ***Several residents have responded in the survey that they are close to moving out of Greenfield because the internet situation is incompatible with their work environment.***

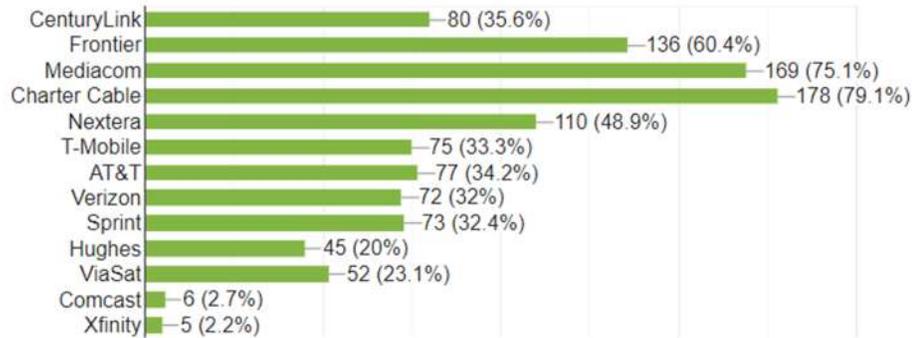
Some residents have responded that streaming video and other media-rich services also do not work in Greenfield.

Residents are paying about \$100/month on service that does not fulfill their needs. That price does not vary much by speed, users report that 1.5 Mb/s down costs similar to 100Mb/s down.

Lack of service provider options and often-cited poor customer service by existing providers has driven resident to respond in survey that they want new providers capable of meeting today’s internet requirements.

**Additional
Who can't service
Greenfield?**

Users reported that these companies denied connection requests when attempting to start service.



HIGHLIGHT

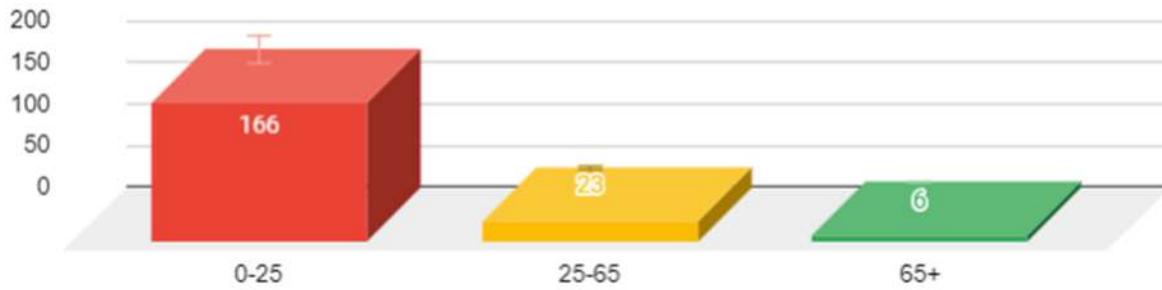
CenturyLink DSL Detail

To highlight the primary internet provider, the data returned from the surveys was filtered to reflect just CenturyLink DSL.



69% (about 690 homes) of Greenfield is serviced by CenturyLink DSL. CenturyLink's DSL system is fiber optic-fed from two Central Offices into 10 different DSL access points ("remote terminals") throughout the city. The remote terminals are spaced evenly through most of Greenfield, but effective ranges of VDSL2 (the specific DSL technology) are very short (less than a ¼ mile for > 25 Mb/s), providing most of Greenfield low-speed service.

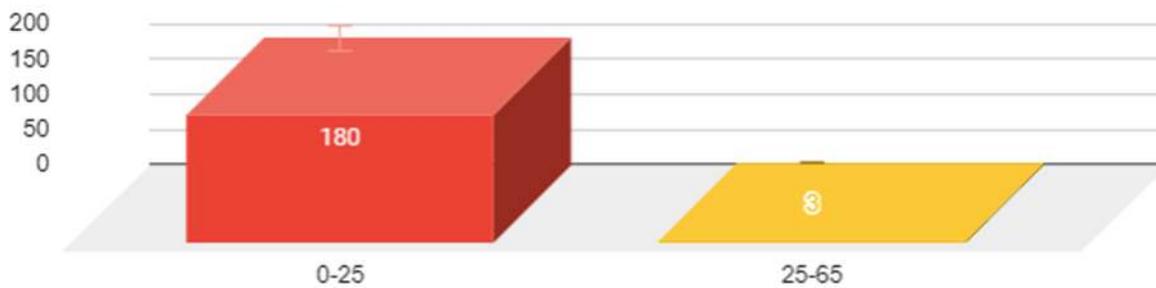
CenturyLink DSL Survey Reported Download Speeds (Mb/s)



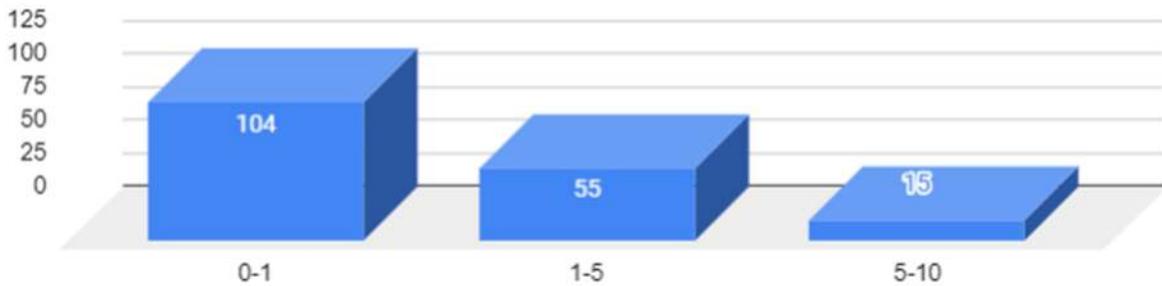
83% of Greenfield CenturyLink customers have less than 25Mb/s download.

Additionally, CenturyLink DSL has significantly slower upload speeds.

CenturyLink DSL Survey Reported Upload Speeds (Mb/s)



CenturyLink DSL Survey Reported Upload Speeds – Detail (Mb/s)



52% of Greenfield CenturyLink customers have less than 1Mb/s upload.

SELECTED COMMENTS FROM THE SURVEY

Extremely expensive for standard speed and during peak times we do have packet loss and inability for me to work on video calls (a requirement for my job).

Unreliable to use for everyday work or School purposes.

Not fast enough for me to work from home.

Too slow for Teams calls reliably, way to slow for movies.

I work from home and there's an unprofessional and unacceptable delay, and often poor reception. Lots of buffering when we watch TV.

Slow & constantly loses connection. Can't effectively work from home.

The service is reliable, but the upload is terrible. It makes working from home difficult, especially when both of us need to.

Not reliable, fortunately my office in Medina has fiber. Couldn't work from home if I needed to.

With distance learning Internet is very slow.

We need reliable high speed internet in Greenfield. We are severely lacking that which will ultimately slow development for people who rely on internet to do their jobs.

I even lost a job opportunity because the upload speed is less than 1 megabit/second.

VERY hard to run a business out of our home with the level of service in our area, makes one consider moving at times

Makes teleconferencing with clients super difficult.

We have 2 adults working full time from home. It is almost impossible to be productive.

Slow service, not fast enough for concurrent activities and regularly too slow for anything other than browsing. Uploading for work and school can take hours.

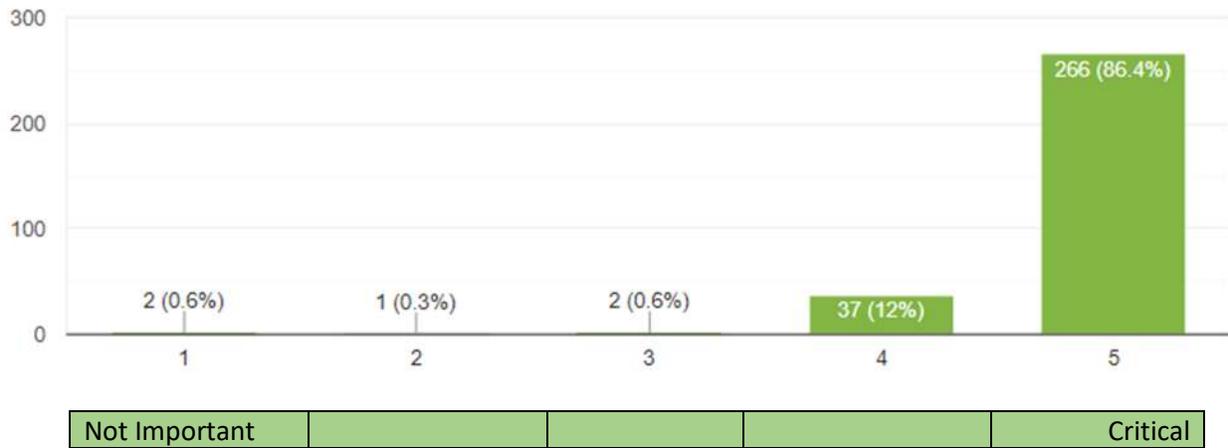
VERY Slow and difficult to work from home

Connection is bad for working from home.

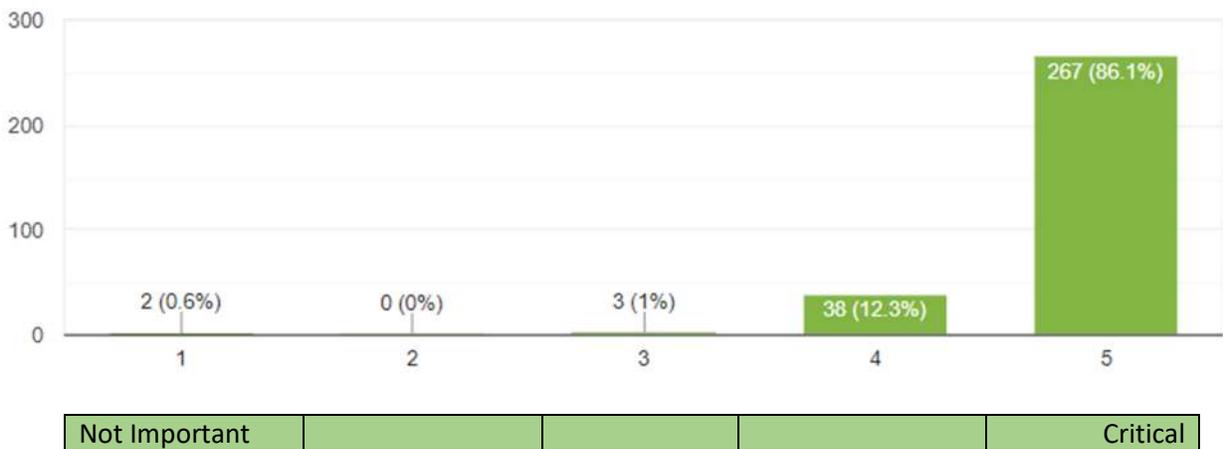
CITY INTERNET DEMAND

Residents were asked how important quality and reliable internet service was to them. 86% rated the service was of the greatest importance (5).

How Important is High Quality Internet Survey Results

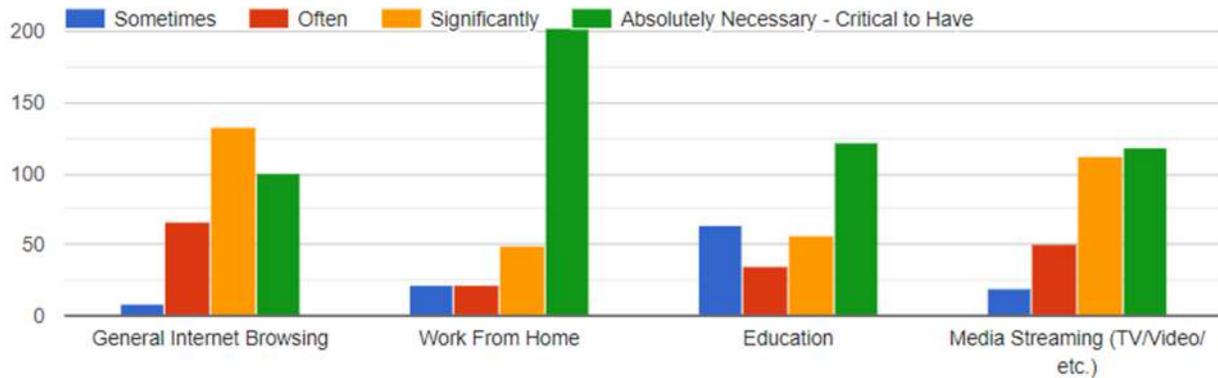


How Important is Reliable Internet Survey Results



Again, residents responded with why the internet is important to them. Primarily, work and education were top reasons.

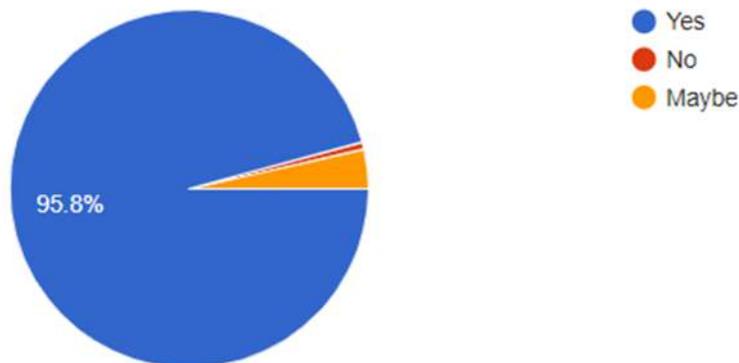
Internet Use Case and Importance Survey Responses



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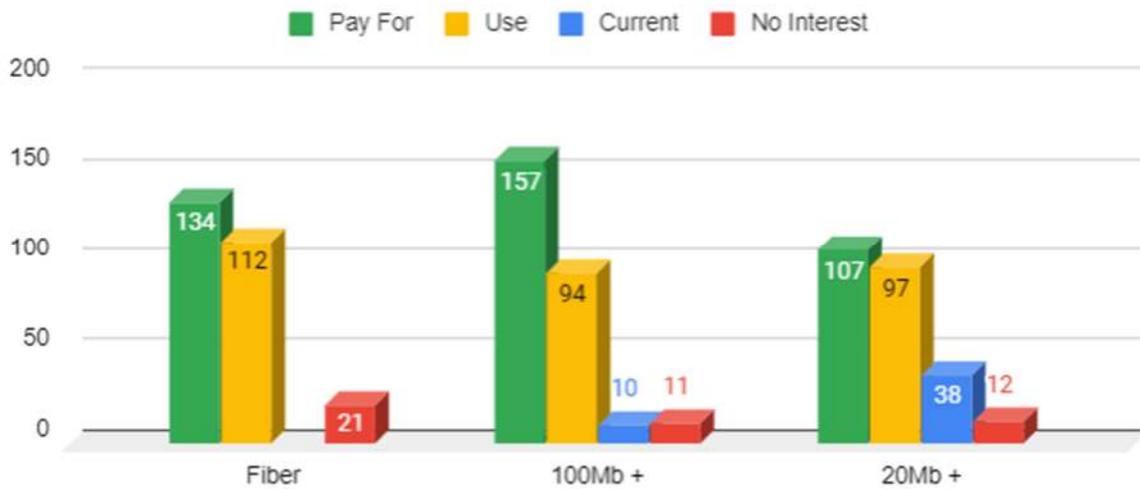
The survey asked users if they expected the Work and Education from home conditions to remain after COVID-19. 96% responded that they expected that they were to continue working and learning from home indefinitely. This is in alignment with current studies that show workers are unwilling to return to the office and company financiers are planning to cut office space expenses by wide margins going forward. This underlies the critical need for high speed internet expressed by residents.

Do Residents Expect to Stay Working from Home Survey Results



It was asked what internet service level was considered “high quality.”

Desired Internet Service Types and Speeds Survey Results



Type	Survey Percentage	Estimated Homes
Fiber to the Home*	82%	820
100Mb/s +	84%	840
20Mb/s +	68%	680

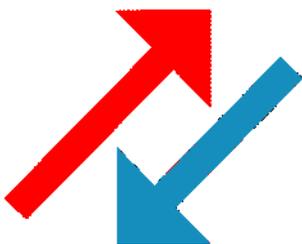
(Pay For and Use combined)

Pay For	Users will pay extra to have this level service installed, including installation costs, cable bury costs, and equipment charges.
Use	Users will pay for this service if it is provided in their area.
Current	Users currently have this level of service.
No Interest	Users will not use this service.

(*) Including gigabit service

HIGHLIGHT

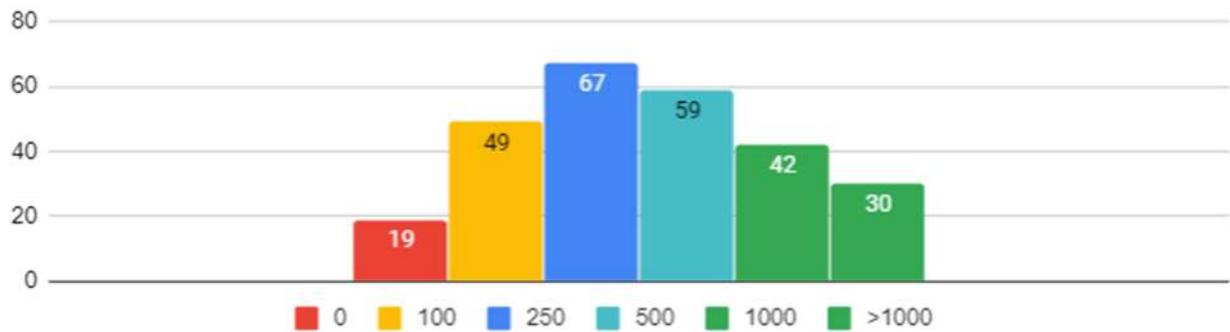
Symmetric data service



Symmetric data service is service in which the upload and download are the same speed. Current service in Greenfield is heavily *asymmetric*, meaning the upload and download are not the same. In the CenturyLink responses, the difference is often upload being 10% or less of download. The Greenfield Internet Task Force highly recommends providers make available high-rate upload plans, including full symmetric, to accommodate corporate VPNs, videoconferencing, video media uploading, and distance learning that have become common.

Greenfield residents were asked what they were willing to pay for the install of new internet service that met the above conditions. This was presented as a one-time install charge separate from a monthly recurring charge.

Residents are Willing to Pay for Install Survey Results (\$)



Will Pay Install	Survey Percentage	Estimated Homes
Up to \$100	16%	160
Up to \$250	22%	220
Up to \$500	20%	200
Up to \$1000	14%	140
More than \$1000	10%	100

66% of Greenfield residents are willing to pay \$250, and many are willing to pay more, for installation charges.

Most residents are willing to continue paying about \$100 a month for service.

SELECTED COMMENTS FROM THE SURVEY

The sooner the better!! With school starting and work from home we need improvement as soon as possible.

Our neighbors house was for sale and they had multiple people who really wanted to buy the house but could not afford to not have decent internet available. One even put in an offer and pulled it when he found out the poor internet that was available.

I'm strongly considering moving closer to [Minneapolis] so I can continue to work from home.

Our next door neighbors just had a sales offer retracted when they found out how slow the internet service was. This issue is directly impacting home values along with quality of life concerns.

Even after the pandemic, the way people work and are being schooled will drastically change. There will be far more reliance on virtual approaches. It will also make resale of existing property next to impossible.

If going to continue to work from home for foreseeable future, even after COVID, internet is extremely important.

We really need this. We have friends that rely on internet for their jobs and haven't moved out to Greenfield due to the lack of internet speed / quality.

We didn't realize Covid would have a lasting impact. My husband and I both work full-time from home for [Fortune 500] and need at least 10 Mbps. We are constantly losing income because we were kicked out of the Internet and not paid for time we were missing. We are considering leasing this home and moving to a place with stable Internet this has become such an issue. Our employer just told us we are 100% satellite employees from now on Covid or not. So we need a long-term solution as soon as possible or we need to leave the city.

I am a high school teacher and find a decent internet connection to be crucial to doing my job, especially if my school goes back to online classes for covid reasons.

Due to covid and going forward, I believe working from home and remote learning will be a part of our daily lives to some extent even after covid is no longer a crisis. Therefore, communities like Greenfield will need to upgrade their internet service options to residents.

With all the kids on the internet with school now it is essential they are able to be on the internet.

Our terrible internet is one of the factors in consideration of moving from Greenfield. Today, nobody should have the slow service we are forced to utilize.

High speed internet (100 mbps+) is essential. You'll hear that from educators, from healthcare professionals like me, again and again. As people age in place it can be the difference between staying in one's home or not, connecting with family or not, interacting with a doctor or not. For kids, it's about keeping up or even going to school or not.



October 2020, Greenfield Internet Task Force

GITF/ljt