

Town of Timnath, Colorado



Broadband Study

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April 2022

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1. Executive Summary

1.1 Broadband Study Purpose

The Town of Timnath is at a very unique juncture in that it is growing amid a region that supports connectivity and has embraced fiber technology as a necessary utility, no different than water or power. To properly evaluate, position and ultimately implement a telecommunications solution for the Town, staff have commissioned this study and alternatives analysis.

Since the onset of COVID-19 in 2020, the need for Fiber to the Premise (FTTP) has been more prevalent than ever to allow:

- Work from home
- Telehealth
- Educational and other key community services
- Economic Development
- Aging at Home – helping elderly stay at home longer
- Prepare municipalities for Smart City technologies such as:
 - Smart Parking Solutions
 - Surveillance and Public Safety
 - Remote Intelligent Lighting solutions for parks, streets, public spaces
 - Smart Kiosks and Signs
 - Smart Transportation; self-guided vehicles

Many municipalities across the nation have decided to further evaluate, and often implement, FTTP systems through a variety of delivery methods. Many of these systems are owned and operated by the municipality, many are private, and others have been delivered using a public-private partnership model. Recently, the Town has been awarded Cares Act grant funding that could fund broadband initiatives. This study is meant to guide and inform the decisions around implementation of broadband for the Town of Timnath.

1.2 Market Condition

Market conditions around high-speed, broadband internet connectivity in the Town of Timnath are constrained. The current competitive landscape offers few options for Town residents that provide reasonable service plans, at reasonable prices and speeds. Nationally, the NTIA, FCC and others are now recognizing internet minimum levels of performance at +100 Mbps symmetrical to be viable networks qualifying for federal grants. Realistically, there are only four service providers that can reliably offer this level of service a competitive cost to Timnath residents.

Service Provider	Technology Deployed	Maximum Advertised Speed	Cost
Comcast	Coaxial Cable/Fiber	1 Gbps ↓ / 1 Gbps ↑	+ \$110.00/mo
Connexion (City of Fort Collins)	100% Fiber	1 Gbps symmetrical	\$59.95/mo
Pulse (City of Loveland)	100% Fiber	1 Gbps symmetrical	\$74.95/mo
Lightgig Communications	Fiber	Up to 1 Gbps symmetrical	\$65.00/mo

1.3 Costs and Funding

Costs for the overall outside plant design and construction were based on high-level design performed as part of this study. These costs have been broken down into priority areas that could be funded over time. Here, the Town can uniquely leverage regional municipal and county relationships to fund its broadband implementation. The funding plan can come from local sources, federal and state grants and partnerships with the County and municipal providers.

Area/Site Designation	Description	Estimated Cost* \$ (millions)
1A	Town Center, Timnath Ranch, Summerfields	\$9.1
1B	Harmony	\$2.9
1C	Saratoga, Wild Wing, Fisher	\$10.5
1D	North Old Town Timnath	\$0.40
1E	I-25/Harmony	\$0.40
2A	Old Town Timnath	\$1.5
2B	Timnath Ranch (east)	\$3.1
2C	Landings	\$1.7
Total		\$29.6

*when constructed in sequence along planned fiber routes

1.4 Implementation

The implementation of FTTP for the Town is not a program that will occur in the short-term without significant investment (from the Town, municipal or private providers). The approach should be one of thought, precisely timed implementation and opportunity when funds are made available. The full FTTP network could be built out over a 5–8-year span through leveraged relationships, grant funds and local general fund contributions. This phased approach should focus on prioritizing the middle mile network and serving priority, key community asset areas first.

END EXECUTIVE SUMMARY

2. Introduction

The Town of Timnath is at a very unique juncture in that it is growing amid a region that supports connectivity and has embraced fiber technology as a necessary utility, no different than water or power. To properly evaluate, position and ultimately implement a telecommunications solution for the Town, staff have commissioned this study and alternatives analysis.

Since the onset of COVID-19 in 2020, the need for Fiber to the Premise (FTTP) has been more prevalent than ever to allow work from home, telehealth, educational and other key community services. Many municipalities across the nation have decided to further evaluate, and often implement, FTTP systems through a variety of delivery methods. Many of these systems are owned and operated by the municipality, many are private, and others have been delivered using a public-private partnership model. Recently, the Town has been awarded Cares Act grant funding that could fund broadband initiatives. This study is meant to guide and inform the decisions around implementation of broadband for the Town of Timnath.

3. Glossary of Terms

Active Network An active network uses equipment such as a switch, or multiplexer that is electrically powered to distribute a signal. Active network equipment is usually located in a hut or central office.

Broadband The Federal Communications Commission (FCC) currently defines broadband as a fiber optic network that provides speeds that reach a minimum of 25 Mbps download and 3 Mbps upload (25/3). In recent FCC guidance, broadband is being redefined as 100 Mbps symmetrical download/upload speeds.

Backbone A primary fiber optic cable mainline that provides connectivity to the internet.

Backhaul Network cable that comprises the intermediate link between a core network and small subnetworks across a large area.

Conduit A pathway that is used to house and protect network cabling.

Dark Fiber Refers to fiber optic cable that has been installed and is available to use. It may or may not be in use. If in use, it is normally privately leased. Dark fiber can be excess capacity fiber cabling.

Design/Build A partnership between a network designer and contractor that allows the design and construction to be joined, contractually to an owner.

Fiber-to-the-Premise (FTTP) or Fiber-to-the-Home (FTTH) A last-mile network that connects all buildings (residential, business and public facilities) in a community.

FuturePath Conduit that contains multiple pathways for cabling, within one main duct.

Hut The location where active network equipment is installed to distribute light signals to the FTTP network and connect the FTTP network to backhaul or the internet.

Indefeasible Right of Use (IRU) Commonly used in the industry to provide long-term access to assets. Conduit and fiber deployed is normally leased through an agreement called an IRU.

Last-Mile Network that provides services directly to homes and businesses in a community.

Latency A term used to indicate the delay that happens in data communication over a network either wireline or wireless.

Middle-Mile Typically defined as a network that serves community anchor institutions (e.g., schools, libraries, government buildings, public safety agencies, hospitals, etc.) but does not directly serve homes and businesses. In rural settings, it can represent the feeder network to get fiber to the area, but not serve the homes and businesses.

Open-Access Network A network where fiber optic infrastructure assets are made available through leases to multiple non-network owners that meet terms and conditions established by the owner.

Optical Line Terminal (OLT) An endpoint hardware device in a passive optical network (PON) that converts standard signals to the frequency and framing used by the PON system. The OLT also coordinates multiplexing between ONTs located on the customer premises.

Optical Network Terminal (ONT) Is an outlet to the internet for fiber technology just like how a cable modem is the outlet for a coaxial cable internet connection. It is a device that communicates directly with an internet service provider (ISP) to get a fiber-optic internet connection in your home or office.

Outside Plant (OSP) A term used to refer to the engineering and construction of fiber infrastructure across a community or area.

Passive Optical Network (PON) A passive optical network is a point-to-multipoint network with a high bandwidth that brings optical fiber cabling and signals, all or most of the way, to the end user by non-powered optical splitters.

Public-Private Partnerships (P3) A legal partnership that typically involves a public and private entity to design, build and possibly operate a last-mile FTTP network.

4. Purpose of the Study

The Town of Timnath desires high speed, reliable internet connectivity for all of its residents. As a growing community, it has a distinct need to provide alternatives in the telecommunications space that allow residents to work from home, participate in telehealth, take classes, age at home and participate in e-commerce. The need for high-speed internet service is greater than it's ever been. This demand has stretched existing copper networks to their limit of service capability. Many communities are implementing fiber solutions to "future proof" their cities through use of advanced fiber technology. As the industry, funding and the overall implementation landscape is rapidly changing, the Town commissioned this study to accomplish the following goals.

- Understand existing service providers, speeds and technologies available to Timnath residents.
- Educate and inform staff and Town Council on available technologies and fiber optic alternatives.
- Perform high level design, analysis and cost estimating for extension of municipal fiber networks in the immediate area.

5. Digital Divide and Service

The digital divide is a term that refers to the gap between demographics and regions that have access to modern information and communications technology (ICT), and those that don't or have restricted access. This technology can include telephone, television, personal computers and internet connectivity. Well before the late 20th century, the digital divide referred chiefly to the division between those with and without telephone access. After the late 1990s, the term began to be used mainly to describe the split between those with and without internet access, particularly broadband. Now, the term is primarily used to distinguish between those who have high speed internet access (greater than 100 Mbps) and those who don't have this level of service.

The digital divide typically exists between those in urban areas and those in rural areas; between the educated and the uneducated; between socioeconomic groups; and, globally, between the more and less industrially developing countries. Even among populations with some access to technology, the digital divide can be evident in the form of lower-performance computers, lower-speed wireless connections, lower-priced internet use connections such as dial-up and limited access to subscription-based content.

According to studies and reports, the digital divide is still very much a reality today. In 2019, approximately 5 million rural American households and 15.3 million urban or metro areas still didn't have access broadband internet. Meanwhile, a study by the Pew Research Center noted that 24% of adults with household incomes below \$30,000 a year don't own a smartphone and 40% of those with lower incomes don't have home broadband service or a computer.

In Timnath, residents have access to multiple providers of internet service including Comcast, Century Link/Lumen (wireline); Front Range Internet, MHO (fixed wireless) and Hughes, and

ViaSat (satellite). These providers have differing packages, speeds and reliability. However, it appears as though none can reliably provide 1 Gbps symmetrical speeds which is being provided in adjacent communities like Fort Collins and Loveland. A listing of providers and their service offerings is provided in **Exhibit A**.

6. Town Goals

The Town of Timnath commissioned this study to better understand the marketplace, its ability to serve the Town's residents and develop alternatives that may support FTTP in Timnath.

Internet service is normally provided in four categories; Wireline, Wireless (fixed and cell), and satellite. Of these technologies, all are available in the Town with the exception of fiber to the premise.

- Wireline. Wireline service is normally referred to as copper (coaxial or twisted cable; DSL) or fiber cable service to a premise. Fiber cable is the fastest, most reliable, and most high-tech internet available. Unlike internet connections like cable and DSL, it doesn't rely on older or potentially outdated communications infrastructure. Instead, it carries data over light signals through a network of fiber-optic cabling. Coaxial cable internet is reliable, fast, and pretty much ubiquitous. It operates over the coaxial wiring normally installed by cable companies. Internet service packages are often bundled with cable TV plans or other streaming options. Coaxial cable does not match fiber for speed, but it can approach 1 Gbps, but not reliably. Cable internet can slow down during peak hours since service is drawn from a neighborhood-wide network. DSL internet carries data over the aged wiring of a landline phone network. This infrastructure makes DSL many times slower than cable or fiber—and the signal gets weaker as you get farther away from the main network.
- Fixed Wireless. Fixed wireless technology delivers internet over radio or microwave signals beamed to an antenna console installed in a premise. Fixed wireless internet service is more common in rural areas where the only other common option is satellite, which tends to be slower and cost more. Fixed wireless internet provides slower speeds and less data for the money compared to cable, DSL, and fiber providers. Limits on monthly data usage also normally apply.
- 4G/5G. 5G is built on the latest generation of wireless technology, which promises speeds of 1 Gbps and faster with minimal buffering. But, 5G networks are still in the process of coming together, so it's likely a number of years before 5G home internet becomes a properly viable internet type. 5G relies on smaller cell sites fed by a fiber optic network designed around a dense grid to provide this type of wireless internet service. Currently, availability is very limited, as most wireless companies are focusing on cell phone service. Also, the technology works best in densely-populated areas, so 5G rollouts are mostly focused around major metropolitan areas and cities with high population centers (New York, Chicago, Denver). 4G LTE internet provides a Wi-Fi connection over a 4G wireless network. It's the typical wireless network provided when using the internet data on your phone or a mobile hotspot. But lately it's also evolved into an option for home internet with the launch of services like Verizon's 4G LTE Home Internet and T-Mobile Home

Internet. Although speeds can be inconsistent—since they depend on the service location in relation to the nearest cell tower.

- Satellite. Satellite internet works by beaming a signal down from satellites in space. This technology allows satellite internet basically anywhere in the world. However, it also means this internet service is fairly slow because the signal has to travel literally to space and back again—a distance that could span up to 1,200 miles one way—to reach a computer, tablet, or phone.

Service Providers. There are a host of internet service providers (ISPs) working in the northern Colorado marketplace. Many are small, independent operators. Some are leading national ISP and cable companies that are engrained in the marketplace. A few are new, municipal sponsored providers that have entered the marketplace in the past several years. **Table 1** below shows a listing of providers in the area and their advertised speeds.

Table 1

Service Provider	Technology Deployed	Type	Maximum Speed
Comcast	Coaxial Cable/Fiber	Wireline	1 Gbps ↓ / 50 Mbps ↑
Lumen	DSL/Fiber	Wireline	3 Mbps ↓ / 0.75 Mbps ↑
Connexion (City of Fort Collins)	100% Fiber	Wireline	+ 1 Gbps symmetrical
Pulse (City of Loveland)	100% Fiber	Wireline	+ 1 Gbps symmetrical
Hilltop Broadband	Fiber/Radio or Microwave	Wireline/Wireless	50 Mbps ↓ / ? Mbps ↑
Lightgig Communications	Fiber	Wireline/Wireless	Up to 1 Gbps symmetrical
Ascent Broadband	Microwave	Fixed Wireless	150 Mbps ↓ / ? Mbps ↑
Front Range Internet, Inc.	Radio Piggy Back DSL	Wireline/Wireless	100 Mbps ↓ / 50 Mbps ↑
MHO Networks	Microwave	Fixed Wireless	Up to 1 Gbps ↓ / 1 Gbps ↑
Rise Broadband	Microwave	Fixed Wireless	50 Mbps ↓ / 6 Mbps ↑
Hughes Network Systems, LLC	Satellite	Satellite	50 Mbps ↓ / 6 Mbps ↑
ViaSat	Satellite	Satellite	50 Mbps ↓ / 50 Mbps ↑
Varies (Verizon, T-Mobile, AT&T)	Cellular	4G/5G	Highly variable

Source: Colorado Broadband Office; Internet Search

To further the Town’s goals, this study also performed high level design, analysis and cost estimating for extension of municipal fiber networks in the immediate area as an alternative to private sector delivery models. This effort translated to the understanding that both Connexion and Pulse could, relatively easily, serve the Town with FTTP. Connexion serves areas to the immediate north and west of Timnath while Pulse serves areas south. Connexion’s network is approximately 0.5 miles from Town limits. Pulse’s network is approximately 3 miles away.

7. Marketplace

The marketplace and current environment for telecommunications service to customers is varied and changing rapidly. Specifically related to internet service to homes and businesses, many options exist in the marketplace with varying degrees of service packages, speeds and reliability.

7.1 Current Landscape

The current competitive landscape is relatively small for the Town of Timnath. Practically, few options exist for Town residents that provide reasonable service plans, at reasonable prices and speeds. For the purposes of this report, comparisons below in **Table 2** have been made for those providers who can provide speeds expected in the industry, now considered minimum levels of performance, at +100 Mbps symmetrical, reliably.

Table 2

Service Provider	Technology Deployed	Maximum Advertised Speed	Cost
Comcast	Coaxial Cable/Fiber	1 Gbps ↓ / 1 Gbps ↑	+ \$110.00/mo
Connexion (City of Fort Collins)	100% Fiber	1 Gbps symmetrical	\$59.95/mo
Pulse (City of Loveland)	100% Fiber	1 Gbps symmetrical	\$74.95/mo
Lightgig Communications	Fiber	Up to 1 Gbps symmetrical	\$65.00/mo
Ascent Broadband	Microwave	150 Mbps ↓ / ? Mbps ↑	+ \$179.00/mo
MHO Networks	Microwave	Up to 1 Gbps ↓ / 1 Gbps ↑	+ \$150.00/mo

Source: Internet Service Package Listings.

Note: Comparison across Residential Service Offerings; Internet Service Only, No TV; Bundles. Some providers add fees for installation and network construction.

7.2 Mapping of Service and Current Providers

A current map of broadband service coverage can be found in **Exhibit B**. This map has been translated from the Colorado Broadband Office (CBO) Data and Development Program. The CBO map shows service data as of June 2021. Data is collected, as supplied, by *various internet service providers* claiming to serve the areas identified on the map. The map is only as accurate as the information claimed by ISPs serving the areas.

More accurate service and speed data has been collected as part of this study from Ookla speed data and speed test data collected from the CBO. Ookla speed test data is collected each time a customer tests their local network speed. This data is supplied to the State for improvement in understanding of internet speeds available in a particular area. The Ookla test data map can be found in **Exhibit C**.

For the past several years, Larimer County has been collecting speed test data through an interface on its website. Numerous Timnath residents have taken this test. Test data from Larimer County can be found in **Exhibit D**.

7.3 Private Sector Service Models

Delivering internet service to customers across both rural and urban areas can take many forms (wireline, wireless, satellite, cellular). The plethora of options in the industry can be overwhelming for customers and communities to evaluate. Adding to this confusion are the various delivery models private industry ISPs are using to serve communities. These delivery models are normally pursued in a response to the community's desire to install FTTP as a last-mile network to serve their communities better. Often, specifically urban areas within cities and counties are choosing to identify internet service as a primary utility and taking bold steps to fund these last mile networks.

7.3.1 P3

Public Private Partnerships (P3) are a model that is relatively new to the telecommunications industry. Here, private investment is paired with an ISP and municipality to bring middle and last-mile service to a community. Often, private investment is provided through a third-party equity partner that requires a return on their investment and ownership in the built infrastructure. In certain cases, the equity partner may transfer assets to the municipality over a period of time (15-20 years) after the return on their investment is satisfied. The form of P3s vary widely and can involve ISPs, contractors, investment firms, private equity investors, towns, cities, counties and other partners. The attraction to this delivery model is that the municipality may not participate in any portion of the cost, or at least, at a participation level that allocates the appropriate amount of risk to the municipality. However, risk allocation also usually translates to loss of control and guarantees on installation, schedule, quality and customer service. Often, P3 entities will require subsidies from the municipality in the form of free permits, inspection preferences or other forms of subsidy.

7.3.2 Design/Build

A Design/Build delivery model is also a risk-transfer model that allows a team normally consisting of a contractor/designer, and sometimes, ISP to build out a network for a community. Most often, the municipality or owner is only the entity that issues a contract to the design/builder. If the municipality acts as its own ISP, it may continue in this capacity. A local example of this is Connexion in Fort Collins. This delivery model transfers most of the risk to the design/builder to design and construct the network, if the contract is configured properly. Normally, the owner funds the entire network design and construction through issuance of debt or other means.

7.3.3 Design-Bid-Build (DBB)

A Design-Bid-Build delivery model is very traditional and provides the municipality the most control over each phase of the infrastructure design and construction. The

private sector (ISPs and contractors) respond to a municipality's request for bid or proposal for each phase of the project. A local example of this is Pulse in Loveland. Through this model the private sector may provide design, construction and ISP services if the municipality is not acting as an ISP. Often, this model provides for the most cost-effective delivery with a high degree of cost and quality control. If contracts are configured properly, risk can be allocated to each participant properly.

7.3.4 Network Ownership Models

As with infrastructure delivery models, network ownership also varies widely. Historically, network infrastructure that provides internet service to homes is owned and operated by private sector companies. More recently, municipalities have been designing and building networks (primarily FTTP) that are owned and operated by the city or town. In some instances, portions of the municipal network may still be owned and operated by private sector firms such as feeder, core or backhaul network elements.

7.4 Municipal Broadband Service Model

As the municipal broadband service market continues to expand, various northern Colorado communities have joined together to implement municipal broadband. Currently, Longmont, Estes Park, Loveland and Fort Collins all offer FTTP in their communities. Estes Park, Loveland and Fort Collins share backhaul and network operations. This partnership is similar to that which developed years ago in the electric utility service sector. Each entity has slightly different price points and service offerings but all have either issued debt or paid-as-you-go to deliver their respective networks.

7.4.1 Service Providers

Service providers in the immediate area of the Town are Connexion (Fort Collins) and Pulse (Loveland). Each network offers gigabit speeds at very competitive market prices. Both networks are Gigabit Passive Optical Network (G-PON) networks, with the capability to be upgraded to Next Generation Passive Optical Network (NG-PON2). The networks can accommodate all residential and business premises within the respective service areas and can accommodate growth and expansion of the networks to serve other communities within Larimer County. The Connexion network relies on 100% spliced components while the Pulse network is connectorized, specifically at service locations.

7.4.2 Network Access

Network access to either municipal provider is similar. Connexion's network is within 0.5 miles of Town boundaries. Pulse's network is approximately 3 miles away. Considering fiber network expansion, either distance is considered minor. Network access also relies on "active network" elements which allow access to the internet. Both networks are robust in this manner. The Pulse network may offer better expansion possibilities as their active network elements have been purposefully

oversized. In any case, either municipal provider could easily serve the Town's current and future residents considering the entire growth management area and Town Masterplan.

7.4.3 Business Model

To properly evaluate municipal broadband service to the Town, this study evaluated not only high-level design and costs, but return on investment. Of important note, simultaneous to this study, Larimer County completed its Broadband Strategic Plan. Here, the County's plan focuses on expansion of municipal networks to cement broadband as an essential utility. The County has been actively applying for grants and leveraging its Cares Act funding to pursue broadband projects across the County. Timnath could benefit from this County partnership and broadband expansion across towns within the County.

7.4.3.1 Ownership

As with any delivery model where the ISP or service provider builds the network, they have distinct expectations to own the network infrastructure. However, in the municipal service market, the providers are acting as non-profit entities allowing for lower costs and options on revenue sharing to benefit all customers and entities involved in the partnership. For Timnath, Connexion or Pulse would expect to own the network but would likely consider conduit leasing, dark fiber rental or other forms of revenue generation and sharing with the Town.

7.4.3.2 Funding

Funding to build a last-mile, FTTP network throughout Timnath would likely come from three sources, grants, Town general fund, and municipal service providers. Currently, Connexion and Pulse have little capital to invest in expansion of their networks. Their bond funds are restricted for use within their municipal boundaries. However, both are able to serve outside their boundaries through their respective formation documents. For Timnath to fund the approximately \$30 million needed to extend either municipal network, it would need to leverage local dollars against State and Federal grant programs. A phased implementation schedule would allow the Town to carefully plan and target funding over time.

7.4.3.3 Income Opportunity

The most unique aspect of the municipal providers offerings in the northern Colorado market is their offer to share revenue. The County has been proactively working with municipal providers to develop cost recovery and return on investment (ROI) models with Connexion and Pulse to offset its capital investment in their network expansion. This approach could benefit Timnath in a similar manner offering long-term income and cost recovery of

any initial capital investments the Town may make through grants or general fund contributions. Through this model, the municipal providers are competing directly with P3 models that offer revenue sharing aspects across a long-term horizon.

8. Outside Plant Network

As part of this study, the expansion of outside plant networks, specifically related to Connexion, were evaluated. This evaluation is easily translated to Pulse as well. The overall ability for the Town to benefit from adjacent municipal networks was a key consideration in determining future FTTP service to Town residents and businesses.

8.1 High Level Design

Broadband network design is typically considered in two stages. High-level design is equivalent to designing a network that is approximately 30% complete allowing broad cost estimating, routing and service planning to take place. High level design for Timnath was completed as part of this study and can be found in **Exhibit E**.

The second step is network design is normally referred to as low-level design which takes network design to 100% complete. Here, all premise service counts are fully known, cabinets/FDHs, huts, core, feeder and distribution cabling are sized and splice cards are developed. Active network components are also specified and sizing determined. Low level design for Timnath would be completed after the final broadband provider is known.

8.1.1 Feeder Network

An initial step for high level design is to identify the feeder network of fiber cabling and how it would serve various sites or areas of a community. A feeder network has been designed for Timnath and can be found as part of the high-level design map in **Exhibit E**. Feeder networks provide for the larger fiber optic cables extending service from the core in a tree and branch network design arrangement. Typically, feeder network cabling comprises 288 and 144 count cable sizes.

8.1.2 Prioritized Routes and Areas

Timnath staff participated in this study helping address prioritized routes and area/sites related to density of development and future development pressures. A prioritized area/site map was developed showing areas of Town that could be served. A prioritized area map is provided in **Exhibit F**. This approach also informed capital cost expenditures over time. Overall, the network expansion would have a capital cost of approximately \$30 million.

8.1.3 Costs

Outside plant network costs were developed from historical unit prices for network design and construction. Here, costs were applied to roadway centerline miles throughout Timnath to generate a high-level, budgetary cost estimate for each prioritized area. The cost estimates assumed a fully underground network serving both sides of the street built according to municipal broadband standards. After the direct construction cost was developed, the following cost factors for design, project management and contingencies were added to develop a full programmatic cost. In particular, these factors were developed and applied to simulate current market conditions and represent their volatility (e.g., inflation, material cost escalation).

- Materials Cost Inflation 20.0%
- Estimating Contingency 8.0%
- Owner Contingency 18.0%
- Engineering and Network Design 10.0%
- Project Management 4.5%

Detailed cost estimates for each prioritized area of Timnath can be found in **Exhibit G**.

To summarize the costs applied to various areas across the Town, prioritized areas, their cost and descriptions are summarized in **Table 3** below.

Table 3

Area/Site Designation	Description	Estimated Cost* \$ (millions)
1A	Town Center, Timnath Ranch, Summerfields	\$9.1
1B	Harmony	\$2.9
1C	Saratoga, Wild Wing, Fisher	\$10.5
1D	North Old Town Timnath	\$0.40
1E	I-25/Harmony	\$0.40
2A	Old Town Timnath	\$1.5
2B	Timnath Ranch (east)	\$3.1
2C	Landings	\$1.7
Total		\$29.6

*When constructed in sequence along planned feeder routes.

8.2 Next Steps and Recommendations

The Town of Timnath is in a very unique position to leverage existing municipal networks in very close proximity to the Town boundaries and potentially gain long-term revenue from initial capital investments made through grants or general fund expenditures. Larimer County is simultaneously pursuing implementation of its Broadband Strategic Plan and aggressively looking to partner with local municipalities. Considering this unique position, the current market conditions and implementation of the County's strategic plan, this study makes the following recommendations.

8.2.1 Partnerships

The Town should formalize partnerships with one or both municipal providers through a proposal process that would outline each providers ability to serve the Town.

Key aspects to any partnership with a municipal provider would include:

- Formalize a revenue sharing model that could return any Town capital investment over time.
- Discuss dark fiber leases, rates and revenue sharing. Fiber lease rates vary greatly across the country but are normally configured in a fashion that charges the leasee a cost per pair of fiber strands, per month. These lease rates can range from \$10 to over \$250 per pair, per month.
- Formalize conduit rental or lease parameters that could benefit the Town long-term. Consider the use of future path conduit throughout the network design to ensure future conduit capacity. Conduit rental rates typical range from \$3 - \$5 per foot per year.
- Negotiate terms of an intergovernmental agreement (IGA) or Indefeasible Right of Use (IRU) as may be applicable.

The Town should simultaneously approach the County about participating in its efforts to expand municipal broadband. The County is actively looking to leverage its Cares Act funding against other grant money. There are numerous state and federal programs that are, and will, offer grant funds to expand high-speed broadband networks. Specifically, the Town should focus grant application efforts towards the following programs.

- Colorado Broadband Office – Broadband Fund Program (funds FTTP)
- NTIA - Broadband Infrastructure Program (funds FTTP)
- DOLA - Broadband Program (funds backbone and middle mile, studies)
- FCC – E-Rate (funds school and library connections)

8.2.2 SB 152

In 2005, the Colorado General Assembly passed Senate Bill 05-152 (SB05-152), which excludes local governments from entering into the broadband market and prohibits most uses of municipal or county money for infrastructure to improve local broadband service

without voter permission. More than 100 municipalities in Colorado have successfully passed ballot initiatives related to SB05-152. In April 2022, The Town similarly voted to opt out of SB05-152 in order to pursue options related to municipal broadband.

8.2.3 Implementation

The implementation of FTTP for the Town is not a program that will occur in the short-term without significant investment (from the Town, municipal or private providers). The approach should be one of thought, precisely timed implementation and opportunity when funds are made available.

8.2.3.1 Build Over Time

The Town should take a “build over time” approach that targets the prioritized areas designing and constructing feeder networks first. Then, as funds are made available, design and build last-mile networks (distribution to the premise). In a logical, programmed manner, the Town could see the entire service network constructed within 5 to 8 years.

8.2.3.2 Prioritized Middle Mile Network

Considering a “build over time” approach, the middle mile feeder network becomes an initial priority. This priority network is broadly shown in **Exhibit E** and can be built relatively easily over a short period of time. The Town should consider funding this network through regular, general fund appropriations targeting key community assets.

8.2.4 Dig Once Policy

With a high-level network design complete, the Town could institute a Dig Once Policy that requires the placement of conduit/fiber when road construction is occurring. The key to a Dig Once policy is ensuring that it is connected to the Town’s network design and as-built properly as construction work is completed.

8.2.5 New Development

New Development policies around broadband infrastructure should include provisions for developers to install conduit and/or fiber during construction of the development. This can be done at fraction of the cost to the Town or provider. Developers do not always notify broadband providers and cellular carriers of new development prior to it being built and thus opportunities are missed. Even if the provider provides materials or pays for the initial installation, doing so during construction of the development saves enormous amounts of money.

Exhibit A

Source: Colorado Broadband Office

Wireline Providers

[Comcast Cable Communications, LLC](#)

1000-1000 Mbps ↓ / 25-50 Mbps ↑

[Lumen Technologies](#)

1.5-3 Mbps ↓ / 0.2-0.75 Mbps ↑

Fixed Providers

[Front Range Internet, Inc.](#)

50-100 Mbps ↓ / 25-50 Mbps ↑

[MHO Networks](#)

1000-1000 Mbps ↓ / 1000-1000 Mbps ↑

[Rise Broadband](#)

25-50 Mbps ↓ / 3-6 Mbps ↑

Satellite Providers

[Hughes Network Systems, LLC](#)

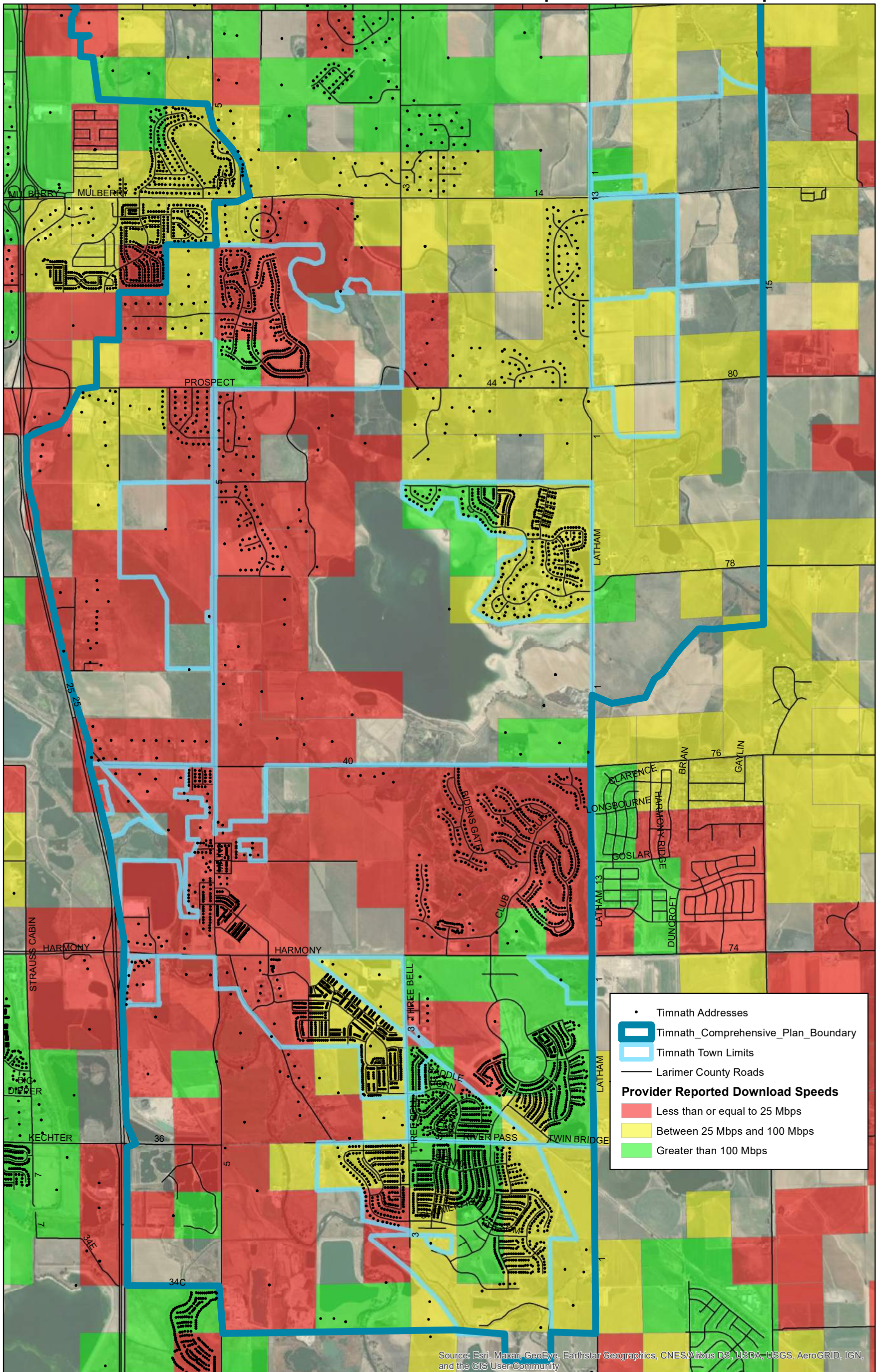
25-50 Mbps ↓ / 3-6 Mbps ↑

[ViaSat](#)

25-50 Mbps ↓ / 25-50 Mbps ↑

Exhibit B

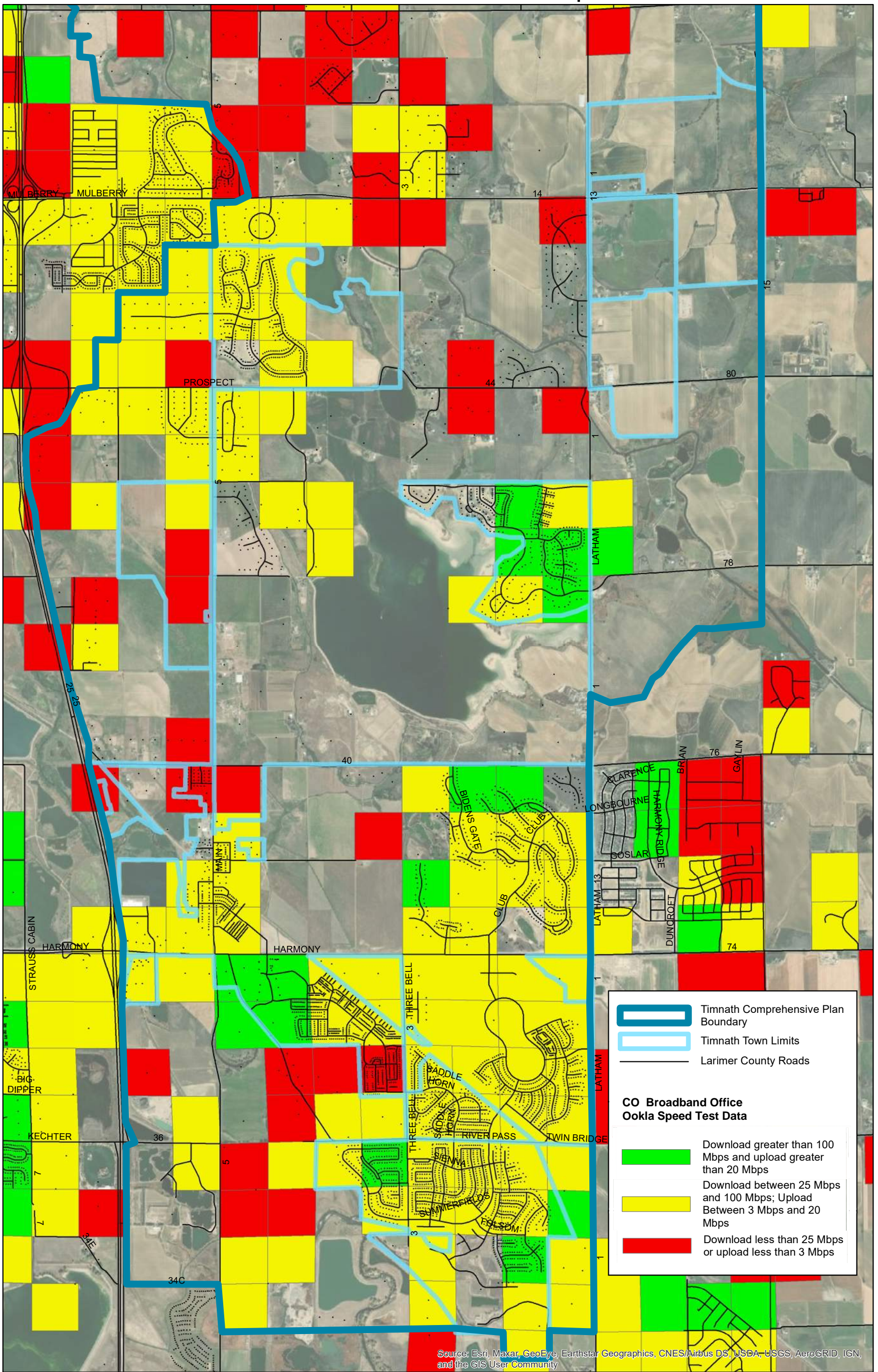
Exhibit B - CO Broadband Office Provider Reported Download Speeds



*Not printed to scale

Exhibit C

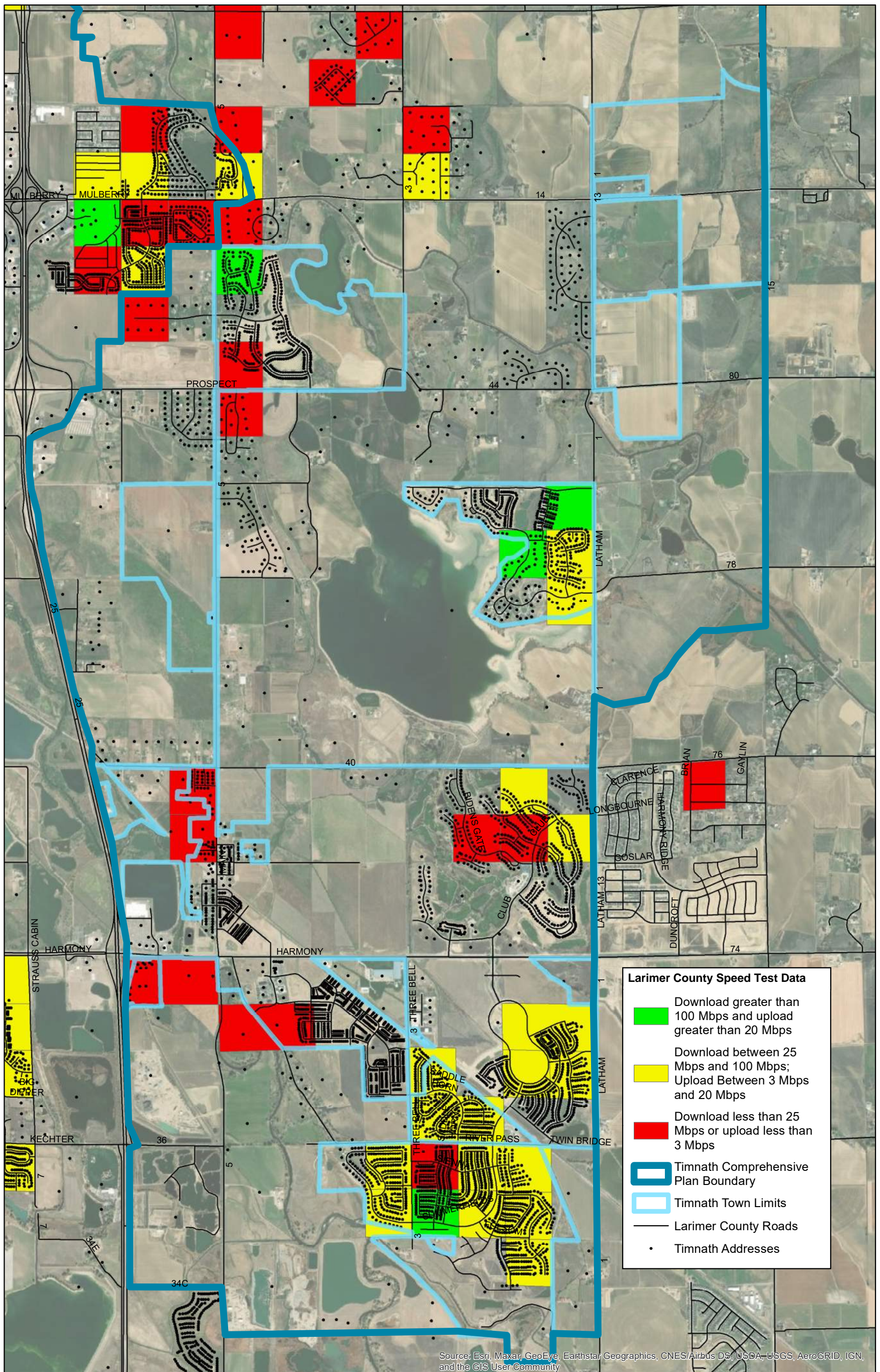
Exhibit C - CO Broadband Office Ookla Speed Test Data



*Not printed to scale

Exhibit D

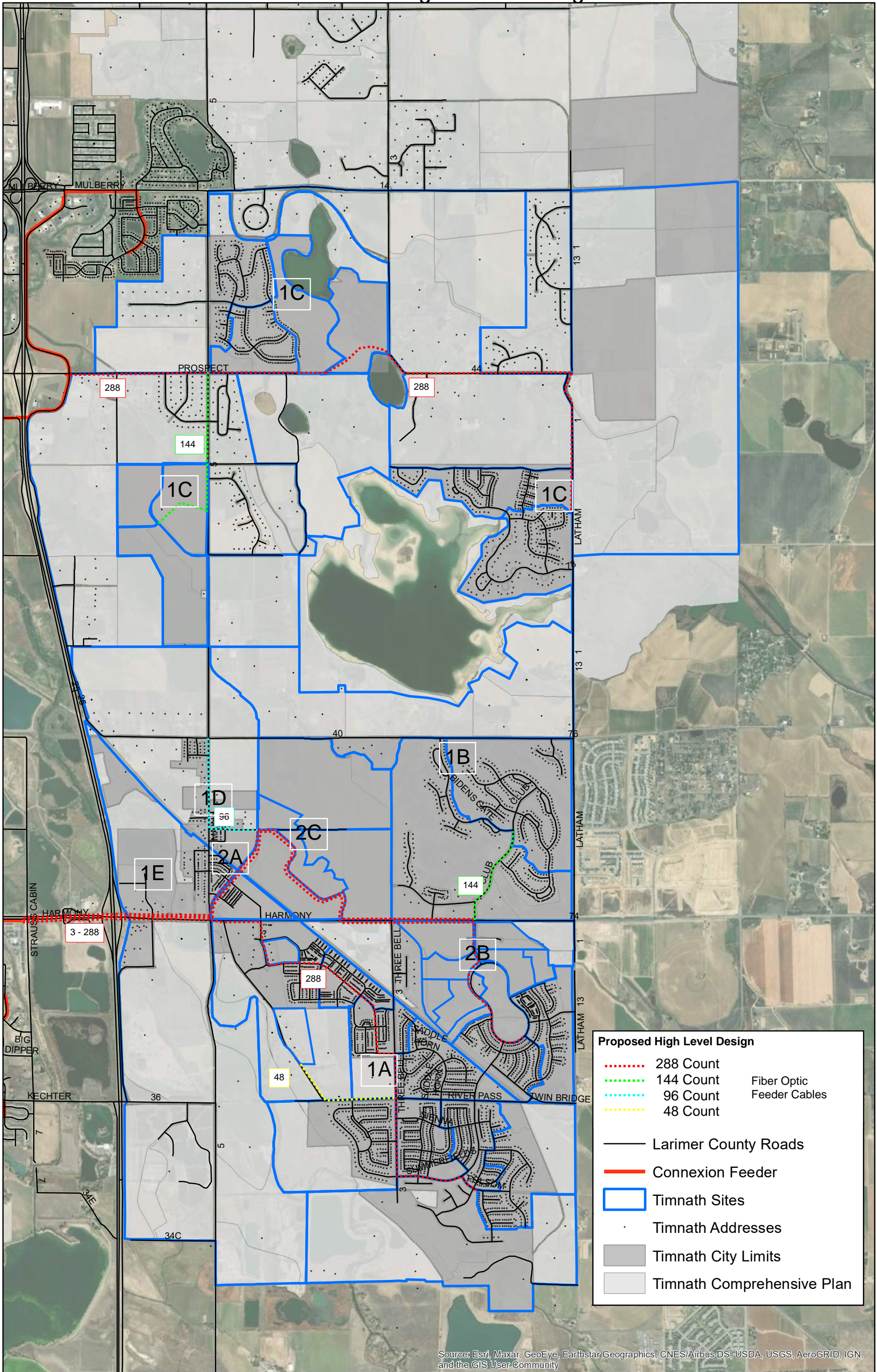
Exhibit D - Larimer County Speed Test Data



*Not printed to scale

Exhibit E

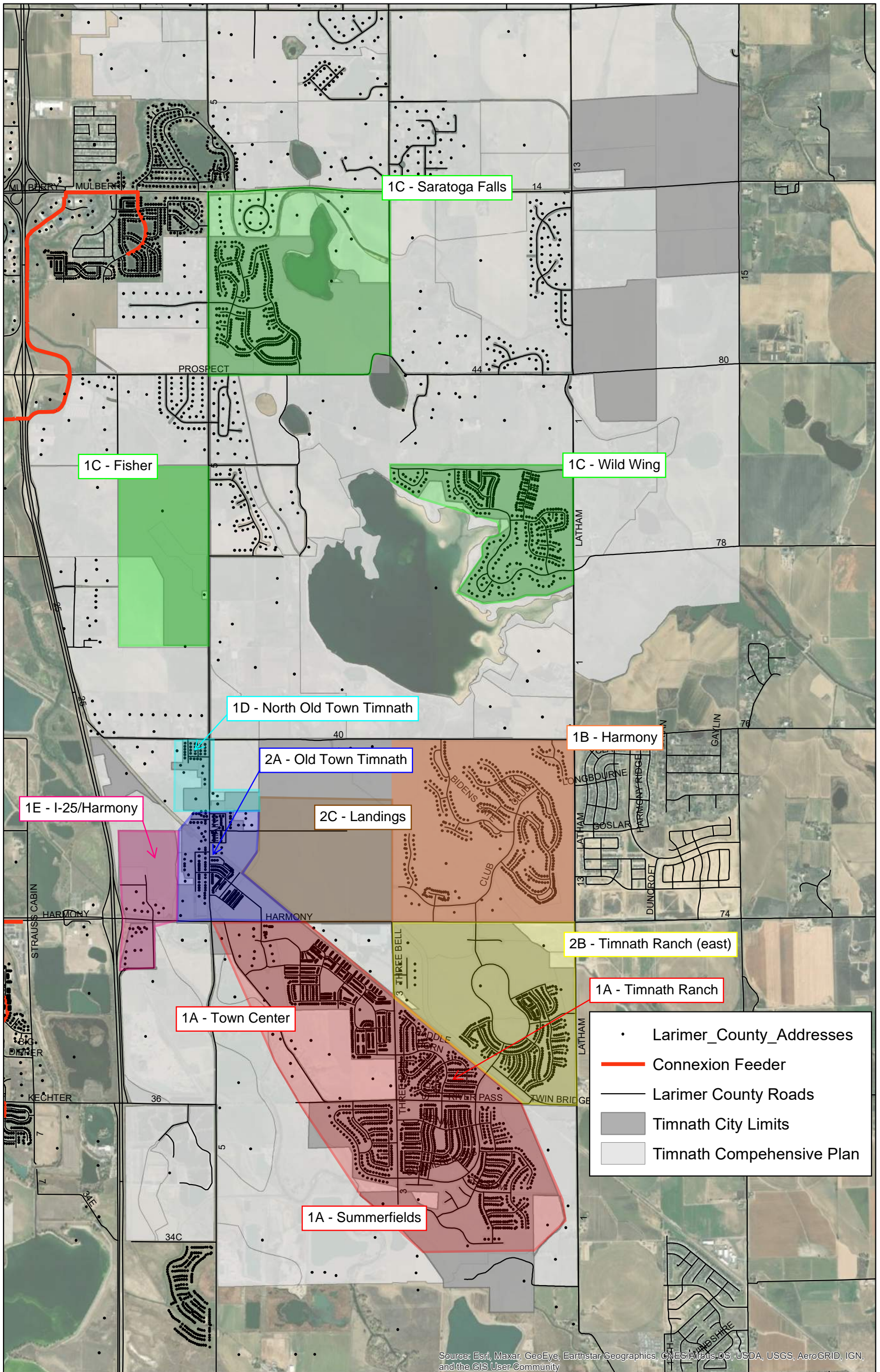
Exhibit E - High-Level Design



*Not printed to scale

Exhibit F

Exhibit F - Preliminary Prioritized Areas



*Not printed to scale

Exhibit G



Timnath Broadband Initiative
 Timnath Priorities
 PLAN DATE: N/A
 PREPARED BY: JO/KM
 ESTIMATE TYPE: CLASS 5

Date: November 16, 2021

Subdivision: 1A
 Town Center, Timnath Ranch, Summerfields

ITEM	UNIT	UNIT COST	QTY	EXTENDED COST	NOTES
OUTSIDE PLANT CONSTRUCTION					
General Conditions (8.0%)	LS	\$473,540	1	\$473,540	
Mobilization (10.0%)	LS	\$538,114	1	\$538,114	
Outside Plant Build - Roadway Centerline	LF	\$35.10	129,199	\$4,534,627	
Outside Plant Materials - Roadway Centerline	LF	\$6.55	129,199	\$846,512	
Subtotal				\$6,392,792	
Materials Cost Inflation	20.0%			\$169,302	allowance for shortages
Estimating Contingency	8.0%			\$511,423	
Owner Contingency	18.0%			\$1,150,703	
Engineering and Network Design	10.0%			\$639,279	
Project Management	4.5%			\$287,676	
TOTAL				\$9,151,176	
Cost per lineal foot				\$70.83	
Cost per premise					# premises and cost per passing
Built-Out Premise Count (Low)					low density based on comp plan
Built-Out Premise Count (High)					high density based on comp plan



Timnath Broadband Initiative
 Timnath Priorities
 PLAN DATE: N/A
 PREPARED BY: JO/KM
 ESTIMATE TYPE: CLASS 5

Date: November 16, 2021

Subdivision: 1B
 Harmony

ITEM	UNIT	UNIT COST	QTY	EXTENDED COST	NOTES
OUTSIDE PLANT CONSTRUCTION					
General Conditions (8.0%)	LS	\$148,910	1	\$148,910	
Mobilization (10.0%)	LS	\$169,216	1	\$169,216	
Outside Plant Build - Roadway Centerline	LF	\$35.10	40,628	\$1,425,962	
Outside Plant Materials - Roadway Centerline	LF	\$6.55	40,628	\$266,195	
Subtotal				\$2,010,282	
Materials Cost Inflation	20.0%			\$53,239	allowance for shortages
Estimating Contingency	8.0%			\$160,823	
Owner Contingency	18.0%			\$361,851	
Engineering and Network Design	10.0%			\$201,028	
Project Management	4.5%			\$90,463	
TOTAL				\$2,877,685	
Cost per lineal foot				\$70.83	
Cost per premise					# premises and cost per passing
Built-Out Premise Count (Low)					low density based on comp plan
Built-Out Premise Count (High)					high density based on comp plan



Timnath Broadband Initiative
 Timnath Priorities
 PLAN DATE: N/A
 PREPARED BY: JO/KM
 ESTIMATE TYPE: CLASS 5

Date: November 16, 2021

Subdivision: 1C
 Saratoga, Wild Wing, Fisher

ITEM	UNIT	UNIT COST	QTY	EXTENDED COST	NOTES
OUTSIDE PLANT CONSTRUCTION					
General Conditions (8.0%)	LS	\$541,321	1	\$541,321	
Mobilization (10.0%)	LS	\$615,137	1	\$615,137	
Outside Plant Build - Roadway Centerline	LF	\$35.10	147,692	\$5,183,694	
Outside Plant Materials - Roadway Centerline	LF	\$6.55	147,692	\$967,678	
Subtotal				\$7,307,830	
Materials Cost Inflation	20.0%			\$193,536	allowance for shortages
Estimating Contingency	8.0%			\$584,626	
Owner Contingency	18.0%			\$1,315,409	
Engineering and Network Design	10.0%			\$730,783	
Project Management	4.5%			\$328,852	
TOTAL				\$10,461,036	
Cost per lineal foot				\$70.83	
Cost per premise					# premises and cost per passing
Built-Out Premise Count (Low)					low density based on comp plan
Built-Out Premise Count (High)					high density based on comp plan



Timnath Broadband Initiative
 Timnath Priorities
 PLAN DATE: N/A
 PREPARED BY: JO/KM
 ESTIMATE TYPE: CLASS 5

Date: November 16, 2021

Subdivision: 1D
 North Old Town Timnath

ITEM	UNIT	UNIT COST	QTY	EXTENDED COST	NOTES
OUTSIDE PLANT CONSTRUCTION					
General Conditions (8.0%)	LS	\$21,130	1	\$21,130	
Mobilization (10.0%)	LS	\$24,011	1	\$24,011	
Outside Plant Build - Roadway Centerline	LF	\$35.10	5,765	\$202,340	
Outside Plant Materials - Roadway Centerline	LF	\$6.55	5,765	\$37,772	
Subtotal				\$285,253	
Materials Cost Inflation	20.0%			\$7,554	allowance for shortages
Estimating Contingency	8.0%			\$22,820	
Owner Contingency	18.0%			\$51,346	
Engineering and Network Design	10.0%			\$28,525	
Project Management	4.5%			\$12,836	
TOTAL				\$408,335	
Cost per lineal foot				\$70.83	
Cost per premise					# premises and cost per passing
Built-Out Premise Count (Low)					low density based on comp plan
Built-Out Premise Count (High)					high density based on comp plan



Timnath Broadband Initiative
 Timnath Priorities
 PLAN DATE: N/A
 PREPARED BY: JO/KM
 ESTIMATE TYPE: CLASS 5

Date: November 16, 2021

Subdivision: 1E
 I-25/Harmony

ITEM	UNIT	UNIT COST	QTY	EXTENDED COST	NOTES
OUTSIDE PLANT CONSTRUCTION					
General Conditions (8.0%)	LS	\$19,865	1	\$19,865	
Mobilization (10.0%)	LS	\$22,574	1	\$22,574	
Outside Plant Build - Roadway Centerline	LF	\$35.10	5,420	\$190,231	
Outside Plant Materials - Roadway Centerline	LF	\$6.55	5,420	\$35,512	
Subtotal				\$268,183	
Materials Cost Inflation	20.0%			\$7,102	allowance for shortages
Estimating Contingency	8.0%			\$21,455	
Owner Contingency	18.0%			\$48,273	
Engineering and Network Design	10.0%			\$26,818	
Project Management	4.5%			\$12,068	
TOTAL				\$383,899	
Cost per lineal foot				\$70.83	
Cost per premise					# premises and cost per passing
Built-Out Premise Count (Low)					low density based on comp plan
Built-Out Premise Count (High)					high density based on comp plan



Timnath Broadband Initiative
 Timnath Priorities
 PLAN DATE: N/A
 PREPARED BY: JO/KM
 ESTIMATE TYPE: CLASS 5

Date: November 16, 2021

Subdivision: 2A
 Old Town Timnath

ITEM	UNIT	UNIT COST	QTY	EXTENDED COST	NOTES
OUTSIDE PLANT CONSTRUCTION					
General Conditions (8.0%)	LS	\$75,796	1	\$75,796	
Mobilization (10.0%)	LS	\$86,132	1	\$86,132	
Outside Plant Build - Roadway Centerline	LF	\$35.10	20,680	\$725,827	
Outside Plant Materials - Roadway Centerline	LF	\$6.55	20,680	\$135,495	
Subtotal				\$1,023,251	
Materials Cost Inflation	20.0%			\$27,099	allowance for shortages
Estimating Contingency	8.0%			\$81,860	
Owner Contingency	18.0%			\$184,185	
Engineering and Network Design	10.0%			\$102,325	
Project Management	4.5%			\$46,046	
TOTAL				\$1,464,766	
Cost per lineal foot				\$70.83	
Cost per premise					# premises and cost per passing
Built-Out Premise Count (Low)					low density based on comp plan
Built-Out Premise Count (High)					high density based on comp plan



Timnath Broadband Initiative
 Timnath Priorities
 PLAN DATE: N/A
 PREPARED BY: JO/KM
 ESTIMATE TYPE: CLASS 5

Date: November 16, 2021

Subdivision: 2B
 Timnath Ranch (East)

ITEM	UNIT	UNIT COST	QTY	EXTENDED COST	NOTES
OUTSIDE PLANT CONSTRUCTION					
General Conditions (8.0%)	LS	\$159,909	1	\$159,909	
Mobilization (10.0%)	LS	\$181,715	1	\$181,715	
Outside Plant Build - Roadway Centerline	LF	\$35.10	43,629	\$1,531,291	
Outside Plant Materials - Roadway Centerline	LF	\$6.55	43,629	\$285,857	
Subtotal				\$2,158,772	
Materials Cost Inflation	20.0%			\$57,171	allowance for shortages
Estimating Contingency	8.0%			\$172,702	
Owner Contingency	18.0%			\$388,579	
Engineering and Network Design	10.0%			\$215,877	
Project Management	4.5%			\$97,145	
TOTAL				\$3,090,246	
Cost per lineal foot				\$70.83	
Cost per premise					# premises and cost per passing
Built-Out Premise Count (Low)					low density based on comp plan
Built-Out Premise Count (High)					high density based on comp plan



Timnath Broadband Initiative
Timnath Priorities
 PLAN DATE: N/A
 PREPARED BY: JO/KM
 ESTIMATE TYPE: CLASS 5

Date: November 16, 2021

Subdivision: 2C
Landings

ITEM	UNIT	UNIT COST	QTY	EXTENDED COST	NOTES
OUTSIDE PLANT CONSTRUCTION					
General Conditions (8.0%)	LS	\$88,907	1	\$88,907	
Mobilization (10.0%)	LS	\$101,030	1	\$101,030	
Outside Plant Build - Roadway Centerline	LF	\$35.10	24,257	\$851,372	
Outside Plant Materials - Roadway Centerline	LF	\$6.55	24,257	\$158,932	
Subtotal				\$1,200,241	
Materials Cost Inflation	20.0%			\$31,786	allowance for shortages
Estimating Contingency	8.0%			\$96,019	
Owner Contingency	18.0%			\$216,043	
Engineering and Network Design	10.0%			\$120,024	
Project Management	4.5%			\$54,011	
TOTAL				\$1,718,125	
Cost per lineal foot				\$70.83	
Cost per premise		\$3,648	471		# premises and cost per passing
Built-Out Premise Count (Low)					low density based on comp plan
Built-Out Premise Count (High)					high density based on comp plan



**Standard Conduit with
a single fiber cable**



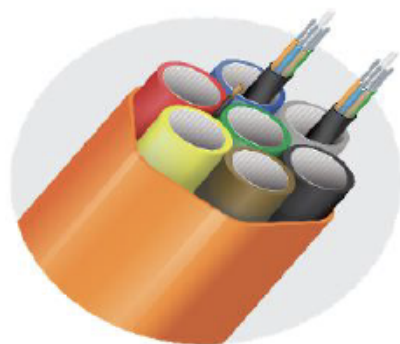
Single Standard Conduit



Two Standard Conduit



Three
Standard
Conduit



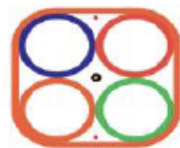
**MicroDucts or FuturePath with
high-density fiber cables**



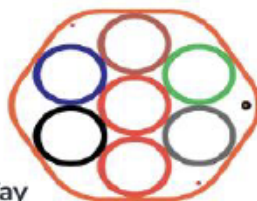
2 Way



3 Way



4 Way



7 Way



8 Way