

Whatcom PUD Broadband Feasibility Study

Abstract

This broadband feasibility study analyzes the need and cost of building infrastructure to bring broadband to the southern and western portions of Whatcom County. Throughout, the study explores the most effective ways a public agency in Whatcom County could position itself to apply for the myriad of grant and loan opportunities that have become available during the COVID-19 pandemic. The study will analyze two models for public, open-access systems for delivering services. It will also explore the potential for public-private partnerships that leverage investments to bring broadband services to the constituents of Whatcom County.



Petrichor Broadband LLC
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Contents

Executive Summary.....	3
Community Support.....	3
Community Outreach Meetings.....	3
Whatcom County Demographics	4
Project Focus.....	8
Local Broadband Needs and Goals	9
Inventory of Existing Broadband Infrastructure	10
Incumbent Licensed Exchange Carriers	13
Gap Analysis	14
Rural Digital Opportunity Fund (RDOF).....	20
Potential Network Design	22
NoaNet Proposed Network Model (Model #1) – Retail Broadband Services	23
Model #2 Dark Fiber Network Model– Wholesale Fiber Leasing	28
Dark Fiber Model	33
Lit Fiber Model	33
Assessment of Municipal Procedures, Policies, Rules, and Ordinances	34
Digital Inclusion.....	35
Affordable Internet	35
Affordable Equipment.....	35
Digital Literacy Training	35
Public Computer Access.....	36
Vision Statement.....	37
Financial Commitment and Budget	38
Potential Funding Sources	38
Federal Level	38
State Level	38
American Rescue Plan Fiscal Recovery Funds Program (ARPA).....	38
Infrastructure Investment and Jobs Act (IIJA).....	38
Key Documents/Existing Efforts.....	39
Potential Community Anchor Institutions and Businesses	39

Libraries.....	39
Fire Districts	41
Police Departments.....	44
City Halls.....	46
Hospital and Medical Clinics	46
Medical Facilities.....	47
Ambulance Services	47
Education Institutions	47
Readiness Self-Assessment	51
Health and Safety Benefits.....	51
Education Access Benefits	51
Community’s Served Status	51
Broadband Survey.....	52
Additional Comments from Respondents.....	53
Acknowledgements.....	56

Executive Summary

This broadband feasibility study seeks to guide the development of broadband services in rural Whatcom County to achieve the vision shared by its residents, businesses and government agencies. The study analyzes dark and lit network designs and operating models that a public entity in Whatcom County could utilize to achieve speeds and service offerings in rural Whatcom County comparable to those in denser, urban areas of Washington State. The first model is a fiber to the premise network managed and operated by a public agency in Whatcom County selling retail broadband services to customers. This lit model was prepared by the Northwest Open Access Network (NoaNet), while Petrichor Broadband LLC (Petrichor) prepared the second, a dark fiber model. The dark fiber model entails a fiber to the premise network managed by a contract operator that leases dark fiber to retail service providers that light their own network and sell retail services to customers. NoaNet and Petrichor kept the assumptions for both models as consistent as possible in order to most accurately compare. Both models assume there would be no debt financing used by the public agency. They would utilize all grant monies to build the infrastructure. A comparison of the revenue models between the lit and dark fiber models found that a dark fiber model proves to be the more fiscally responsible and sustainable option for a public agency in Whatcom County. To further decrease risk, an Irrevocable Right of Use for maintenance of the publicly-owned, dark fiber model could be explored.

Community Support

The Port of Bellingham (Port) and the Public Utility District No. 1 of Whatcom County (PUD) formed a broadband steering committee through a [local agreement](#). The committee's goal is to review active broadband projects in Whatcom County and collaborate on strategy, policies, and funding opportunities that would move the project forward in a successful and collaborative way.

The committee members include Port Executive Director Rob Fix, PUD General Manager Chris Heimgartner, Port Economic Development Project Manager Gina Stark, and PUD Broadband Manager Andrew EntriKin.

In addition, Technology Alliance Group for Northwest Washington (TAGNW), a 501(c)(3) nonprofit organization in Bellingham, formed two community groups that meet to discuss broadband issues impacting the community. A digital literacy group led by the director of the Bellingham Library works to coordinate agencies and groups that provide digital literacy classes, training opportunities and access to no cost/low-cost equipment. A connectivity group headed by a local community member looks to engage and coordinate community members and agencies interested and engaged on policies and practices around connective infrastructure.

Community Outreach Meetings

During this study, the PUD and Port met with several entities that support the principle of public investment in telecommunications infrastructure. The joint Port-PUD broadband steering committee held two meetings, one with local internet service providers and the other with members of the general public. The first meeting was held on May 13, 2022. In attendance were representatives from local government, as well as local internet service providers. The intent was to initiate a dialogue surrounding current and future broadband plans and how best to collaborate toward a common goal of serving the

Whatcom County community. All local providers were invited, as well as some outside of the area (*Attachment A – Invitation to ISPs*). The meeting attendees included the following individuals:

- Simon A. Sefzik – Washington State Senate - 42nd District (R)
- Sharon Shewmake – Washington House of Representatives - 42nd District (D) position 2
- JD Sinclair – Pogozone
- Ray Poorman – CSS
- Vincent Buys – Comcast
- Wayne Jeffers – Whidbey Telecom
- Steve Smith – Whidbey Telecom
- Elizabeth Brayman – Ziply Fiber
- Kevin Stamy – Astound Broadband
- Jeff Stoner – Astound Broadband
- Lydia Kinsella – Astound Broadband
- Gina Stark – Port of Bellingham
- Chris Heimgartner – Whatcom PUD
- Andrew Entrikin – Whatcom PUD

Attendees were asked, “Which providers are currently serving your community?” The answers included Ziply Fiber, Whidbey Telecommunications, Comcast, Pogo Zone, Astound/WAVE and CSS. All of the named providers were in attendance at the meeting.

Asked about how mapping results compare with actual experiences, the group discussed how the Part 477 mapping could be improved on. The consensus was that the existing broadband in Whatcom County does not meet the needs of all community members. Current challenges include the difficulty of reaching certain pockets of the community and a lack of funding to build infrastructure countywide. When asked about current broadband uses, the group cited remote work, streaming and general purposes. The full meeting notes are shown in *Attachment B - Meeting Minutes of May 13, 2022*.

The second meeting was held on June 14, 2022, at the Ferndale Chamber of Commerce (*Attachment C – Open House Flyer*). The purpose of this meeting was to share about active broadband projects in the County and invite community input on where they think future funding and construction should occur. Community members reviewed maps of the currently funded broadband projects and asked questions. The group concluded there are still many pockets of the community left unserved. They were supportive of the roles of the PUD and the Port in building broadband infrastructure.

Whatcom County Demographics

Whatcom County borders Lower Mainland British Columbia (BC) to the north, Skagit County to the south, Okanogan County to the east and the San Juan Islands to the west. The Lummi Indian Reservation is located primarily to the west of Bellingham and approximately 20 miles south of the Canadian border,

and the Nooksack Indian Reservation is located near Deming and approximately 12 miles south of the Canadian border.

Three islands in the Strait of Georgia – Lummi, Portage and Eliza – are part of Whatcom County or the Lummi Nation Reservation. Lummi Island is part of Whatcom County with a small population and many businesses. There is regular ferry service between Lummi Island and the mainland. Eliza Island lies just east to Lummi Island’s southern tip. Portage Island is fully within the jurisdiction and boundaries of the Lummi Reservation. Point Roberts, which is on the southern tip of the Tsawwassen peninsula, is a highly unusual geographic feature of Whatcom County known as a pene-exclave, a land area of one country that is accessible only by traveling through that of another. Point Roberts can be reached from the rest of the county, and vice versa, by boat or via two border crossings and a 23-mile drive through Canada.

Whatcom County also has seven incorporated cities: Bellingham, Blaine, Everson, Ferndale, Lynden, Nooksack and Sumas. There are also several unincorporated communities with substantial populations such as Birch Bay, Lummi Island, Point Roberts, the Columbia Valley and several communities in Eastern Whatcom County.

In 2021, Whatcom County had a population of 228,831 (US Census Bureau 2021). From 2010 to 2020 Whatcom County grew by 12.78%, which is below the state average of 14.61%, and makes Whatcom the 11th fastest growing county in the state (OFM 2022). However, between 2020 and 2021, Whatcom County’s population growth was actually negative at -.24% and a total loss of 547 individuals. According to the OFM (2022, p. 6) this decline is primarily due to the loss of student groups.

The local economy continued to have numerous disruptions over the last year due to the COVID-19 pandemic, the Canadian Border Closure and the November 2021 Nooksack River flood. Despite these disruptions, unemployment rates have recovered substantially throughout Washington State since spring 2020. Whatcom County was down to 4.8% in June 2022, which was above the state unemployment rate of 3.9%. Non-farm jobs have increased and are nearly back to pre-pandemic levels in June 2022, with Whatcom at 95,800 jobs. According to the Employment Security Department (2021), prior to the COVID-19 pandemic Whatcom County’s average annual wage was \$49,662 in 2019, below the statewide annual average wage of \$69,195. In 2018, the county’s median hourly wage was \$22.12, lower than the state median of \$25.98 per hour.

The local economy has diversified from its historic dependence on natural resource industries. Much of the growth is due to small business and local industry expansion, as well as new business coming in from outside of Whatcom County. The service-providing sectors of the economy, which were hard hit by COVID-19 related closures, account for 77,300 of 95,800 (80.7%) non-agricultural jobs in June 2022 (ESD Labor Area Summaries 2022). The three largest employers in the county are Peace Health St. Joseph Medical Center, the Lummi Nation and Western Washington University (WWU 2017). The BP refinery is the largest private company with over 1,000 jobs including contractors. Manufacturing provided 9,900 jobs in June 2022 compared to 10,900 jobs in 2019. The closure of Alcoa/Intalco accounts for much of this continued loss.

The Canadian border and the large population in lower mainland British Columbia heavily influence Whatcom County’s economy. In the past, a strong Canadian dollar, plus other cost differentials in goods,

has benefited retail activity in the county. Due to the COVID-19 outbreak, the US-Canadian Border was closed to non-commercial activity from March 21, 2020, to August 9, 2021. This 19-month closure hit border cities and communities in Whatcom County hard, particularly those that rely upon Canadians for consumption-based visits such as package parcels, milk, gas and tourism. The Canadian dollar slightly strengthened compared to the U.S. dollar and is currently around \$0.78 US. Despite the closure, Canadian manufacturers continue to show interest in expanding into the county to access US markets.

Whatcom County has a well-educated workforce with 19.4% having a bachelor's degree, 8.4% with an associate's degree and 12.1% with a graduate or professional degree (American Community Survey 2014-2019). Western Washington University (WWU), with a student population of 15,197 in 2021, as well as Whatcom Community College (WCC), Bellingham Technical College (BTC) and Northwest Indian College (NWIC), provide Whatcom County with a strong academic and vocational-technical base. Graduates of these institutions enhance the education and skill level of the area labor force. Moreover, WWU has received national recognition as one of the finest regional public universities and WCC's Cybersecurity Center is a National Center of Academic Excellence in Information Assurance / Cyber Defense. Meeting industry demand for skilled workforce is a high priority of area education institutions.

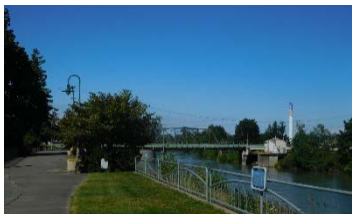
A large minority of the population of Whatcom County live in the City of Bellingham at 91,482 residents (US Census 2022). The city with the next highest population is Lynden at 15,749 closely followed by the city of Ferndale at 15,048. The city of Nooksack has the smallest population at 1,471.

The demographics of each community in Whatcom County with available census data from the U.S. Census Bureau (2020) are shown below. Please note census-designated places have fewer data points collected and available than cities and towns with a population of 5,000 or more.



BELLINGHAM, WA

Population: 91,482
 Median Household Income: \$56,198
 Percentage of Persons in Poverty: 20%
 Households with a Broadband Internet Subscription: 89.7%



FERNDALE, WA

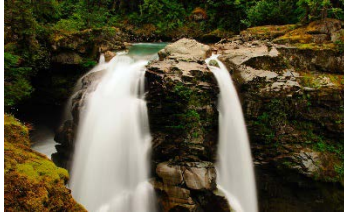
Population: 15,048
 Median Household Income: \$62,852
 Percentage of Persons in Poverty: 14.4%
 Households with a Broadband Internet Subscription: 91.3%



LYNDEN, WA

Population: 15,749
 Median Household Income: \$70,308
 Percentage of Persons in Poverty: 6.3%

Households with a Broadband Internet Subscription: 84.5%



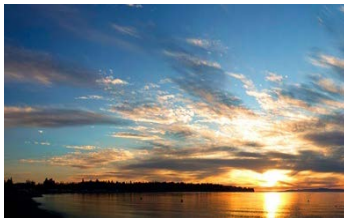
NOOKSACK, WA

Population: 1,594
 Median Household Income: \$67,813
 Percentage of Persons in Poverty: 8.22%
 Households with a Broadband Internet Subscription: N/A



BLAINE, WA

Population: 5,884
 Median Household Income: \$72,772
 Percentage of Persons in Poverty: 9.3%
 Households with a Broadband Internet Subscription: 91.3%



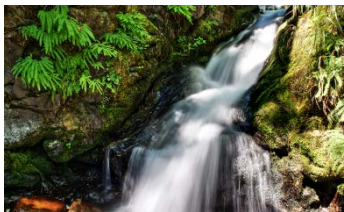
BIRCH BAY, WA

Population: 10,115
 Median Household Income: \$63,157
 Percentage of Persons in Poverty: 13%
 Households with a Broadband Internet Subscription: 81.7%



DEMING, WA

Population: 174
 Median Household Income: N/A
 Percentage of Persons in Poverty: N/A
 Households with a Broadband Internet Subscription: N/A



MAPLE FALLS, WA

Population: 226
 Median Household Income: \$27,374
 Percentage of Persons in Poverty: N/A
 Households with a Broadband Internet Subscription: N/A



SUMAS, WA

Population: 1,405
 Median Household Income: \$57,930
 Percentage of Persons in Poverty: 9.67%
 Households with a Broadband Internet Subscription: N/A



SUDDEN VALLEY, WA

Population: 6,354
Median Household Income: \$83,158
Percentage of Persons in Poverty: 4.7%
Households with a Broadband Internet Subscription: 93.9%



POINT ROBERTS, WA

Population: 1,100
Median Household Income: \$52,692
Percentage of Persons in Poverty: 10.3%
Households with a Broadband Internet Subscription: N/A



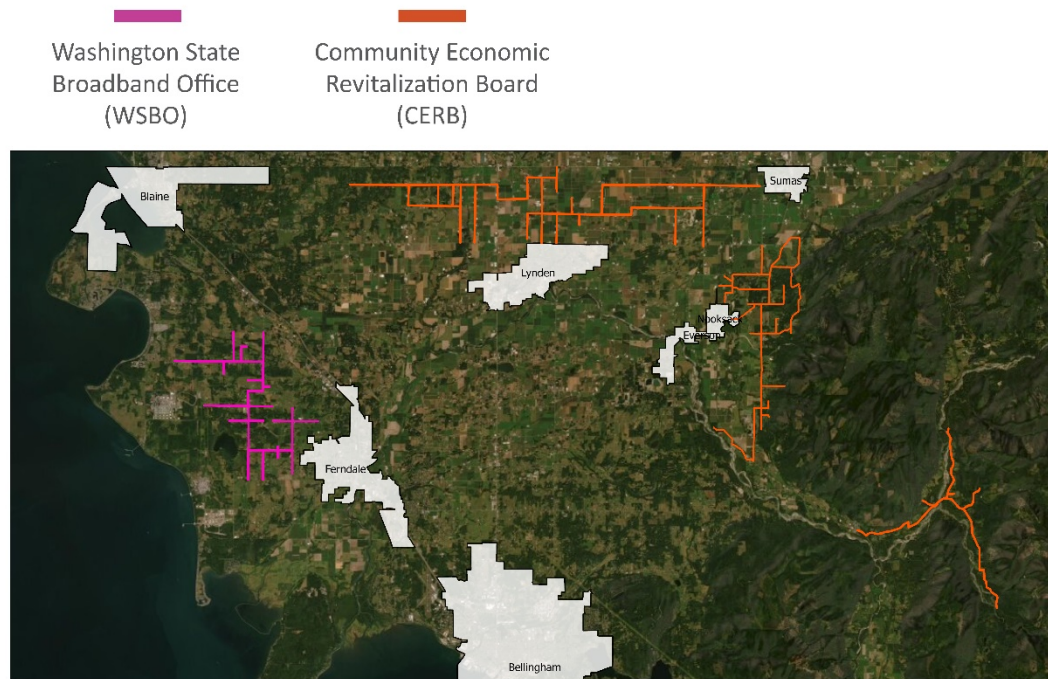
EVERSON, WA

Population: 2,773
Median Household Income: \$59,650
Percentage of Persons in Poverty: 13.7%
Households with a Broadband Internet Subscription: N/A

Project Focus

The focus of this study is to build off a previously commissioned feasibility study for the Port of Bellingham to identify the gaps in broadband service and current needs in rural Whatcom County. Additionally, the study seeks to understand through financial modeling the cost of establishing and operating a publicly owned retail system model.

State funded project areas by agency



Source: Port of Bellingham

FIGURE 1: WSBO AND CERB FUNDED BROADBAND PROJECT AREAS IN WHATCOM COUNTY

The Port of Bellingham has been successful in obtaining funding to build fiber infrastructure in Whatcom County. Figure 1 shows the areas of Whatcom County where fiber to the home networks are currently being deployed. These project areas were chosen because current broad infrastructure cannot deliver broadband speeds of 100/20 Mbps service to people in the area. The Washington State Broadband Office defines these areas as unserved.

Local Broadband Needs and Goals

Since the creation of the Rural Electrification Administration in 1936, policymakers have known that public investment and policy are necessary to solve the problem of bringing electrification and telecommunications to rural communities. The economics of providing services in rural areas has become increasingly difficult with a declining population base, posing a challenge for telecommunications providers aiming to provide services while seeking a return on investment.

Broadband is no longer a socially desirable good, but an economic necessity. Without access to broadband, citizens in Whatcom County cannot participate in the digital economy or take advantage of

the opportunity broadband brings for better education, healthcare, civic and social engagement. There are schools in Whatcom County without fiber to the facility.

Through [SSB 5511 \(2019\)](#), the Washington State legislature set broadband deployment goals for the State of Washington based on the following assumptions:

- (1) Access to broadband is critical to full participation in society and the modern economy;*
- (2) Increasing broadband access to unserved areas of the state serves a fundamental governmental purpose and function and provides a public benefit to the citizens of Washington by enabling access to health care, education, and essential services, providing economic opportunities, and enhancing public health and safety;*
- (3) Achieving affordable and quality broadband access for all Washingtonians will require additional and sustained investment, research, local and community participation, and partnerships between private, public, and nonprofit entities.*

Figure 2 shows Washington State’s Broadband goals¹ for businesses to reach speeds of 25 Mbps upload and 3 Mbps download by 2024 and 150 Mbps symmetric service by 2028. The timeline to meet these goals falls far short of what businesses in Whatcom County, and arguably all of Washington State, need to become and/or remain competitive and expand markets.

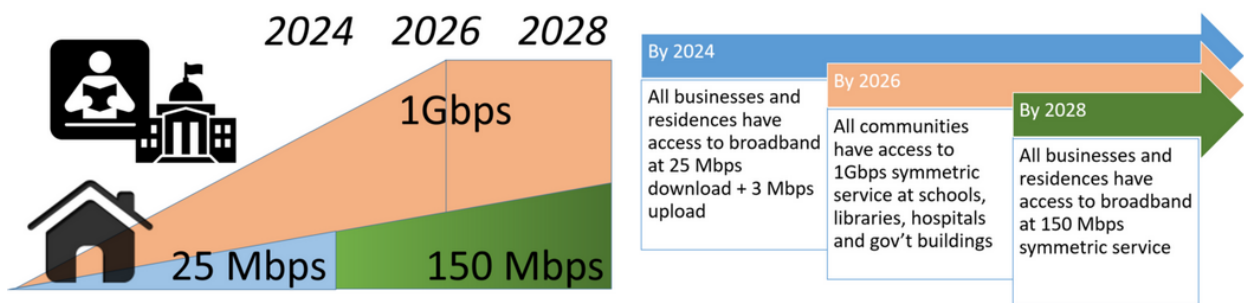


FIGURE 2: WASHINGTON STATE BROADBAND

Inventory of Existing Broadband Infrastructure

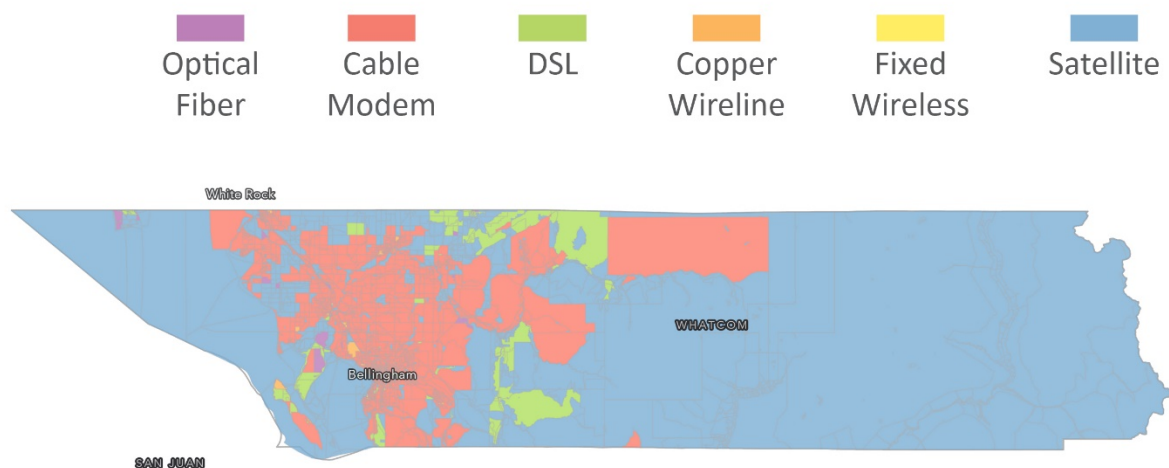
Current broadband offerings in rural Whatcom County provide relatively high-cost services because of monopolistic market forces (low competition and limited customer choice). This creates higher-cost offerings, often providing low bandwidth with inconsistent speeds. This is common in rural areas. Wireless companies listed on FCC Part 477 mapping show pricing for services over \$100 per month for 100 Mbps speeds and lower. This contrasts with 1 Gbps offerings in Bellingham, Washington by Comcast for \$80 per month. There has been private-sector investment in the deployment of broadband infrastructure in the incorporated city limits of Bellingham, Sumas, Ferndale and Lynden by the legacy cable television provider, incumbent exchange carrier and competitive licensed exchange carriers. Fiber

¹ [Washington Broadband - Data WA Gov](#)

networks have been limited in scope and slow to roll out due to the cost and need for a quick return on investment. Fiber assets in the community service anchor institutions and some companies who purchase enterprise business services. There are not extensions of urban-rate services to lower-density areas, especially outside the incorporated city limits of the communities. While there has been significant private sector investment in the deployment of broadband infrastructure in the incorporated areas of Whatcom County by incumbent exchange carriers, competitive licensed exchange carriers and cable television providers, most rural areas do not have competition or fiber to the home offerings. There remains a lack of ubiquitous broadband access and capacity.

Transmission technology in Whatcom County

Predominant Download Technology



Source: FCC 477 data

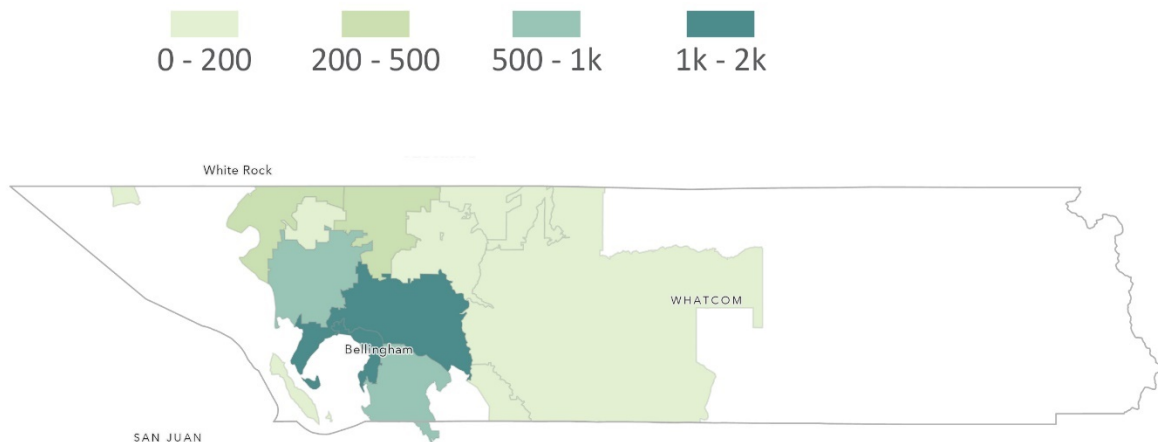
FIGURE 3: PREDOMINANT DOWNLOAD TECHNOLOGIES IN WHATCOM COUNTY

As the cable television company in the urban region, Comcast has nearly 100% coverage of the city of Bellingham and surrounding urban areas of Whatcom County. Comcast provides traditional cable television services and business internet services with 1.2 Gbps Internet for \$80.00 per month on an introductory offer. Comcast also participates in the Affordable Connectivity Program (ACP) where qualified customers can receive internet at a subsidized rate or free from Comcast. The Comcast network consists of fiber and coaxial cable outside plant. Traditionally cable companies built out communities with different sizes of coaxial cable to perform different functions on the network. The larger diameter of cable the company has, the lower the signal loss and the higher the signal to noise

ratio will be, allowing the company to reach out into the community farther. These are called trunk runs. From there, smaller cables and line extender amplifiers are used to service homes. As the use of fiber optic cable became more common, fiber replaced the coaxial trunk runs. Fiber runs from a centralized location to fiber nodes located in the community. At the node the fiber is terminated, and the existing coaxial cable plant is still used to service the home. As speeds of service have increased, companies have deployed fiber deeper into the community and eliminated their aging coaxial cable.

Affordable Connectivity Program (ACP) enrollment in Whatcom County

Total enrolled as of July 2022



Source: Universal Service Administrative Co.

FIGURE 4: ACP ENROLLMENT THROUGHOUT WHATCOM COUNTY

There are two Incumbent Licensed Exchange Carriers (ILEC) in the county: Lumen (formerly Century Link) and Ziplly Fiber (formerly Frontier). Both companies offer 1 Gbps services in communities in Whatcom County where they are replacing older copper phone lines with fiber optic networks. As the ILECs in the county, Lumen and Ziplly have 100% coverage of their exchange areas with traditional phone services and offer Asymmetric Digital Subscriber Line (ADSL) throughout their rural exchange areas over legacy copper phone lines.

Unlike Comcast, legacy telephone infrastructure consists of copper phone lines. ADSL is a technology that enables the internet to be transmitted over copper phone lines at higher speeds than conventional voiceband modems allow. The service is asymmetric, meaning the download speed is larger than the upload speed. The speed that can be offered is a function of how far the customer is from the origination equipment. Copper phone lines and ADSL technology will not meet Washington State’s goal of 150/150 Mbps speeds for all residents and businesses.

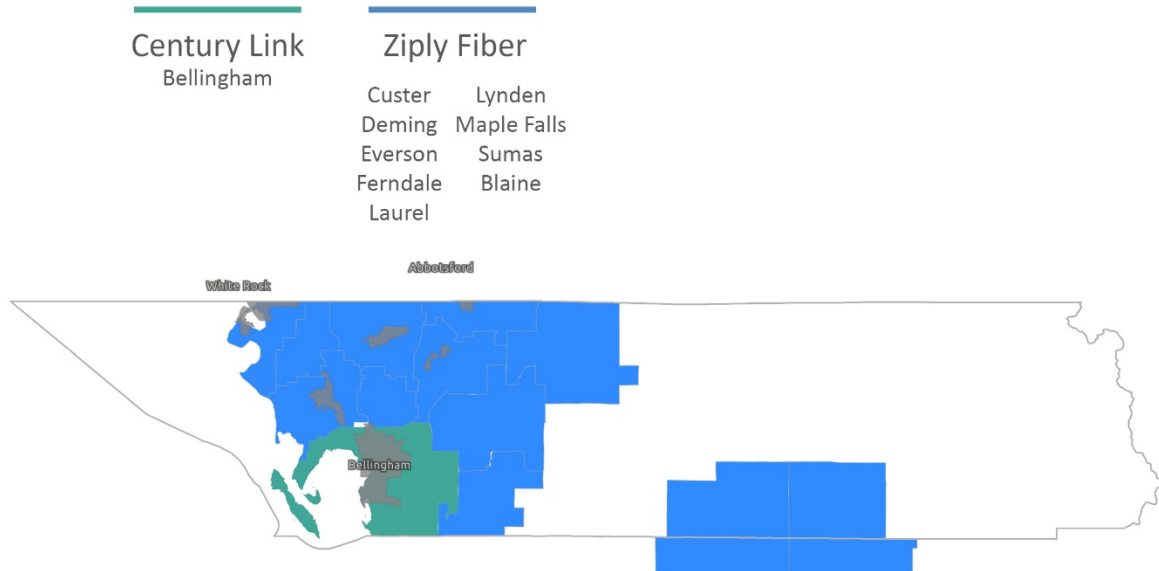
Incumbent Licensed Exchange Carriers

The providers for each community in Whatcom County are listed in Table 1. The incumbent local exchange carrier (ILEC) boundaries for Lumen and Ziplly Fiber in the county are depicted in Figure 5.

TABLE 1 INTERNET SERVICE PROVIDERS IN WHATCOM COUNTY

Provider	Communities
Lumen Technologies	Bellingham
Ziplay Fiber	Parts of North and east county
Comcast	Cities, part of the east and west unincorporated areas that are more densely populated
Whidbey Telecommunications	Point Roberts
Astound	Parts of the east county/Mt. Baker Hwy

Exchange Areas in Whatcom County by company



Source: WA Utilities & Transportation Commission

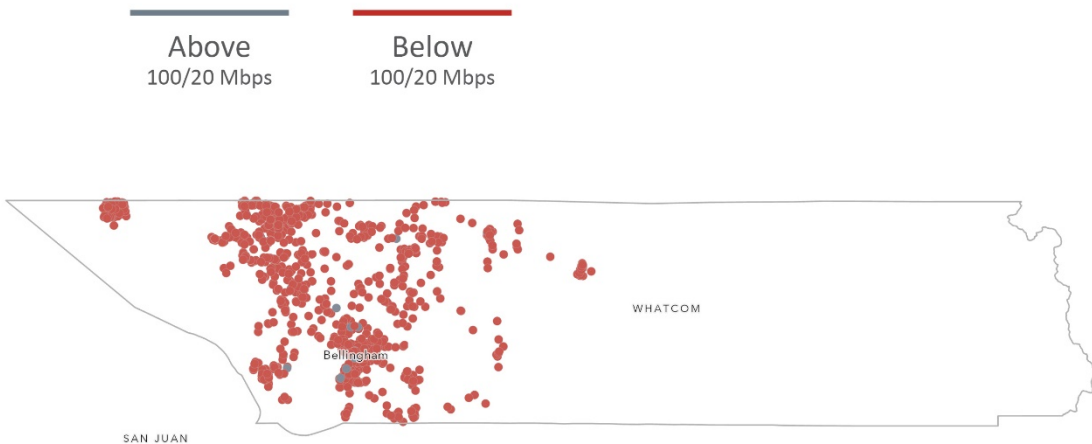
FIGURE 5: ILEC BOUNDARIES IN WHATCOM COUNTY

Gap Analysis

Speed tests from the Washington State Broadband Office, as well as private technology companies such as Microsoft and Google, offer additional insight into local broadband needs.

The Washington State Broadband Office of the Department of Commerce conducts an annual speed test survey across the state. The mapping initiative is intended to “help identify gaps in high-speed internet service and areas of broadband infrastructure needs in order to advance the state’s goal to have universal broadband access in Washington by 2024,” according to Commerce. As of April 2022, out of 1,196 respondents in Whatcom County, the median download speed was 14.2 Mbps and the median upload speed was 3.96 Mbps (Figure 6).

WA State Broadband Speed Test Results



Source: Washington State Broadband Office

FIGURE 6: APRIL 2022 SPEED TEST RESULTS IN WHATCOM COUNTY

Microsoft also collects speed results based off aggregated and anonymized data from its users.

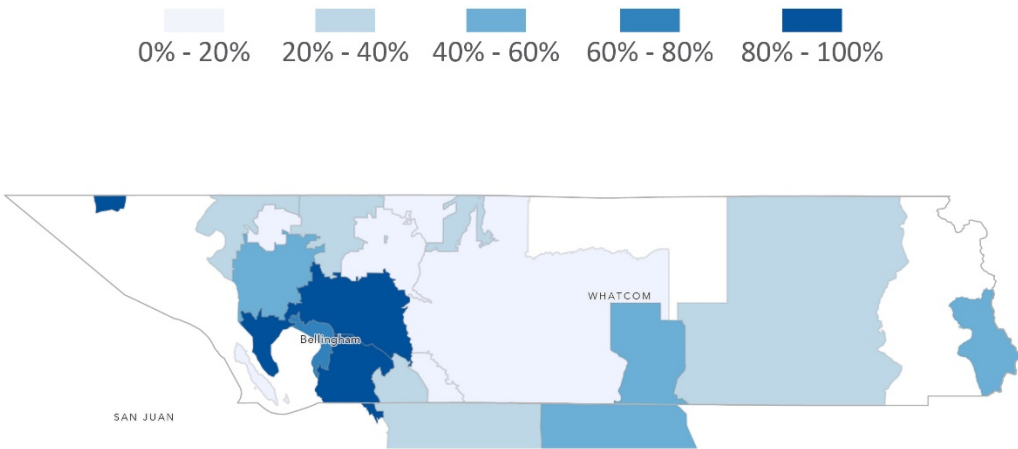
“Every time a device receives an update or connects to a Microsoft service, we can estimate the throughput speed of a machine. We know the size of the package sent to the computer, and we know the total time of the download. We also determine zip code level location data via reverse IP,” according to Microsoft. “Therefore, we can count the number of devices that have connected to the internet at broadband speed per each zip code based on the FCC’s definition of broadband that is 25 Mbps per download.”²

By this definition of broadband, people in Whatcom County do not use the internet at broadband speeds (Figure 7).

² [Microsoft Broadband Usage Percentages Dataset Frequently Asked Questions](#)

Microsoft broadband usage data

% who use the internet at broadband speeds



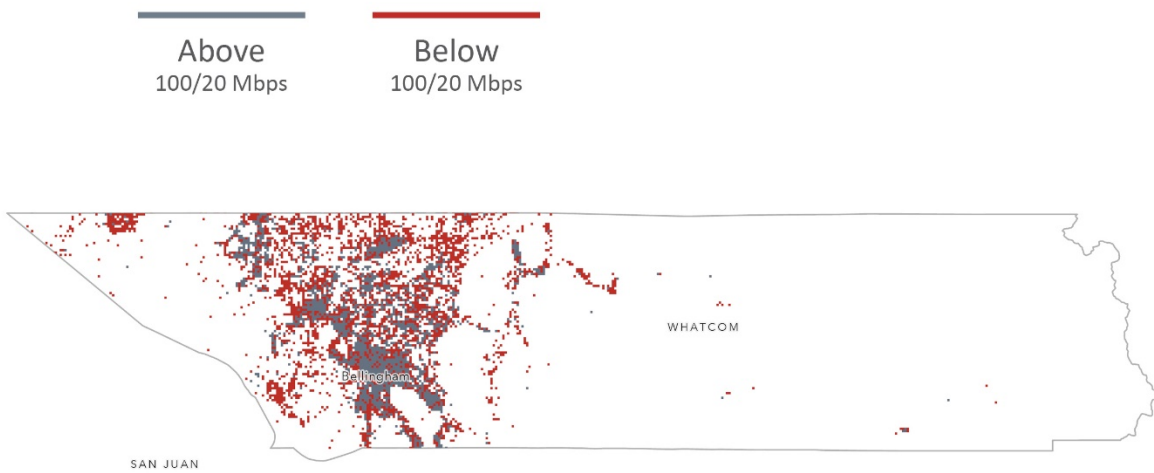
Source: Microsoft

FIGURE 7: MICROSOFT BROADBAND SPEEDS IN WHATCOM COUNTY

At the 2019 census, the County's population was 228,831. This means roughly 63.3 percent of the County's residents use the internet below the basic FCC definition of broadband, according to Microsoft data.

Ookla is a private company offering fixed broadband and mobile network testing applications, data and analysis. Its speed test at speedtest.net has been used nearly 40 billion times. Download speed, upload speed and latency are collected via the Speedtest by Ookla applications for Android and iOS and averaged for each tile. Measurements are filtered to results containing GPS-quality location accuracy. According to Ookla data, the majority of Whatcom County, excepting the denser populated city areas currently lacks 25/3 Mbps broadband speeds, as shown by Figure 8.

Ookla fixed network performance by download speed



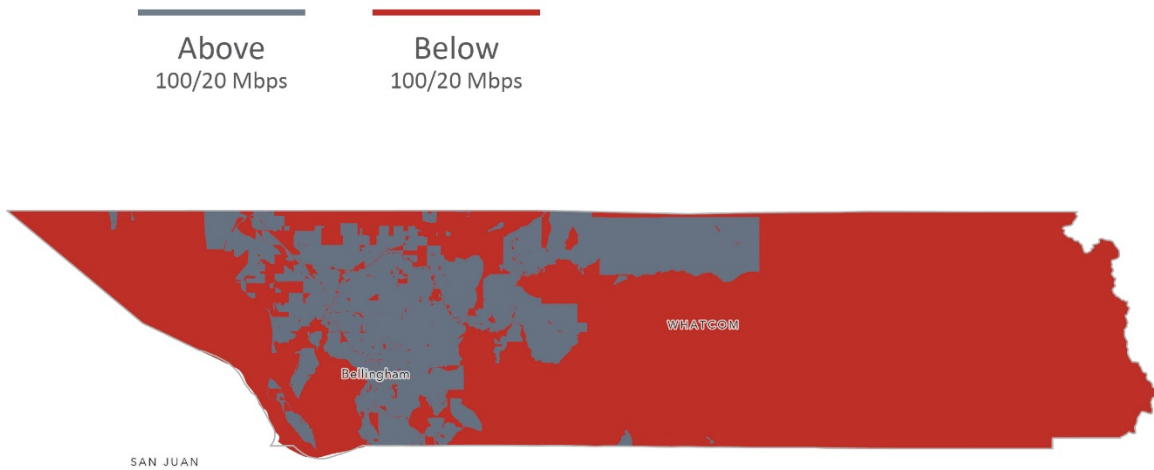
Source: Ookla

FIGURE 8: OOKLA BROADBAND SPEEDS IN WHATCOM COUNTY

Another way to gauge the broadband landscape of Whatcom County is to analyze the broadband speeds published by the Federal Communications Commission (FCC)³ in conjunction with the prices and offerings advertised by internet service providers. Whatcom County has a well-served urban core in the Bellingham area. As of July 2022, the broadband speeds recorded by the FCC and advertised pricing by providers are shown in Table 2 for the denser populated areas of Whatcom County that are colored dark blue in the map shown in Figure 9. Ten providers have reported to the FCC they offer services in the urban core areas of Whatcom County. Three of these companies are competing, selling services above Washington State’s goal of 100/20 Mbps speed.

³ [FCC Broadband Map](#)

Broadband service areas in Whatcom County by census block



Source: Federal Communications Commission (FCC)

FIGURE 9: FCC PART 477 MAPPING IN WHATCOM COUNTY

TABLE 2: BROADBAND SPEEDS AND PRICES IN BLUE REGIONS OF WHATCOM COUNTY FCC MAP

Provider	Tech	Down (Mbps)	Up (Mbps)	Best Monthly Price
Comcast Corporation	Cable	1000	35	\$80.00
Radiate Holdings, LP	Cable/Microwave	250	20	\$100.00
Sound Internet Services, Inc.	Fiber	100	100	\$55.00
Lumen Technologies, Inc.	ADSL	60	5	\$50.00
ViaSat, Inc.	Satellite	35	3	\$64.99
Sound Internet Services, Inc.	Fixed Wireless	25	10	\$64.99
T-Mobile USA, Inc.	Fixed Wireless	25	3	\$55.00
Hughes Network Systems, LLC	Satellite	25	3	\$39.99
StarTouch Broadband	Fixed Wireless	20	20	Unlisted

VSAT Systems, LLC	Satellite	2	1.3	\$64.99
Sound Internet Services, Inc.	Other	100	100	\$55.00
Lumen Technologies, Inc.	ADSL	60	5	\$55.00
ViaSat, Inc.	Satellite	35	3	\$69.99
Sound Internet Services, Inc.	Fixed Wireless	25	10	\$40.00
Hughes Network Systems, LLC	Satellite	25	3	\$64.99
StarTouch Broadband	Fixed Wireless	20	20	Unlisted

TABLE 3: BROADBAND SPEEDS AND PRICES IN RED REGIONS OF WHATCOM COUNTY FCC MAP

Provider	Tech	Down (Mbps)	Up (Mbps)	Best Monthly Price
Northwest Fiber, LLC	ADSL	70	3	\$20.00
ViaSat, Inc.	Satellite	35	3	\$149.99
Hughes Network Systems, LLC	Satellite	25	3	\$64.99
Northwest Fiber, LLC	ADSL	12	1	\$20.00
Northwest Fiber, LLC	ADSL	6	1	\$20.00
VSAT Systems, LLC	Satellite	2	1.3	\$64.99

In contrast to Table 2, Table 3 represents a rural area of Whatcom County just outside the urban core where there is still housing density. Three of the providers listed as serving the area are satellite feeds. The other provider is the incumbent licensed exchange carrier for the area and is offering ADSL services over copper phone lines. None of these service offerings are at the 100/20 Mbps speed that is currently Washington State’s definition of being served with adequate broadband services. The FCC mapping has not been updated to show SpaceX, a low orbit satellite offering of up to 100 Mbps speed service. The FCC is developing new mapping that will be released in the fall of 2022.

According to the FCC’s Household Broadband Guide,⁴ homes with more than one high-demand application running at the same time need more than 25 Mbps. Any business conducting online transactions or utilizing integrated software systems, and multiple users on high-demand applications (such as video streaming, multiparty video conferencing or telecommuting) will clearly not have their broadband needs met through the State’s goal of 25 Mbps download and 3 Mbps upload by 2024. These businesses need 150 Mbps symmetrical broadband services today to stay relevant and compete with businesses that already benefit from urban rate services. This is Washington State’s goal for 2028. Petrichor recommends that public agencies work to accelerate timelines for these areas.

In the 2022 Washington State legislative session, [SB 5715](#), sponsored by Sen. Wellman (D–Mercer Island), modified and expanded the definition of broadband from 25 megabits per second download to

⁴ [FCC Household Broadband Guide](#)

100 megabits, and from three megabits per second upload to 20 megabits. The current federal speed standard remains 25/3. The bill's passage recognizes that faster, more reliable download and upload speeds are vital to ensuring equitable and consistent access to telemedicine, education and economic development for all Washingtonians.

To summarize the three sources of speed test data, it is conservative to say that over half of Whatcom County does not use the Internet at speeds above 25/3 Mbps speeds. The majority of respondents to the Washington State Broadband Office speed tests resulted in speeds of less than half of 25/3 Mbps. Crowd-sourced speed tests align with FCC-reported service speeds below.

Portions of rural Whatcom County study areas would be classified as unserved as defined by the Federal Communications Commission (FCC). Current FCC policies define unserved as areas that do not have access to fixed broadband at speeds of at least 25/3 Mbps. The FCC set the minimum requirements for broadband services under CAF Phase II for voice and broadband services.⁵ These minimum requirements for speed, latency, usage allowance and pricing are listed below:

- Broadband at speeds of at least 10 megabits per second (Mbps) downstream and 1 Mbps upstream
- Network latency (the time it takes for a data packet to travel through a network) cannot be higher than 100 milliseconds round trip.
- At least one plan offering with a minimum usage allowance of at least 150 gigabytes (GB) per month or a monthly usage allowance that reflects the average usage of a majority of fixed broadband customers as announced by the Wireline Competition Bureau annually, whichever is higher. Or offering a usage allowance that is at or above the usage level for 80 percent of their broadband subscribers if it is at least 100 GB.
- Service at rates reasonably comparable to rates in urban areas

Rural Digital Opportunity Fund (RDOF)

The FCC's 2020 Rural Digital Opportunity Fund (RDOF) auction prioritized networks with higher speeds, greater usage allowances and lower latency. Bidders were required to commit to providing a minimum speed of more than double what was required in the CAF Phase II auction. Whatcom County was awarded to one company. The reverse auction bid took place in the fall of 2020 two successfully bid portions of Whatcom County at 1 Gbps low latency service. This is the highest criteria of service in RDOF.

Winners must deploy service to the number of locations won on a statewide basis:

- 20% of Connect America Model (CAM)* locations by year two of the contract (optional)
- 40% of CAM locations by year three
- Additional 20% of locations in each subsequent year
- 100% of CAM locations by year six
- 100% of actual locations by year eight

⁵ [FCC Connect America Fund FAQ](#)

- Newly built locations upon reasonable request to be built after actual locations determined before year eight

**The Connect America Model (CAM) is a mapping model created by the FCC to evaluate the United States for unserved (25/3 Mbps) broadband services. In 2022 this mapping tool is being replaced. There are many flaws in the CAM mapping tool. If one home in a census tract has broadband service at over 25/3 Mbps speeds the whole tract would show as served. This has left much of the unserved areas of the country ineligible for federal subsidies to bring broadband to high-cost areas. A new system, the Deployment, Accuracy, and Technology Availability (DATA) Mapping tool, is intended to correct the flaws in CAM and demonstrate unserved areas of the country more accurately. This new mapping tool will be rolled out by the FCC in fall 2022.*

Other features of accountability in the RDOF programs include:

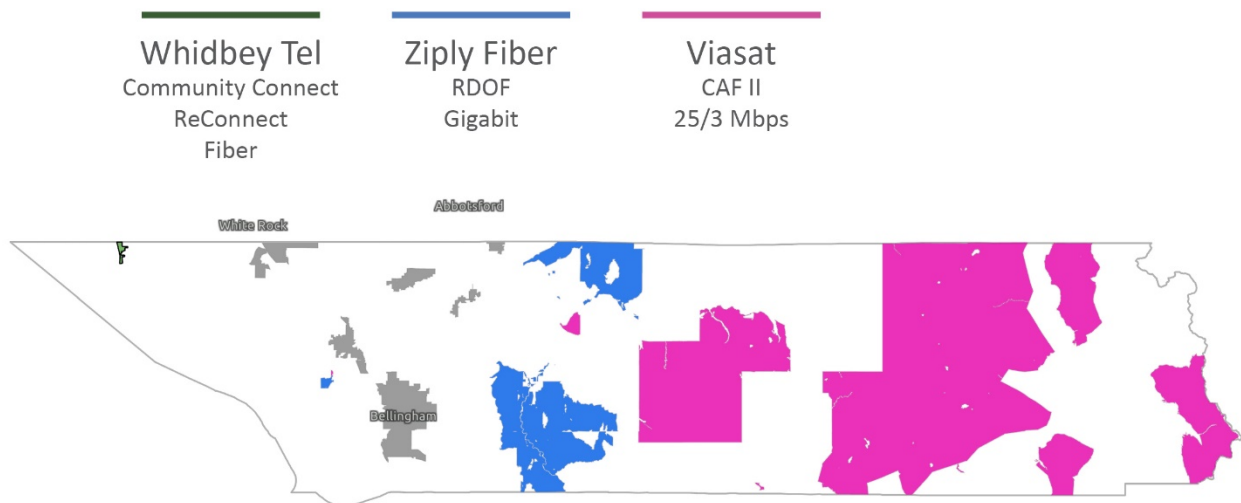
- Mandatory Progress Reports to the FCC
- Rates charged must be reasonably comparable to rates for similar services in urban areas.

The RDOF rulemaking gave companies until July 2021 to enter a contract with the FCC. One company has completed this milestone. A company under contract has until July 2027 to build out the awarded project area.

Unfortunately, a company that fails to build an awarded project area faces comparably insignificant penalties. The fines are calculated based on the average reserve subsidy a bidder won in the RDOF auction across the state, rather than the reserve subsidy for the specific census block. Therefore, a company faced with very high construction costs to reach the last few customers could opt to pay a fine to the FCC that is a small fraction of the cost to build to these customers. Such an example exemplifies the impact of the low FCC penalties in incentivizing providers to drop isolated sites.

This scenario could impact Whatcom County. Under RDOF Phase 1 rules, a winning provider could draw a large portion of its total subsidy while declining to serve a geographic footprint leaving the least populated areas stranded until the 2030s. Because these households and areas would appear on maps as “going to be served” based on RDOF, they would be ineligible for other sources of broadband funding to avoid overbuilding. Perversely, the higher reserve values assigned to these abandoned areas would end up subsidizing deployments in lower-cost, less remote areas that have been awarded to the provider. Petrichor Broadband reported these issues to the FCC during rulemaking comment periods prior to the finalization of the RDOF rules.

Federal funding areas in Whatcom County by company



Source: Federal Communications Commission

FIGURE 10: FEDERAL FUNDING AREAS IN WHATCOM COUNTY

Potential Network Design

Public utility districts and port districts in Washington State have been building telecommunications infrastructure since the 1999-2000 state legislative session. Originally, public entities were only allowed to sell wholesale services, but this has changed over time. Today, most municipalities can own and operate broadband networks and sell services in the retail space competing with the private sector. Port districts ([RCW 53.08.370](#)), public utility districts ([RCW 54.16.330](#)) and counties ([RCW 36.01.360](#)) have the authority in Washington State to build telecommunications infrastructure, and provide retail broadband service in addition to wholesale service.

Preliminary analysis suggests that fiber-to-the-premise (FTTP) offers the only solution that can achieve Washington State's goal of 100% coverage of high-performance broadband at speeds of 150 Mbps symmetrical by 2028. While capital costs for FTTP will be higher than other options, the operating costs

will be lower, and the useful life measured in decades. Fiber-based solutions frontload costs with high capital construction commitments. The revenues, on the other hand, build over time. The cost to provide fiber termination and related equipment for a customer seeking the lowest tier connectivity varies little from the cost of providing a gigabit connection. As the broadband services improve, the economic conditions of the region and the appetite for bandwidth will increase and revenues will rise. Such impacts may take a generation to fully play out.

A high-level network design identifies the type of infrastructure needed to deliver broadband services to the rural, unserved areas of Whatcom County. This includes the estimated cost, the coverage area of the build and potential revenue. The network design presented in this study does not include the incorporated city limits of served communities. The rural areas that make up the project area do not have access to 100/20 Mbps service and are defined as unserved at this time. The design compares to urban area infrastructure and market offerings. To meet or exceed the state's goals for broadband deployment by 2028, a fiber-to-the-home (FTTH) design was chosen to understand the maximum investment that could be made.

This study looks at two network designs and operating models that public entities use to operate municipal broadband systems:

- Model #1: A fiber to the premise network that is managed and operated by a public agency in Whatcom County selling retail broadband services to customers.
- Model #2: A fiber to the premise network that is managed by a contract operator that leases dark fiber to retail service providers that light their own network and sell retail services to customers.

Public Utility District No. 1 of Whatcom County contracted with the Northwest Open Access Network (NoaNet) to propose a network model, including a high-level network design, construction analysis and operation budget. This design is for a lit service network with a public agency in Whatcom County providing retail services to customers. NoaNet describes Model #1 below.

NoaNet Proposed Network Model (Model #1) – Retail Broadband Services

NoaNet's charter for this study was to evaluate a Fiber to the Home (FTTH) project for every residential and commercial subscriber in the identified serving territory and provide value to the county while maintaining financial viability for the public agency in Whatcom County providing retail services to customers.

The system model is a fiber-based passive optical network (PON) divided into three distinct "Service Zones" that delivers high-speed broadband with the capacity to serve the community at speeds more than 150 Mbps symmetrical and can support 10 Gbps services based on customer requirements. The financial model was derived from a service offering product to the subscriber at 1 Gbps symmetrical. Every subscriber will have access to these services through their provider, which in this case is a public agency in Whatcom County.

Traditionally, a Retail Service Provider (RSP) would have a physical and logical connection through the PON architecture deployed from this project, however in 2021, retail authority was granted to public utility districts and other governmental agencies, giving this study the ability to do a feasibility analysis of a retail product offering. The network deployment was divided into three service zones to allow phased deployment and grant/loan program applications. However, the Budget Summary as provided in *Attachment D* assumes the entire project is awarded simultaneously.

The proposed plan for the public agency-owned community telecommunications network is separated into three categories: Operating Revenues, Operating Expenses and Capital Projects. Each of these three categories is described below.

These categories are also further captured in the financial data, as shown in the following attachments:

- *Attachment E – Future State Grant Options*
- *Attachment F – Revenue Model Internal Operations*
- *Attachment G – Operations and Expense Model*
- *Attachment H – Network Recurring Expenses*

Fiber Network Design

The fiber network design provides connectivity to community subscribers and generally follows existing utility right of ways and would be deployed in a manner that would maximize the ability to extend to residential and commercial customers. The fiber network would comprise the backbone system that would provide the main transport systems and the distribution system that would connect individual properties. The core aggregation point is at an outdoor cabinet near the long-haul fiber carriers.

The fiber network would be deployed with conduit sizing and fiber counts that allow for the growth of services and connections as required. The proposed conduit is specifically selected to provide adequate breakout points and room to accommodate the deployment of additional fiber cable. The fiber network would have fibers sufficient to accommodate an aggregated fiber-to-the-premise network, dedicated point-to-point connections and support carrier/service provider connections as required. The system will enable the public agency owner/provider to take advantage of connectivity to support their internal services, both existing and planned.

The financial analysis divided the infrastructure into three categories: backbone, distribution and drop and then summarized between Homes Passed (HP) and Homes Activated (HA). This process was followed through each of the three services zones: East, North and West. In addition, capital categories include Electronics, Services Connections and various other expenses commonly seen in grant modeled projects. Each category of fiber optic systems is separated to manage the facilities' engineering, construction and deployment. The backbone constitutes the infrastructure associated with the high-capacity fiber counts to deliver connectivity to the service area. The distribution network

extends the backbone network closer to the consumer and prepares the network for the service drops. This actual connection goes either to the residence or the business.

Fiber Network Services

The service network or home category provides the customer premise electronics that connect back to the core network electronics located on a network aggregation site. Presently, this is designed to be a single site per zone, but dual sites could be established to accommodate redundancy. The proposed architecture will support both GPON and Active Ethernet deployments, with GPON as the primary service delivery mechanism for traditional residential and commercial subscribers.

GPON

The GPON system modeled can combine up to 32 customer fibers in the field utilizing a single fiber to the aggregation site. The system can provide end-users with Gigabit interfaces and provide varying levels of speeds and levels of service. The system is capable of 10 Gigabit capacity on the fiber. GPON systems efficiently create a large, shared bandwidth pool and are a superior technology for addressing residential and small business services. The network aggregation device would be proposed with redundant modules and connections into the router network to minimize service outages.

Active Ethernet

The Active Ethernet system utilizes a dedicated fiber linking each premise to the aggregation site. This system can provide full symmetrical line rates in increments of 100 Megabits per second, 1 Gigabit per second, and, if needed, upgraded to 10 Gigabits per second. Generally, Active Ethernet systems are deployed for commercial customers who require higher bandwidth than residential users. The customer premise electronics are predictably more expensive than GPON systems. This solution could serve as an add-on to the PON network for customers requiring these services.

Each system can address customers' requirements and be addressed in a detailed design. Depending on the service scenarios, a hybrid network consisting of GPON and Active Ethernet is possible. The Access Network can be deployed in a bandwidth-only wholesale model, where RSPs lease bandwidth from the public agency owner for their customers. In addition to the network electronics, infrastructure to support routing, security and operational management are required, as outlined below.

Routing and Security Network

The routing and security network provides the functionality to interconnect to the service providers and delivers the necessary security to protect the broadband network and, to a certain extent, the customers from outside threats/outages. A high availability router and firewall would be leveraged to provide adequate capacity for expansion. Routing and security require specialized skill sets to optimize and secure the infrastructure continually.

Network Operating Expense

The overall network operating expenses include the internal personnel time, outsourced firms, circuits and machinery necessary to implement and operate the network daily. Managing a broadband business for the PUD will require various skills and support systems. The associated expenses of these operations are outlined in the comprehensive budget documents included in *Attachment H – Network Recurring Expenses*.

Sales and Marketing Broadband Manager

Managing a broadband business for a public agency in Whatcom County will require full-time employee(s) for the foreseeable future. The personnel will act as the liaison between the customer and the public agency to ensure successful project management of the system and its service offerings. They will work closely with outsourcing agencies and internal staff to ensure customer acquisition, sales and marketing, execution of new services, network reliability and customer service are maintained at the highest level.

Revenues Assumptions

With this program, revenues to support the significant operational expenses of the network are critical to success. We modeled a 40% take rate due to the feedback received from the demand aggregation portion of this assessment. We anticipate that the first three-year market share will be aggressive, with subsequent years tapering off due to market saturation. We do not predict revenue shortfalls as the consumers have few alternatives to services in this area, minimizing churn.

Residential

The homeowners in the proposed service area are in high need of bandwidth capacity. Many consumers have little to no access to broadband and, therefore, no access to quality-of-life applications seen in more urban communities. In some locations, there is even an absence of cellular services. The model represents the expected initial take rate and four years after that.

Commercial

The marketplace consists of small to medium businesses that rely on broadband and access to the internet to support business operations. These businesses could include a point-of-sale organization, those that require access to the cloud and Internet of things solutions or generally require a more reliable service than what is usually seen in the residential marketplace. The model has no initial take rate.

High Cap Services

These services will occur when a commercial entity requires high-capacity bandwidth with service level agreements that support and require 100% uptime. These circuits are likely to be equal to or more than 1 Gig and generally are for longer terms than other less costly services. In rural communities, these services can occur with large industrial or technical firms, cell tower connections, schools, public safety organizations or government offices.

Budget Matrix

The service area has been divided into three distinct Service Zones to facilitate a phased network deployment and has three projects shovel ready for potential future funding opportunities.

The project expects a 40% adoption rate during the first three years of service. Each year after that 5% growth is anticipated. The revenues accrued annually take into consideration an initial take rate with modest growth.

Currently, the financial analysis also considers such items as churn, affordability programs and default payments. These appear as expenses in the O&M Model included in *Attachment G – Operations and Expense Model*. The overall revenues from non-recurring and monthly recurring revenue are represented in the roll up tab under Revenue Model.

The network expenses after initial construction consist of those items listed in the O&M model, including labor, network expenses, call center, operational outsourcing and debt service. These are also summarized in the budget summary; however, the project sees a reduction in expenditures as the project starts.

Operating Revenues

The operating revenues are separated between Residential, Commercial, Commercial Fiber and High-Capacity Customers. Each customer type has a different monthly fee associated with their service, with Commercial Fiber and High-Capacity Customers having the additional advantage of a Service Level Assurance, for an additional higher fee. The entire project, however, is based on a residential revenue basis due to the rurality of the locations studied.

The revenue values come from a 3-year acquisition period to obtain 40% for the market. Once the third year is completed, new customers are expected to increase by five percent annually. Additional revenues come from a Line Extension fee applied to all new customers; this amount increases upon completion of the grant cycle.

Operating Expenses

The operating expenses are a mixture of a number of items, including internal personnel, outsourced services, wholesale internet, pole attachments, contractor support, marking and sales and various technical support services. With the initial build out taking approximately three years, the growth of these expense occurs over time, and eventually increases to their full amount by year 3 of the project in 2025. These expense categories can be extended further into the future depending on when the build out starts and eventually is completed. Internal labor makes up the majority of the operating expenses, with pole attachments, capital repair and network management coming in moderately lower.

Capital Projects

This category captures financial contributions to the network from grant programs and customer line extension fees. The initial build out is projected to be a 90% grant 10% match model, with the match

coming from outside contributions. This model allows for new connection costs to the consumer to be deferred. Once the project is completed, new customers would be expected to contribute a line extension fee to help fund the project's future connections to the PON network previously discussed.

Capital Expenditures Summary

Calculation Information

Area Name	Whatcom PUD WSBO
Design Rules	Whatcom Financials July 2022
Number of Homes Activated	808
Number of Homes Passed	2019

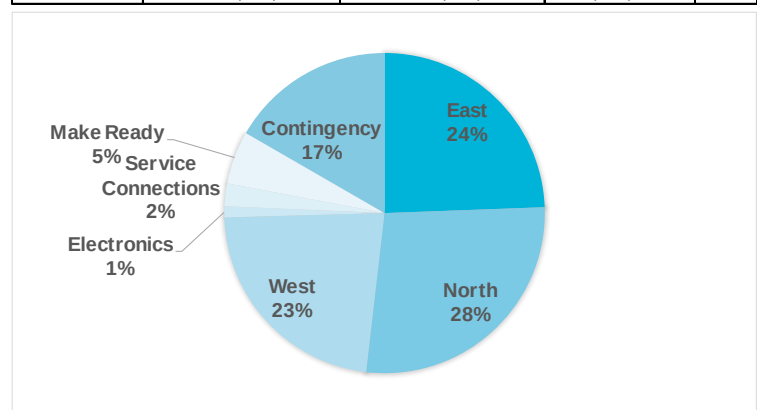
Service Connections	808
Price to Install	\$450
Equipment to Install	\$245
Total	\$695

Make Ready	\$1,319,200.00
Contingency	20%
Design	10%
Project Management Grant Complie	3%

Poles	
East	1267
North	1022
West	1009
Cost Per Pole	\$400

Cost Breakdown

	HP	HA	Total	%
East	\$4,722,430.75	\$1,281,840.00	\$6,004,270.75	24%
North	\$4,703,272.38	\$2,040,698.00	\$6,743,970.38	27%
West	\$3,445,857.88	\$2,144,302.50	\$5,590,160.38	23%
Electronics	\$276,693.45	\$0.00	\$276,693.45	1%
Service Connect	\$0.00	\$561,282.00	\$561,282.00	2%
Make Ready	\$1,319,200.00	\$0.00	\$1,319,200.00	5%
Contingency	\$2,893,490.89	\$1,205,624.50	\$4,099,115.39	17%
Design	\$1,314,825.45	\$602,812.25	\$1,917,637.70	8%
Proj Management	\$434,023.63	\$180,843.68	\$614,867.31	3%
Total Cost	\$17,360,945.35	\$7,233,747.00	\$24,594,692.35	100%



Lit Model Proforma Budget Summary

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Operating Revenues	0	255,315	452,768	640,706	612,763	641,352	690,146	710,722	731,297	751,873	772,449
Construction Revenues	0	0	0	0	27,800	27,800	17,375	17,375	17,375	17,375	17,375
Operating Expenses	(66,000)	(135,329)	(529,626)	(605,224)	(642,979)	(661,914)	(682,051)	(701,622)	(721,734)	(742,405)	(763,650)
Cash from Operations	(66,000)	119,986	(76,858)	35,482	(2,416)	7,238	25,470	26,475	26,938	26,843	26,174

Model #2 Dark Fiber Network Model– Wholesale Fiber Leasing

Fiber Network Design

The fiber network design is very similar to the first model in that it provides connectivity to community subscribers and generally follows existing utility right of ways and would be deployed in a manner that would maximize the ability to extend to residential and commercial customers. The fiber network

would comprise the backbone and distribution system consisting of a “home run fiber” that connects individual properties to aggregation points. The aggregation point could be a facility or an outdoor cabinet leading back to long haul fiber that service providers use to enter the network. This system would be open access allowing companies to compete for customers. The “home run” configuration of the network allows any company competing to reach any premise by connecting the “home run” fiber from the premise back to the aggregation point onto their network.

The fiber network would be deployed with conduit sizing and fiber counts that allow for the growth of services and connections as required. The proposed conduit is specifically selected to provide adequate breakout points and room to accommodate the deployment of additional fiber cable. The fiber network would have fibers sufficient to accommodate an aggregated fiber-to-the-premise network and dedicated point-to-point “home run” connections.

For a comparison to model #1, the financial analysis uses the same homes passed and homes activated as model #1. Model #2 also uses the same capital costs as model #1, and the electronics to light the system are only 1% of the budget. The significant difference in the two models can be found in the operating budget under the install fees to customers, a monthly reoccurring cost for services.

Model #2 pays 15% of gross revenue to a contract company to manage the dark fiber system. Revenue on the system is generated by leasing dark fiber to retail service providers who light their own network and provide services to end users. The PUD charges \$20.00 per month per customer to the retail service provider to use the system. Installation fees would be between the retail provider and the customer. Dark fiber systems currently operating in Washington State owned by municipal entities and managed by Petrichor have multiple companies providing services on the network. It is common to see companies offering 1 Gbps service for \$75.00 per month with no install fee.

TABLE 4: MODEL #2 FINANCIALS

Segment	Construction Cost Estimate	Passings
	\$	
Whatcom PUD Project Area	27,265,553	2019
	\$27,265,553	2,019

Segments	Subscribers	Number of Strands	Run Length (miles)	Monthly Fee	Gross Annual Revenue
Whatcom PUD Project Area	1010			\$20.00	\$242,280.00
				\$20.00	\$0.00
				\$20.00	\$0.00
				\$20.00	\$0.00
				\$20.00	\$0.00

				\$20.00	\$0.00
				\$20.00	\$0.00
				\$20.00	\$0.00
				\$20.00	\$0.00
Totals					\$242,280.00

Operating Expenses

Expense	Unit Cost	Units	Quantity	Total Cost
Management Fees				\$36,342.00
Pole Attachment Fees	\$25.00	per pole	3500	\$87,500.00
One Call System and Locate Fees	\$15.00	per mile	55	\$9,877.50
Total Annual Expenses				\$133,719.50

Other financial information for Model #2 is captured in the following budget attachments:

- *Attachment I – Construction Estimate*
- *Attachment J – Balance Sheet*
- *Attachment K – Cash Flow Projection*
- *Attachment L – Income Statement*

Sales and Marketing Broadband Manager

Operation of the network is contracted to a company. Retail providers who lease the dark fiber provide marketing and manage their own networks.

Management Plan

Model #2 is a traditional fiber plant that demonstrates the services that Petrichor Broadband offers to clients.

Contract Operating Structure

Six ports in Washington State formed Petrichor Broadband, LLC to help communities realize their goals of urban rate services in rural communities (*Attachment M - Petrichor Broadband Introduction*). Petrichor Broadband was formed under the authority of the Interlocal Cooperation Act (RCW 39.34.030) to jointly provide wholesale telecommunications facilities. Its collective goals include enabling communication services to unserved or underserved areas; creating economic opportunities, including sustainable community wage jobs; consolidating administrative and operating functions for efficiency; reducing administrative layering; and reducing administrative costs, to the extent consistent with the State of Washington's legislative policy as set forth in RCW 53.08.370.

Petrichor Broadband brings together a collective experience of over 20 years work on broadband policy and the construction of broadband infrastructure. Petrichor Broadband currently manages fiber systems

for public entities such as tribes, counties, and ports in Washington State. As part of the agreement for operations and management, Petrichor would provide the following services:

- (1) Fiber and facility mapping, including cut sheet documentation.
- (2) One-Call management services.
- (3) An option to contract for locate services in accordance with standards in the industry.
- (4) Emergency restoration management in accordance with standards in the industry.
- (5) Review of construction design.
- (6) Oversight of Network Operations Center (NOC) contracted services; and
- (7) Management of service order summaries with providers (Figure 11).

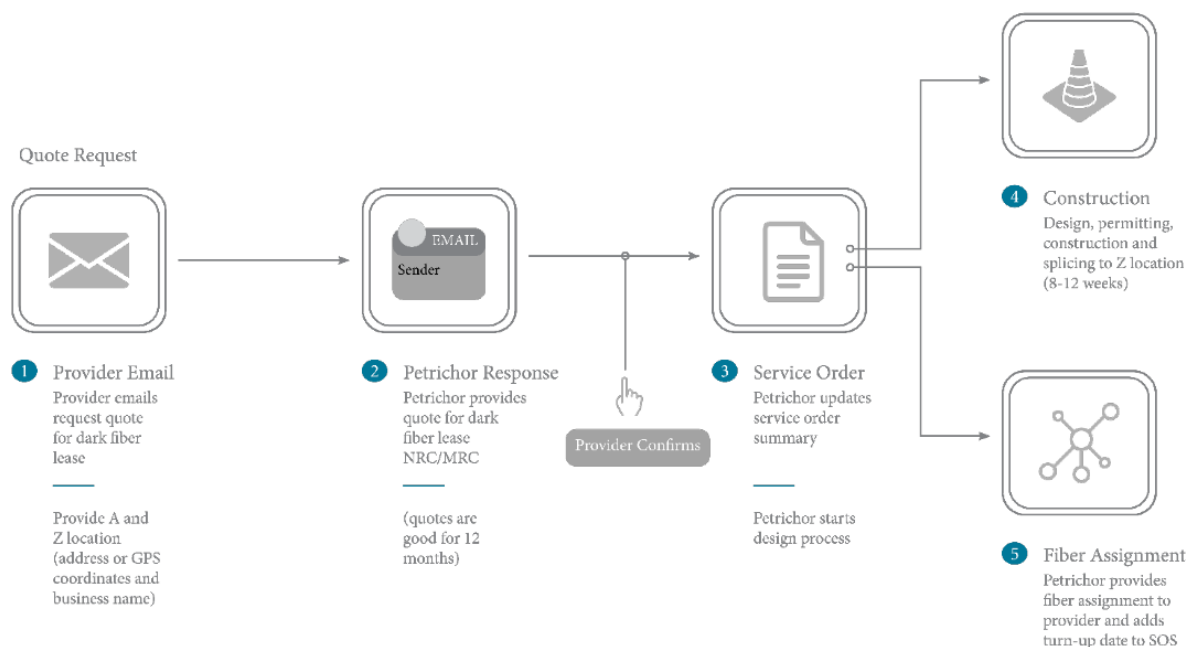


FIGURE 11 FIBER MANAGEMENT WORKFLOW

The Owner would be responsible for the administration of billing and collection; and the collection and remittance of applicable taxes as directed by the State of Washington (*Attachment N - Sample Agreement for Fiber Management Services*). The costs associated with these services are 15% of the Owner's gross revenues.

If selected to manage the fiber construction project, Petrichor shall provide the following services for the Project:

- (1) Design process overview and recommendations;
- (2) Assistance with permitting, pole contact agreements, and franchise acquisition;
- (3) Invitation to bid documents and process management;

- (4) Construction oversight;
- (5) Mapping of the project as-built;
- (6) Public outreach guidance as needed; and
- (7) On-site meetings or visits as required.

A sample agreement for these services is shown in *Attachment O - Sample Agreement for Construction Oversight Services*. The cost for these services would be negotiated depending on the timeline of the project and the execution of a fiber management contract.

Proforma Budget Summary

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Operating Revenues	0	63,962	128,644	192,606	202,297	211,988	229,392	236,196	243,000	249,804	256,608
Construction Revenues	0	0	0	0	0	0	0	0	0	0	0
Operating Expenses	28,000	84,684	128,202	153,431	157,840	162,323	168,037	172,239	176,519	180,880	185,324
Cash from Operations	(28,000)	(20,722)	442	39,175	44,457	49,665	61,354	63,957	66,481	68,923	71,283

In summary, the dark fiber system creates more revenue for the public owned fiber asset than the lit fiber model. The lit fiber retail service model involves creating and managing a telecommunications business. It involves hiring professional staff and servicing a retail product. While it is projected to make a small profit by the year 2033, the electronics in the system will need to be upgraded by this time, and there is no revenue to support these upgrades. Standing up a retail broadband service and only building to rural, low-population-based, unserved customers is infeasible. The retail provider must compete in the urban markets of Whatcom County to cashflow the lit fiber model. Even fulling supporting the lit fiber model by capitalizing the retail business with grant dollars, the business does not appear to be sustainable in the rural market.

Within the dark fiber model, the public sector builds telecommunications infrastructure to serve unserved constituents in Whatcom County, capitalizing the majority of the build with grant dollars. The cost of operating the network and staffing a retail service is placed in the hands of private sector companies competing for customers. The low overhead of operating dark fiber assets is left to the public entity. Maintenance of the outside plant is the primary cost associated with this business model.

If the public sector wishes to further decrease risk, an IRU for maintenance of the publicly-owned, dark fiber model could be considered.

If a public agency in Whatcom County decided to discuss contract terms for an IRU, it would enter negotiations with a telecommunications service provider to select a project area. After choosing a project area, the agency would work with the telecommunications service provider to design, build and maintain the necessary telecommunications infrastructure for a term that follows the funding agency rules, if applicable. This gives the agency certainty the project will come in at cost and be maintained for the contract terms of the grant obligations without the complexity or risks involved with starting a telecommunications enterprise inside Whatcom County PUD.

Petrichor Broadband recommends the IRU terms include an open-access component. An open-access system allows any company competing to sell services to use the infrastructure built by the IRU in a non-discriminatory manner. Therefore, constituents in Whatcom County will have choices when it comes to their internet service.

There are two models within the IRU structure that this system could utilize.

A public agency in Whatcom County could build the necessary infrastructure for companies to use in delivering services. This eliminates the long-term return-on-investment (ROI) that inhibits private sector investment in rural areas. The agency could choose a model in which the IRU terms dictate the contracted company will light the fiber and operate a network in which competing companies purchase a finished service from the IRU provider and resell this service to its customers. Conversely, the agency could select a dark fiber model in which each individual company lights its own network and sells services to its customers. There are advantages and disadvantages to each of these models.

Considering the overarching goal – to bring broadband services to rural, unserved areas of Whatcom County – Petrichor Broadband recommends building out infrastructure, where feasible, that gives companies a choice between lit and dark fiber to offer services.

Dark Fiber Model

When available, the dark fiber model offers:

- Control of the network to the company leasing the fiber, allowing companies to offer service-level agreements to customers
- A broad ability to distinguish and differentiate services from competitors
- In this model, the private sector competes to sell services, while investing in employees and equipment to grow their businesses in these rural communities. However, this poses a higher cost to entry for a company than a lit model.

Lit Fiber Model

When available, the lit fiber model offers:

- Lower cost to entry for competing providers as they do not purchase network equipment or necessarily need staff to run a network
- Ability to differentiate services by offering value-added services and products
- Typically, lowers the overall cost of network up to 15%

In either model, the first consideration retail providers will address as they consider entering a market is how to create revenue by introducing new revenue streams, differentiation strategies and innovation. Having readily available fiber to use allows providers to differentiate their services and attract customers. Today, increasing numbers of larger and smaller communications providers are expanding their revenue sources to better serve their customers' needs for always-on connectivity. For example, service providers are developing premium content packages with content partners, based on the interests of their target audience. Customized services can be offered to target customer groups, such as work-at-home professionals and gamers who are willing to pay for very high-performance symmetry,

latency and uptime. This allows service providers to differentiate their services from competitors while staying ahead of new developments in technology.

Communications providers have typically viewed costs exclusively in terms of capital expenses (CapEx) and operating expenses (OpEx). However, many are now realizing that cost models should not only focus on getting the network in place and passing homes or businesses but also factor in the cost and speed of making individual connections. In a rural area, having the fiber plant already constructed saves time and money for the private sector to deploy. The costs of offering services, equipment, labor, permissions, maintenance and power also need to be considered. Retail providers will consider the total cost of ownership (TCO). Although initially, it might appear to make sense to minimize CapEx when making a buying decision, a high OpEx could negatively impact the profitability of the overall operation. Organizations that see success budget for other factors influencing the overall outcome and are optimized for the future network lifecycle. Many public entities leasing dark fiber have experienced the benefits and economic impacts of having multiple retail providers expand services with competitive pricing in their communities by creating an infrastructure model that works for the retail providers in their CapEx/OpEx modeling.

Risks associated with these models are minimal. The infrastructure is futureproof, and currently, there are no limits to the capacity for fiber. Both models have been employed statewide, and providers in the region have built successful business plans utilizing this type of infrastructure. Termination of fiber leases in other areas have been rare and with a rare exception, a new lease is signed by a competing provider before the cancellation is received. Current risks to be mitigated include the lead time on fiber and materials. At the time of this report, fiber lead times are six to nine months, depending on cable size. It is anticipated that fiber construction across the country will continue over the next several years and increase the demand for both materials and labor.

[Assessment of Municipal Procedures, Policies, Rules, and Ordinances](#)

The most common franchise fees and agreements are between cable TV providers and wireless service providers. In these cases, a fee may be charged for use of the city's right-of-way. Cable franchise fees are governed by the FCC. The franchise fee for cable utilities is limited to five percent. The franchise fee differs from the utility taxes a city may impose on utilities. Note the language of [47 USC 542\(g\)\(2\)\(A\)](#), which states (emphasis added):

"The term 'franchise fee' does not include, any tax, fee, or assessment of general applicability including any such tax, fee, or assessment imposed on both utilities and cable operators or their services but not including a tax, fee, or assessment which is unduly discriminatory against cable operators or cable subscribers."

Whatcom County Municipal Code stipulates conditions of franchise agreements. These include, but are not limited to:

- Ord 1996-005 Franchise Agreement
- Ord 2021-031 Wireless Telecommunications Services
- Ord 2014-040 Franchise Agreement
- Ord 2011-044 Franchise Agreement

The County also has a Franchise Agreement Application (*Attachment P*).

Digital Inclusion

In Whatcom County, various entities are working on digital equity and inclusion efforts, including the Bellingham Public Library, Whatcom County Library System, Goodwill and Technology Alliance Group for Northwest Washington (TAGNW). As previously mentioned, TAGNW currently has two community groups, TAG Digital Literacy Group led by the Bellingham Library Director and the TAG Connectivity group led by local community members. Both groups are designed to provide platforms and gathering spaces for community members and local practitioners to come together and share efforts.

Affordable Internet

Affordable internet is one of the services offered by Goodwill Connect, a statewide collaboration of all the independent Goodwills in Washington to increase digital equity by offering free digital skills training, devices and broadband connectivity in partnership with the Washington State Broadband Office. Evergreen Goodwill of Northwest Washington, which includes the Bellingham store, is one of participating locations.

Other benefits of the program include:

- Personal help using a computer or digital services
- Tech support
- Finding a computer or device
- Building computer skills

Community members can call 1-844-GWCONNECT to see if they qualify for services.

Affordable Equipment

TAGNW offers a program in which the organization collects used computers and laptops from local businesses and government agencies and distributes them to local schools, as well as students enrolled in area community colleges.

Digital Literacy Training

The Bellingham Public Library offers basic technology assistance at their public computers during all open hours at all three locations. In addition, they offer one-on-one technology coaching at the Central Library one day per week.

Prior to the COVID-19 pandemic, some branches of the Whatcom County Library System connected the public with staff or volunteer tech tutors to work one-on-one. They hosted a variety of tech-related programming that included topics from internet safety and digital literacy to "How to Download eBooks" and more.

The library system has a partnership with LAW Advocates through which they provide people with internet access to connect with an attorney without driving into Bellingham.

Their ConnectED program provides every K-12 student in Whatcom County with a library account, and their staff visits schools to show students how to download eBooks and other resources to their devices to use offline when at home.

The Ferndale and Lynden libraries have TTY and video software to allow deaf or hard of hearing patrons to communicate with others and magnification machines for the visually impaired. They also have microfilm reader/printers, which allow people to look at records that may be on microfilm or microfiche, such as veteran's records.

In addition, the Goodwill Tech van visits the Whatcom County branch libraries, bringing technology classes to the local communities. Its mobile classroom brings computer classes, workforce development programs and wraparound support services directly to people in rural and historically under-resourced communities across Northwest Washington.

Goodwill is currently offering English to Speakers of Other Languages (ESOL) classes in Maple Falls and Everson. They integrate the use of technology into all ESOL classes through a partnership with the East Whatcom Regional Resource Center (EWRRC), Nooksack Valley School District and A Watered Garden.

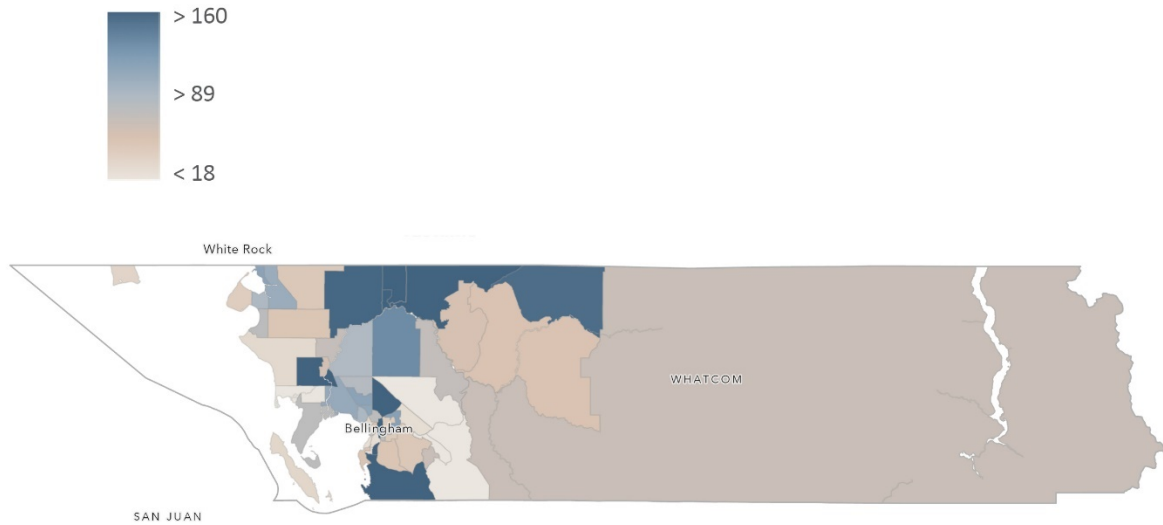
Most participants in the Maple Falls (East Whatcom Regional Resource Center) classes are Ukrainian Refugees, and the majority of participants in the Everson classes are farm workers.

They also offer employment workshops to Mount Baker School District students in partnership with the Mount Baker Community Coalition. In addition, they offer case management workshops to farm workers in the Everson area. The focus of the workshops is to show people how to safely search for resources online.

Public Computer Access

The Whatcom County Library system provides computer access at branches throughout Whatcom County accessible during business hours. Pogozone, a regional internet service provider in Whatcom County, offers WiFi hotspots in public areas in the Sumas region, along with WiFi supporting community events in Whatcom County. Comcast, a regional cable TV provider, provides free public internet access in "lift zones." One of these facilities is located at Light House Mission in Bellingham. Lift zones help people who may need a place to access online education, healthcare and employment resources. Lift zones partner with community centers that supply computers and other technology devices for use.

Households with no computer in Whatcom County



Source: American Community Survey

FIGURE 12: HOUSEHOLDS WITHOUT A COMPUTER IN WHATCOM COUNTY

Vision Statement

The Port-PUD broadband steering committee formed the following vision statement to guide their work to advance access to high-speed internet service in Whatcom County:

“To build open access fiber networks in order to provide broadband service to community members in Whatcom County who are currently unserved and underserved”

The committee’s other objectives include:

- Rapid deployment of broadband infrastructure to areas that are currently unserved and underserved
- Affordable Internet services to homes, business, education, and other use
- Competitive, open-access internet networks that give customers choices
- Accountable and fiscally responsible stewardship of public resources
- Collaboration and partnership with stakeholders

Financial Commitment and Budget

The longer return on investment associated with building telecommunications infrastructure in rural areas is the chief reason hindering private investment. Without significant federal or state funding, there is no business case with a reasonable return on investment for the FTTP infrastructure needed in Whatcom County.

Potential Funding Sources

Federal Level

The need for higher bandwidth to homes and businesses in the United States grew substantially during COVID-19. Overnight the level of service required outpaced the legacy federal funding programs that were put in place for broadband adoption in high-cost areas. According to the FCC's Household Broadband Guide,⁶ homes with more than one high-demand application running at the same time now need more than 25 Mbps.

In response to the pandemic, Congress passed two major pieces of legislation: on March 11, 2021, the American Rescue Plan Fiscal Recovery Funds Program (ARPA), and on November 15, 2021, the Infrastructure Investment and Jobs Act (IIJA). Final rules for these programs raise broadband speeds at the federal level from 25/3 Mbps to 100/20 Mbps to qualify for funding. Below are some of the excerpts from the final rulemaking that apply to broadband funding from these pieces of legislation.

State Level

Since 2021, the Washington State Capital budget received significant funding from the federal government for broadband infrastructure deployment, programs to subsidize broadband services to low-income constituents in Washington State and funding to start a digital equity and inclusion office within the State Department of Commerce. Public entities are eligible to apply for grants and loans through the Community Economic Revitalization, Public Works Trust Fund Board and the Washington State Broadband Office. These funds are largely intended for unserved regions of the state.

American Rescue Plan Fiscal Recovery Funds Program (ARPA)

This money has flowed through Washington State primarily to counties to be administered by county commissioners. This money can be used as matching money for the second major piece of legislation passed by Congress, the Infrastructure Investment and Jobs Act (IIJA). Two components of the IIJA are the Digital Equity Act and the Broadband Equity, Access, and Deployment (BEAD) Program.

Infrastructure Investment and Jobs Act (IIJA)

The IIJA passed on a bipartisan basis and includes \$2.75 billion to create the Digital Equity Act and \$42.45 billion to create the BEAD Program. These pieces of legislation fund programs administered by the Washington State Department of Commerce Broadband Office. While the Digital Equity Act works to enhance broadband adoption through digital literacy programs primarily, the BEAD program focuses on deploying broadband infrastructure to unserved and underserved areas. The IIJA also requires broadband providers to have a low-cost option to provide broadband services and has provided \$14

⁶ [FCC Household Broadband Guide](#)

billion in subsidies for low-income households. The Affordable Connectivity Program (ACP) expands and makes permanent the temporary Emergency Broadband Benefit (EBB) program. Under the ACP, providers will receive \$30 per month to provide discounted broadband services to low-income households (tribal lands and “high cost” areas will receive \$75 per month). This program could allow providers to essentially deliver broadband services to constituents in Whatcom County at no cost if they qualify for the subsidy.

Key Documents/Existing Efforts

Currently in Whatcom County there are three fully funded broadband projects. The Port of Bellingham was successful in securing funding from Whatcom County Economic Development Investment Program, CERB and WSBO to fund fiber to the home projects in East Nooksack, North Mosquito Lk Rd, North Lynden and North Ferndale. Collectively, the projects will extend 122 miles of fiber and provide access to service for 1,831 homes and businesses. The East Nooksack project is currently hanging fiber and is anticipated to complete in early 2023. The North Ferndale and North Lynden projects are scheduled to start in 2023. All three network projects are designed to be open access, lit networks with local ISPs providing the lit services on behalf of the Port.

Potential Community Anchor Institutions and Businesses

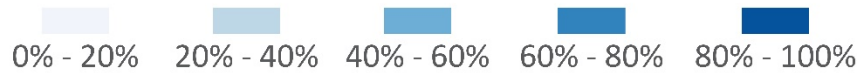
Libraries

Whatcom County has two library systems, the Whatcom County Library System and the Bellingham Public Library system. Whatcom County has eight library locations and one book mobile library. The county locations include Birch Bay, Blaine, Deming, Everson, Ferndale, Lynden, North Fork and Sumas. At the time of writing this report, the Sumas location was closed due to the recent Nooksack River flooding, and that community was being served by the book mobile library. All of the locations have WiFi service inside and outside of their facilities, and they extended their signals to ensure coverage over a large section of their parking lots. In many cases, their WiFi is on 24/7; however, due to security concerns in some communities, they had to turn off the WiFi in the late evening.

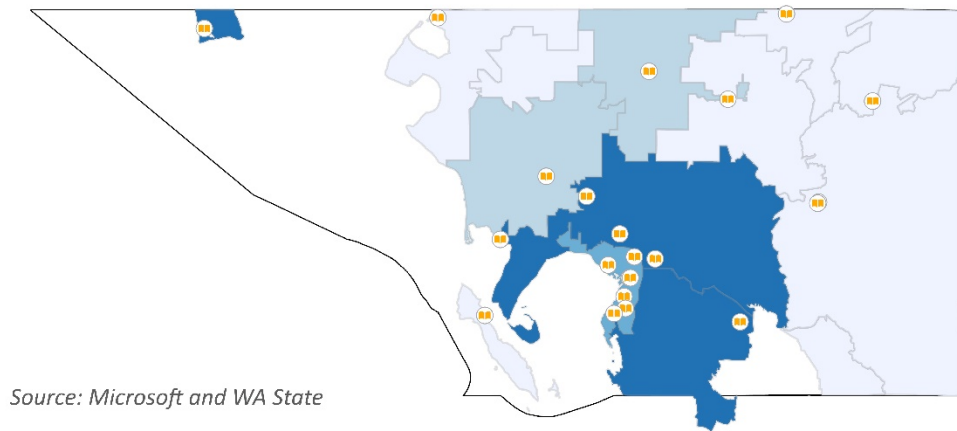
The Bellingham Public Library System has three locations: Central, Fairhaven and Barkley. All of these locations have free WiFi in their facilities. They also added additional wireless access points at their central location for better coverage in the immediate area outside of the building during the pandemic. In addition, they added a Wireless Access Point at their Fairhaven location to obtain coverage in their parking lot area. They were not able to replicate this at their Barkley location because they did not own the building. During the pandemic, the library system also implemented their own wireless hotspot lending program.

Microsoft broadband usage data & Library Locations

% who use the internet at broadband speeds



 Library Locations



Source: Microsoft and WA State

FIGURE 13: MICROSOFT BROADBAND USAGE LAYERED ONTO MAP OF WHATCOM COUNTY LIBRARIES

Library Branch	Address	City	Zip Code
Whatcom Community College	237 W Kellogg Rd	Bellingham	98226-8003
Bellingham Technical College Library	3028 Lindbergh Ave	Bellingham	98225-1599
Western Washington University	516 High St.	Bellingham	98225-5946
WWU Music Library	516 High St	Bellingham	98225-5946
Whatcom County Law Library	311 Grand Avenue, Suite B6	Bellingham	98225-4038
State Archives, Northwest Regional Branch	Western Washington University	Bellingham	98225-9123
Whatcom County Library System	5205 Northwest Dr	Bellingham	98226-9050
South Whatcom Library	10 Barn View Ct	Bellingham	98229
Bellingham Public Library	210 Central Avenue	Bellingham	98225
Fairhaven Branch	1117 12th Street	Bellingham	98225

Barkley Branch	3111 Newmarket Street, Suite 103	Bellingham	98226
PeaceHealth St. Joseph Medical Center Library	2901 Squalicum Pkwy	Bellingham	98225-1851
Lummi Library	2522 Kwina Rd	Bellingham	98226
Blaine Library	610 3rd St	Blaine	98230-4022
Deming Library	5044 Mt Baker Hwy	Deming	98244-0357
Nooksack Tribal Library	5016 Deming Road	Deming	98244-5291
Everson McBeath Community Library	104 Kirsch Dr	Everson	98247-0250
Ferndale Public Library	2125 Main Street	Ferndale	98247
Island Library	2144 S Nugent Rd	Lummi Island	98262-0090
Lynden Public Library	216 4th St	Lynden	98264-1980
North Fork Community Library	7506 Kendall Rd	Maple Falls	98266
Point Roberts Library	1431 Gulf Rd	Point Roberts	98281-0970
Sumas Public Library	461 2nd St	Sumas	98295-0215

Fire Districts

Whatcom County has 12 fire districts and one South Whatcom Fire Authority. Each fire district has its own Fire Chief. The districts include:

- [Fire District 1](#) (Everson, Nooksack, Deming and the Nooksack Indian Tribe)
- [Fire District 4](#) (Britton Road, Agate Bay, and Van Wyck)
- [Fire District 5](#) (Point Roberts)
- [Fire District 7](#) (Ferndale, North Bellingham, and Point Whitehorn)
- [Fire District 8](#) (Marrietta and Gooseberry Point)
- [Fire District 11](#) (Lummi Island)
- [Fire District 14](#) (Sumas, Kendall, and Welcome)
- [Fire District 16](#) (Acme, Wickersham, and Vanzandt)
- [Fire District 17](#) (Sandy Point)
- [Fire District 18](#) (South Lake Whatcom, Glenhaven, and South Bay)
- [Fire District 19](#) (Glacier Fire and Rescue)
- [Fire District 21](#) (North Whatcom Fire and Rescue)
- [South Whatcom Fire Authority](#) (Formerly District 2, 6, 9, 10) (Lake Whatcom, Sudden Valley, Lake Samish, Chuckanut and Yew Street Road)

All of the North Whatcom Fire and Rescue stations have fiber optic connections, with the exception of the station located at 3401 Haynie Rd, which does not have fiber and is considered an unserved area. They require improved mobile connectivity for their mobile data terminals and electronic patient care reporting tool to function properly.

Microsoft broadband usage data & Fire Stations

% who use the internet at broadband speeds

0% - 20% 20% - 40% 40% - 60% 60% - 80% 80% - 100%

 Fire Stations

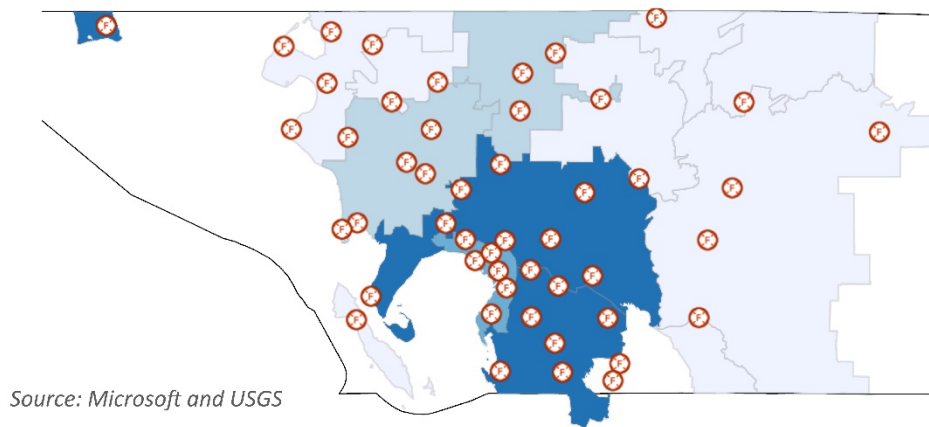


FIGURE 14: MICROSOFT BROADBAND USAGE LAYERED ON MAP OF FIRE DISTRICTS IN WHATCOM COUNTY

Fire District Name	Address	City	Zip Code
Whatcom County Fire District 16	2036 Valley Highway	Acme	98220
Whatcom County Fire District 8 Station 34	2600 MacKenzie Road	Bellingham	98225
Whatcom County Fire District 8 Station 31	2913 Bennett Drive	Bellingham	98225
Whatcom County Fire District 4 Station 11 - Agate Bay	3131 Y Road	Bellingham	98226
Bellingham Fire Department Station 1	1800 Broadway	Bellingham	98225
Whatcom County Fire District 4 Station 12	4142 Britton Loop Road	Bellingham	98226
Whatcom County Fire District 8 Station 33	4519 Curtis Road	Bellingham	98225
South Whatcom Fire Authority Station 16	2095 Yew Street Road	Bellingham	98226
North Whatcom Fire and Rescue Station 69 Laurel	6028 Guide Meridian Road	Bellingham	98226
South Whatcom Fire Authority Station 22	2050 Lake Whatcom Boulevard	Bellingham	98229
South Whatcom Fire Authority Samish Way Fire Station 28	5070 Samish Way	Bellingham	98229-8963

South Whatcom Fire Authority Station 29	705 West Lake Samish Drive	Bellingham	98229
Whatcom County Fire District 7 Station 43 North Bellingham	5386 Northwest Drive	Bellingham	98226
South Whatcom Fire Authority Fire Station 21	4518 Cable Street	Bellingham	98229
Whatcom County Fire District 18 Station 18	686 Chuckanut Drive	Bellingham	98226
Bellingham Fire Department Fairhaven Hose Company 2	1590 Harris Avenue	Bellingham	98225
Bellingham Fire Department Station 3	1111 Billy Frank Junior Street	Bellingham	98225
Bellingham City Fire Department Station 4	2306 Yew Street	Bellingham	98225
Bellingham City Fire Department Station 5	3314 Northwest Avenue	Bellingham	98225
Bellingham City Fire Department Station 6	4060 Deemer Road	Bellingham	98225
Whatcom County Fire District 7 Station 45 Enterprise	1886 Grandview Road	Bellingham	98248
Bellingham Airport Aircraft Rescue and Fire Fighting Station	2005 West Bakerview Road	Bellingham	98226
Whatcom County Fire District 4 Station 13	2308 East Smith Road	Bellingham	98226
North Whatcom Fire Rescue Station 62 Semiahmoo	9001 Semiahmoo Parkway	Blaine	98230
North Whatcom Fire Rescue Station 63 Birch Bay	4581 Birch Bay Lynden Road	Blaine	98230
North Whatcom Fire and Rescue Station 65 Haynie	3401 Haynie Road	Blaine	98230
North Whatcom Fire and Rescue Station 61 Blaine	9408 Odell Road	Blaine	98230
North Whatcom Fire and Rescue Station 64 Custer	7625 Custer School Road	Custer	98240
Whatcom County Fire District 14 Station 93 Welcome	5640 Mosquito Lake Road	Deming	98244
Whatcom County Fire District 16 Station 87	5491 Potter Road	Deming	98244
Whatcom County Fire District 1 Station 81	101 East Main Street	Everson	98247
Whatcom County Fire District 1 Station 82	5664 Lawrence Road	Everson	98247
Whatcom County Fire District 7 Station 42 Brown Road	4047 Brown Road	Ferndale	98248
Whatcom County Fire District 7 Station 44 - Birch Bay	5491 Grandview Road	Ferndale	98248
North Whatcom Fire and Rescue Station 68 Delta	8188 North Enterprise Road	Ferndale	98248
Whatcom County Fire District 17 Sandy Point Heights	3685 Prevost Way	Ferndale	98248
Whatcom County Fire District 17 Sandy Point	4332 Sucia Drive	Ferndale	98248
Whatcom County Fire District 7 Station 41 Headquarters	2020 Washington Street	Ferndale	98248

Whatcom County Fire District 7 Station 46 Church Road	6081 Church Road	Ferndale	98248
Whatcom County Fire District 19 Glacier Fire and Rescue	9953 Mount Baker Highway	Glacier	98244
Whatcom County Fire District 11 Lummi Island Volunteer Fire Department	3809 Legoe Bay Road	Lummi Island	98262
Lynden Fire Department	215 4th Street	Lynden	98264
North Whatcom Fire and Rescue Station 72 Northwood	1507 East Badger Road	Lynden	98264
North Whatcom Fire and Rescue Station 70 - Wiser Lake	633 East Wiser Lake Road	Lynden	98264
Whatcom County Fire District 14 Station 92 Kendell	7528 Kendall Road	Maple Falls	98266
Whatcom County Fire District 5	2030 Benson Road	Point Roberts	98281
Newhalem / Diablo Volunteer Fire Department	Diablo Street	Rockport	98283
Whatcom County Fire District 18 Station 26	431 Cain Lake Road	Sedro - Woolley	98284
Whatcom County Fire District 18 Fire Station 25	3250 South Bay Drive	Sedro Woolley	98284-9547
Whatcom County Fire District 14 Station 91 Sumas	143 Columbia Street	Sumas	98295

Police Departments

Each of the municipalities in Whatcom County has a police department that has a broadband connection. The Whatcom County Sheriff's Office has broadband connections in their brick-and-mortar locations but experience difficulty with communications in rural areas servicing emergency calls and providing essential services to community members through wireless connections. Law enforcement in Whatcom County has been supportive of grant writing efforts for broadband infrastructure writing letters of support. The Sheriff office has expressed interest in leasing dark fiber from the Port of Bellingham once the current broadband projects are completed.

Microsoft broadband usage data & Police Stations

% who use the internet at broadband speeds

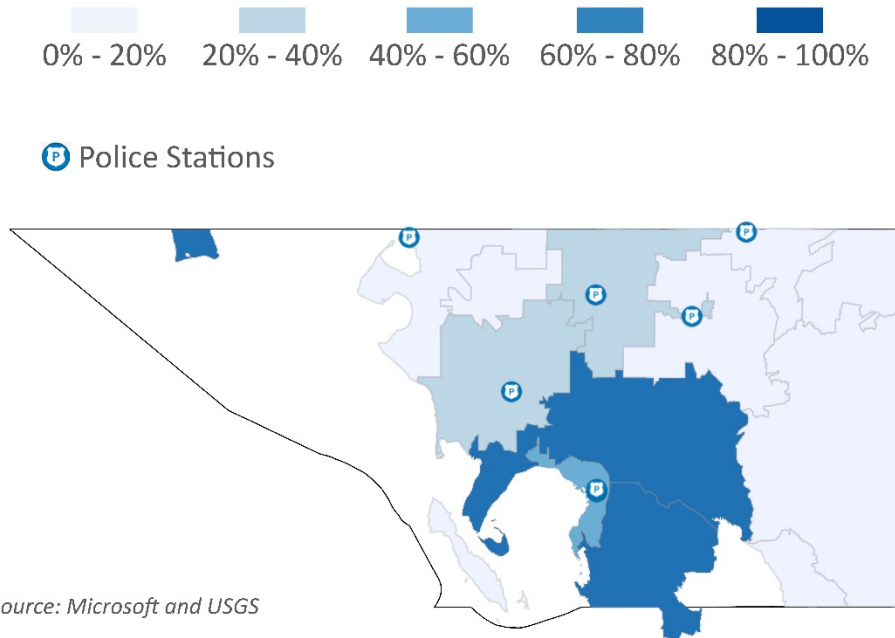


FIGURE 15: MICROSOFT BROADBAND USAGE LAYERED ON MAP OF WHATCOM COUNTY POLICE STATIONS

Police Station Name	Address	City	Zip Code
Lynden Police Department	203 19th Street	Lynden	98264
Ferndale Police Department	2220 Main Street	Ferndale	98248
Sumas Police Department	433 Cherry Street	Sumas	98295
Everson Police Department	111 West Main Street	Everson	98247
Whatcom County Sheriff's Office	311 Grand Avenue	Bellingham	98225
Bellingham Police Department	505 Grand Avenue	Bellingham	98225
Blaine Police Department	322 H Street	Blaine	98230

City Halls

Each of the cities in Whatcom County has a City Hall equipped with broadband. Leadership in the communities have been holding conversations about the possibility of connecting their municipal networks together making for a stronger countywide network that can benefit Whatcom County and each community within the county. With the advent of rural broadband projects being funded in Whatcom County to bring broadband to the unserved rural areas mid mile fiber is being constructed that could be utilized as a network backbone connecting communities making these conversations a reality.

Hospital and Medical Clinics

Hospitals, medical clinics and healthcare providers offer critical services that should be accessible to every member of the community. While most hospitals and clinics are located in municipalities with adequate broadband speeds, this is not the case in rural Whatcom County as illustrated by the below map.

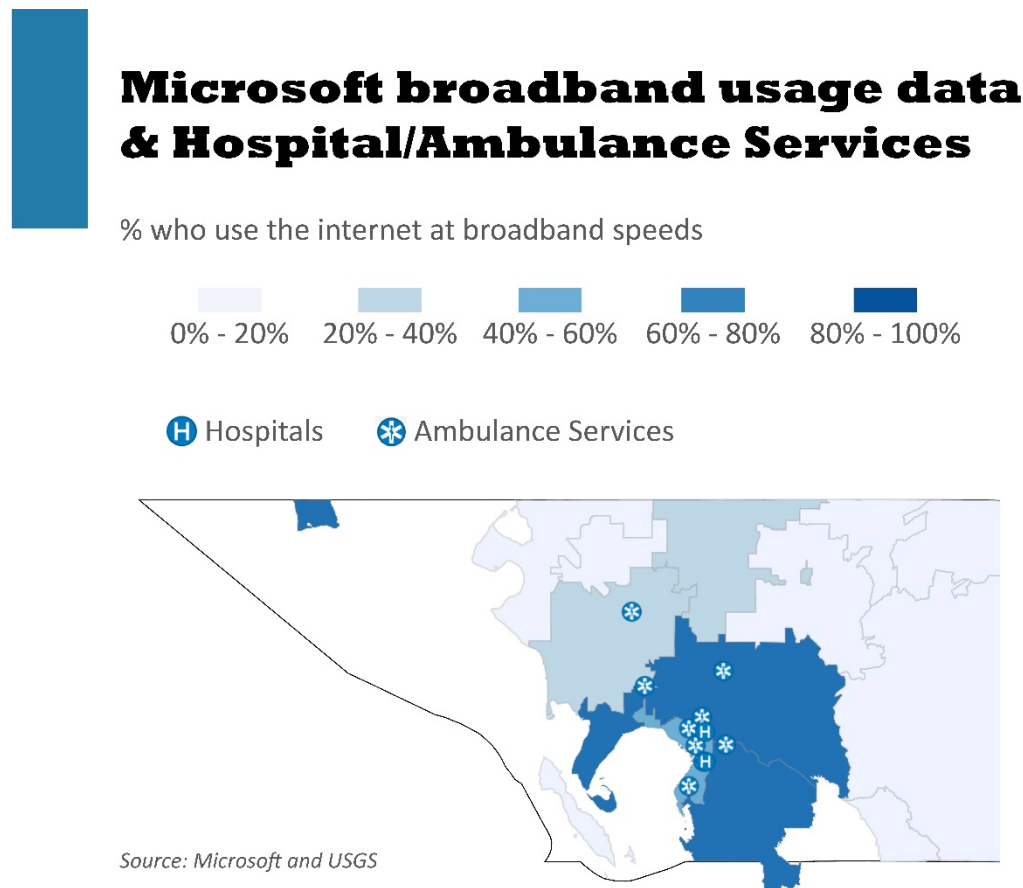


FIGURE 16: MICROSOFT BROADBAND USAGE LAYERED ON MAP OF HOSPITALS AND AMBULANCE SERVICES

Medical Facilities

Hospital Name	Address	City	Zip Code
PeaceHealth Saint Joseph Medical Center	2901 Squalicum Parkway	Bellingham	98225
PeaceHealth Saint Joseph Medical Center South Campus	809 East Chestnut Street	Bellingham	98225

Ambulance Services

Company	Address	City	Zip Code
Whatcom Medic One	2306 Yew Street	Bellingham	98225
Whatcom Medic One	3314 Northwest Avenue	Bellingham	98225
Whatcom Medic One	1111 Indian Street	Bellingham	98225
Whatcom Medic One	1590 Harris Avenue	Bellingham	98225
Whatcom Medic One	1800 Broadway	Bellingham	98225
Whatcom Medic One	4060 Deemer Road	Bellingham	98225
Whatcom Medic One Satellite Medic 3 Station	1886 Grandview Road	Bellingham	98248
Cascade Ambulance Service	1482 Slater Road Suite A	Ferndale	98248-8919
Bellingham Medic Station 10	858 East Smith Road	Bellingham	98226-9744

Education Institutions

High-speed internet service is now essential for education in the 21st century. Online learning plays an important role in Whatcom County's seven school districts, both during the school year and over summer break when the dreaded "summer slide" can take place. Fiber infrastructure in Whatcom County project areas would allow students in these schools to access high-speed internet at home or locations outside of school anytime. While WiFi hotspots were set up around the schools during the pandemic, many county households still lacked accesses to broadband infrastructure or sufficient reliable broadband service for families with children and multiple device users.

Microsoft broadband usage data & Schools

% who use the internet at broadband speeds



Public Schools Private Schools

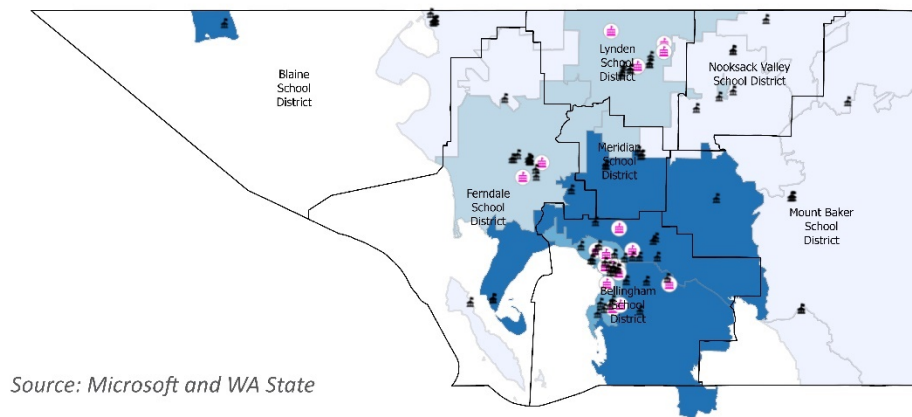


FIGURE 17: MICROSOFT BROADBAND USAGE LAYERED ON MAP OF SCHOOLS

Private School Name	Address	City	Zip Code
Assumption Catholic School	2116 Cornwall Ave	Bellingham	98225
Bellingham Christian School	1600 E Sunset Dr	Bellingham	98226
Cedar Tree Montessori	2114 Broadway St	Bellingham	98225
Gardenview Montessori	2117 Walnut St., Ste B101	Bellingham	98225
Cascades Montessori Middle	2710 Mckenzie Ave	Bellingham	98225
The Franklin Academy	3000 NW Ave	Bellingham	98225
Trinity Classical School	2826 Birchwood Ave	Bellingham	98225
Whatcom Hills Waldorf School	941 Austin St	Bellingham	98229
Lynden Christian School Evergreen Campus	567 E Kellogg Rd	Bellingham	98226
Montessori At Samish Woods	1027 Samish Way	Bellingham	98229
Explorations Academy	1701 Ellis St # 215	Bellingham	98225
Independence High School	100 Pine St	Bellingham	98225
St Paul's Academy	1509 E Victor St	Bellingham	98225
Pioneer Meadows Montessori School	2377 Douglas Rd	Ferndale	98248

Providence Christian School Nw	5942 Portal Way	Ferndale	98248
Ebenezer Christian School	9390 Guide Meridian Rd	Lynden	98264
Covenant Christian School	9088 Northwood Rd	Lynden	98264
Cornerstone Christian School	8872 Northwood Rd	Lynden	98264
Lynden Christian School	307 Drayton St	Lynden	98264
Lynden Christian Schools: Administration	515 Drayton St	Lynden	98264

Public School Name	Address	City	Zip Code
Acme Elementary	5200 Turkington Rd	Acme	98220
Mount Baker Academy	5200 Turkington Rd	Acme	98220
Whatcom Co Detention Ctr	311 Grand Ave 6th Fl	Bellingham	98225
Fairhaven Middle School	110 Park Ridge Rd	Bellingham	98225
Alderwood Elementary School	3400 Hollywood Ave	Bellingham	98225
Bellingham Family Partnership Program	1409 18th St	Bellingham	98225
Silver Beach Elementary School	4101 Academy St	Bellingham	98226
Whatcom Middle School	810 Halleck St	Bellingham	98225
Home Port Learning Center	707 Astor St	Bellingham	98225
Visions (Seamar Youth Center)	1603 E Illinois St	Bellingham	98226
Sunnyland Elementary School	2800 James St	Bellingham	98226
Options High School	2020 Cornwall Ave	Bellingham	98225
Columbia Elementary School	2508 Utter St	Bellingham	98225
Parkview Elementary School	3033 Coolidge Dr	Bellingham	98225
Bellingham Re-Engagement Program	1306 Dupont St	Bellingham	98225
Lummi High School	2334 Lummi View Drive	Bellingham	98226
Meridian Impact Re-Engagement	3028 Lindbergh Ave	Bellingham	98225
Blaine Re-Engagement	Bellingham Technical College	Bellingham	98225
Wade King Elementary School	2155 Yew Street Rd	Bellingham	98229
Lummi Elementary School	2334 Lummi View Drive	Bellingham	98226
Sehome High School	2700 Bill Mcdonald Pkwy	Bellingham	98225
Shuksan Middle School	2717 Alderwood Ave	Bellingham	98225
Carl Cozier Elementary School	1330 Lincoln St	Bellingham	98229
Squalicum High School	3773 E Mcleod Rd	Bellingham	98226
Birchwood Elementary School	3200 Pinewood Ave	Bellingham	98225
Happy Valley Elementary School	1041 24th St	Bellingham	98225
Geneva Elementary School	1401 Geneva St	Bellingham	98229
Northern Heights Elementary School	4000 Magrath Rd	Bellingham	98226
Bellingham High School	2020 Cornwall Ave	Bellingham	98225
Meridian High School	194 W Laurel Road	Bellingham	98226
Lowell Elementary School	935 14th St	Bellingham	98225
Harmony Elementary	5060 Sand Road	Bellingham	98226
Roosevelt Elementary School	2900 Yew St	Bellingham	98226
Meridian Special Programs	214 W Laurel Road	Bellingham	98226

Kulshan Middle School	1250 Kenoyer Dr	Bellingham	98229
Cordata Elementary School	4420 Aldrich Rd	Bellingham	98226
Blaine Home Connections	580 C Street	Blaine	98230
Blaine Middle School	975 H Street	Blaine	98230
Blaine Primary School	820 Boblett St	Blaine	98230
Blaine High School	1055 H Street	Blaine	98230
Blaine Elementary School	836 Mitchell Ave	Blaine	98230
Custer Elem	7660 Custer School Road	Custer	98240
Mount Baker Junior High	4936 Deming Rd	Deming	98244
Mount Baker Senior High	4936 Deming Rd	Deming	98244
Educational Resource Center	4888 Deming Rd	Deming	98244
Meridian Parent Partnership Program	960 E. Hemmi Road	Everson	98247
Nooksack Valley High School	3326 East Badger Road	Everson	98247
Nooksack Valley Middle School	404 W. Columbia St.	Everson	98247
Nooksack Elementary	3333 Breckenridge Rd.	Everson	98247
Nooksack Valley Special Services	3326 E. Badger Road	Everson	98247
Everson Elementary	216 Everson Goshen Rd.	Everson	98247
Irene Reither Elementary School	954 E. Hemmi Road	Everson	98226
Ferndale Re-Engagement	6041 Vista Drive	Ferndale	98248
Eagleridge Elementary	2651 Thornton Road	Ferndale	98248
Ferndale High School	5830 Golden Eagle Drive	Ferndale	98248
Skyline Elementary School	2225 Thornton Road	Ferndale	98248
Central Elementary	5610 Second Avenue	Ferndale	98248
Windward High School	5275 Northwest Ave	Ferndale	98248
Ferndale Special Services	6041 Vista Dr	Ferndale	98248
Parent Community Connection	5870 Hendrickson Avenue	Ferndale	98248
Horizon Middle School	2671 Thornton Road	Ferndale	98248
Vista Middle School	6051 Vista Drive	Ferndale	98248
Cascadia Elementary	6175 Church Rd	Ferndale	98248
Beach Elem	3786 Centerview Road	Lummi Island	98262
Lynden High School	1201 Bradley Rd	Lynden	98264
Impact Reengagement Program	1201 Bradley Rd	Lynden	98264
Lynden Academy	200 South Bc Ave Suite 102	Lynden	98264
Isom Elementary School	8461 Benson Rd	Lynden	98264
Fisher Elementary School	501 N 14th St	Lynden	98264
Lynden Middle School	516 Main St	Lynden	98264
Vossbeck Elementary School	1301 Bridgeview Dr	Lynden	98264
Meridian Middle School	861 Ten Mile Road	Lynden	98264
Lynden Special Services	205 S Bc Ave Ste 115	Lynden	98264
Kendall Elementary	7547 Kendall Rd	Maple Falls	98266
Point Roberts Primary	Pt. Roberts Primary	Point Roberts	98281
Sumas Elementary	1024 Lawson Street	Sumas	98295

Readiness Self-Assessment

The Readiness Self-Assessment was completed by Whatcom County PUD on November 7, 2022.

Health and Safety Benefits

Access to healthcare is a basic human necessity. While still not without its own challenges, individuals who live in the urban areas and municipalities of Whatcom County have more access to healthcare service than those in the rural and unincorporated areas. Those with access to affordable and high-speed internet have the ability to conduct medical and mental health appointments through tele-health, report non-emergency crimes online to the Whatcom County's Sheriff's Office and interact with the Public Health Department, the Department of Social Services and other critical public agencies online. Community members in Whatcom County's rural areas without quality broadband are denied this access to basic healthcare, especially given the limited number of medical clinics in these areas. Whatcom County's fire districts, Sheriff's Office and EMS providers rely on mobile connectivity for access to data terminals and electronic patient reporting tools. First responders and Fire Chiefs shared with the study authors that more stable broadband would greatly benefit them as first responders.

Education Access Benefits

High-speed internet service is now essential for education in the 21st century. Fiber infrastructure in Whatcom County project areas would allow students in these schools to access high-speed internet at home or locations outside of school anytime. While WiFi hotspots were set up around the schools during the pandemic, many households in the rural areas of the county still lacked accesses to broadband infrastructure or sufficient reliable broadband service for families with children and multiple device users.

The superintendents of the seven school districts reported that though they have adequate broadband at each of the schools' locations, many of their students still lack the necessary infrastructure or financial ability to obtain access to reliable broadband. This highly impacts students in the Nooksack and Mt. Baker School Districts, the County's most rural communities, and creates a disparity between those students with access to broadband and those without. Schools attempted to address this divide by providing paper packets to students without internet access and creating computer lab times outside of the normal school hours. However, this required additional staff time and hours that created a burden for staff and families. Building and extending broadband infrastructure to the County's most rural communities would create an equitable learning environment for all students.

Community's Served Status

Whatcom PUD and the Port utilized several methods to garner community feedback on whether the County should be considered unserved or underserved. The methods included a broadband survey, phone calls, community meetings and email correspondence.

The Port and PUD participate in various community meetings addressing broadband needs throughout the county. A few meetings have been hosted by the South Fork Community, which is located in South Whatcom and includes residents from the City of Deming, Nooksack, Glacier and Acme. These

communities shared stories about their lack of infrastructure and access to broadband. Many stated they have been waiting over 10 years to bring broadband to their communities.

Additionally, the Puget Sound Regional Council in Point Roberts has sponsored and conducted several meetings on broadband. Many citizens have shared they often lack the speeds to participate on Zoom calls, work efficiently from home or access their medical providers.

Broadband Survey

The following summary statistics are based on 452 observations. 358 observations had identifiable zip codes. 94 observations did not include an address or sufficient detail in the address field to locate a zip code. Unless respondents entered their exact address (not all did), it is not possible to rule out that there may be some duplicates. Nine observations were excluded from the analysis due to being located outside of Whatcom County.

122 observations from the Snowater Condominiums were removed from this analysis as they represented approximately 20% of all responses and greatly skew the data. This is “sample bias.”

TABLE 5: WHATCOM COUNTY SURVEY RESULTS

Zip code	Observations	% with internet	% that say needs are met ⁱ	Most common problem ⁱⁱ	Most common provider ⁱⁱⁱ
98220 (Acme)	4	100%	0%	Too slow	Verizon
98225 (Bellingham)	19	100%	26%	A combination of too slow, unreliable, too expensive, data limits	Xfinity / Comcast
98226 (Bellingham)	33	91%	18%	Too slow	Xfinity / Comcast
98229 (Bellingham)	28	100%	11%	Too slow	Xfinity / Comcast
98230 (Blaine)	15	93%	13%	Too slow	Ziply & Hugh’s Net
98240 (Custer)	4	75%	0%	Too slow	Ziply
98244 (Deming & Glacier)	172	80%	5%	Too slow	Ziply
98247 (Everson)	18	89%	17%	Too slow	Pogozone
98248 (Ferndale)	20	80%	5%	Too slow	Ziply
98262 (Lummi Island)	6	100%	17%	Too slow	Pogozone

98264 (Lynden)	5	100%	0%	A combination of too slow, unreliable, too expensive, data limits	Xfinity / Comcast & Ziply
98266 (Maple Falls)	28	96%	21%	Too slow	Xfinity / Comcast
98276 (Nooksack)	1	100%	100%	N/A	Xfinity / Comcast
98295 (Sumas)	4	100%	25%	Too slow	Pogozone
Not Reported	94	91%	8%	Too slow	Xfinity / Comcast & Ziply

i = Respondent answered “Yes” that their current internet met their needs.

ii = 50% or more of the responses were coded in this category. If no one category made up 50% of responses, then the next highest percentage was chosen.

iii = The majority of the responses were coded in this category. Not all zip codes had responses that totaled 50% or more with one provider, indicating more variation in providers in those areas.

Additional Comments from Respondents

The vast majority of respondents indicated their internet service included either data only or data and phone services. The vast majority also indicated that if they had better internet connections, they would use it for streaming services, including Zoom for working from home, running their business, schoolwork, entertainment, general research, paying bills and “how everyone uses the internet.”

It is important to note that of the 452 respondents, 63 identified that security and safety were a primary concern, and if they had better internet, they noted that they would be able to use their internet service or phone service for emergencies, as well as to install security cameras to monitor criminal or fire activity on their properties.

Another common comment in the unmet needs and additional comments section from respondents, particularly those with Xfinity/Comcast services, was that they felt that the monopoly resulted in poor service, slower and unreliable connections, poor customer service and higher prices. Many did not like the service even if they said it met all of their needs because they dislike using monopolized services on principle.

Two different tools have been created recently to work with communities to help close the digital divide. A professor at Purdue University, Roberto Gallardo, PhD has developed the Digital Divide Index (DDI). The DDI was created to gauge the digital inclusion of all socioeconomic groups in a geographic area. The higher a score is on the index, the higher the digital divide and inequality is in a community.

There are two ratios that Professor Gallardo has created in the Digital Divide Index that are very useful in determining the health of digital inclusion in a community: the Infrastructure/Adoption ratio (INFA) and the socioeconomic (SE) score.

The **INFA** score groups five variables related to broadband infrastructure and adoption:

1. Percent of total 2020 population without access to fixed broadband of at least 100/20 Mbps based on the Ookla Speed test
2. Percent of homes without a computing device (Laptops, desktops, tablets, smartphones)
3. Percent of homes with no Internet access
4. Median maximum advertised download speeds
5. Median maximum advertised upload speeds

The **SE** score groups five variables known to impact technology adoption:

1. Percent of population age 65 and over
2. Percent of population age 25 and over with less than a high school degree
3. Individual poverty rate
4. Median maximum advertised download speeds
5. Median maximum advertised upload speeds

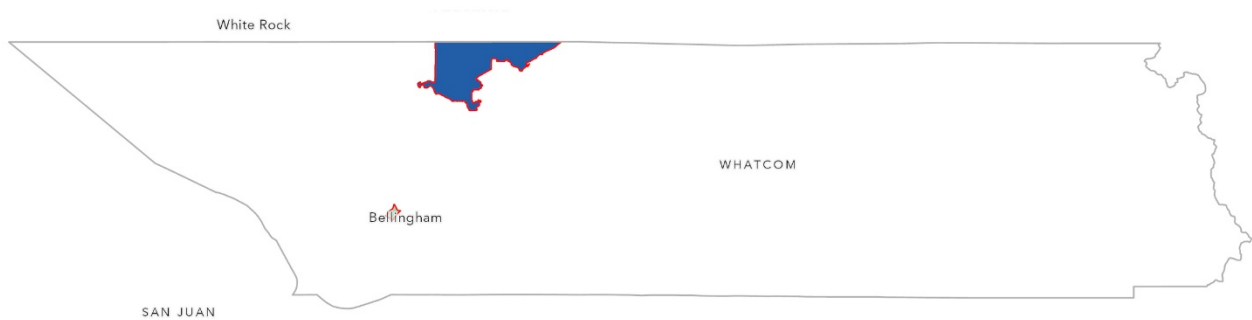
TABLE 6: DIGITAL DIVIDE INDEX IN WHATCOM COUNTY, WASHINGTON

Census Tract	Highest Divide 53073010202	Lowest Divide 53073000402	Whatcom, WA DDI Score =18.25
Avg Download (Mbps)	47.32	147.07	120.0
Avg Upload (Mbps)	10.72	77.71	18.4
Population with no Internet access to 100/20 (Mbps)	98.13%	2.19%	82.9%
No Internet access	13.62%	2.42%	8.4%
No computer device	11.73%	2.42%	5.4%
Less than HS degree	12.70%	7.45%	7.3%
Poverty Rate	14.4%	8.46%	13.9%
Age 65+	12.26%	12.21%	17.3%
Disability Rate	15.70%	11.97%	13.2%
Internet Income Ratio	67.33	0.00	5.15
Infrastructure Score	27.80	6.09	26.68
Socioeconomic score	27.24	12.86	13.35

Digital Divide Index in Whatcom County

Digital Divide Score

 Highest Divide
 Lowest Divide



Source: Purdue University

FIGURE 18: DIGITAL DIVIDE INDEX IN WHATCOM COUNTY

Data for the DDI was obtained from the American Community Survey and Ookla speed test crowd sourced data. As mentioned earlier in this report, the Connect America Model mapping is flawed. Advertised speeds self-reported by providers to the FCC compared to Ookla crowd sourced speed test results do not align to tell an accurate story. Pullman, Washington, for example, has two providers competing to sell 1 Gbps services in the community. Yet the people who took Ookla speed tests all reported under 100/20 Mbps speeds leaving the DDI to report 100% of the community does not have 100/20Mbps service. Factors such as old routers and poor performing computers can explain some of this discrepancy. Oversubscribed and poor performing networks probably account for some of the discrepancy also. As communities work to remove the digital divide, tools like the DDI can be used to provide data for conversations around broadband adoption and digital equality. Community members and broadband providers can use this data to work towards solving the digital divide issues communities face.

Acknowledgements

Petrichor Broadband would like to extend its sincere gratitude to the Public Utility District No. 1 of Whatcom County Commissioners Christine Grant (District 1), Atul Deshmane (District 2) and Mike Murphy (District 3), as well as General Manager Chris Heimgartner and Broadband Manager Andrew EntriKin for their active participation in the compilation of this study and ongoing broadband expansion efforts in Whatcom County. The Port of Bellingham has also been critical to the development of this study, partnering with the PUD to analyze the business models in this study and hold public meetings. The Port has been working in broadband in Whatcom County for five years and has developed a strong rapport within the County, leading community efforts and funding broadband expansion projects. Thank you to Commissioners Michael Shephard (District 1), Ken Bell (District 2) and Bobby Briscoe (District 3), as well as Executive Director Rob Fix and Economic Development Project Manager Gina Stark for your guidance and leadership in bringing broadband to the unserved areas of Whatcom County. NoaNet's contributions to this study were invaluable. Petrichor would like to thank NoaNet Senior Executive Director of Infrastructure Strategy Chris Walker for supplying the retail broadband services model and financial information. Petrichor is grateful for the perspectives of local internet service providers, which were sought at every step of the study's progression. Finally, a great debt of gratitude is owed to all who attended community broadband meetings and participated in the survey included in this study.

Attachment A

From: [Stark, Gina](#)
To: [Buys, Vincent](#); [Davis, Terry J](#); [Jeffrey Stoner](#); [Lydia Kinsella](#); [jd@pogozone.com](#); [rpoorman@cssnw.com](#); [John Gevaert](#); [ian@npinfo.com](#); [vince@npinfo.com](#); [Epley, Jessica](#); [St. Germaine, Chris](#); [david.namura@centurylink.com](#)
Cc: [Andrew Entrikin](#)
Subject: Port of Bellingham/ PUD ISP Stakeholder and Partner meeting invite
Date: Monday, April 25, 2022 9:18:51 AM

Good Morning- The Port of Bellingham and the PUD of Whatcom County are conducting an updated Broadband Feasibility Study to identify remaining unserved/underserved gaps in Whatcom County. We would like to have a meeting with you our stakeholders and partners to help us with that conversation and identify the remaining needs.

Please join us for a meeting on May 13th at 10:00am-11:00am at the Port of Bellingham Mt. Baker room and via zoom.

Calendar invite to follow. Please feel free to share this invite with other attendees you think should attend.

Please reach out if you have any questions.

All the best,
Gina

Gina Stark
Economic Development Project Manager
Port of Bellingham
ginas@portofbelllingham.com
360-715-5117 direct
360-739-2166 (cell)

Attachment B

Internet Service Provider Meeting

May 13, 2022

Meeting commenced at 10:01 a.m. The following individuals were in attendance.

Attendees

- Simon A. Sefzik – Washington State Senate - 42nd District (R)
- Sharon Shewmake – Washington House of Representatives - 42nd District (D) position 2
- JD Sinclair – Pogozone
- Ray Poorman – CSS
- Vincent Buys – Comcast
- Wayne Jeffers – Whidbey Telecom
- Steve Smith – Whidbey Telecom
- Elizabeth Brayman – Ziplly Fiber
- Kevin Stamy – Astound Broadband
- Jeff Stoner – Astound broadband
- Lydia Kinsella – Astound broadband
- Gina Stark – Port of Bellingham
- Chris Heimgartner – Whatcom PUD
- Andrew Entrikin – Whatcom PUD
- Gina Stark – Port of Bellingham

Current Projects

Ms. Stark reviewed and explained the current Port projects to bring broadband services to unserved areas of Whatcom County. A Google map of CERB and WSBO funded project areas was presented to the group. Ms. Stark also presented a project area located near Blaine, WA that was not funded.

There was a question-and-answer period after the presentation.

Mr. Poorman asked if the grant funding required a build to the premise or if it will end at the street with a potential to serve a home.

Ms. Stark replied all projects are funded to build to the home.

Ms. Stark led a discussion on funding for mid-mile telecommunications infrastructure, a part of the Infrastructure Investment and Jobs Act legislation that was passed in 2021. This funding will be administered by the National Telecommunications Infrastructure Act (NTIA) program. The program is currently in rule making, and there will be \$100 million available for competitive grants.

Representative Shewmake asked why the Blaine project was not funded.

Ms. Stark explained the competitive nature of the grant and reported on her follow-up meeting with the funding agency. She explained that based on the population threshold Whatcom County is not considered rural. This impacted the funding decision.

Future Opportunities

Mr. Entrikin led the group through a series of questions to better understand the current broadband accessibility of Whatcom County.

1. Which providers are currently serving your community?

JD Sinclair, PogoZone - Everyone in the room is serving a portion of the community.

Ms. Stark explained it would be helpful to know where providers are going to build to avoid duplicating efforts. Mr. Buys said Comcast estimates Whatcom County has nearly \$65 million worth of broadband gaps, including Comcast's contributions.

2. Which providers attended the meeting

Pogozone, CSS, Comcast, Whidbey Telecom, Ziply Fiber and Astound Broadband

3. How does the mapping results compare with members' actual experiences?

Mr. Poorman, CSS, asked if Ms. Stark could share more about the Port of Bellingham's model including maintenance, construction and operations.

Ms. Stark explained the Port's project areas employ a lit model with a dark fiber option. She also provided details about the Port's current open access IRU and partnership with local internet service provider Pogozone. Discussion occurred, and Mr. Entrikin provided additional context regarding the Port of Skagit's IRU with Ziply Fiber.

The group heard continued interest in the IRU model. Ms. Stark will arrange one-on-one meetings with each provider as a follow-up to the conversation.

4. Does existing broadband access meet your needs?

A short discussion occurred, and the group agreed there are many areas of the community still in need of broadband infrastructure to deliver adequate services.

5. If it is inadequate, in what ways does it fall short?

A dialogue began with both Comcast and CSS explaining the true cost of building networks and the challenges with current and past funding opportunities.

Mr. Buys, Comcast, expressed concerns with open access and their ability to partner with public agencies for broadband funding. He suggested working with the WSBO to remove the open access requirement for funding. He further explained their corporate policy surrounding monetary contributions for open access networks. Discussion and explanation continued regarding Comcast's corporate policy.

A brief discussion occurred regarding the Washington State Broadband Office funding structure, concerns regarding public agencies overbuilding private networks and lack of financing for project areas that do not fit nicely with current funding sources.

6. If you have broadband, how do you use it now?

- a. Streaming
- b. Video games
- c. Email
- d. Work from home
- e. Mr. Poorman – 80% of our traffic is video games. Mr. Buys stated the same is true for Comcast.

WHATCOM COUNTY BROADBAND PROJECT OPEN HOUSE

Come learn about current and future Port
and PUD broadband infrastructure projects!

Light refreshments provided

June 14th 2022 5:30-7:30pm
Ferndale Chamber of Commerce
2007 Cherry Street
Ferndale, WA 98248



Attachment D

Whatcom PUD

20-Year Broadband Financial Model

Project Folder

<https://noanet3.app.box.com/folder/162981915453>

Input Cell input options as desired

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
	Budget	Budget	Budget	Budget	Budget	Budget	Budget	Budget	Budget	Budget	Budget	Budget	Budget	Budget	Budget	Budget	Budget	Budget	Budget	Budget	Budget
OPERATING REVENUES	Rate																				
Residential Customer Count	\$59	0	0	0	0	0	0	25	50	75	100	125	150	175	200	225	250	275	300	325	350
Commercial Customer Count	\$79	0	0	0	0	0	2	2	4	6	8	10	12	14	16	18	20	22	24	26	28
Commercial Fiber Customer Count	\$109	0	0	0	2	2	2	2	2	4	2	2	2	2	2	2	2	2	2	2	2
High Capacity Customer Count	\$450	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Telecom Sales		0	0	0	8,016	8,016	8,016	8,016	27,612	47,208	66,804	86,400	105,996	125,992	145,188	164,784	184,380	203,976	223,572	243,168	262,360
Future Rate Increases		0	0	0	0	0	0	0	1,381	2,360	3,340	4,320	5,300	6,280	7,259	8,239	9,219	10,199	11,179	12,158	13,138
Other Operating Revenue		0	0	0	750	0	0	0	6,750	6,750	6,750	6,750	6,750	6,750	6,750	6,750	6,750	6,750	6,750	6,750	6,750
Total operating revenue		0	0	0	8,766	8,016	8,016	8,016	35,743	56,318	76,894	97,470	118,046	138,622	159,197	179,773	200,349	220,925	241,501	262,076	303,228
OPERATING EXPENSES																					
Upstream Internet Cost		0	1,500	1,500	1,500	1,500	1,500	1,500	1,650	1,800	1,950	2,100	2,250	2,400	2,550	2,700	2,850	3,000	3,150	3,300	3,450
Warehouse, Procurement		0	8,500	8,755	9,018	9,288	9,567	9,854	10,149	10,454	10,768	11,091	11,423	11,766	12,119	12,483	12,857	13,243	13,640	14,049	14,471
Pole Attachments	\$25	0	0	31,250	78,030	79,591	81,182	82,806	84,462	86,151	87,874	89,632	91,425	93,253	95,118	97,020	98,961	100,940	102,959	105,018	107,118
Contractor Support		0	0	0	23,100	46,200	70,000	72,100	74,263	76,491	78,786	81,149	83,584	86,091	88,674	91,334	94,074	96,896	99,803	102,797	105,881
Operations: Labor - 2 FTE		0	0	0	298,700	298,700	307,651	316,891	326,398	336,180	346,275	356,663	367,349	378,384	389,766	401,428	413,417	425,675	438,251	451,119	470,326
Distribution Expense (Repairs, Maint.)		0	15,000	15,450	15,914	16,391	16,883	17,389	17,911	18,448	19,002	19,572	20,159	20,764	21,386	22,028	22,689	23,370	24,071	24,793	25,536
Legal, Office, Admin		0	26,000	26,780	27,583	28,411	29,263	30,141	31,045	31,977	32,936	33,924	34,942	35,990	37,070	38,182	39,327	40,507	41,722	42,974	45,263
Marketing and Sales Expenses		0	15,000	5,000	5,150	5,305	5,464	5,628	5,796	5,970	6,149	6,334	6,524	6,720	6,921	7,129	7,343	7,563	7,790	8,024	8,264
NOC: Network Support Systems		0	0	7,639	15,278	23,148	23,727	24,439	25,172	25,927	26,705	27,506	28,331	29,181	30,056	30,958	31,887	32,843	33,829	34,843	35,889
Network Facilities		0	0	20,000	20,000	21,218	21,855	22,510	23,185	23,881	24,597	25,335	26,095	26,878	27,685	28,515	29,371	30,254	31,159	32,094	33,057
Vendor: Technical Support Plans		0	0	17,871	18,407	18,959	19,538	20,114	20,717	21,339	21,979	22,638	23,318	24,017	24,738	25,480	26,244	27,031	27,842	28,678	29,538
Tax expense		0	0	340	311	311	311	311	1,385	2,182	2,979	3,776	4,573	5,370	6,167	6,964	7,762	8,559	9,356	10,153	10,950
Total operating expense		0	66,000	114,245	490,039	546,842	584,711	601,402	619,802	638,425	657,560	677,225	697,434	718,203	739,549	761,488	784,039	807,218	831,046	855,540	880,720
Operating income		0	(66,000)	(114,245)	(481,273)	(538,826)	(576,695)	(593,386)	(584,060)	(582,106)	(580,666)	(579,755)	(579,388)	(579,581)	(580,351)	(581,715)	(583,690)	(586,294)	(589,545)	(593,463)	(598,068)
OTHER INCOME AND EXPENSE																					
Investment income		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other nonoperating income (expense)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other income and expense		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
INCOME FROM OPERATIONS		0	(66,000)	(114,245)	(481,273)	(538,826)	(576,695)	(593,386)	(584,060)	(582,106)	(580,666)	(579,755)	(579,388)	(579,581)	(580,351)	(581,715)	(583,690)	(586,294)	(589,545)	(593,463)	(598,068)
DEBT SERVICE																					
Principal		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Interest		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

25	per year after 2028
2	per year after 2028
0	per year after 2028
0	per year after 2028

5%	rate increase in 2028
\$250	Line Extension

2% annual rate increase

\$695.00

Attachment E

State Grant Options - Future		
	Total	
WSBO	\$ 25,000,000	WSBO Grant Maximum
WSBO Local Contributions	\$ 2,500,000	10% Contribution
CERB	\$ 2,000,000	CERB Grant Amount
CERB Contributions	\$ 1,000,000	Local Match
CERB Grant Loan	\$ 1,000,000	Required Loan
PWB		2022 grant program closed
Total	\$ 31,500,000	

Attachment F

Revenue Model Internal Operations									
				Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6 +
			Rolling Annual Take Rate :	33%	33%	33%	5%	5%	5%
Residential:	Customers	Rate	New Residential	0	0	0	0	0	0
	0	\$59	NRC Revenue per subscriber	\$250	\$250	\$250	\$250	\$250	\$250
			Revenue	\$0	\$0	\$0	\$0	\$0	\$0
			Rolling Annual Take Rate :	33%	33%	33%	5%	5%	5%
Commercial:	Customers	Rate	New Business	0	0	0	0	0	0
	0	\$79	NRC Revenue per subscriber	\$250	\$250	\$250	\$250	\$250	\$250
			Revenue	\$0	\$0	\$0	\$0	\$0	\$0
			Rolling Annual Take Rate :	20%	20%	20%	20%	20%	0%
Commercial Fiber:	Customers	Rate	New Business	0	0	0	0	0	0
	0	\$109	NRC Revenue per subscriber	\$250	\$250	\$250	\$250	\$250	\$250
			Revenue	\$0	\$0	\$0	\$0	\$0	\$0
			Rolling Annual Take Rate :	20%	20%	20%	20%	20%	0%
High Cap Fiber:	Customers	Rate	New Business	0	0	1	0	0	0
	0	\$450	NRC Revenue per subscriber	\$500	\$500	\$500	\$500	\$500	\$500
			Revenue	\$0	\$0	\$5,900	\$0	\$0	\$0

Attachment G

Operations and Expense Model						
LINE ITEM DESCRIPTION	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6+
Operating Expenses						
Network Operating Expense	\$ 53,509.84	\$ 122,989.81	\$ 215,738.49	\$ 272,033.91	\$ 280,451.29	\$ 285,255.73
NOC: Network Support Systems	\$ 7,638.84	\$ 15,277.68	\$ 23,148.00	\$ 23,726.70	\$ 24,319.87	\$ 24,927.86
Vendor : Technical Support Plans	\$ 17,871.00	\$ 18,407.13	\$ 18,959.34	\$ 19,528.12	\$ 20,113.97	\$ 20,717.39
Network Facilities, Installation and Engineer, Salary	\$ -	\$ -	\$ 20,000.00	\$ 20,600.00	\$ 21,218.00	\$ 21,854.54
Contractor: Support and Maintenance	\$ -	\$ 23,100.00	\$ 46,200.00	\$ 70,000.00	\$ 72,100.00	\$ 74,263.00
Distribution Expense (Repairs, Maint.)	\$ 15,000.00	\$ 15,450.00	\$ 15,913.50	\$ 16,390.91	\$ 16,882.63	\$ 17,389.11
Upstream Internet	\$ 4,500.00	\$ 4,500.00	\$ 7,500.00	\$ 7,500.00	\$ 11,250.00	\$ 11,250.00
OSS/BSS	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Warehouse, Procurement, Materials Management	\$ 8,500.00	\$ 8,755.00	\$ 9,017.65	\$ 9,288.18	\$ 9,566.82	\$ 9,853.83
Pole Attachment Fees	\$ -	\$ 37,500.00	\$ 75,000.00	\$ 105,000.00	\$ 105,000.00	\$ 105,000.00
Sales and Marketing	\$ 15,000.00	\$ 5,000.00	\$ 295,150.00	\$ 304,004.50	\$ 313,124.64	\$ 322,518.37
Project Manager / Broadband Manager, Salary	\$ -	\$ -	\$ 200,000.00	\$ 206,000.00	\$ 212,180.00	\$ 218,545.40
Project Assistant / Customer Acquisition Team	\$ -	\$ -	\$ 90,000.00	\$ 92,700.00	\$ 95,481.00	\$ 98,345.43
Marketing, Branding, and Collateral / Demonstration Center	\$ 15,000.00	\$ 5,000.00	\$ 5,150.00	\$ 5,304.50	\$ 5,463.64	\$ 5,627.54
Business Administration	\$ 26,000.00	\$ 31,780.00	\$ 32,733.40	\$ 33,715.40	\$ 34,162.07	\$ 35,186.94
General Office	\$ 4,500.00	\$ 4,635.00	\$ 4,774.05	\$ 4,917.27	\$ 4,500.00	\$ 4,635.00
Churn, Billing Disputes, Non-Payment, Low Income Program	\$ -	\$ 5,000.00	\$ 5,150.00	\$ 5,304.50	\$ 5,463.64	\$ 5,627.54
Legal and Administrative Fees	\$ 21,500.00	\$ 22,145.00	\$ 22,809.35	\$ 23,493.63	\$ 24,198.44	\$ 24,924.39

Attachment H

Network Operations Summary Report

	Devices	Per Month	Per Year
MVP / Core	1	\$76.00	\$2,412.00
PON	3	\$76.00	\$2,736.00
CPE Business	0	\$30.50	\$0.00
CPE	0	\$6.50	\$0.00
CPE NBD	808	\$3.00	\$29,073.60
Management Fee	12	\$1,500.00	\$18,000.00
COS	0	\$1,500.00	\$0.00
Total			\$52,221.60

Upstream Internet Sample Costs			
Per Meg	1,000	\$0.25	\$4,500.00
	2,000	\$0.25	\$7,500.00
	10,000	\$0.25	\$31,500.00
	40,000	\$0.25	\$121,500.00

Network Technical Support Plans

	Annual
IXR Support-Nokia	\$7,869.00
OLT,ONT, AMS Support	\$10,002.00
Total	\$17,871.00

Minimum Viable Product NOC services (includes \$1500 management fee)	
One Device per Service Zone	
Business Class Service	\$0.50 adder for OSP Fiber Management
CPE for Next business day services business	\$0.50 adder for OSP Fiber Management
CPE for Next business day services residential	\$0.50 adder for OSP Fiber Management
NOC Management Fee	
COS System for Provisioning	

300 subscribers
600 subscribers
10,000 subscribers
40,000 subscribers

Attachment I

Segment	Project Feet	Passings	Poles	Make Ready \$400 per pole	Aerial FT	Aerial ft w/slack	UG Footage	UG Footage w/slack	\$ Aerial/\$12.00	UG/ \$25.00 ft	Outside Plant Const total	Underground Drops at \$3600	Aerial Drops at \$1000	Total Const Cost	Design 10%	Contingency 20%	Permitting	Environmenta l	Project Management	Total	Cost per premise
West Project Area	237,000	645	1009	\$ 403,555.56	227,000	249,700	26,070	28,677	\$ 2,996,400.00	716,925.00	\$ 3,713,325.00	\$ 696,600.00	\$ 451,500.00	\$ 5,264,980.56	\$ 526,498.06	\$ 1,052,996.11	\$ 50,000.00	\$ 50,000.00	\$ 157,949.42	\$ 7,102,424.14	\$ 11,011.51
North Project Area	306,000	814	1022	\$ 408,888.89	230,000	253,000	91,800	100,980	\$ 3,036,000.00	\$ 2,524,500.00	\$ 5,560,500.00	\$ 879,120.00	\$ 569,800.00	\$ 7,418,308.89	\$ 741,830.89	\$ 1,483,661.78	\$ 50,000.00	\$ 50,000.00	\$ 222,549.27	\$ 9,966,350.82	\$ 12,243.67
East Project Area	335,000	560	1267	\$ 506,666.67	285,000	313,500	56,950	62,645	\$ 3,762,000.00	\$ 1,566,125.00	\$ 5,328,125.00	\$ 604,800.00	\$ 392,000.00	\$ 6,831,591.67	\$ 683,159.17	\$ 1,366,318.33	\$ 50,000.00	\$ 50,000.00	\$ 204,947.75	\$ 9,186,016.92	\$ 16,403.60
Whatcom PUD Total Project Area	878,000	2,019	3500	\$ 1,400,000.00	614,600	676,060	263,400	289,740	\$ 8,112,720.00	\$ 7,243,500.00	\$ 15,356,220.00	\$ 2,180,520.00	\$ 1,413,300.00	\$ 20,350,040.00	\$ 2,035,004.00	\$ 4,070,008.00	\$ 100,000.00	\$ 100,000.00	\$ 610,501.20	\$ 27,265,553.20	\$ 13,504.48

Notes:
Pole attachment fee \$20 per pole per year
Assumption Pole spacing 225 ft
Total Build 143 Miles 166
Build 30% Underground 42 miles /226561 ft 50 263,400
Build 70% Aerial 53 miles/528642 ft 116 614,600
Project furnishes drop materials/labor 100% penetration

Note: Slack for fiber calculated at 10% of project footage.

\$47,000.00
\$10,000.00
\$61,625.00 2,500 4,000 4,000
\$59,520.00 20,000 30,000 30,000
\$5,100.00 27,500 42,000 42,000
285,000 230,000
\$211,200.00 76,000
\$56,400.00 335,000 306,000
\$190,800.00
\$0.00
\$38,280.00
\$9,920.00
\$36,120.00

\$725,965.00
x.17 =
123,414
0 \$17/ft for underground we are at \$25

Attachment J

Balance Sheet		Year											
	0	1	2	3	4	5	6	7	8	9	10		
ASSETS													
Current Assets													
Cash	\$ 27,265,553.20	\$ 106,060.50	\$ 214,180.38	\$ 324,380.23	\$ 436,680.86	\$ 551,103.27	\$ 667,668.68	\$ 786,398.51	\$ 907,314.42	\$ 1,030,438.27	\$ 1,155,792.13		
Fixed Assets													
Land		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Facilities		\$ 27,265,553.20	\$ 27,265,553.20	\$ 27,265,553.20	\$ 27,265,553.20	\$ 27,265,553.20	\$ 27,265,553.20	\$ 27,265,553.20	\$ 27,265,553.20	\$ 27,265,553.20	\$ 27,265,553.20	\$ 27,265,553.20	\$ 27,265,553.20
TOTAL ASSETS	\$ 27,265,553.20	\$ 27,371,613.70	\$ 27,479,733.58	\$ 27,589,933.43	\$ 27,702,234.06	\$ 27,816,656.47	\$ 27,933,221.88	\$ 28,051,951.71	\$ 28,172,867.62	\$ 28,295,991.47	\$ 28,421,345.33		
LIABILITIES													
Current Liabilities		\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Long-Term Liabilities	\$ -	\$ -	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Total Liabilities	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
NET WORTH													
Cash Contribution	\$ 2,726,555.32	\$ 2,726,555.32	\$ 2,726,555.32	\$ 2,726,555.32	\$ 2,726,555.32	\$ 2,726,555.32	\$ 2,726,555.32	\$ 2,726,555.32	\$ 2,726,555.32	\$ 2,726,555.32	\$ 2,726,555.32	\$ 2,726,555.32	\$ 2,726,555.32
Grant Proceeds	\$ 24,538,997.88	\$ 24,538,997.88	\$ 24,538,997.88	\$ 24,538,997.88	\$ 24,538,997.88	\$ 24,538,997.88	\$ 24,538,997.88	\$ 24,538,997.88	\$ 24,538,997.88	\$ 24,538,997.88	\$ 24,538,997.88	\$ 24,538,997.88	\$ 24,538,997.88
Retained Earnings		\$ 106,060.50	\$ 214,180.38	\$ 324,380.23	\$ 436,680.86	\$ 551,103.27	\$ 667,668.68	\$ 786,398.51	\$ 907,314.42	\$ 1,030,438.27	\$ 1,155,792.13		
Total Net Worth	\$ 27,265,553.20	\$ 27,371,613.70	\$ 27,479,733.58	\$ 27,589,933.43	\$ 27,702,234.06	\$ 27,816,656.47	\$ 27,933,221.88	\$ 28,051,951.71	\$ 28,172,867.62	\$ 28,295,991.47	\$ 28,421,345.33		
TOTAL LIABILITIES AND NET WORTH	\$ 27,265,553.20	\$ 27,371,613.70	\$ 27,479,733.58	\$ 27,589,933.43	\$ 27,702,234.06	\$ 27,816,656.47	\$ 27,933,221.88	\$ 28,051,951.71	\$ 28,172,867.62	\$ 28,295,991.47	\$ 28,421,345.33		

Attachment K

Cash Flow	Year		Year																			
	0	1	2	3	4	5	6	7	8	9	10											
CASH RECEIPTS																						
Income from Sales																						
Cash Sales	\$	-	\$	242,280.00	\$	244,702.80	\$	247,149.83	\$	249,621.33	\$	252,117.54	\$	254,638.71	\$	257,185.10	\$	259,756.95	\$	262,354.52	\$	264,978.07
Total Cash from Sales	\$	-	\$	242,280.00	\$	244,702.80	\$	247,149.83	\$	249,621.33	\$	252,117.54	\$	254,638.71	\$	257,185.10	\$	259,756.95	\$	262,354.52	\$	264,978.07
Grant Proceeds	\$	24,538,997.88	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-
Loan Proceeds	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-
Equity Capital Investments	\$	2,726,555.32	\$	-	\$	-	\$	-	\$	-			\$	-	\$	-	\$	-	\$	-	\$	-
Total Cash from Financing	\$	27,265,553.20	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-
Other Cash Receipts	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-
Total Cash Receipts	\$	27,265,553.20	\$	242,280.00	\$	244,702.80	\$	247,149.83	\$	249,621.33	\$	252,117.54	\$	254,638.71	\$	257,185.10	\$	259,756.95	\$	262,354.52	\$	264,978.07
CASH DISBURSEMENTS																						
Operating Expenses	\$	-	\$	136,219.50	\$	136,582.92	\$	136,949.97	\$	137,320.70	\$	137,695.13	\$	138,073.31	\$	138,455.27	\$	138,841.04	\$	139,230.68	\$	139,624.21
Capital Purchases	\$	-	\$	27,265,553.20	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-	\$	-
Loan Principle	\$	-	\$	-		\$0.00		\$0.00		\$0.00		\$0.00		\$0.00		\$0.00		\$0.00		\$0.00		\$0.00
TOTAL CASH DISBURSEMENTS	\$	-	\$	27,401,772.70	\$	136,582.92	\$	136,949.97	\$	137,320.70	\$	137,695.13	\$	138,073.31	\$	138,455.27	\$	138,841.04	\$	139,230.68	\$	139,624.21
NET CASH FLOW																						
Opening Cash Balance	\$	-	\$	27,265,553.20	\$	106,060.50	\$	214,180.38	\$	324,380.23	\$	436,680.86	\$	551,103.27	\$	667,668.68	\$	786,398.51	\$	907,314.42	\$	1,030,438.27
Cash receipts	\$	27,265,553.20	\$	242,280.00	\$	244,702.80	\$	247,149.83	\$	249,621.33	\$	252,117.54	\$	254,638.71	\$	257,185.10	\$	259,756.95	\$	262,354.52	\$	264,978.07
Cash Disbursements	\$	-	\$	27,401,772.70	\$	136,582.92	\$	136,949.97	\$	137,320.70	\$	137,695.13	\$	138,073.31	\$	138,455.27	\$	138,841.04	\$	139,230.68	\$	139,624.21
Ending Cash Balance	\$	27,265,553.20	\$	106,060.50	\$	214,180.38	\$	324,380.23	\$	436,680.86	\$	551,103.27	\$	667,668.68	\$	786,398.51	\$	907,314.42	\$	1,030,438.27	\$	1,155,792.13

Attachment L

Income Statement		Year									
		1	2	3	4	5	6	7	8	9	10
INCOME											
Fiber Leases	\$	242,280.00	\$ 244,702.80	\$ 247,149.83	\$ 249,621.33	\$ 252,117.54	\$ 254,638.71	\$ 257,185.10	\$ 259,756.95	\$ 262,354.52	\$ 264,978.07
GROSS PROFIT	\$	242,280.00	\$ 244,702.80	\$ 247,149.83	\$ 249,621.33	\$ 252,117.54	\$ 254,638.71	\$ 257,185.10	\$ 259,756.95	\$ 262,354.52	\$ 264,978.07
EXPENSES											
Interest Expense on 2% loan	\$	-	\$ -	\$ -	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Management Fees	\$	36,342.00	\$ 36,705.42	\$ 37,072.47	\$ 37,443.20	\$ 37,817.63	\$ 38,195.81	\$ 38,577.77	\$ 38,963.54	\$ 39,353.18	\$ 39,746.71
Pole Attachment Fees	\$	87,500.00	\$ 87,500.00	\$ 87,500.00	\$ 87,500.00	\$ 87,500.00	\$ 87,500.00	\$ 87,500.00	\$ 87,500.00	\$ 87,500.00	\$ 87,500.00
Locate Fees	\$	9,877.50	\$ 9,877.50	\$ 9,877.50	\$ 9,877.50	\$ 9,877.50	\$ 9,877.50	\$ 9,877.50	\$ 9,877.50	\$ 9,877.50	\$ 9,877.50
R&M	\$	2,500.00	\$ 2,500.00	\$ 2,500.00	\$ 2,500.00	\$ 2,500.00	\$ 2,500.00	\$ 2,500.00	\$ 2,500.00	\$ 2,500.00	\$ 2,500.00
TOTAL EXPENSES	\$	136,219.50	\$ 136,582.92	\$ 136,949.97	\$ 137,320.70	\$ 137,695.13	\$ 138,073.31	\$ 138,455.27	\$ 138,841.04	\$ 139,230.68	\$ 139,624.21
NET PROFIT		\$ 106,060.50	\$ 108,119.88	\$ 110,199.85	\$ 112,300.63	\$ 114,422.41	\$ 116,565.41	\$ 118,729.84	\$ 120,915.91	\$ 123,123.84	\$ 125,353.86

Petrichor Broadband LLC

Attachment M

Petrichor Broadband LLC is a publicly owned corporation formed by six public port districts with over 20 years' experience creating open access networks. Petrichor works with other ports, tribes, counties, cities, public utility districts, industrial development zones and the Washington State Broadband Office to expand broadband access to underserved communities across Washington State. To accomplish this goal, we provide fiber optic planning and design, network management and local, state and federal policy development services.

We promote publicly owned, open-access, free trade platforms for the private sector to sell services. This public-owned infrastructure allows competition in markets where investments have not been made by the private sector, bringing urban-rate-priced services to all markets.

To serve rural customers, Petrichor members leverage public sector investment to build co-location and outside plant infrastructure for lease to telecommunications providers. Petrichor members also partner on joint builds with telecommunications service providers, lowering the costs to build and creating redundant networks in communities.



The founding members of Petrichor Broadband include Port of Kalama, Port of Ridgefield, Port of Bellingham, Port of Skagit County, Port of Pasco and Port of Whitman County.

This open-access model allows companies to choose between purchasing lit services or leasing dark fiber. In developing this model, ports learned repeatably that companies desire to own individual networks, which they control and maintain. The ability to lease dark fiber provides companies the control necessary to offer a service-level agreement to their customers. By leasing the dark fiber plant to retail service providers at a price point that allows competitive retail pricing to consumers, this model facilitates economic development. The private sector competes to sell services, while investing in employees and equipment to grow their business in unserved communities.

Petrichor performs feasibility and planning studies for all entities based on this model. Consulting services include funding applications, design services, project management and fiber mapping and management.

Attachment N

INTERLOCAL COOPERATION AGREEMENT FOR TELECOMMUNICATION SERVICES

THIS INTERLOCAL COOPERATION AGREEMENT ("this AGREEMENT") entered into by PETRICHOR BROADBAND, LLC, a Washington interlocal limited liability company permitted by RCW 39.34.030, (hereinafter "PETRICHOR"), and the _____, a municipal corporation of the State of Washington, (hereinafter the "_____").

RECITALS

WHEREAS, PETRICHOR is a Washington interlocal limited liability company consisting of the following Ports as members: Port of Bellingham, Port of Kalama, Port of Pasco, Port of Ridgefield, Port of Skagit County, and Port of Whitman County; and

WHEREAS, the Port of Whitman County is the named Manager for PETRICHOR; and

WHEREAS, PETRICHOR contracts with public and private entities for the planning, development and operation of local and regional telecommunication facilities; and

WHEREAS, the PORT owns and operates telecommunication infrastructure ("the Facilities"), within and without its district for its own use and to provide wholesale telecommunication services within Asotin County; and

WHEREAS, the _____ has or intends to construct a fiber optic telecommunication network, which is the subject matter of this agreement (herein the "_____"); and

WHEREAS, this Agreement provides for certain services to be provided by PETRICHOR to the PORT in exchange for fees and revenue sharing as set forth below and the mutual benefits to be derived;

NOW, THEREFORE, IT IS HEREBY AGREED AS FOLLOWS:

INTERLOCAL COOPERATION AGREEMENT
FOR TELECOMMUNICATION SERVICES

(_____)

1. Management, Services and Expenses:

a. PETRICHOR shall provide the following services for the Facilities which are subject to the revenue sharing provisions of this Agreement:

- (1) Fiber and facility mapping, including cut sheet documentation;
- (2) One-Call management services;
- (3) _____ Will or _____ will not contract for locate services in accordance with standards in the industry;
- (4) Emergency restoration management in accordance with standards in the industry;
- (5) Review of construction design; and
- (6) Oversight of Network Operations Center (NOC) contracted services.

PETRICHOR may contract with third parties for the services to be provided.

b. _____ shall provide the following services for the Facilities which are subject to the revenue sharing provisions of this Agreement:

- (1) Administration of billing and collection;
- (2) Collection and remittance of applicable leasehold tax as directed by the State of Washington and franchise fees; and
- (3) Provide financial reports displaying monthly invoiced amounts by customer.

c. Expenses for the Facilities subject to the Revenue Sharing provisions of this Agreement will be allocated as follows:

- (1) Fiber and facility mapping, including cut sheet documentation will be provided by PETRICHOR;
- (2) One-call and locate services expenses shall be paid by the PORT;

(3) Emergency restoration service charges and expenses shall be paid by the PORT;

(4) Administration, billing and collection will be provided by the PORT; and

(5) NOC contracted services will be overseen by PETRICHOR and expenses shall be paid by the PORT.

2. Revenue Sharing and Fees:

All revenue derived from the _____ Facilities shall belong to the _____ and payment therefrom shall be as follows:

a. Commencing January 1, _____, payment for services will be on a revenue share basis whereby PETRICHOR will receive fifteen percent (15%) of monthly revenue, or Ten Thousand and no/100ths Dollars (\$10,000.00) per year, whichever is greater, derived from the Facilities, payable within thirty (30) days of month end. If at the end of the year, the total revenue paid to PETRICHOR is less than Ten Thousand and no/100ths Dollars (\$10,000.00), the _____ shall pay the difference between the revenue paid and Ten Thousand and no/100ths Dollars (\$10,000.00) within thirty (30) days.

b. The term "Revenue" as used in the Revenue Sharing provisions of this Agreement shall mean the gross amount invoiced/derived from the wholesale lease or grant of use of fiber optic lines. Non-reoccurring fees, fees for power charges, co-location fees, leasehold taxes, and franchise fees, shall not be considered Revenue for purposes of Revenue Sharing.

3. Leases and Contracts:

a. This Agreement shall apply to the wholesale lease or grant of use of the _____'s Facilities.

b. Lease, contracts, and agreements, to which this Agreement applies, shall be leases, contracts, and agreements of the PORT. Said leases, contracts, and agreements shall conform to and be consistent with the Master Service Agreement attached as EXHIBIT "A,"

or such other agreement as mutually agreed upon by PETRICHOR and the PORT.

c. No lease or contract subject to this Agreement shall extend beyond a period of twenty years from the date of execution, except as expressly authorized in writing by both parties. The Revenue from any leases, contracts, or agreements made during the term hereof and subject to this Agreement that have a termination date extending beyond the termination of this Agreement shall, belong to the PORT.

d. All rates, fees and charges for the use the Facilities shall be as mutually agreed upon with the goal of meeting each entity's revenue expectations. The initial rate structure is set forth in EXHIBIT "B".

e. Nothing herein shall be deemed to require the PORT to enter any lease, contract, or agreement for the use of its telecommunication lines or facilities.

f. Nothing herein shall prohibit the _____ from charging non-reoccurring fees for construction, relocation, or capital improvements to its Facilities, which fees shall not be considered Revenue, but will belong to the PORT.

4. Taxes, Fees and Assessments: The collection and payment of all taxes, fees, and assessments shall remain the responsibility of the PORT.

5. Term: The term of this Agreement shall begin January 1, _____, and terminate on the 31st day of December _____ (the "Initial Term"). Upon expiration of the Initial Term, this Lease shall automatically and successively renew for additional terms of one (1) year each, unless either party notifies the other in writing of its intent to terminate this Lease by giving one hundred eighty (180) days' notice prior to the end of the Initial Term, or any renewal thereof.

6. Development of Additional Facilities: It is understood and agreed that the _____ may wish to add to or expand its telecommunication fiber system, and nothing herein shall be deemed or considered as a restriction or prohibition on future development. However, any subsequent Interlocal Agreements which result in the management of additional fiber not owned by the PORT will require PETRICHOR's written consent.

7. Ownership on Termination: Upon termination of this Agreement and its non-renewal, all lines and facilities within the Clarkston Network shall remain the sole property of the PORT.

8. Relocation: In the event relocation of the Facilities which are subject to the Revenue Sharing provision of this Agreement is necessary, relocation costs and expenses shall be the sole responsibility of the PORT.

9. Annual Meeting: The _____ and PETRICHOR shall meet annually in the month of _____ at a date, time and location mutually agreeable to discuss financial reports, planning and budgeting.

IN WITNESS WHEREOF, the parties enter into this Agreement the _____ day of _____, _____, and the undersigned represent that he or she is authorized to sign this Agreement.

PETRICHOR BROADBAND, LLC, a _____, a municipal Washington interlocal limited liability company: _____ corporation of Washington

By _____
Port of Whitman County, Manager

By _____,
Executive Director

INTERLOCAL COOPERATION AGREEMENT
FOR TELECOMMUNICATION SERVICES

(_____)

Attachment O

AGREEMENT FOR PROJECT ADMINISTRATIVE SERVICES

THIS AGREEMENT ("this AGREEMENT") entered into by the PETRICHOR BROADBAND, LLC, a municipal corporation of the State of Washington, ("PETRICHOR"), and the ENTITY, a municipal corporation of the State of Washington, ("ENTITY").

RECITALS

WHEREAS, PETRICHOR owns and operates telecommunication facilities within and without its district for its own use and to provide wholesale telecommunication services within its district; and

WHEREAS, ENTITY owns and operates telecommunication facilities ("the Facilities"), within ENTITY County for its own use and to provide wholesale telecommunication services within its district; and

WHEREAS, ENTITY intends construct _____ ("the Project"); and

WHEREAS, this Agreement provides for certain services to be provided by PETRICHOR to ENTITY for a one-time fee as set forth below and the mutual benefits to be derived;

NOW, THEREFORE, IT IS HEREBY AGREED AS FOLLOWS:

1. Management Services:

a. PETRICHOR shall provide the following services for the Project:

- (1) Design process overview and recommendations;
- (2) Assistance with permitting, pole contact agreements, and easement acquisition;
- (3) Invitation to bid documents and process management;
- (4) Construction oversight;
- (5) Mapping of the project as-built;
- (6) Public outreach guidance as needed; and
- (7) An annual average of twelve on-site meetings or visits by Port of Petrichor personnel.

b. Project Expenses

All project expenses shall be paid by ENTITY.

2. Fees:

a. Payment for services will be made in _____ payments of _____ due upon invoice.

3. Term: The term of this Agreement shall begin _____ and terminate upon completion of the services to be provided but no later than the _____.

4. Ownership: Petrichor shall acquire no ownership or property interest in the Project lines or facilities.

IN WITNESS WHEREOF, the parties enter into this Agreement the
_____ day of _____, _____, and the undersigned represent that
he or she is authorized to sign this Agreement.

PETRICHOR, a municipal
corporation of the State of
Washington:

By _____
Executive Director

ATTEST:

By _____

ENTITY, a municipal
corporation of the State of
Washington:

By _____
Executive Director

ATTEST:

By _____

Attachment P

APPLICATION FOR FRANCHISE

TO THE WHATCOM COUNTY COUNCIL:

COMES NOW, _____

who respectfully petitions the Whatcom County Council for a twenty-five (25) year
franchise to lay, construct, maintain, and repair

and all necessary appurtenances along, over, and across the following roads situated
in Whatcom County, Washington:

The petitioner further requests that the Whatcom County Council fix a time and place
for a public hearing on the granting of this continuation of franchise, and that public
notice be given, at the expense of the petitioner, as provided by law; and that, at
said hearing, petitioner be granted the franchise continuation herein requested.

DATED: _____

Company Name

Signature of authorized agent/owner

Mailing Address

Print or type name

City State Zip

Phone Number

Chapter 12.24 FRANCHISE REQUIREMENTS

Sections:

- [12.24.011](#) Authority.
- [12.24.021](#) Application requirements.
- [12.24.025](#) Transfer of ownership or control.
- [12.24.031](#) Forward to public works.
- [12.24.041](#) Ordinance.
- [12.24.051](#) Application – Notice of hearing.
- [12.24.061](#) Recording of franchise.
- [12.24.070](#) Submittal of plans and specifications.
- [12.24.080](#) Time limit.
- [12.24.090](#) Surety bonds.
- [12.24.100](#) Inspection.
- [12.24.110](#) Approval of alteration or revision.
- [12.24.120](#) Liability for construction or maintenance.

12.24.011 Authority.

This chapter is enacted pursuant to authority contained in Chapter [36.55](#) RCW and Whatcom County Charter Section 9.30. (Ord. 2008-005 Exh. A; Ord. 2004-022).

12.24.021 Application requirements.

A. Application for franchises on county roads and bridges shall be submitted to the Whatcom County council pursuant to RCW [36.55.040](#).

B. Every franchise application submitted to the county council shall be accompanied by a franchise application fee as set forth in the current Whatcom County unified fee schedule.

C. Every franchise application submitted to the county council must also be accompanied by a sketch of the proposed installation. (Ord. 2008-005 Exh. A; Ord. 2004-022).

12.24.025 Transfer of ownership or control.

A. A franchise shall not be sold, transferred, leased, assigned or disposed of in whole or in part either by sale, voluntary or involuntary merger, consolidation or otherwise, unless approval is granted by the county council to ensure a review of circumstances not present at the time of the adoption of the original franchise. The council's approval shall not be unreasonably withheld.

Such costs associated with this review process shall be reimbursed to the county council by a new prospective franchisee.

B. An assignment of a franchise shall be deemed to occur if there is an actual change in control or where ownership of 50 percent or more of the beneficial interests, singly or collectively, are obtained by other parties. The word "control" as use herein is not limited to majority stock ownership only, but includes actual working control in whatever manner exercised.

C. A franchisee shall promptly notify the county council prior to any proposed change in, or transfer of or acquisition by any other party of control of a franchisee's company. Every change, transfer, or acquisition by any other party of control of a franchisee's company shall cause a review of the proposed transfer. In the event that the county council adopts a resolution denying its consent and such change transfer or acquisition of control has been effected, the county may cancel the franchise. Approval shall not be required for mortgaging purposes or if said transfer is from a franchisee to another person or entity controlling, controlled by, or under common control with a franchisee.

D. Application for transfer of ownership or control shall be submitted to the county council.

E. Every franchise application for transfer of ownership submitted to the county council shall be accompanied by a franchise transfer of ownership fee as set forth in the current Whatcom County Unified Fee Schedule.

F. Regardless of the circumstances, a franchisee shall promptly notify the county prior to any proposed name change of the franchisee's company. In the event that the county approves a resolution withholding its consent to the name change within 60 days of receipt of notice thereof, the county may cancel the franchise unless the parties to such change reverse its effects within 60 days after the county notifies the franchisee of its intent to cancel the franchise hereunder. (Ord. 2008-005 Exh. A).

12.24.031 Forward to public works.

Upon receipt of franchise application, application fee, and sketch of proposed installation, or application for transfer of ownership and transfer of ownership fee, the clerk of the council shall forward a complete copy to the director of Whatcom County public works or the county engineer. (Ord. 2008-005 Exh. A; Ord. 2004-022; Ord. 93-066 Exh. A; prior code § 4.44.010. Formerly 12.24.010).

12.24.041 Ordinance.

Whatcom County public works director or the county engineer shall prepare an ordinance granting the franchise for consideration by the county council. (Ord. 2008-005 Exh. A; Ord. 2004-022).

12.24.051 Application – Notice of hearing.

The clerk of the council shall schedule a public hearing on the ordinance granting the franchise pursuant to RCW [36.55.050](#). (Ord. 2008-005 Exh. A; Ord. 2004-022).

12.24.061 Recording of franchise.

The Whatcom County council clerk shall cause the franchise to be recorded by the county auditor pursuant to RCW [36.55.080](#). (Ord. 2008-005 Exh. A; Ord. 2004-022).

12.24.070 Submittal of plans and specifications.

There shall be submitted to the director of Whatcom County public works or the county engineer three copies of the final plans, specifications or special provisions of the proposed installation, at the time of the granting of a franchise. (Ord. 2008-005 Exh. A; Ord. 2004-022; Ord. 93-066 Exh. A; prior code § 4.44.020. Formerly 12.24.020).

12.24.080 Time limit.

There shall be a time limit imposed upon the construction of any facility granted by franchise on any county road or bridge, subject to the approval of the county engineer. (Ord. 2008-005 Exh. A; Ord. 2004-022; prior code § 4.44.030. Formerly 12.24.030).

12.24.090 Surety bonds.

There shall be a surety bond posted at the time of granting a franchise for any facility upon a county road or bridge to ensure replacement of any county road or bridge to its original condition and shall be in an amount not less than 10 percent of the total estimate of the proposed installation and releasable only by the county engineer. (Ord. 2008-005 Exh. A; Ord. 2004-022; Ord. 93-066 Exh. A; prior code § 4.44.040. Formerly 12.24.040).

12.24.100 Inspection.

There shall be adequate inspection by an inspector approved by the county engineer who shall be responsible to the county engineer for all construction of any facility upon any county road or bridge. (Ord. 2008-005 Exh. A; Ord. 2004-022; prior code § 4.44.050. Formerly 12.24.050).

12.24.110 Approval of alteration or revision.

No alteration or revisions of plans as submitted at the time of granting a franchise shall be permitted by a person or persons, or any franchise-holder, unless prior approval is requested and submitted to the county engineer. (Ord. 2008-005 Exh. A; Ord. 2004-022; Ord. 93-066 Exh. A; prior code § 4.44.060. Formerly 12.24.060).

12.24.120 Liability for construction or maintenance.

The foregoing regulations are not to be construed as relieving the franchise holder of any responsibility or liability for the construction, reconstruction, or maintenance of such facilities as the franchise may grant. (Ord. 2008-005 Exh. A; Ord. 2004-022; prior code § 4.44.070. Formerly 12.24.070).