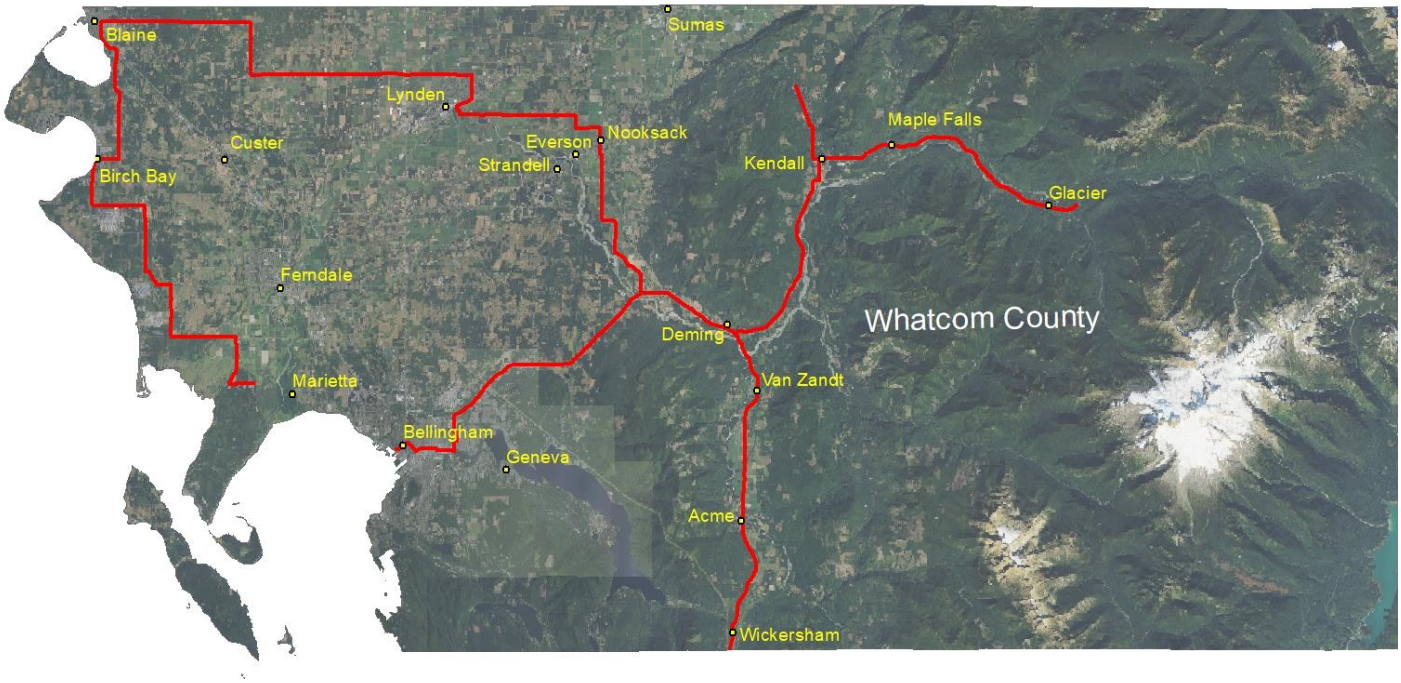
FEBRUARY 2019

BROADBAND FEASIBILITY STUDY FOR RURAL WHATCOM COUNTY

Prepared for

PORT OF BELLINGHAM
Washington State



Prepared by

Ascent GIS

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EXECUTIVE SUMMARY

The Port of Bellingham has commissioned this study to evaluate the need for further broadband investments in Whatcom County, with a focus on rural economic development. Ascent GIS performed a survey of existing provider networks and service coverage in Whatcom County, an analysis of the current market for telecom services, and a study of Whatcom County demographics. A proposed fiber optic backbone route was identified through the county connecting the Bellingham urban core with rural communities to the east and north. In addition, the study identified a fiber segment connecting the proposed Whatcom County network with Skagit County to the south along Highway 9, where the Port of Skagit and Skagit PUD are currently building a fiber optic network. Detailed route maps were prepared for the study, along with construction cost estimates and a detailed financial analysis of the proposed network.

Whatcom County, in general, has a higher than average adoption rate for broadband internet use. More than 91 percent of households in the county have a computer and nearly 85 percent have a broadband internet subscription. In addition, three providers in the county report offering services of at least 25 Mbps download and 3 Mbps upload speeds. Despite these reports, however, stakeholder outreach suggests that significant portions of rural Whatcom County still lack adequate access to affordable, reliable high speed internet.

Implementation of a dark fiber open access network in Whatcom County would allow multiple providers to access these communities on a competitive basis. The network could be managed with minimal additional staffing initially using a contract management model, possibly in coordination with the Port of Skagit and Skagit PUD in Skagit County. This model would provide an economy of scale for both networks and would allow providers to access a greater service area on a common platform.

The construction cost estimate for this network is $4,328,896.22. Construction of the Highway 9 connector to Skagit would cost an additional $2,508,302.64 to build, for a total cost of $6,837,198.86. A financial assessment of the proposed network indicates a positive return on investment in 16 years without the addition of grant funding. With an estimated $2,000,000 in grant funding, the return period is reduced to 9 years.

The project presents a significant opportunity for the Port of Bellingham to strengthen the economy of rural Whatcom County by deploying more broadband infrastructure and reducing barriers to entry for telecom providers.

CHAPTER 1 INTRODUCTION

Broadband infrastructure is essential to the delivery of high speed internet access to end users and has rapidly become a necessary ingredient to the economic health and growth of communities. In a 2016 brief to the White House, the Council of Economic Advisors detailed the economic benefits of adequate internet access to communities[1]. Positive impacts include increased access to labor markets, as well as wage and employment growth, leading to higher household incomes and lower unemployment rates on average. Broadband internet also supports improved socio-economic opportunities for communities, including increased access to medical care and education.

Despite the well-documented societal benefits of broadband internet, a significant digital divide still exists in the U.S., particularly in rural areas. In 2018, the Pew Research Center found that a quarter of rural Americans still lack adequate, affordable broadband internet access[2]. This disparity perpetuates a "haves and have-nots" scenario with inequitable economic opportunities for rural communities. More than 20 years ago, the 1996 Telecommunication Act sought to create competition and incentivize private sector investment in telecom markets. Results have been mixed with most private investment pushed to profitable urban markets, leaving rural communities behind. The federal government, together with private telecommunications companies and local governments, have sought solutions for this challenge for years. Public entities, including municipalities, ports, and public utility districts (PUDs) have increasingly become involved in broadband infrastructure in rural communities where private sector investment alone has not realized adequate broadband infrastructure.

STUDY BACKGROUND

This study has been commissioned by the Port of Bellingham (Port) to evaluate the need for broadband infrastructure investment in rural Whatcom County. In consideration of that purpose, the study includes a review of existing broadband infrastructure, evaluates the market demand for services, and provides a review of potential business models and role of the Port in supporting the deployment of broadband infrastructure.

[1] 2016, March. Issue Brief. The Digital Divide and Economic Benefits of Broadband Access. Council of Economic Advisors to the White House.

[2] 2018, September. Anderson, Monica. About a Quarter of Rural Americans Say Access to High-Speed Internet a Major Problem. Pew Research Center.

Strategic goals of this project include ensuring the provision of a countywide fiber optic network that:

1. Is carrier grade and open access.
2. Provides consumer choice.
3. Provides community members and businesses access to affordable high speed internet throughout the county.
4. Supports and promotes growth for economic development, education, public health and safety.

STUDY AREA

Whatcom County is located in northwestern Washington State and is bordered by Skagit County to the south, Okanogan County to the east, and the Canadian border to the north. The county's western border is formed by Puget Sound. The City of Bellingham is the county seat and the largest population center in the county. The county includes several smaller cities, towns, unincorporated urban growth areas (UGAs), and other unincorporated rural communities, including Blaine, Everson, Ferndale, Lynden, Nooksack, Sumas, Birch Bay, Deming, Maple Valley, Glacier, and Sudden Valley. The area is also home to two Indian tribal communities, including the Lummi Nation and the Nooksack Tribe. The study focused on rural communities located along population corridors between Bellingham and Glacier to the east, Nooksack to the northeast, and Blaine/Birch Bay to the northwest. Figure 1 depicts the Study Area.

Figure 1: Study Area

PORT OF BELLINGHAM

Formed in 1920, the Port of Bellingham serves as an economic driver for its community. The Port district extends throughout Whatcom County except for federal lands to the east.

The Port's mission statement is as follows:

> *To promote sustainable economic development, optimize transportation gateways, and manage publicly owned land and facilities to benefit Whatcom County.*

The Port acts in a lead role, in partnership with Whatcom County and the City of Bellingham, as the Associate Development Organization (ADO) for Whatcom County. The Port utilizes various tools in pursuit of its mission, including physical infrastructure such as Bellingham International Airport, two marinas, a working waterfront in Bellingham, and industrial properties. In addition, the Port provides financial, planning, and technological expertise to help industries succeed in Whatcom County.

The Port was an early adopter of building fiber optic cable in Washington State. In the mid-1990's, the Port built fiber optic infrastructure throughout the downtown Bellingham area. Service providers on this network sold T1 Internet to the Port, hotels, and other businesses in the downtown area. The Port has also collaborated with local broadband providers for fiber to the Port's remote facilities.

PUBLIC UTILITY DISTRICT NO. 1 OF WHATCOM COUNTY

The Port is conducting its broadband planning assessment in partnership with the Public Utility District No. 1 of Whatcom County (PUD). The PUD operates a water and power utility in rural Whatcom County with the following mission statement:

> *Public Utility District No. 1 of Whatcom County is a steward of water and energy resources providing locally controlled utility services and resource protection for the benefit of the residents, businesses and agricultural community of greater Whatcom.*

The PUD installs and manages fiber optic cable for internal purposes for the operation of its SCADA system.

BROADBAND AUTHORITY

Both the Port and the PUD have the statutory authority to offer wholesale telecommunications services in Washington State. The applicable statutes are as follows:

Port telecom statute - RCW 53.08.370

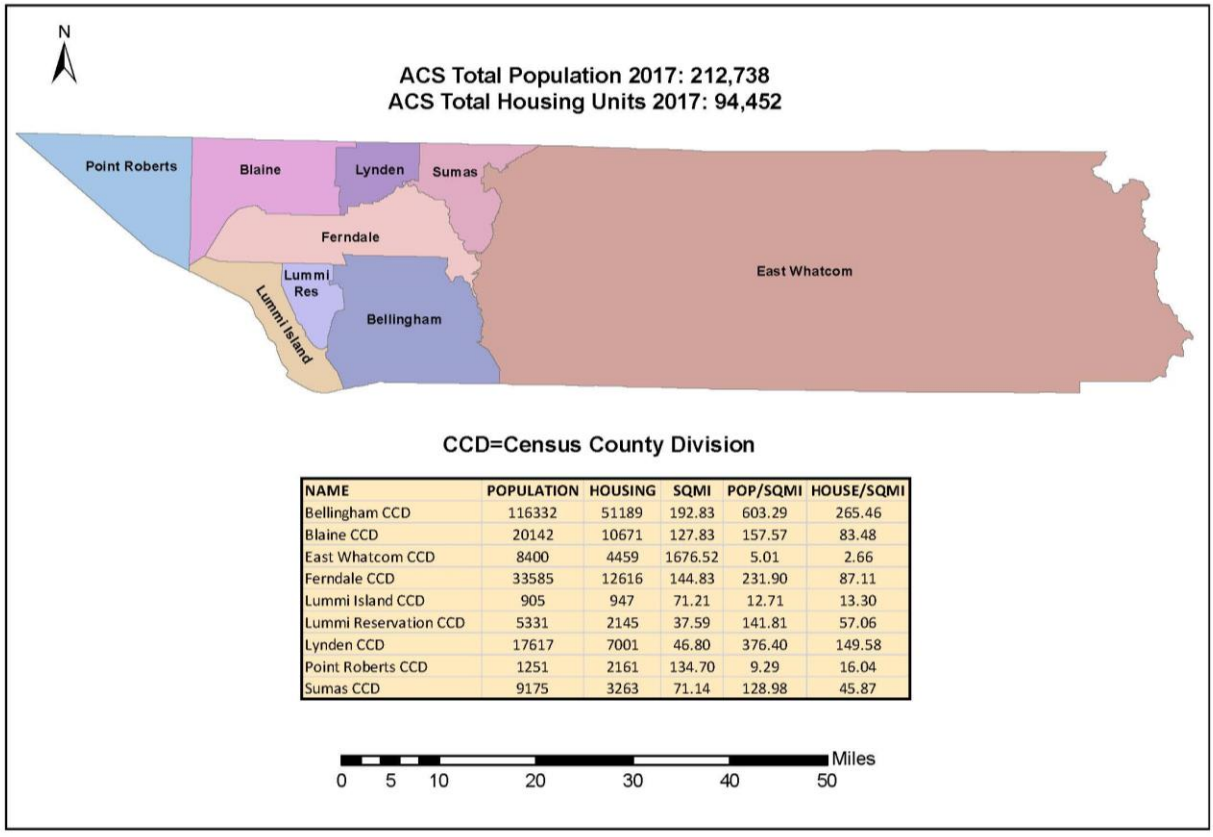
PUD telecom statute - RCW 54.16.330

Appendix A provides the complete text of each statute.

WHATCOM COUNTY PROFILE

Whatcom County is approximately 2,154 square miles in size, 62 percent of which is federal land. As of 2017, Whatcom County's population totaled 212,738 with 94,452 total housing units [Figure 2 – Population and Housing Whatcom County]. The median household income in the county is $56,419. More than 91 percent of households in the county have a computer and nearly 85 percent have a broadband internet subscription.

Figure 2: Whatcom County Housing and Population Data

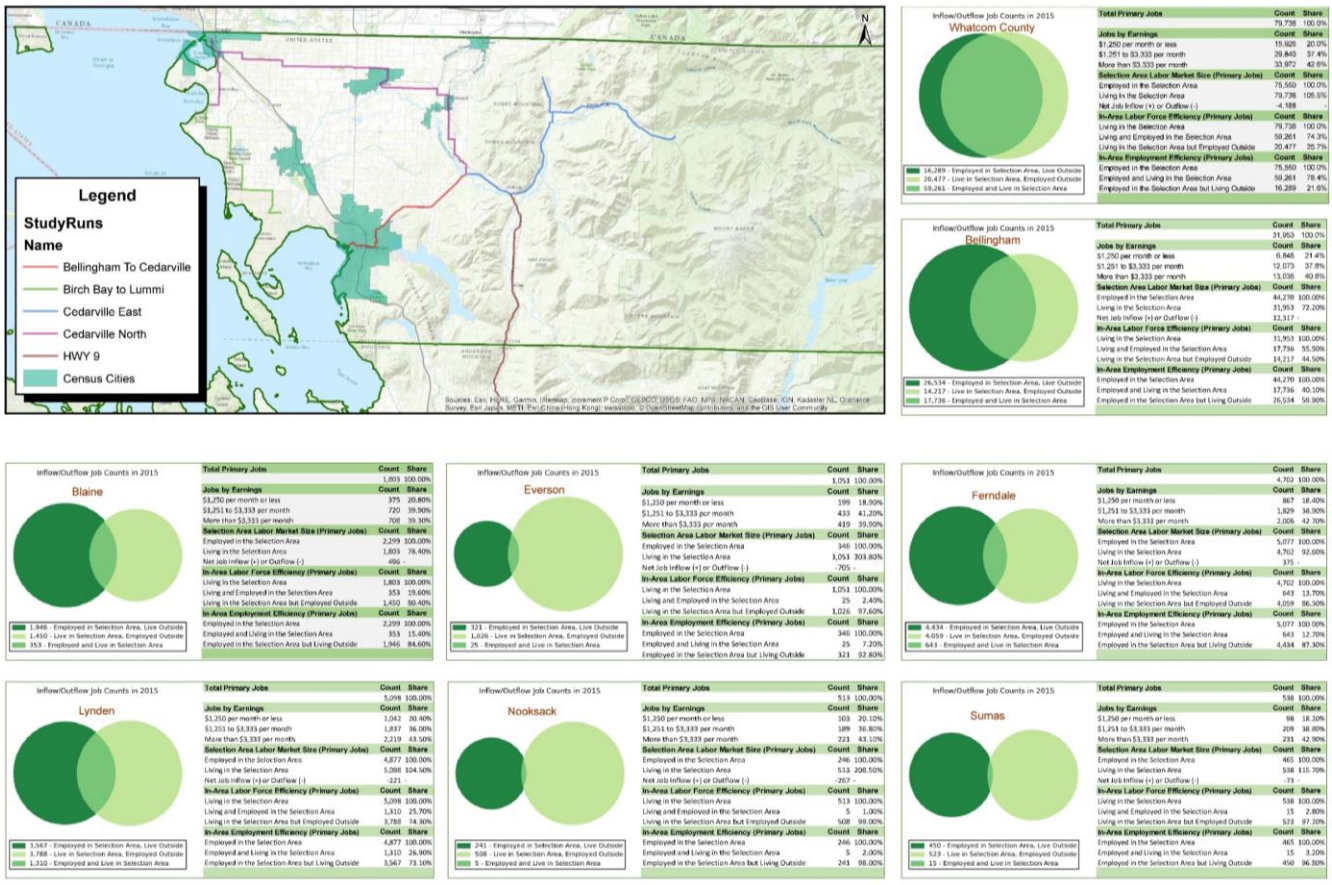


NAME	POPULATION	HOUSING	SQMI	POP/SQMI	HOUSE/SQMI
Bellingham CCD	116332	51189	192.83	603.29	265.46
Blaine CCD	20142	10671	127.83	157.57	83.48
East Whatcom CCD	8400	4459	1676.52	5.01	2.66
Ferndale CCD	33585	12616	144.83	231.90	87.11
Lummi Island CCD	905	947	71.21	12.71	13.30
Lummi Reservation CCD	5331	2145	37.59	141.81	57.06
Lynden CCD	17617	7001	46.80	376.40	149.58
Point Roberts CCD	1251	2161	134.70	9.29	16.04
Sumas CCD	9175	3263	71.14	128.98	45.87

The county is home to diverse industries from healthcare, hospitality, education, and recreation, to manufacturing and high tech industries. The Washington State Employment Security Department recorded total employment counts of 109,428 workers as of December 2018. The county's unemployment rate stands at approximately 5 percent. Figure 3 shows employment dynamics for Whatcom County in key communities. The county overall is balanced in terms of in-

commuting and out-commuting trends. The distance from the Seattle/King County metro area makes Whatcom County, in general, less of a bedroom community than its neighbors in Skagit County and Snohomish County to the south. However, smaller communities in Whatcom County, such as Everson and Nooksack, lack the employment opportunities of larger cities, and have a trend toward greater out commuting than communities such as Blaine and Bellingham.

Figure 3: Employment Data



CHAPTER 2 DEMAND ASSESSMENT

BROADBAND NEEDS IN WHATCOM COUNTY

Population growth in Whatcom County over the last 30 years has been driven by the in-migration of people from outside the county seeking jobs, quality of life, and other amenities available in the area. In the last 20 years, the trend has been to concentrate population in cities and see less growth in rural communities.

Access to affordable broadband services can support job creation and retention in these rural communities. Small businesses require access to reliable internet service to sell products online and/or support a digital presence for marketing and communications purposes. Telecommuting opportunities are also supported by broadband access.

The Port's focus in this study is to better understand the need for broadband infrastructure in Whatcom County's rural communities. These include Nooksack, Kendall, Maple Falls, Glacier, Deming, Lynden, and Blaine along with several smaller communities along the same primary highway routes.

MARKET RESEARCH SUMMARY

The market for broadband services in rural Whatcom County includes small businesses, particularly in the recreational and tourism industries along the Mount Baker Highway, public institutions including school districts and fire districts, and support infrastructure for fixed wireless and cellular network facilities. In remote areas like rural Whatcom County, support infrastructure for fixed wireless services is becoming increasingly important to the delivery of broadband services to communities.

The study area encompasses a range of potential customers for broadband services that include governmental organizations, schools, tribal facilities, and private businesses. These entities constitute the base of last mile service connections that would potentially be served with high speed internet services in the study area. Of these potential customers, a total of 54 are government institutions including fire districts, county offices, port facilities, and other public facilities, a total of 52 are schools, a total of 5 are tribal facilities, and 75 are private businesses.

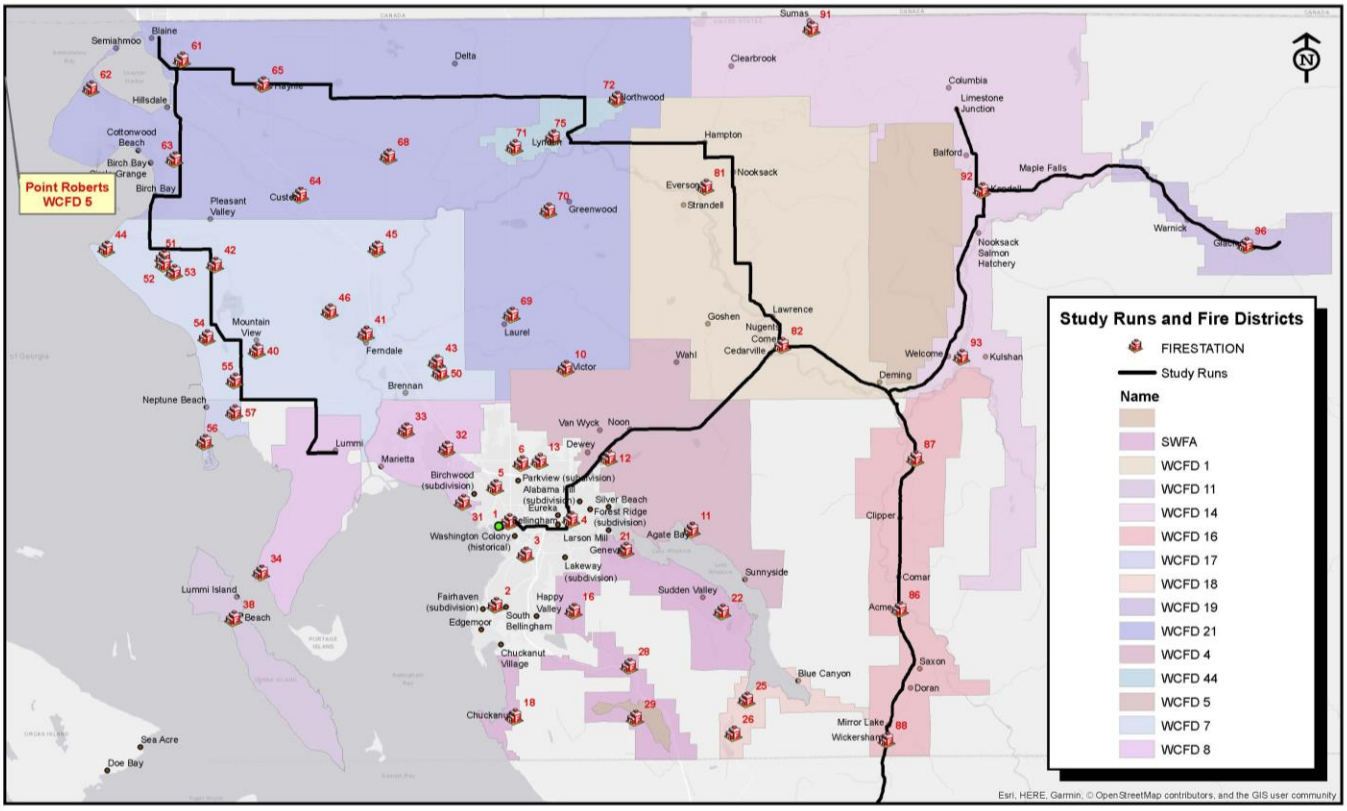
A breakdown is provided in Table 1.

Table 1. Summary of End User Service Connections by Category and Study Run

Study Run	Government	Schools	Tribal	Private	Total
Bellingham to Cedarville	25	25	0	8	58
Birch Bay to Lummi	7	1	1	9	12
Cedarville East	7	8	4	4	23
Cedarville North	17	16	0	45	78
Highway 9 Deming to Sedro-Woolley	4	2	0	9	15
Totals	**54**	**52**	**5**	**75**	**186**

There are 14 fire districts in rural Whatcom County.

Figure 4: Proposed Fiber and Fire Districts



There are 7 school districts in Whatcom County.

Figure 5: Proposed Fiber and School Districts

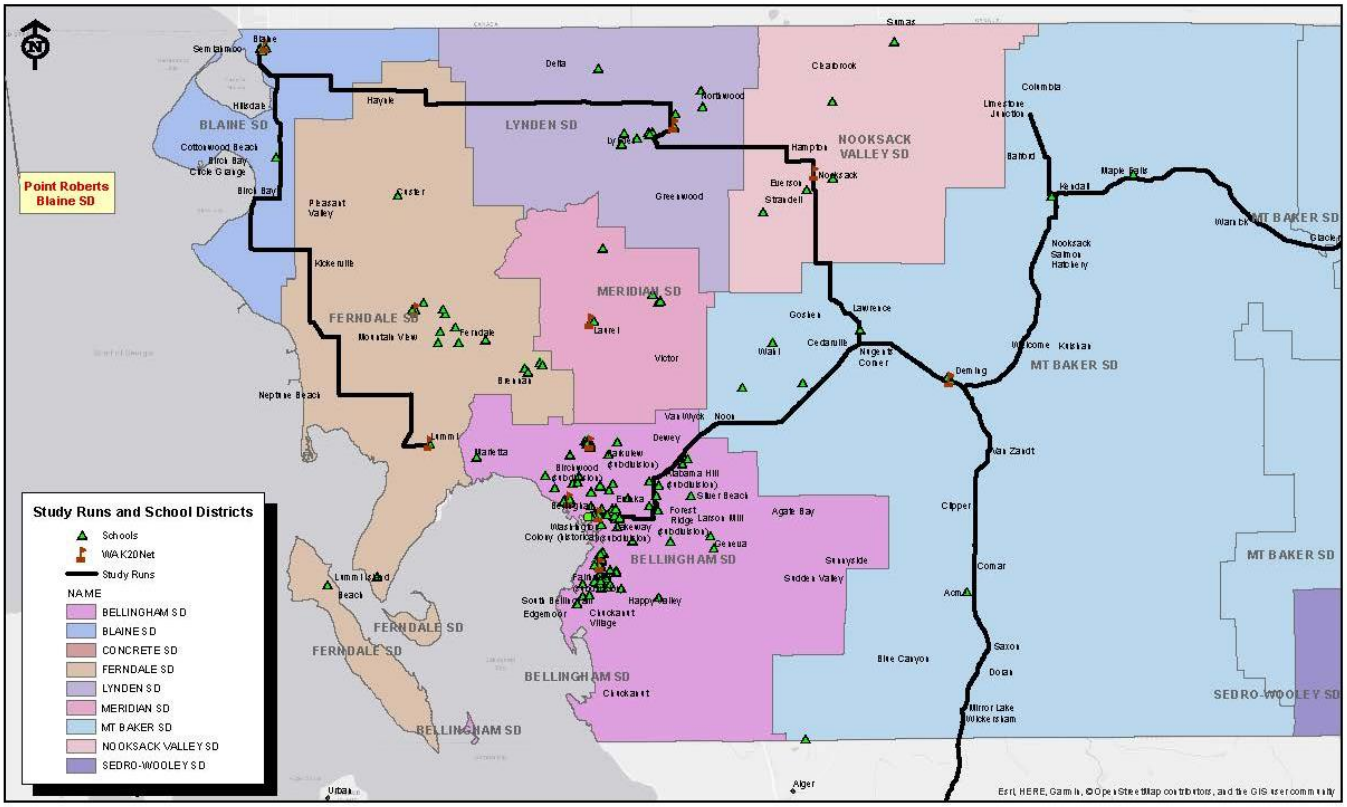


Figure 6 shows the location of FCC cell licenses and registered antennas in the county. These facilities also require connection to fiber optic infrastructure.

Figure 6: FCC Cell Licenses and Antennas

BROADBAND COVERAGE IN WHATCOM COUNTY

An assessment of existing broadband infrastructure was conducted by driving routes through the study area and making physical observations. In addition, provider data was obtained through publicly available sources. Information on publicly owned fiber optic infrastructure was obtained through communications with the City of Bellingham and Whatcom PUD directly.

Several telecommunications companies own and operate broadband infrastructure in Whatcom County. These include Frontier Communications, Wave Broadband, and Zayo. Maps of existing networks in Whatcom County as well as broadband coverage maps by census block are provided in Appendix F.

Several companies provide 4G LTE cell phone coverage in Whatcom County. These include AT&T, Verizon, Sprint, and T Mobile. Appendix G shows cellular 4G LTE coverage in Whatcom County.

In addition to privately held broadband infrastructure, both the City of Bellingham and Whatcom PUD own fiber optic networks in Whatcom County.

The FCC reports more than three broadband providers throughout Whatcom County providing broadband service of at least 25 Mbps download and 3 Mbps upload speeds. Based on stakeholder outreach within the study area, the FCC data may over represent the actual availability of broadband service in many rural areas throughout Whatcom County and does not address the affordability of such options if they do exist.

STAKEHOLDER OUTREACH

A quantitative and qualitative analysis was done on the needs and service available for schools, emergency services, businesses, and to the community. This was achieved through surveys, meetings, and one-on one-conversations.

SCHOOL DISTRICTS OUTREACH

Port staff met with superintendents of school districts and surveyed teachers and faculty members in the Mt. Baker, Lynden, and Kendall School District. Survey results showed inadequate speeds at some of the schools that affected the teacher's ability to plan and teach. A summary of survey results is provided in Table 2 below. Students have challenges completing assignments at home due to a lack of internet and many families do not have access due to affordability or services not being offered. A sample of comments received is provided below.

> *"Best case scenario-if I plan a lesson with internet, I might lose 10 minutes getting all the students to get on the site because of the slow internet. Worst case scenario-a lesson is*

planned with the internet and the internet crashes from having 30 students on it at once." - 7th grade teach Lynden School District.

"…there are many students impacted by lack of access to internet. This hinders their access to education and impact their grades greatly. If they are unable to do the research which is assigned for homework due to no internet accessibility, this puts the student at a major disadvantage." - 9-12 grade teacher Lynden School District.

Table 2. School District Outreach Survey Results

Survey Question	Yes	No
1. Does the lack of internet or slow internet have an impact on your job?	99%	1%
2. Have you experienced or know of instances where students have difficulties completing homework or tasks due to no internet or lack of internet?	100%	N/A Gave out paper homework or no homework
3. Do you know of students who do not have access to internet at home due to affordability?	99%	1%
4. Do you know of students/families who do not have access to internet at home due to service not being offered?	68%	19%

FIRST RESPONDERS OUTREACH

Port staff met with Whatcom County fire chiefs and Emergency Management Services coordinators and surveyed fire stations within the study area. Fire stations are generally served with internet connection; however, first responders rely on cell service when responding to calls in rural areas and service is severely lacking in those areas throughout the county. The lack of cell coverage makes it challenging when responding to calls and limits community members access to 911. Areas of greatest need where cell service is lacking include Highway 9, the Mount Baker Highway towards the community of Glacier, and along H Street east of Blaine. Cell towers not connected to fiber add to the limited cell coverage. One fire station has a cell tower just over two blocks away but it is not connected to a fiber network and therefore provides no service.

BUSINESS OUTREACH

The study identified 75 private businesses located within the study area. These include services such as gas stations/mini-marts, financial institutions, automotive shops, and manufacturing businesses. These businesses report internet service that is very expensive with limited options.

One small business owner has an IT business out of his home located just outside of Blaine and pays $160 a month for satellite internet. Service is not adequate and he often goes into town or directly to his clients to complete the job.

COMMUNITY OUTREACH

Many community members lack reliable and/or affordable internet. Residents report monthly fees ranging between $50.00 and $200.00 a month for internet service. Some pay for data package plans for set amounts of downloads/uploads and once used they either have no internet or it becomes very slow to the equivalent of dial up.

A community member who lacks internet commented:

> *"When others hear you don't have internet they really don't believe you. When contacting a business, they will always say to look up on the internet and then you get to wait on hold often up to 30 minutes to talk with an operator and sometimes never. Often you have to use the internet elsewhere."* Community member, Acme.

CHAPTER 3 ROUTE PLANNING

The Port identified rural broadband needs as its priority focus area for this study. The study then focused on two primary highway corridors extending east and north throughout the county. The first of these corridors, denoted as Segment 1, extends a total of 40.6 miles from the City of Bellingham east to Cedarville and then continuing east along the Mount Baker Highway corridor to the community of Glacier [Figure 7]. The second corridor, denoted as Segment 2, totals 64.8 miles and extends east to Cedarville and then north to Lynden, west to Blaine, and south to Lummi [Figure 8]. A third corridor, Segment 3, was also reviewed in this study and extends 21.7 miles south along the Highway 9 corridor from Deming to Sedro-Woolley [Figure 9].

Segments 1 and 2 form a mid-mile backbone through rural Whatcom County, connecting smaller cities and towns with key broadband infrastructure on the I-5 corridor and in the urban core of downtown Bellingham. Segment 3 provides a strategic opportunity to connect fiber optic infrastructure in Whatcom County with fiber optic infrastructure in Skagit County and eventually south to the Westin Exchange in downtown Seattle.

Compete route maps for each segment are provided in Appendix C.

Figure 7. Segment 1 – Bellingham to Cedarville/East

Segment 1 Construction Costs (40.6 Miles)

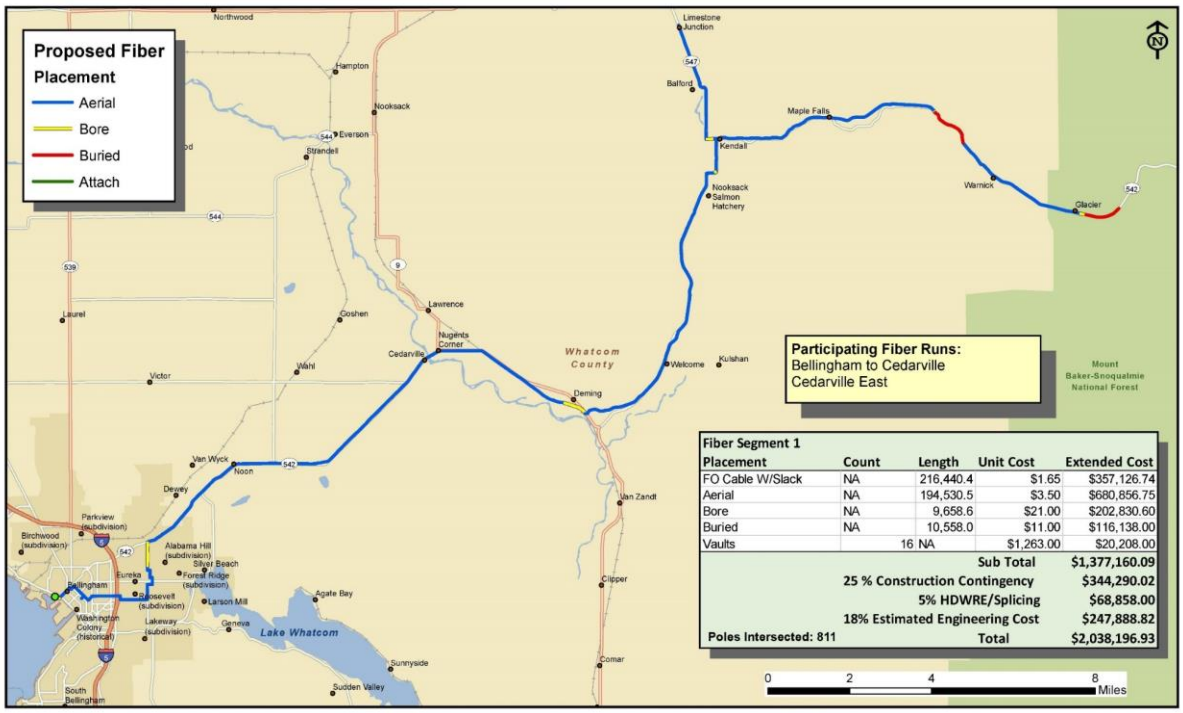


Figure 8. Segment 2 – Bellingham to Cedarville/North

Segment 2 Construction Costs (64.8 Miles)

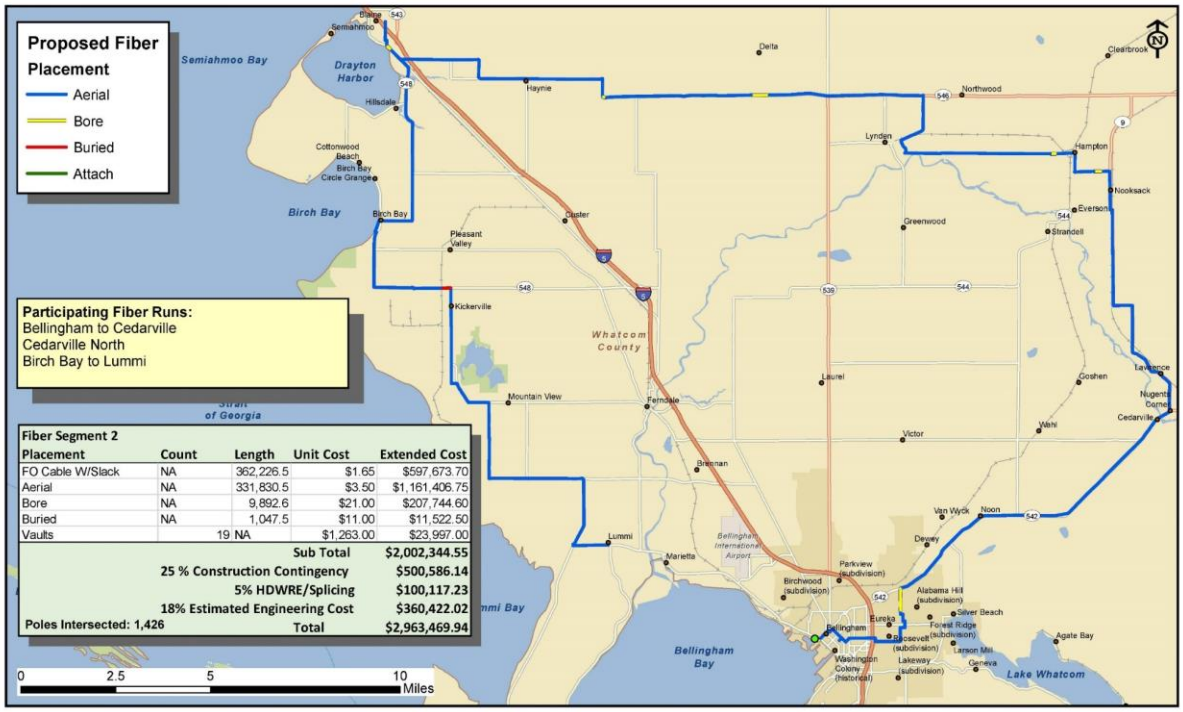
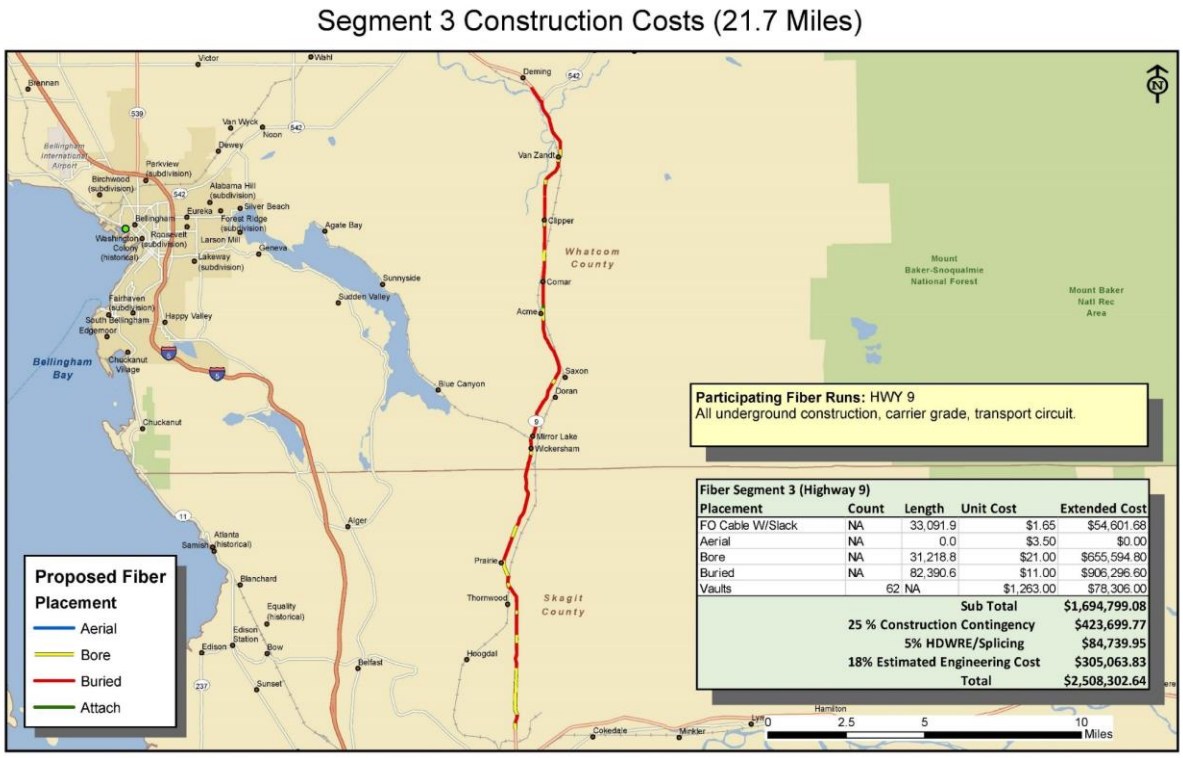


Figure 9. Segment 3 – Highway 9



CHAPTER 4 REGULATORY FRAMEWORK

The proposed routes through Whatcom County will require a variety of entitlements to construct. These include federal, state, and local land use and environmental permits, private utility permits, franchise agreements, and private easements with landowners. The following entitlements apply to the proposed routes.

LOCAL REGULATIONS

COUNTY RIGHT-OF-WAY AND ROAD PERMITTING

Construction of fiber optic infrastructure within Whatcom County right-of-way (ROW) will require a ROW encroachment permit during construction. The permit will require a traffic control plan and will dictate what and how fiber optic cable and related appurtenances such as pole anchor points will need to be constructed and placed within ROW.

FRANCHISE AGREEMENTS

Franchise agreements for use of ROW may be required by Whatcom County and the individual cities located within the county where fiber infrastructure is to be placed. Franchise agreements will dictate how utility relocations are conducted in conjunction with road projects that may require moving power poles and other infrastructure located within ROW. The franchise agreement determines who is responsible for conducting utility moves and who bears the cost for such moves. In addition, jurisdictions may impose franchise fees on utility owners. A typical fiber optic franchise fee for retail internet service providers is equivalent to six percent of gross revenues.

CRITICAL AREAS ORDINANCES

Whatcom County has a critical areas ordinance that governs work near wetlands and other sensitive aquatic areas. Any fiber optic installation that requires earth disturbance in or near a wetland or stream, including underground stream crossings, will require a critical areas review by Whatcom County. Critical areas reviews are typically triggered with the application for a building or grading permit. A professional wetland consultant can identify these features within the proposed fiber optic route and recommend project alternatives to avoid or minimize impacts to aquatic features.

STATE REGULATIONS

STATE ENVIRONMENTAL POLICY ACT (SEPA)

Projects and plans proposed by the Port will be subject to SEPA analysis. The Port is authorized by state law to act as its own lead agency. This means that whenever the Port requests a land use permit (such as a shoreline permit), it will be required to fulfill the environmental documentation requirements of SEPA. The Port is authorized to prepare and submit to Ecology either an environmental checklist or an environmental impact statement, depending upon the complexity of the project. The preparation of SEPA documentation is required for a plan or a permit application.

WASHINGTON DEPARTMENT OF ECOLOGY 401 WATER QUALITY CERTIFICATION

The 401 water quality certification for in-water projects is typically issued in conjunction with the United States Army Corps of Engineers (USACE) permit process described below. Upland issues associated with 401 water quality certification are handled directly by Ecology on an individual basis.

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE (WDFW) HYDRAULIC PROJECT APPROVAL

Any forms of work that use, divert, obstruct, or change the natural flow or bed of any freshwater or saltwater of the state require a hydraulic project approval (HPA) from WDFW. Activities requiring an HPA include the placement of utility lines below the ordinary high water mark (OHWM) in freshwater and waterward of the MHHW line in saltwater. (See Chapter 220-110 WAC.)

A Joint Aquatic Resource Permit Application (JARPA) will be required for in-water utility projects. Drawings of the proposed project are submitted along with the JARPA form to WDFW for review and permit issuance.

WSDOT RIGHT-OF-WAY

As with county ROW, any installation located within ROW of a state highway or any crossing of a state highway will require authorization from the Washington State Department of Transportation (WSDOT). WSDOT will issue a permit or a franchise agreement for the construction. Permits are issued for lateral crossings and longitudinal installations no longer than 300 feet. Franchise agreements are issued for longitudinal installations longer than 300 feet.

FEDERAL REGULATIONS

UNITED STATES ARMY CORPS OF ENGINEERS

Any work that causes the discharge of fill material to a wetland or other water of the US requires a Section 404 permit from the USACE. Utility projects with minimal and temporary impacts to waters of the US qualify for a Nationwide 12 permit. This is an abbreviated permit process with no notice procedures and programmatic approval provided the project complies with USACE requirements to restore the site to preexisting conditions post construction.

If the project affects waters that support salmon species listed under the Endangered Species Act (ESA) or other listed species, the USACE must consult with the National Oceanic and Atmospheric Administration (NOAA) Fisheries and the United States Fish and Wildlife Services (USFWS) prior to issuing a permit. In this case, the permit applicant will also be required to prepare a biological evaluation (BE) as part of the permitting documentation to USACE.

PRIVATE AUTHORIZATIONS

POLE ATTACHMENTS

Pole attachment agreements are required by Puget Sound Energy, Frontier Communications, and the City of Blaine for any communications infrastructure attached to a privately-owned utility pole. PSE is the majority owner of all poles along the planned routes. A limited number of city-owned poles exist along the route in the City of Blaine.

PSE requires a Pole Attachment Agreement to cover the general terms of all pole attachments on the network. The agreement will prescribe yearly rental fees for each pole. These fees can range from $18 to $25 per pole per year. The agreement will also specify the terms of relocation costs, should a pole need to be replaced or moved, specifications for attachment, and terms for the performance of work. Each new pole attachment must also be reviewed by PSE for construction specifications and make ready work. Any make ready work required to accommodate the attachment will be paid for by the permittee.

RAIL CROSSINGS

Any work across or along an active railway corridor will require a License for Communication Line, Television Cable, and/or Fiber Optic Line Across or Along Railway Property. The license will prescribe insurance requirements for working in railway property, along with specifications for the construction and maintenance of infrastructure within railway property.

EASEMENTS

Linear utility installations such as fiber optic cable often require the acquisition of privately held easements. Easements will be required for any underground installation of fiber optic cable that occurs outside public ROW. In addition, anchor points for pole down guys, vaults, telecommunications huts, and other network appurtenances may need to be located on private property and may require privately held easements to locate.

CHAPTER 5 BUSINESS MODEL

BUSINESS MODEL CASE STUDIES

The Port can consider several approaches to providing broadband infrastructure in Whatcom County.

DARK FIBER MID MILE FOCUS

In this scenario, the Port builds mid mile fiber optic infrastructure and leases it to private telecommunications providers. The provider builds to end user premises from the Port-owned backbone. The mid-mile infrastructure can be used by providers to gain backhaul services and provide redundancy to existing networks. The infrastructure can be used to supplement existing privately held networks, allowing providers to focus investment on last mile connections and possibly expand into areas that would not have been financially feasible to enter previously.

This model supports provider efforts to deploy additional resources in communities by supplementing existing networks and focusing resources on areas in the greatest need of additional infrastructure. The disadvantage of this model it that is perpetuates existing barriers to entry for providers and limits competition in communities. This model does not create an open access environment. Because a provider controls access to the end user customer, consumers must pay an additional installation fee if they wish to switch to a different provider. In rural areas, the infrastructure required to access the premises will often make it cost prohibitive to offer consumer choice in providers.

Case Study: The Commonwealth of Kentucky is currently investing in a statewide mid-mile network designed to accelerate last-mile investment in communities.

DARK FIBER OPEN ACCESS FOCUS

In this model, the Port owns the fiber optic system to a demarcation point on every premises. Dark fiber is leased on a non-discriminatory basis to providers offering services on a competitive platform. This model creates a true open access environment. Providers can lease fiber to customers and compete for services. An open access colocation facility is required to allow providers to stage electronics on the network. The Port owns the fiber optic cable, vaults, and splice cases on the network, along with the colocation facility. Fiber is terminated in each premises such that a provider can initiate new service to a customer by making the connection at the colocation facility without need for a new installation charge. The service provider owns the electronics housed at the colocation facility.

This model removes barriers to entry for providers in Whatcom County and makes it possible for more providers to compete for business on a competitive basis. The introduction of additional providers can help diversify the telecom economy in Whatcom County and hedge against consolidation in the industry. In eastern Washington, the Port of Whitman owns and operates an open access dark fiber system that is currently used by 16 service providers and licensed exchange carriers providing service in the area.

Case Study: The Port of Whitman in Washington State has built more than 300 miles of fiber between Spokane, Washington and Lewiston, Idaho.

LIT FIBER OPEN ACCESS FOCUS

A final model requires the entity to light fiber on the system. In this model, the entity creates a lit fiber optic environment and sells access on the system to providers. Ports do not have legislative authority to provide lit services. This model requires that the entity owns all electronics necessary to light the network. This creates more risk and capital outlay for the entity.

Case Study: NoaNet, a consortium of PUDs in Washington State is an example of a public entity providing a lit network with bandwidth sold to telecom providers on a wholesale basis.

Types of internet connectivity

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

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

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

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

PREFERRED BUSINESS MODEL

This study recommends the Port pursue a dark fiber open access business model. Public ports are well equipped to build and manage dark fiber infrastructure. Provisioning the physical infrastructure required to form the foundation of an economy is the core work of port districts. Where airports and marine terminals provide essential infrastructure for the movement of cargo and freight, fiber optic cable is essential to the movement of data in a digital economy.

This model allows the port to focus on its core competency, management of physical infrastructure, and leaves the provisioning of electronics and other required elements of a telecommunications network to the private sector, which is better suited to driving innovation in response to market demand.

OPERATIONAL MANAGEMENT MODELS

The proposed infrastructure can be operated with various management models. The Port may elect to develop the staffing and equipment resources in-house to manage the network or may elect to contract for services. Some combination of these approaches would also work. A summary of required roles and responsibilities is provided in Table 3 below with recommended approach.

Table 3. Summary of Operational Roles

Role	Description	Recommended Approach
Business Development and Network Planning	Work with providers and stakeholders in the area to define network expansion needs and direct long-term capital investment.	Develop in-house expertise and manage internal to the Port.
Outside Plant Design	Engineering design for network	Contract for services with qualified design firm.
Network Construction	Construction of fiber optic backbone segments and line extensions	Handle construction project management in-house and contract for construction through public works bidding process.
Installation/termination of fiber at premises	Construction of service installations to the premises in coordination with service provider.	Can be addressed through small works contracting or with trained in-house staff.
Non-recurring charge estimates	Develop cost estimate for service installations.	Contract for services with a qualified design firm.
Maintenance and Repair	Perform needed maintenance and repair on infrastructure.	Trained staff technician and/or one or more on-call contracts with qualified contractor(s).
Emergency Restoration Services	Perform emergency response in the event of an outage.	Contract for services with a qualified Network Operating Center.

Locates	Provided one-call locate services	Contract for services.
Network Operating Center	Provided 24/7 network operating center services including outage reporting.	Contract for services.
Network mapping and splice cut sheet management	As-built mapping and record keeping for splice points and customer circuits.	Contractor as-builts required with all construction. Contract for network mapping and cut sheet management.
Customer Billing	Monthly lease billings to providers.	Contract for services or integrate into in-house accounts receivable system.

CHAPTER 6 FINANCIAL ANALYSIS

CONSTRUCTION COST ESTIMATE

Appendix D provides a detailed financial analysis of the overall project including a breakdown of the construction costs for Segments 1 and 2 and the Segment 3 Highway 9 connector. A summary of those costs by segment is provided in Table 4 below. If Segments 1 and 2 were both constructed, the total cost estimate would be $4,328,896.22. If only Segment 1 was constructed, the total cost would be $2,038,196.93. If only Segment 2 was constructed, the total cost to construct would be $2,963,469.94. For purposes of estimating the cost to build both Segments 1 and 2, fifty percent (50%) of the cost of the run from Bellingham to Cedarville was assigned to each segment.

The Segment 3 Highway 9 connector would add an additional $2,508,302.64 to the project, for a total cost of $6,837,198.86 should the Port elect to build all three segments.

Table 4. Construction Cost by Segment

Segment	Miles of Fiber	Individual Cost Estimate	Combined Cost Estimate
Segment 1 - Bellingham to Cedarville/East	40.6	$2,038,196.93	$1,701,811.60
Segment 2 - Bellingham to Cedarville/North	64.8	$2,963,469.94	$2,627,084.61
Total Construction Cost Segments 1 and 2		N/A	**$4,328,896.22***
Segment 3 - Highway 9 Connector	21.7	$2,508,302.64	$2,508,302.64
Total Construction Cost w/Highway 9			**$6,837,198.86**

*Segment 1 and 2 combined cost estimate allocates 50% of the shared construction cost of the run from Bellingham to Cedarville to each segment.

PROPOSED FEE STRUCTURE

The fiber will be priced on a unit basis. Different fiber designs will be priced separately. A retail provider that is leasing fiber from the Port that is used as a long haul will be charged differently than a fiber to the home model where a cost per month segment is charged. The following are examples that are used in the financial modeling for the communities and routes in this feasibility study.

End mile business applications .02 cents per foot, one mile minimum. This would be an A to Z location monthly charge for fiber to the premise.

An end mile segment charge. This would be a monthly charge for an A to Z premise charge. This is used when the A location is not in an equitable placement for all customers to be treated fairly in a community. A charge of $125.00 to $200.00 per month would be charged in place of the .02 cents per foot circuit charge.

A premise hooked up per month charge. In the fiber to the premise designs a $20.00 to $25.00 per month charge is assessed for each premise that a retail provider has a customer on in a community.

A per mile charge is commonly used for mid mile and long haul fiber applications. A monthly charge between $15.00 to $25.00 per month per strand is a normal rate in the pacific NW. Agreements that are based on an Irrevocable Right of Use (IRU) are usually done for long term usage and can involve a discount for the value of money if the agreement terms are paid at the time of contract for the length of term. Example: 100 miles of fiber is leased for $20.00 per month per mile. One strand would lease for $2,000.00 per month. If the term of the IRU was 10 years the value of the whole contract would be $240,000. The customer would request a time value of money cash discount if the contract was paid up front.

REVENUES AND EXPENSE PROJECTION

Table 5 includes annual revenue and expense estimates for the network.

Table 5. Revenue and Expense Projection

	---------- Annual Revenue Projections ----------			Annual Operating Expense
	Mid Mile	**Last Mile**	**Total**	
Segment 1	$47,606.36	$73,872.00	$121,478.36	$20,964.22
Segment 2	$58,426.88	$134,976.00	$193,402.88	$36,022.99
Segment 3	$13,008.00	$13,680.00	$26,688.00	$3,873.07

Revenue estimates are based on leasing both mid mile and last mile fiber optic cable. Mid mile revenues are derived from leasing fiber optic strands on a per-mile basis over the length of the run at a rate of $25 per strand per mile per month. The study assumes the following mid mile leases: two competitive licensed exchange carriers (CLEC) and two internet service providers will lease fiber on Segment 1; one CLEC and two ISPs will lease fiber on Segment 2; and one CLEC and one ISP will lease fiber on Segment 3. These assumptions are based on lease modelling from similar sized communities in the Port of Whitman's service area.

Last mile revenues are derived from leasing fiber optic strands from a centrally located colocation facility in each community to the end user premises at a rate of $205 per circuit per month, where each circuit consists of 2 strands of fiber optic cable from the colocation facility to the premises. The number and type of potential end user service connects is included in Table 1 above. The study assumes that the network achieves 40% penetration of potential service connections at full build out. Revenues are stepped in over the first five years of service until the full 40% customer penetration rate is reached. See Appendix D for a full breakdown of revenue projections.

Operating expenses on the network are assumed to include annual pole attachment fees and on-call locate costs. Flow through expenses that are balanced by a revenue stream are not included in this estimate. These include NOC charges for colocation facility monitoring and power requirements. These expenses will be off-set by usage fees for the colocation facility. Staffing costs are also not included in this assessment. True staffing costs for the network will vary greatly with the chosen operational management model and compensation plans of the contributing organization.

ROI ANALYSIS

Table 6 summarizes return on investment projections 10 and 20 years into operation of the proposed network. Segments 1 and 2 combined realize a positive return approximately 16 years after construction. If the initial capital cost can be off-set with $2,000,000 in grant funding, the projected return is realized in Year 9.

Segment 3, the Highway 9 connecting section does not realize a positive return in the study period of 20 years. The value of this segment, however, is not in its ability to cash flow the infrastructure cost, but is in the opportunity to connect the proposed network in Whatcom County with the network currently under construction by the Port of Skagit and Skagit PUD in Skagit County. Connecting these two networks would provide the opportunity for more providers to do business regionally across a common business platform.

Table 6. Return on Investment Projections

		Year 10		Year 20	
	Estimated Capital Investment	Estimated Revenues	Estimated ROI	Estimated Revenues	Estimated ROI
Segment 1	$ (1,921,399.43)	$ 121,478.36	-20.19%	$ 121,478.36	1.15%
Segment 2	$ (2,841,891.07)	$ 193,402.88	-8.80%	$ 193,402.88	1.80%
Segments 1 and 2 Combined	$ (4,090,225.04)	$ 314,881.24	-7.13%	$ 314,881.24	2.98%
Segment 3 Hwy 9	$ (2,309,065.51)	$ 26,688.00	-27.78%	$ 26,688.00	-11.30%

PROJECT REPORTING AND REVIEW

KEY DATA

Key data used to track network performance over time includes the following:

- Return on investment will be tracked for the initial construction and each service connection.
- Private sector jobs supported in maintaining and operating the network.

- Number of providers on the network.
- Service coverage and available internet service speeds.

APPENDICES

APPENDIX A. BROADBAND STATUTES

APPENDIX B. SCHOOL DISTRICT OUTREACH SURVEY

APPENDIX C. DETAIL ROUTE MAPS

APPENDIX D. DETAIL FINANCIAL ANALYSIS

APPENDIX E. MASTER OPTICAL FIBER AND FACILITIES LEASE

APPENDIX F. EXISTING NETWORKS AND BROADBAND COVERAGE BY CENSUS BLOCK

APPENDIX G. EXISTING 4G LTE NETWORKS IN WHATCOM