Public Works Department
City of Bellingham

BROADBAND ADVISORY WORKGROUP

FINAL REPORT

RECOMMENDATIONS AND DOCUMENTS

September 26, 2022

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Resolution Providing Clarification and Direction Regarding the Broadband Advisory Workgroup

RESOLUTION NO. <u>2020-31</u>

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF BELLINGHAM, WASHINGTON DIRECTING THE ADMINISTRATION TO CREATE AN AD HOC BROADBAND ADVISORY WORKGROUP TO ADVISE THE CITY ON POLICY CONSIDERATIONS REGARDING MUNICIPAL BROADBAND

WHEREAS, Access to the internet with reliable connections, low latency, high bandwidth and high speed is increasingly important and today is considered a basic need and essential for businesses and households; and

WHEREAS, Broadband, or high-speed internet, is defined by the Federal Communication Commission as 25megabits per second (mbps) download and 3mpbs upload for private companies offering internet service. However, this standard is increasingly out-dated, and there are households and businesses seeking greater symmetrical speeds up to 1 gigabit per second (gbps) to meet growing demand for internet consumption and interconnected devices; and

WHEREAS, The State of Washington, under the direction of Governor Inslee, is funding and developing programs to expand access to high speed internet to rural areas of the state to support economic development, education, health care, public safety and basic services; and

WHEREAS, fast, affordable internet is seen as one way to assist existing local companies expand, or to attract new companies; and

WHEREAS, the City of Bellingham, in partnership with the Bellingham School District and the Port of Bellingham, owns and operates a public fiber optic network serving city owned utilities, Bellingham School District, Western Washington University, Port of Bellingham facilities, City and Whatcom County Public safety communications systems, Whatcom Transportation Authority; and

WHEREAS, the Bellingham public fiber infrastructure system may have capacity to serve additional users; and

WHEREAS, the Bellingham City Council allocated $100,000 with the approved 2019-2020 budget to fund a consultant study to develop a business plan and consider options to use the City's fiber optic network for public purposes and further desires to consider fiber as critical infrastructure to meet society's needs both today and in the future; and

WHEREAS, the Bellingham City Council desires to form a workgroup utilizing the assistance and advice of local residents, local professionals and expert consultants; and

WHEREAS, the purpose and mission of said workgroup is to evaluate the possibility of municipally owned broadband infrastructure as one way to further the goals of greater availability, affordability, equitability, and quality of broadband access across the community;

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City of Bellingham
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to address policy considerations, and the financial costs and benefits thereto; to assess existing conditions related to broadband access, equity and affordability as well as options and ways to use the City of Bellingham fiber optic network as it exists today, or as may be expanded or improved, to improve access, equity and affordability to quality broadband and to the report findings and recommendations to the City so that the Council can hold public discussions on a broadband infrastructure policy.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF BELLINGHAM THAT:

SECTION 1. Advisory Workgroup

The Bellingham City Council, directs the Mayor to appoint a volunteer ad hoc Broadband Advisory Workgroup, ("the Workgroup" or "BAW") consisting of not less than 5 and not more than 9 community members and industry professionals comprised of the following:

    a. General: At least 3 local residents with general backgrounds or experience with education, small business, manufacturing, organized labor, contractor associations, non-profit entities, and other interests representing diverse public interests.

    b. Fiber Network Industry: At least 1 but not more than 3 individuals with professional technology experience and training in fiber optic networks, internet provider industry, fiber optic installation, telecommunication utility providers, information technology or similar fields. Individuals currently employed by telecommunications service providers, fiber optic installers or similar are encouraged to apply, provided that there is no direct benefit to a current employer or business interest.

    c. Financial: At least 1 but not more than 3 individuals with professional experience and training in business, finance, economics, municipal operations or similar field. Individuals in this area shall not represent the views of their employer.

    d. In the event of a resignation or vacancy, the position will be filled by Mayoral appointment. Unexcused absences of more than 2 consecutive meetings shall be considered a resignation from workgroup. Substitutes or alternates shall not be allowed for any member.

The Mayor and Council shall consider perceived or real conflicts of interest in appointing and confirming members to the Workgroup.

The Mayor and administration shall support the Workgroup by appointing members, assigning staff, coordinating and implementing communications strategies, providing contract procurement and administration. The Council's role is to confirm or reject appointments and receive and consider the advice and recommendations of the Workgroup.

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The administration shall advertise, though usual and customary means, for applications from interested individuals, residents, community members, and industry professionals. The Mayor shall give preference to residents of the City in considering appointments. The Mayor is authorized to make appointments to persons not residing within City limits if the training, knowledge and experience, or number of applicants, from interested City residents is not sufficient to meet the mission of this Workgroup. Consideration of a diverse and inclusive group reflecting the demographics of the City shall be made in forming the Workgroup. The Workgroup shall be appointed by the Mayor and confirmed by the City Council. Individuals may be removed by the Mayor.

In addition, staff from the City Council office, Public Works Department and Information Technology Departments shall serve on and support the Workgroup as non-voting ex-officio members. Staff from the Bellingham School District and Port of Bellingham as well as other individuals or organizations identified by the Mayor may also serve as non-voting ex-officio members. Council confirmation is not required for non-voting ex-officio members. Elected officials and persons employed by the City of Bellingham shall not be appointed to the Workgroup but may serve as non-voting ex-officio members at the discretion of the Mayor.

The Workgroup shall not in any way have influence or control over any contract, procurement, award, or contract administration.

SECTION 2. Facilitator -
Council directs the Administration to contract with an outside entity or individual to serve as a neutral Facilitator to support the Broadband Advisory Workgroup, to chair and organize meetings, prepare agendas, guide the work of the Workgroup, prepare reports, prepare meeting minutes and otherwise generally support and guide the Workgroup. The Public Works Department shall be responsible for procurement and contract management as necessary. Facilitator shall work and liaise with communications staff in the Public Works Department and the Mayor's office in disseminating information on the progress of the workgroup and general outreach and general communications on the work of the Workgroup. Funding for the facilitator shall be from the existing budget authorization.

SECTION 3. Workgroup Scope of Work -
The Broadband Advisory Workgroup shall take the following actions and present a final report and recommendations to the City Council:

a. Assist with development of a Request for Proposals to select a qualified consultant to prepare a report assessing current conditions and future options for municipal broadband

b. Assist with development of a Scope of Work for a consultant (the Consultant) to address the following items, provided there is sufficient funds in the authorized budget:

    i. Survey of existing quality, accessibility, equity, and affordability of broadband service options for residents and business within the City of Bellingham and its Urban Growth Area Boundary

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      ii.   Inventory and evaluate existing broadband infrastructure within the City of Bellingham and its Urban Growth Area Boundary

     iii.   Provide analysis and recommendations, including economic impact analysis and business case, on a range of common options for municipal broadband and fiber networks offered by other Cities including fully public, public private partnership, dark fiber leasing, open access and other options as may be known to the consultant or workgroup members. Recommendations should include any additional infrastructure and other operational and security needs and/or requirements for the range of service model(s).

     iv.   Provide an analysis and recommendation on the development of a Fiber to the Home (FTTH) and/or Fiber to the Premises (FTTP) network. The work shall include consideration of the City as provider and the creation of an open access or leased system or other options as may be identified by the Consultant. Recommendations should include any additional infrastructure and other operational needs for the range of service model(s). Estimate capital and operating cost (including staffing and equipment requirements), connection costs and equipment installation costs for a City of Bellingham FTTH and/or FTTP at 100 mbps and at 1.0 gbps symmetrical speeds.

     v.   Assess financial models for operations and capital improvements for options considered including but not limited to pay as you go, property tax levy, local improvement district, general fund, enterprise utility creation, user fees or other means as may be known to the Consultant or Workgroup members

     vi.   Provide recommendations to increase quality, access, equity, and affordability of broadband and higher speed internet services.

     vii.   Consult and coordinate with the Workgroup on a regular but not less than monthly basis.

c.   Advise in the Selection of a qualified Consultant (note that final selection and contract award shall be made the Mayor or his designee and not by the Workgroup). The Mayor or his designee shall be the administrator of the contract between the consultant and the City. The Workgroup shall not have any control or influence on contract administration.

d.   Participate in discussions with City staff and its contractor as the scope of work is completed. A report shall be drafted and written by the contracted Consultant. Upon completion of the final report by the contracted Consultant, the Workgroup shall submit the final report to the Council Workgroup of the Whole with recommendations of the Workgroup for further action by the Council. The presentation shall be made by the Consultant and Facilitator with written or oral commentary and discussion by such members of the Workgroup as may be decided on by the Workgroup.

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e. The Workgroup and Consultant shall focus on broadband and fiber optic networks and the use of the city's fiber optic network to potentially expand quality, access, equity, and affordability and shall not investigate other forms of telecommunication services providing broadband including cellular, cable, digital subscriber line, or satellite services, except insofar as they directly relate to fiber optic networks.

f. The total cost of the contracted consultant work and facilitator services shall not exceed $100,000 as budgeted. The scope of work in Section 3b shall be prioritized by the Workgroup to fit within the approved budget. Work not able to be completed within the approved budget shall held for future phases as funding becomes available.

SECTION 4. Schedule

The Workgroup shall proceed quickly and efficiently. The Workgroup shall use the following general schedule in developing the work plan:

a. October 2020 – Workgroup membership confirmation by City Council
b. November 2020 – First Workgroup meeting and agreement on rules, roles and responsibility, selection of members to coordinate with Facilitator, procedures, schedules, understanding of protocols and decorum
c. January 1, 2021- RFP posted for Consultant
d. April 2021- Consultant Contract executed and Notice to Proceed issued by City staff
e. May 2021- Workgroup progress report submitted to or presented to City Council
f. October 2021- Consultant work completed
g. November 2021- Consultant, facilitator and Workgroup submits and presents final report and recommendations to City Council

Where possible the Workgroup is encouraged to complete the work faster than this schedule. All work of the Workgroup, Consultant and Facilitator, including presentation on recommendations shall be completed not later than December 31, 2021.

SECTION 5. Quorums and Decisions and Meetings

a. The Workgroup shall be comprised of 5 to 9 voting members as appointed by the Mayor.
b. Quorum - Five voting members of the Workgroup shall constitute a quorum for the transaction of business if the Mayor appoints either eight or nine persons. Four voting members of the Workgroup shall constitute a quorum if the Mayor appoints either 6 or 7 persons. Three voting members of the workgroup shall constitute a quorum if the Mayor appoints 5 persons to the workgroup. No meeting shall be held without a quorum being present.
c. The Workgroup shall not establish subgroups.

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d. Decision Making - Workgroup members shall strive for consensus on decisions and recommendations made to the Council. In the absence of consensus, the workgroup shall make decisions and recommendations by simple majority vote of the quorum. In the event of a simple majority vote, the minority votes will be allowed to submit a written dissenting opinion to be included in recommendation made to the Council.

e. The Workgroup shall select 2 members to coordinate with the Facilitator on meeting schedules, agendas and communications issued by the Mayor's office.

f. Attendance may be in person, via telephone, video conference, internet video stream or other method provided the member is able to listen, speak, fully participate and view all portions of the meeting.

g. The Workgroup shall establish its own meeting schedule but shall meet monthly for coordination with the Staff and Consultant. Each monthly meeting shall not exceed 120 minutes in duration.

h. The Workgroup shall terminate and dissolve upon presentation of the final report and policy recommendations described in Section 3 to City Council.

i. The Workgroup shall advise and assist the City on policy issues as defined in previous sections. In an advisory role to the Council, the Workgroup shall use the following in conducting business:

    i. Workgroup meetings shall be open to the public for observation, but shall neither be recorded (audio or video) nor rebroadcast by the City. Meetings may be live streamed using the City's usual and customary means.

    ii. Notice of meetings and agendas shall be published using usual and customary means of the City.

    iii. Summary meeting minutes shall be prepared by the Facilitator and provided to the public using usual and customary means of the City.

    iv. The work of the Workgroup is limited to the scope described in this resolution. The Workgroup shall have no authority to set policy, direct actions of staff or otherwise replace or supplant any authority reserved for the City Council or Mayor

    v. Workgroup meetings shall not include public comment periods nor shall the Workgroup be obligated to seek public comment on the work outlined in this resolution. Public comment and input on the policy advice and recommendations of the Workgroup and the Consultant shall be accepted by the City Council after the completion of the work and presentation to the City Council. The Workgroup is encouraged to include public surveys on needs and interests for broadband access, equity and affordability as part of the Scope of work to be completed by the Consultant.

    vi. The Workgroup may consider inviting its own members or outside individuals or entities to make presentations to the Workgroup to establish a base of common knowledge, develop a shared understanding and increase knowledge base concurrent with other elements of work contained in this resolution.

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SECTION 6. Workgroup Member Roles and Responsibilities

    a. All workgroup members have equal voice and status.

    b. Workgroup members shall be respectful of all opinions and views during all meetings and in all public forums outside of workgroup meetings.

    c. Workgroup members shall respect decisions of the Council and Mayor in appointing members workgroup and shall not criticize other workgroup members, individuals or represented companies for perceived conflicts of interest, background or profession.

    d. Individual Workgroup members will not represent an official Workgroup point of view unless expressly authorized by the Mayor's office or adopted by a formal vote of the Workgroup.

    e. Public communications using social media, traditional media, press releases, public statements, presentations, shall be authorized or issued by the Mayor's office only.

    f. Workgroup members shall attend all scheduled meetings or submit a request to the facilitator for an excused absence at least 72 hours in advance of the meeting. Unexcused absences may result in removal from the Workgroup by the Mayor.

PASSED by the Council this 24th day of August, 2020.

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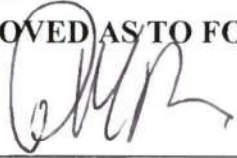Gene Knutson, Council President

APPROVED by me this ___31___ day of __August__, 2020

_____
Seth Fleetwood, Mayor

RESOLUTION - 7

City of Bellingham
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ATTEST:

_____
Andy Asbjornsen, Finance Director

APPROVED AS TO FORM:

_____
Office of the City Attorney

RESOLUTION - 8

City of Bellingham
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RESOLUTION NO. 2021-02

A RESOLUTION OF THE CITY OF BELLINGHAM, WASHINGTON PROVIDING CLARIFICATION AND DIRECTION REGARDING THE BROADBAND ADVISORY WORKGROUP.

WHEREAS, the Bellingham City Council desires the assistance and advice of local residents and professional consultants to assess existing conditions related to broadband access, equity and affordability as well as options and ways to use the City of Bellingham fiber optic network as it exists today, or as may be expanded or improved, to improve access, equity and affordability so that the Council can hold public discussions on a broadband infrastructure policy; and

WHEREAS, the City Council directed the administration to form the Broadband Advisory Workgroup; and

WHEREAS, the Administration selected and appointed, with City Council confirmation, members to the Broadband Advisory Workgroup ("the Workgroup"); and

WHEREAS, whereas the City is committed to providing open and free access by the public consistent with the purpose and intent of the open public meetings act to the proceedings and activities of the Workgroup; and

WHEREAS, Governor Inslee has proclaimed that in person public meetings should not be held to help control the spread of disease; and

WHEREAS, Council Resolution 2020-31 creating the Workgroup includes a prohibition on recording of meetings that were assumed to be occurring in person; and

WHEREAS, the Workgroup will be meeting remotely using a video conference tool that has the ability to record with limited impact and cost until such time as restrictions outlined in the Governor's proclamations and Health Department guidelines are lifted and the Council has expressed an interest in recording and making the recordings available until that time; and

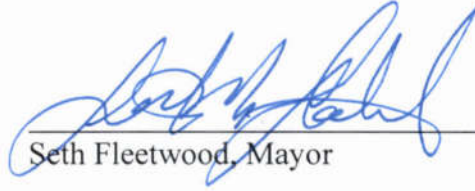**NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF BELLINGHAM THAT:**

Broadband Advisory Workgroup meetings that are held remotely during COVID response under Governor Inslee's proclamations may be recorded and such recordings may be made available for download or viewing.

PASSED by the Council this 22nd day of February, 2021.

Hannah Stone, Council President

RESOLUTION - 1

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APPROVED by me this _____5th_____ day of _____March_____ , 2021

_____
Seth Fleetwood, Mayor

ATTEST:

_____
Andy Asbjornsen, Finance Director

APPROVED AS TO FORM:

_____
Office of the City Attorney

RESOLUTION - 2

Section 2

Agenda Bill 22869

Mayor's Appointments of Members of the Broadband Advisory Group

City Council Agenda Bill

22869

Subject: **Mayor's Appointments of Members of the Broadband Advisory Group (Approval)**

Summary Statement: City Council Resolution 2020-31, created the ad hoc Broadband Advisory Workgroup. The Workgroup consists of 9 appointed community representatives as well as Ex-Officio members. Council approval of the Mayor's recommended list of 9 community representatives is required. Ex-Officio members are invited to participate solely by the Mayor. The Mayor is recommending the following names to serve as community representatives: Maximillian Carper, Linda Fels, Don Gischer, Kristopher Keillor, Michelle Koptcha, Milissa Miller, Spencer Moore, Steven Spitzer, and Russell (RB) Tewksbury.

Previous Council Action: **Council Resolution 2020-31**

Fiscal Impact: **The 2021-2022 Budget includes $100,000 in General Fund for consultant services in support of work assigned to this advisory group.**

Funding Source: **General Fund**

Attachments:
1. STAFF MEMO - BROADBAND ADVISORY WORKGROUP MEMBER APPOINTMENTS
2. CARPER APPLICATION
3. FELS APPLICATION
4. GISCHER APPLICATION
5. KEILLOR APPLICATION
6. KOPCHA APPLICATION
7. MILLER APPLICATION
8. MOORE APPLICATION
9. SPITZER APPLICATION
10. TEWKSBURY APPLICATION

Meeting Activity	Meeting Date	Recommendation	Presented By	Time
Mayor's Report - Appointment - For Approval	1/11/2021	Approve Appointment	Mayor Seth Fleetwood	0 minutes

Recommended Motion:

Council Committee:

Agenda Bill Contact:
Tracy Lewis, Mayor's Office

Council Action:

Reviewed By	Department	Date
Eric C. Johnston	Public Works	1/05/2021
Peter M. Ruffatto	Legal	1/05/2021
Peter M. Ruffatto	Legal	1/06/2021
Seth M. Fleetwood	Executive	1/06/2021

STAFF REPORT

TO:	CITY COUNCIL
FROM:	ERIC JOHNSTON, PUBLIC WORKS DIRECTOR
CC:	MAYOR SETH FLEETWOOD
SUBJECT:	APPOINTMENT OF THE BROADBAND ADVISORY WORKGROUP MEMBERS
DATE:	January 11, 2021

BACKGROUND: In August, 2020, the Bellingham City Council adopted Resolution 2020-031 creating the ad hoc Broadband Advisory Workgroup. The purpose of the Workgroup is to:

> " ...evaluate the possibility of municipally owned broadband infrastructure as one way to further the goals of greater availability, affordability, equitability, and quality of broadband access across the community; to address policy considerations, and the financial costs and benefits thereto; to assess existing conditions related to broadband access, equity and affordability as well as options and ways to use the City of Bellingham fiber optic network as it exists today, or as may be expanded or improved, to improve access, equity and affordability to quality broadband and to the report findings and recommendations to the City so that the Council can hold public discussions on a broadband infrastructure policy."

By Council Resolution the Workgroup is comprised of 9 community members and industry professionals to be appointed by the Mayor and confirmed by the City Council. The resolution also allows the Mayor to appoint non-voting ex-officio members to serve and support the Workgroup.

Following adoption of the resolution, notice was posted inviting applications to serve on the Workgroup. As of the date of this memo, 30 applications have been received.

EVALUATION OR RESPONSE: Applications were received by the Mayor's office staff and referred to responsible staff for evaluation. Written applications were reviewed and ranked by staff from the Public Works and Information Technology Departments. Interviews were conducted by Public Works Department staff via video conference or telephone.

Applicants demonstrated a wide range of expertise, knowledge, experience and diversity. Many applicants have experience directly related to internet technology and business. Others had general interests of community but with specific technology training or professional background Several applicants applied to serve and support the Workgroup on behalf of companies involved in broadband infrastructure. The applicant pool is strong with a diversity of backgrounds and interests. All of the candidates who applied brought unique skill sets and a diversity of backgrounds.

With a strong pool and diverse backgrounds staff recommends that the 9 voting members of the Workgroup be selected from community members who do not represent the large telecommunication companies. The 9 voting members of the workgroup would not currently work for or currently represent a large internet service provider or fiber optic infrastructure provider. The 9 voting members could have interests or employment, current or previous, related to alternative delivery of internet services as compared to a conventional ISP. Industry interests from the large telecommunication companies who own telecommunications infrastructure can be invited to serve and support the Workgroup as non-voting ex officio members. This structure will ensure that industries currently providing internet infrastructure are included in the process to both support and inform the efforts of the Workgroup.

Forming the Workgroup in this fashion also minimizes the appearance of a conflict of interest an allows for all perspectives to be heard while also including the technical expertise from a wide variety of sources. Furthermore, an actual conflict of interest cannot not exist by a regular or ex officio member of the Workgroup since Resolution 2020-030 creating the Workgroup does not grant, and specifically prohibits, any, "...influence or control over any contract, procurement, award, or contract administration."

The pool of applicants includes both residents and non-residents. The Council chose to allow the Workgroup to be formed with both City residents and non-city residents but with preference to City residents. The City Charter also places importance on City residency for boards and commissions. While reviewing applications staff placed first emphasis on City residents and found that the expertise in the general, technology and business interests could be found and the 9 person Workgroup fully appointed with persons residing within City limits. In order to have a more demographically diverse board, applicants residing outside of City limits were also considered. Expanding the selection pool to residents living near but outside city limits was critical to ensuring that Workgroup represents the greater Bellingham community and not a single age, gender or race demographic. After the initial technical review of written applications, some candidates were interviewed via video conference call. The interviews focused on how each candidate would bring diversity, work to find consensus and how the candidate would represent the greater Bellingham community.

The Resolution also directs a neutral facilitator to be retained to support the Workgroup. Following a standard solicitation process, staff selected and contracted with Ms. Emily Barnett Highleyman with Kulshan Services, Inc. to be the service provider.

SUMMARY: With that background the following persons, in no particular order, are recommended for appointment to the City of Bellingham ad hoc Broadband Advisory Workgroup.

In no particular order:

Milissa Miller: Milissa retired from a long career associated with fiber optic deployments on the west coast. Melissa has a strong background in relevant business and operations.
Steven Spitzer: Steve recently retired from a long career working with international organizations to develop standards and policies for maritime communications requiring a consensus and diverse perspectives in highly technical fields. Steve has a general interest in serving the community.
Linda Fels: Linda retired from a career as a software developer with the Indian Health Services and is a small business owner relying on internet access.

Maximilian Carper: Maximilian is an IT and network technology professional with as strong technical background relevant to the conversation.

Kristopher Keillor: Kristopher is an electrical engineering student at WWU with relevant technical expertise. Kristopher has been a disaster relief volunteer with Americorps and is interested in engaging in more civic issues.

RB Tewksbury: RB has a strong background in business administration and finance. RB has served on the Board of several non-profit organizations.

Don Gischer: Don is a former Bellingham City Council member with a background in business and general public policy. Don has been recently active in supporting access to city services for the hearing impaired using technology (eg hearing loops)

Michelle Kopcha: A former livestock veterinarian and educator, Michelle brings a broad, general perspective. Michelle has been active in the community through the League of Women voters and Bellingham City Club.

Spencer Moore: Spencer is a network engineer with a strong technical background relevant to the conversation.

As Ex Officio members:

David Brinn, Wave Communications
Vincent Buys, Comcast
Kurt Gazow, Bellingham School District IT
Allan Meeks, MOX Fiber
David Namura, Lumen (formerly Centurylink)
Gina Stark, Port of Bellingham
Brian Walter, Whatcom PUD

City Staff:

Eric Johnston, City of Bellingham, Public Works
Marty Mulholland, City of Bellingham, ITSD

RECOMMENDATION ACTION:

Appoint the following: Milissa Miller, Steven Spitzer, Linda Fels, Maximilian Carper, Kristopher Keillor, RB Tewksbury, Don Gischer, Michelle Kopcha and Spencer Moore as the 9 voting members of the Broadband Advisory Workgroup.

Section 3

Facilitator Report

Facilitator Report

Prepared for the City Council by David Roberts, Peak Sustainability Group - August 14, 2022

Background

The Broadband Advisory Workgroup was established by Bellingham City Council Resolution 2020-31. The goals of the Workgroup were to: Evaluate the feasibility of using City's municipal fiber network to provide a "public option" for fiber to the home (FTTH); assist the City with Development of an RFP, scope of work, and selection of a Consultant; and participate in discussions w/the City and consultant regarding the public option for FTTH.

Membership

The Workgroup was made up of voting members, citizens of the greater Bellingham community, and non-voting (ex-officio) members. The voting members of the Workgroup had considerable diversity. They were young and old, employed and under-employed. Some were wealthy, and some not. Some shared social interests while others focused on business. All had experience in one way or another with some form of broadband activity, so brought a wide range of perspectives from managers, installers, owners, and users to the process.

Of the nine original members identified in 2021, all but two (who had health challenges) participated throughout the whole process. Attendance at meetings was generally high for the voting members.

In addition to the voting members who participated, the Workgroup was supported by seven ex-officio members who participated on a regular basis. This group was comprised of internet service providers (ISPs), the Whatcom PUD, the Port of Bellingham, Bellingham Public Schools, and the Technology Alliance Group. These members provided valuable insights about the services available, uses of broadband, and funding programs in Bellingham, Whatcom County, across the state, and nationally.

Meetings

The Workgroup held its first meeting on February 2, 2021. The earliest meetings were held twice monthly, but after April 2021, settled into a monthly schedule for most of the remaining months.

A total of twenty-four virtual meetings were held by the full Workgroup over the 20-month period. An additional 25 meetings were held by subsets of the Workgroup to develop agendas, assist the City with contractor selection, develop definitions, create a summary of the meetings, prepare a list of findings and recommendations, and prepare several presentations for City Council.

Early meetings focused on foundational issues like interpretation of the intent of the resolution and understanding the role of the Workgroup. The Workgroup also established ground rules and expectations for their meetings, began the process of addressing definitions, and assisted the City with identifying a contractor to support the Workgroup. Later meetings involved invited presentations, deepening understanding, completing definitions, developing a set of recommendations.

Meetings were initially designed by a rotating subset of the Workgroup members. This process assured that the interests and issues of the Workgroup were adequately addressed in their meetings. Later in the process, the agenda for upcoming meetings was established at the end of each meeting.

Process

A key to the process was learning together. In addition to the contractor, the Workgroup heard from approximately 12 guest speakers who were invited to share insights and perspectives with the Workgroup. Some of the invited speakers were from communities and organizations outside of the Bellingham area. The Workgroup also heard from ex-officio members of the Workgroup who provided valuable information about programs and uses of broadband in the City of Bellingham and efforts to expand broadband services throughout the County.

All meetings for the full workgroup were virtual and facilitated by David Roberts from Peak Sustainability Group. Most decisions by the group were made by consensus of the voting members. Every effort was made to hear all sides of an issue, and this resulted in a high level of understanding and agreement. In addition, the input from the consultant, ISPs, and other ex-officio members added to the consensus. At only two points were votes taken. The first involved the final recommendation to City Council about the form and role of an advisory group moving forward. The second was for approval of the final agenda bill packet and all its content.

Outcomes

The Broadband Advisory Workgroup completed the task assigned to them by the City Council. The process took approximately 6 months longer than anticipated, however this time allowed the Workgroup to dig deeper into the issues and to provide more thoughtful recommendations to City Council regarding the broadband needs of the community.

The Workgroup shared these positive comments about the process (slightly paraphrased for clarity):

- Our interaction was positive resulting in productive collaborations;
- People respected each other and grew together over the process;
- We listened to each other which build trust;
- The local networking was good;
- There was a willingness to commit to public service;
- The diversity of the group was good;
- There was a growth of knowledge on broadband, definitions, infrastructure;
- The ISPs did a fabulous job and were open, honest, and valuable;
- The Port, PUD, and BPS provided helpful insights;
- The facilitator did well and kept us on task;
- Staff did a great job capturing the notes; and
- Eric Johnston's leadership with Magellan's survey and report kept us productive, and he helped us understand how things work in the City.

The Workgroup also identified the following aspects of the process that could have been better:

- The ex-officios should have been engaged earlier as participants in the meetings with cameras and mics on;
- We needed more time and more meetings;
- Concerning the consultant report:
  - The consultant over promised and underdelivered;
  - The consultant's survey was carried out during the holidays;
  - There were disagreements between consultant staff;
  - The consultants did not seem to understand our market.

Section 4

Draft Resolution

RESOLUTION NO. _____

A RESOLUTION TO ADOPT THE OBSERVATIONS AND RECOMMENDATIONS OF THE BROADBAND ADVISORY WORKGROUP

WHEREAS, the City Council directed the administration to create an Ad Hoc Broadband Advisory Workgroup to advise the city of policy considerations regarding municipal broadband and adopted by City Council under Resolution 2020-31 on August 24, 2020; and

WHEREAS, the Workgroup met over 20 months at the request of City Council to address tasks identified in Resolution AB# 22007; and

WHEREAS, the Workgroup established goals for broadband services in the City; and

WHEREAS, Bellingham has a highly competitive marketplace with different types of broadband services; and

WHEREAS, digitally connected residents benefit the whole community, however not everyone in Bellingham has access to the internet despite the fact that internet is available from multiple Internet Service Providers (ISPs); and

WHEREAS, digital equity is a particular concern and access is the primary challenge; and

WHEREAS, the primary barriers to access include the inability to pay for service, having adequate computer technology and digital skills, and/or relevancy of having internet access in their life; and

WHEREAS, based on the 2021 census, the per capita income last year in Bellingham in 2020 dollars was $32,419 and the median household income in Bellingham in 2020 dollars is $56,198, and

WHEREAS, based on the 2021 census, 20% of the people in Bellingham live in poverty; and

WHEREAS, the City of Bellingham provides free public access to computers and the Internet on a limited basis; and

WHEREAS, the current state standard for broadband speeds is 100/20 Mbps; and

WHEREAS, the City's municipal network, which has been developed over more than 30 years, is not designed to be consumer, enterprise or carrier grade. Also, it is not

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optimized for performance, reduced maintenance tasks, and redundancy to enable maximum network reliability and minimal downtime; and

> **WHEREAS,** the City's current municipal network reliably:
>> a.   Supports many critical City services such as fire, police, water, wastewater, streetlights, traffic lights as well as connecting its buildings to a network;
>> b.   Provides services to Bellingham Public Schools and WTA; and
>> c.   Supports the Whatcom Regional 911 services and the Whatcom County Sheriff's EOC; and

> **WHEREAS**, the City has no dedicated staff resources to support the City's broadband network.

> **WHEREAS**, the City retained a consultant whose report provided information regarding the City's current network and options for the future; and

> **WHEREAS**, the consultant described a range of municipal broadband models from providing basic public policy to a full retail model including a city-wide fiber to the home (FTTH) network. The consultant found that a plan to provide a full retail FTTH network would be extremely expensive and the debt service to build such network would be unsustainable;

> **WHEREAS,** the consultant's report provided the following observations regarding the City's role in providing broadband services:
>> a.   The City network provides a "backbone" opportunity with the capacity to increase services to citizens and businesses through a variety of business models that have the potential to generate revenue for the City. (See report Executive Summary, Section 4, and Conclusions and Recommendations);
>> c.   The City should improve the City's infrastructure by adding redundancy and hardening;
>> d.   The City should adopt an "Infrastructure Only" model to provide conduit and/or dark fiber to businesses, broadband providers, and other public organizations;
>> e.   The City's fiber network could be used to improve service to less affluent neighborhoods;
>> e.   New taxes may not be required to support improving service and access; and

> **WHEREAS**, the consultant conducted a public survey of broadband users in the city. (See Community Survey results on page 9 of the report.) From the survey the consultant concluded:
>> a.   Data from the survey indicates that lower speed connections are dispersed throughout the City and do not point to any specific

neighborhoods or areas that are underserved compared to their surroundings.

b.   Forty six percent of survey respondents rated Price as either Bad or Terrible;

c.   Similarly, 42.7% rated Customer Service & Support as Bad or Terrible.

d.   Eighty-two (82) percent of the survey respondents are currently served by one private internet service provider (ISP);

e.   The survey did not provide adequate information regarding business satisfaction with current broadband quality of service.

f.   We did not get adequate information from people who don't have access to the internet; and

WHEREAS, funding from State and Federal sources may be available to assist the City with achieving equitable and affordable broadband throughout the City; and

WHEREAS, there are opportunities for the City to collaborate with the Port of Bellingham and the Whatcom Public Utility District (PUD) to continue to learn, understand, and share knowledge regarding each other's broadband strategies and plans; and

WHEREAS, there are opportunities for the City to collaborate with ISPs to improve service and generate revenue for the City; and

WHEREAS, Workgroup identified a need for additional information:

a.   Data regarding unserved and underserved members of the community, including barriers to technology adoption and adoption rates, access challenges, and affordability;

b.   A financial analysis sufficient to make an educated/informed decision regarding business models other than the City as retail provider of FTTH;

c.   Realistic estimates of anticipated uptake numbers assumed for a city-wide FTTH scenario. (Uptake means: The rate of user/customer acquisition by an ISP as a percentage of total number of users/customers in the service area);

d.   The potential opportunities of the City collaborating with ISPs to achieve the City's goals;

e.   Monitor outcomes of efforts in communities similar to Bellingham to develop community broadband systems providing benchmarks such as price, speed, number of plans for comparison;

f.   The concerns expressed by businesses in our community about the level of service or quality of service;

g.   Opportunities and future plans of private ISPs providing service in the community.

NOW THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF BELLINGHAM THAT:

The Broadband Advisory Workgroup's recommendations are as follows:

1. The City establish the following goals for broadband services in the City of Bellingham:

   a. Residents should have nondiscriminatory access to the information resources necessary to achieve digital equity.

   b. Ensure a broadband speed for residents (housed and unhoused), visitors, and businesses of 150/150 Mbps today, always available, scalable, and a minimum target of 1 Gbps symmetrical service by 2028. The current state standard for broadband speeds is 100/20 Mbps.

   c. Provide broadband services that are available for residents (housed and unhoused), visitors, and businesses through access points such as residences, libraries, public facilities, parks, schools, shelters, and service agencies and organizations.

   d. Ensure broadband services be cost-competitive with reasonable rates based on those achieved by other comparable US cities (by the metric of Gbps/month/$).

   e. Assure quality broadband service for all based on the residents' or business' choice of service level.

2. The City should develop, implement, and seek funding to support a digital equity broadband adoption plan to provide the kind of broadband connection and support individuals need with a focus on unserved and underserved members of the community, including the "missing middle". The plan should identify:

   a. Barriers to adoption to identify the unserved and underserved members of the community;

   b. Opportunities for collaboration with others in the community including non-profits, ISPs, and the library to provide a program for unserved and underserved members of the community to:

      i. Improve internet literacy and access,

      ii. Establish a "navigators" program modeled after the program through the State Broadband Office, and

      iii. Help members of the community find ways to qualify for support programs and get access;

   c. Options to support the digital equity broadband adoption plan as funding becomes available.

3. The City should develop a comprehensive capital and operations plan:

   a. To increase redundancy and reliability in the City's existing system,

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b. To expand the use of the system following an "Infrastructure Only" model,

c. To expand publicly accessible WIFI, and

d. To partner with other agencies and ISPs.

The Infrastructure Only model envisions the development of "carrier class" infrastructure for managing the improved municipal broadband network. It also expands and improves the network's broadband capacity and services in a financially self-sustaining manner by providing leased conduit and/or dark fiber access to businesses, broadband providers, and other public organizations.

To accomplish this, the City should:

a. Consider developing an interlocal agreement between the City, Whatcom County, Port of Bellingham, and the Whatcom PUD to support and expand broadband Internet service availability in the region;

b. Explore expansion of the City's publicly accessible WIFI hotspots at City-owned facilities to provide free and open internet access to residents and visitors to the city;

c. Continue to engage with local private ISPs to identify opportunities to collaborate on improving service and sharing resources;

d. Include the following elements in its comprehensive capital and operations plan:

    i. Documentation of all existing infrastructure;

    ii. Identification of locations for new and replacement infrastructure;

    iii. Identification operational resources to support this infrastructure adhering to data privacy and cyber security best practices;

    iv. Identification of resources to retain, replace and renew this infrastructure;

    v. Completion of a financial analysis of operating, capital investment and renewal costs and revenue potential, and recommendations on fees to ensure financial sustainability;

    vi. Identification of opportunities to invest to serve the unserved and underserved members of the community; and

4. The City should revise and update existing agreements with partner agencies for the current system to meet the goals of the resolution and serve the needs of the network users;

5. The City should conduct a survey of businesses in the city to determine their current and future needs for broadband services;

6. The City consider a future role for the current Broadband Advisory Workgroup.

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</div>

PASSED by the Council this ̤ day of _____, 2022.

_____
Council President

APPROVED by me this _____ day of _____, 2022.

_____
Mayor

ATTEST:_____
           Finance Director

APPROVED AS TO FORM:

_____
Office of the City Attorney

Section 5

Final Report of the Broadband Advisory Group

Final Report
of the
Broadband Advisory Workgroup

September 26, 2022

Outline

- Introduction

- Purpose

- Pathway to Recommendations

- Contents of Packet

- Marketplace and Access Challenges

- Existing Fiber Network

- Recommendations and Considerations

2

City Council Requested BAW Formation

- 7 voting members
- 7 ex-officio members
- City staff

- 17 months
- 23 whole-group meetings
- Many sub-group meetings

City Council Asked Us To:

- Evaluate the feasibility of using City's municipal fiber network to provide a "public option" FTTH

- Assist & Develop RFP
    - Scope of Work
    - Selection of Consultant

- Participate In Discussions w/City & Consultant

4

Pathway to BAW's Recommendations

- Defined access, affordability, equity and quality

- Explored broadband endeavors in other communities and heard presentations from Anacortes and Mount Vernon

- Solicited input from ISP's PUD, the Port, City Services personnel regarding broadband services

- Reviewed the study from the City's consultant (Magellan)

5
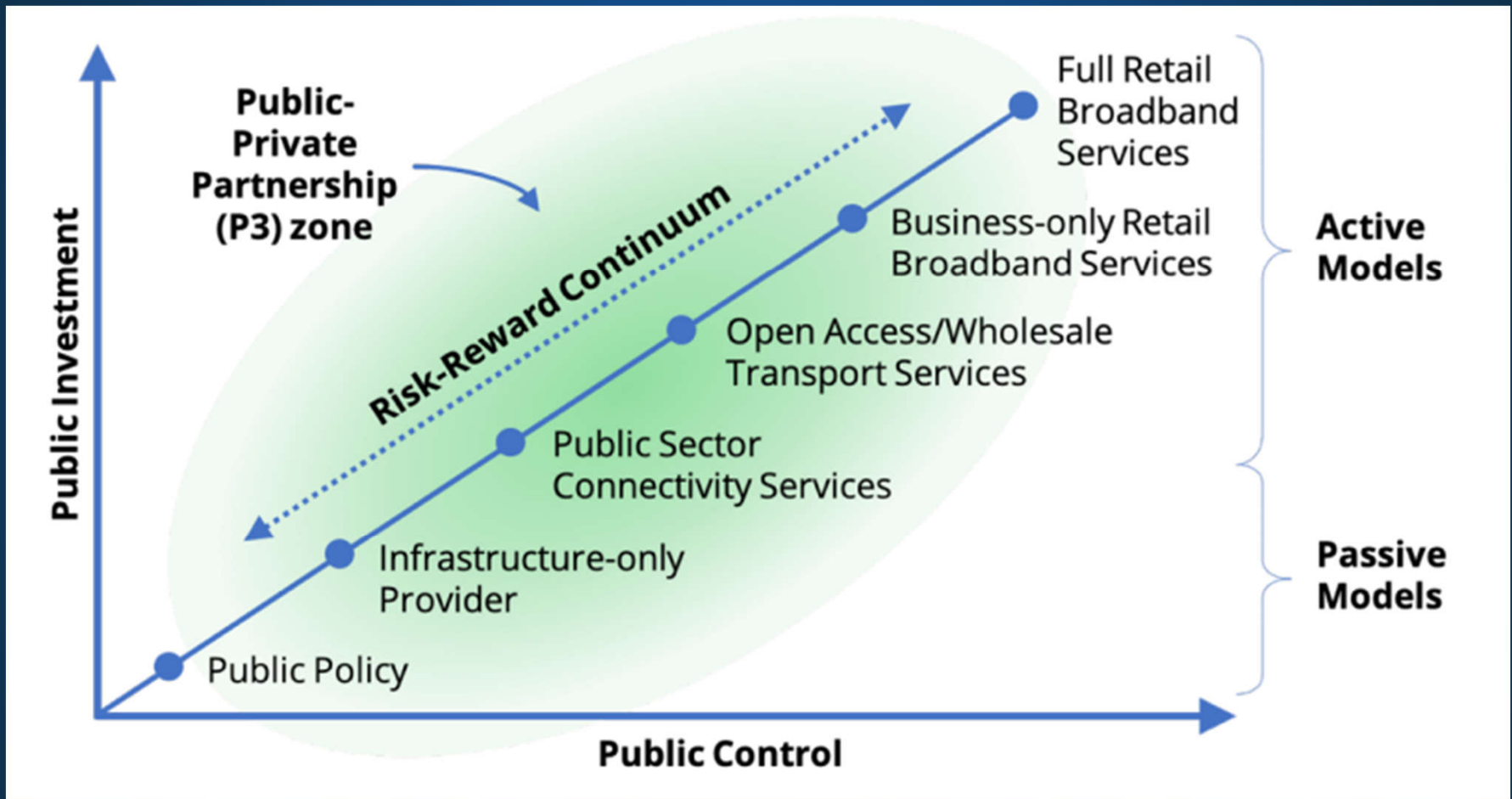
Your Packet Contains:

- Workgroup report
- Resolution
- Glossary
- Meeting summaries
- Magellan report
- Ex-officio statements
- Minority position statements

7

Marketplace and Access Challenges

1. Broadband is a complicated and exciting topic
2. Highly competitive marketplace that provides a variety of broadband services
3. A digital divide exists in the City of Bellingham
4. Studies are needed to better understand how to improve access
5. The community benefits when digitally connected

8

The City's Municipal Fiber Network…

1. Connects the City's essential services
2. Needs major improvements to create coherent, consistent, reliable, and fully usable network infrastructure
3. Needs dedicated City staff to support the municipal fiber network

9

Recommendation One:

Establish goals for broadband services in the City of Bellingham

Recommendation Two:

Develop, implement, and seek funding to support a digital equity broadband adoption plan to provide the kind of broadband connection and support individuals need with a focus on unserved and underserved members of the community, including the "missing middle"

Recommendation Three:

Develop a comprehensive capital and operations plan to:

- Increase redundancy and reliability in the City's existing system,
- Expand the use of the system following an "Infrastructure Only" model,
- Expand publicly accessible WIFI, and
- Partner with other agencies and ISPs.

12

Recommendation Four:

Revise and update existing agreements with partner agencies

- Meet the goals of the resolution, and
- Serve the needs of the network users.

13

Recommendation Five:

Conduct a survey of city businesses to determine their current and future needs for broadband services.

Recommendation Six:

The City consider a future role for the current Broadband Advisory Workgroup.

Broadband Advisory Workgroup Final Report - Subcommittee

Presented by: Broadband Advisory Workgroup members

Section 6

Meeting Summary

BELLINGHAM BROADBAND ADVISORY WORKGROUP
Meeting Summary: February 2021 – August 2022
Facilitator: David Roberts, Peak Sustainability Group

DATE	TOPICS	LINK
2/2/21	This was the first meeting of the Broadband Advisory Workgroup. Key items reviewed and discussed include: 1. Introduction of members. 2. Explained City Council resolution expectations. 3. The Workgroup clarified their purpose and objective, their goals, and the schedule, process, and procedures for the work ahead. 4. Members agreed on ground rules for creating an open and safe culture to exchange ideas. 5. There was an introduction to terminology related to broadband. *(See notes below regarding bold vs underlines)*	Meeting Notes: https://cob.org/wp-content/uploads/Workgroup-Meeting-Notes-2.2.21.pdf Meeting recording: (started recordings 3/2/21)
2/16/21	Subsequent BAW Zoom meetings will be recorded starting with the March 2, 2021 meeting. The PURPOSE, MISSION and GOALS document taken from the Bellingham Broadband Workgroup resolution 2020-31, was discussed. Questions, concerns and comments will be compiled for review at the March 2, 2021 meeting. A draft of the Request for Proposal (RFP) was introduced regarding hiring a consultant firm to develop a business plan, consider options to use the City's fiber network for public purpose and consider fiber as a critical infrastructure to meet current and future societal needs. Members of the committee will review the RFP and forward comments to Eric Johnston/Iris Kaneshige. These will be compiled and discussed at the March 2, 2021 meeting.	Meeting Notes: https://cob.org/wp-content/uploads/Broadband-Workgroup-Meeting-Notes-2.16.21.pdf Meeting recording: (started recordings 3/2/21)
3/2/21	This is the 1st recorded meeting of the BAW. Because this group started about 6 months behind the date originally planned for, we have been meeting 2x per month and will continue to do so through April. Thereafter, we will meet once a month starting in June.	Meeting Notes: https://cob.org/wp-content/uploads/Workgroup-Meeting-Notes-3-2-21.pdf

	Role of the Workgroup and Ex-Officio members:	Meeting Recording:
	1. The Workgroup will be comprised of 5 to 9 voting members appointed by the Mayor and confirmed by the City Council.	https://cob.zoom.us/rec/play/0cXpsPTUOV91QiVMH-CByGhJQMWuZ_K_zKHR1ZpCf-dGmxdX6N-Hb7ZY3PjYEPEynyPFQwjLQNI1Kw3f.uYM_a8Y6jhlZPekf?continueMode=true&_x_zm_rtaid=E4Gn5glgSaKvwByj3xP4YQ.1646067383866.0106689cd16213fa1c2e01b37730a713&_x_zm_rhtaid=727
	2. The Ex-Officio members are non-voting participants, whose role is to support the Workgroup (answer questions, provide presentations on areas of expertise, provide feedback, etc.) They will be included on all communications that involve the Workgroup.	
	Budget:	
	1. The Resolution states that $100,000 was approved by the Council in 2019-2020 to fund a consultant study as outlined in the Request for Proposal.	
	2. Support for facilitation of the BAW has a different source of funding.	
	Communications:	
	1. Social Media – Eric Johnston clarified that BAW members should speak as one voice when communicating with the public regarding the BAW. Personal opinion should be indicated as such.	
	2. The public email address: g.proj.broadbandadvisoryworkgroup@cob.org is monitored and managed by City staff.	
	3. SharePoint – Marty Mulholland has consulted with the City attorney, looked into sharing documents and public records requirements to determine how the BAW could best use the file sharing software, SharePoint. She will try out the SharePoint site for all member of the BAW to share working documents with editing/reviewing capability.	

| 3/16/21 | The city's IT department has created a SharePoint site for Workgroup members to share draft documents and documents that are in progress. Resources will be uploaded to the Broadband Advisory Workgroup Webpage. These resources should be factual rather than opinion-based articles.

The bulk of this meeting was spent discussing the draft Request for Proposal (RFP). Once the group approves the proposal, it will be sent to the Purchasing Manager for review. It is then published, interviews will be conducted, references checked, a consulting firm will be selected, the contract will be negotiated, and insurance coverage will be reviewed and deemed acceptable. The work then begins. The whole process will take approximately 3 to 4 months. The final draft of the RFP was unanimously approved.

Steve Spitzer, RB Tewksbury, Milissa Miller, and Max Carper volunteered to be the RFP team that would review application, interview candidates, and help in the selection process. | Meeting Notes:
https://cob.org/wp-content/uploads/Workgroup-Meeting-Notes-3.16.21.pdf

Meeting Recording:
https://cob.zoom.us/rec/play/5Luog45fGl7LdhXz1-NwI5y6T-lpQORdR61PFbkS3nEbnioJ45sEkSJWZszRchbaNBVnbSOJ3mzJ1a0G.S26dLSoGfQLkCnTW?startTime=1615942808000&_x_zm_rtaid=FLWC9s4WRAy8eRWj5kOKyw.1649203454607.09ea22be86e007b72f09e8588bd2fddc&_x_zm_rhtaid=203 |
| 4/6/21 | The bulk of this meeting was spent discussing definitions focusing on the following term:
1. Broadband
2. Availability
3. Accessibility | Meeting Notes:
https://cob.org/wp-content/uploads/Workgroup-Meeting-Notes-4.6.21.pdf

Meeting Recording:
https://cob.zoom.us/rec/play/UBTq2dq_E9vaDAlxvwAsDY3up2B84wQz5eSt8oIdlo-VzDUZ4YaQRzrvKDJeF0darkb7ScMiQPtMqChY.SFQfVLjhDuT5egoO?startTime=1617757211000&_x_zm_rtaid=FLWC9s4WRAy8eRWj5kOKyw.1649203454607.09ea2 |

		[2be86e007b72f09e8588bd2fddc&_x_zm_rhtaid=203](#)
4/20/21	Three presentations were given at this meeting including: 1. The city's fiber optic network (Eric Johnston), 2. Bellingham School District fiber optic network (Kurt Gazow) and 3. Port of Bellingham's efforts at supporting broadband development (Gina Stark). These presentations provided important historic and current details regarding the City of Bellingham's fiber network. **THE INFORMATION PROVIDED IN THIS MEETING IS CRITICAL TO UNDERSTANDING BROADBAND SERVICE IN OUR COMMUNITY.** People are encouraged to read the meeting notes and/or listen to the meeting recording.	Meeting Notes: [https://cob.org/wp-content/uploads/Broadband-Workgroup-Meeting-Notes-4.20.21.pdf](#) Meeting Recording: [https://cob.zoom.us/rec/play/Swdw5gGz5-RMJghy3pqmChShIlOAm2gVruRp0d7W0JIx3LuezH3LKQXpI5sjEXajdGoxsBNa2-HIImQt.M5tj_rQitZd-sbfd?startTime=1618966840000&_x_zm_rtaid=X8GaX56xSyeWSI1SCue3Lw.1647458625395.caaefddffe78948a13c55473ab0f03e6&_x_zm_rhtaid=52](#)
5/4/21	The first part of this meeting included follow-up questions to the Port (Gina Stark) and the city (Eric Johnston) regarding their presentations from the last meeting (4/20/21). The remaining time was devoted to a presentation by Atul Deshmane from the Public Utility District (PUD) outlining the PUD's goals and history of working on broadband issues.	Meeting Notes: [https://cob.org/wp-content/uploads/Broadband-Workgroup-Meeting-Notes-5-4-2021.pdf](#) Meeting Recording: [https://cob.zoom.us/rec/play/YceU2l_Ij2XeaZGocVoJ40CScynjMcDqKQkzJhWGse3eC2loWlsmGWwom8scC4saOGNW6mU](#)

	THE INFORMATION PROVIDED IN THIS MEETING IS CRITICAL TO UNDERSTANDING BROADBAND SERVICE IN OUR COMMUNITY. People are encouraged to read the meeting notes and/or listen to the meeting recording.	rCJt9Gs0f.UJ7vDEuBQpujUJxj?startTime=1620176408000&_x_zm_rtaid=DgVzxNPGTgWItJeOCHPoWQ.1647544299369.07c2224ae330bdee49d0321b17c7e2b3&_x_zm_rhtaid=351
6/1/21	The first part of the meeting was an update from the city (Eric Johnston) on the review of the Broadband Plan RFP respondents and scope development for the selected consultant's work plan. The first key agenda item was an open conversation from the Working Group members seeking input about key topics and questions the membership would like to hear from the non-public Ex-Officio members of the group (Comcast, Wave, Lumen, etc.). The purpose is to ensure the presentations are focused on positive and relevant subjects and information that informs and supports the education of the membership to benefit the mission of the group. Discussion points provided included digital equity low-income adoption efforts, what they consider public-private partnerships should consist of, Open Access, lessons from the Pandemic, Broadband usage policies and charges, net neutrality policies, and ask them to educate us for what they feel we don't know about the industry. The remainder of the agenda focused on continuing draft definitions mainly around quality.	Meeting Notes: https://cob.org/wp-content/uploads/Broadband-Workgroup-Meeting-Notes-6.1.21.pdf Meeting Recording: https://cob.zoom.us/rec/play/Ux-WDP_kuiBcP-ICbgK4uf9-lw2SCgWIEtOuedevQI4unN8YT4_Kc6ffbhGLJRMubQgluoWMaSofUJRR.eTeZrrjFuctMp1sP?startTime=1622595615000&_x_zm_rtaid=inAECarfR428dLawDdCoPA.1647545955611.dd2ffe2de84b88b5c6984a4a8a4cf753&_x_zm_rhtaid=618
7/6/21	This meeting primarily focused on two speakers invited to present to the working group.	Meeting Notes: https://cob.org/wp-content/uploads/2021-07-06-notes.pdf

	The first speaker was <u>Jim Lemberg</u>, Municipal Broadband Business Manager for the City of Anacortes, provided the background on the work Anacortes is doing to develop a City-wide broadband service. He covered the history of planning and deployment and the current state of operations. The recorded version of the presentation and Jim's presentation slides are on the website. A healthy Q & A session occurred after the presentation covering topics about the City's redundancy, RFP input from private providers, the City's Broadband Survey, City's leadership support, pilot program, investment, equipment, and grants. The Second speaker <u>Russ Elliot</u>, Director, Washington State Broadband Office at the Department of Commerce, provided an excellent overview of state and federal funding programs and policies being implemented out of Olympia. Russ is working with many communities around the state to help them meet their broadband needs. The recorded version of the presentation and Jim's presentation slides are on the website. A Q & A session occurred after the presentation covering topics about the public private partnerships, the state's speed goal of 150 symmetrical, last-mile complications, open access, and the FCC digital equity program.	Meeting Recording: <u>https://cob.zoom.us/rec/play/jVYtvLvQz MMm9merMwjhQug1lYSoRIax2nEIkShk HpUZT8bbBTjNN8TymEYLIFXt7mAkCaqq AjNRJFbF.P5LsRMq-BHpdTcni?startTime=1625619611000&_ x_zm_rtaid=inAECarfR428dLawDdCoPA.1 647545955611.dd2ffe2de84b88b5c6984 a4a8a4cf753&_x_zm_rhtaid=618</u>
8/3/21	This meeting consisted of a speaker from the Bellingham Public Library and continued definition discussion about equity. The Bellingham Public Library speakers included <u>Rebecca Judd</u> (Director) & <u>Jonathan McConnel</u> (Head of Digital Services). They provided an excellent overview of how the library system supports digital equity needs of the city, especially over the COVID-19 pandemic. This includes public Wi-Fi and technology support services.	Meeting Notes: <u>https://cob.org/wp-content/uploads/Broadband-Advisory-Workgroup_08.03.2021.pdf</u> Meeting Recording: <u>https://cob.zoom.us/rec/play/8Vb07lHG 6XHQgAEdbB6umZbRCD3G_8t62B-M9VrzAK6RqpHTw8HFV9NObmg1FM_S</u>

	A Q & A session occurred after the presentation covering topics about FCC's Emergency Connectivity Fund (ECF) ($7.17 billion program), Comcast's Internet Essentials program, digital services for disabled members of the community, and work force development digital skills. **THE INFORMATION PROVIDED IN THIS MEETING IS CRITICAL TO UNDERSTANDING BROADBAND SERVICE IN OUR COMMUNITY.** People are encouraged to read the meeting notes and/or listen to the meeting recording. The remainder of the agenda focused on continuing draft definitions mainly around equity.	WfUwWDnyoMQ0x3OG.pzAeXVOK0-SWPrSV?startTime=1628038777000&_x_zm_rtaid=QwqNzIamQ9CzN7NTJJOZow.1647553304922.b2038a06c9274dbcdb059fb002ae7cbb&_x_zm_rhtaid=591
9/7/21	This meeting consisted of introducing the selected Municipal Broadband Study consultant Magellan Advisors. Jory Wolf and Greg Laudeman from Magellan Advisors provided background on their firm and the work they have done in other similar communities. Magellan outlined the project goals as follows: 1. Cost/benefit analysis for leveraging assets to expand broadband access for the community (Community Survey / Market Analysis) 2. Assess the current state of broadband within the city (Asset Inventory) 3. Create a conceptual network design for leveraging existing infrastructure (Conceptual Network Design) 4. Expand the City's broadband footprint to deploy FTTH or FTTP (Business Model Analysis) 5. Identify business model and financing options (Financial Analysis) 6. Provide clear understanding how to sustain a municipal broadband program (Final Analysis & Recommendations)	Meeting Notes: https://cob.org/wp-content/uploads/Broadband-Advisory-Workgroup-Meeting-Notes-9.7.21.pdf Meeting Recording: https://cob.zoom.us/rec/play/PpEQUqocwmERaUo5_GcTmwJJbziumhpb_wpRcXfJg3o6LiNJL3qLD_Lfkd6kb_Q9UXZGwNksqz7ljv1K.5XVrQtZC2OsVfsaq?startTime=1631062833000&_x_zm_rtaid=QwqNzIamQ9CzN7NTJJOZow.1647553304922.b2038a06c9274dbcdb059fb002ae7cbb&_x_zm_rhtaid=591

	Magellan's work plan includes the following tasks: 1. Community Survey 2. Market Analysis 3. Asset Inventory 4. Conceptual Network Design 5. Business Model Analysis 6. Financial Analysis 7. Final Analysis & Recommendations The timeline for the project runs from September 2021 to May 2022. A Q & A session occurred after the presentation covering topics about Magellan's survey techniques, work plan, and thoughts on digital equity.	
10/5/21	This meeting consisted of Magellan Advisors broadband access and quality survey and a facilitated discussion with Bellingham's Internet Service providers. Magellan Advisors (<u>Jory Wolf and Greg Laudeman</u>) shared a presentation on their survey tool for determining citizen access and quality of service. The survey will be location-based and it contains an embedded speed test that auto-collects data using MLabs Diagnostic Tool. A robust Q & A session occurred after the presentation about Magellan's survey techniques. The Internet Service Provider (ISP) panel, consisting of <u>Comcast, Lumen, and Wave</u>, was facilitated by David Roberts and each was given 5 minutes to describe current activities at their company. After the opening statements from the ISPs, a series of questions were asked by the facilitator for each company to respond to if they wanted. Those questions consisted of:	Meeting Notes: https://cob.org/wp-content/uploads/Broadband-Advisory-Workgroup-Meeting-Notes-10-5-2021.pdf Meeting Recording: https://cob.zoom.us/rec/play/eslBVWQk6A08cnTyhtgY-UZp8r05cluw1gJ1FX1-WNK9J21j_LepZspE6Jdg4IjxqTzmGzZtOHm22rk9.-28NzD1iOTKt637Y?startTime=1633482017000&_x_zm_rtaid=QwqNzIamQ9CzN7NTJJOZow.1647553304922.b2038a06c9274dbcdb059fb002ae7cbb&_x_zm_rhtaid=591

	1) How was the company impacted by COVID and what technology and use learnings can you share? 2) What are the future proofing plans for your technology to address the City's connection needs over time? 3) What is your company doing to address equity and access for disadvantaged communities? 4) What synergies do our Ex-Officio members look for to get involved in a public/private partnership? 5) What is missing from the City's assessment of the Broadband market, that you feel should be taken into consideration? **THE INFORMATION PROVIDED IN THIS MEETING IS CRITICAL TO UNDERSTANDING FIBER OPTICS BROADBAND SERVICE IN OUR COMMUNITY.** People are encouraged to read the meeting notes and/or listen to the meeting recording.	
11/2/21	This meeting consisted of an update from Magellan Advisors on the broadband access and quality survey and an invited speaker, Kim Kleppe from the City of Mt. Vernon. Magellan Advisors (Greg Laudeman) shared an update on the planned broadband survey and their workplan schedule. The main conversation centered on the start date for the survey and how the working group can assist in spreading the word to encourage participants to access the tool. Kim Kleppe with the City of Mount Vernon shared perspectives on Mount Vernon's broadband system and what they have learned. Mount Vernon has an open access hybrid model that serves 20% government use and 7% dark fiber leasing.	Meeting Notes: https://cob.org/wp-content/uploads/Broadband-Advisory-Group-Meeting-Notes-11-2-2021.pdf Meeting Recording: https://cob.zoom.us/rec/play/lQ9C1xeXqYjD8ck6vDvWlFxxiQxt-iBP1gFwMyUalKBpE70QfnqgGSpw8PCvtSwD0H6JkHCfk5-JTwnG.wnK0wfoXtdme0wdY?startTime=1635901215000&_x_zm_rtaid=QwqNzIamQ9CzN7NTJJOZow.1647553304922.b2

	A Q & A session occurred after the presentation covering market analysis, funding, overbuilding, relationship with existing providers, revenue models, and open access. The agenda concluded with two short group discussions: 1) Addressability via new digital Plus Codes; and 2) What the format and style of the final report to Council will be from the Working Group.	038a06c9274dbcdb059fb002ae7cbb&_x_zm_rhtaid=591
12/7/21	This meeting was dedicated to hearing an update from Magellan Advisor Consultants. The survey is up and running. The consultant performed some internal checks, and the results were good. However, some issues had been identified regarding the speed test. Magellan said they would investigate and it would be resolved. Greg Laudeman from Magellan pointed out they are getting the quantity of responses that nominally qualify as **statistically reliable**. They will compare the results later in the study with the demographics of the respondents and the census demographics. The results will then be overlayed with city addresses to determine specifics neighborhoods. A Working Group member made the statement that a speed test is not a load test and that a load test should be used in conjunction with a speed test. There was discussion regarding Tacoma WA from Comcast in reference to strategic failure. Magellan said the marketplace is rapidly evolving. Bellingham market is vibrant with high level of service with many providers. There was discussion regarding thoughtful policy questions:	Meeting Notes: file:///C:/Users/spitz/Desktop/Broadband-Meeting-Notes-12-7-2021.pdf Consultant Business Model Presentation: https://cob.org/wp-content/uploads/Broadband-Business-Models.pdf Meeting Recording: https://cob.zoom.us/rec/play/UjI_30hy2vMod9u9XJtyQyvUzcBEfH29BGv9EqfRuc c5Q8T_DP3GKZsRoG_GM7gSvk4n6Z05oj97FkEr.VM65Y9H42az3Q7Mq?startTime=1638928832000&_x_zm_rtaid=FLWC9s4WRAy8eRWj5kOKyw.1649203454607.09ea22be86e007b72f09e8588bd2fddc&_x_zm_rhtaid=203

	1. Fiber is a real asset but also critical infrastructure. It often becomes a public policy consideration. 2. Does the public have an interest in investing in this infrastructure? 3. Is this a critical asset in your community? 4. If you want businesses to invest in your community, should not government be investing Magellan provided an overview of the proposed Business Model with a presentation that included options for: 1. Public Policy Only 2. Institutional/Public Service 3. Infrastructure Only 4. Open Access/Wholesale 5. Commercial Broadband 6. Full Retail/Residential Broadband Magellan's broadband business models compared the balancing of risk and reward. Broadband friendly policies and managing your underground spaces is very important. There are a range of issues and options for improving local policies. David Roberts asked the Working Group; What have we accomplished so far? What do we have agreement on or not? This was an exercise for the group to determine consensus.	
1/4/22	<u>Greg Laudeman</u> provided an update to the survey. The results indicate that the survey had over **1500 completed responses**, unfortunately there were no Spanish language responses. The survey will be close on Jan 31, 2022.	Meeting notes: <u>https://cob.org/wp-content/uploads/Broadband-Meeting-Notes-1-4-2022.pdf</u>

	Survey instruments used by Magellan has been used in 600 other communities. <u>Jory Wolf</u> from Magellan pointed out that all of the addresses will be plotted and neighborhoods represented, but not many businesses. The survey does not ask for renters or homeowners. The City does have low-income discount for Senior and Disabled as well as low-income residents. Jory Wolf indicated Magellan would review that information as well as socio-economic indexes. Update from the Port of Bellingham and Whatcom Public Utilities District <u>Gina Stark</u> described how the Port, PUD and County were collaborating in building broadband projects with local ISPs outside the City of Bellingham. The focus is on rural areas where there are no providers. Gina indicated that Whatcom Country **does not** count as rural or distressed per Federal standard. There are 2 projects to build in 2022- funded by Community Urban Revitalization Board through the Port. The goal is to get Fiber to the Home (FTTH) to unserved communities. They are focused on the "mid mile". 1. North Mosquito Lake Road - 464 residents will get fiber to the home 2. North of Lynden where 450 homes and 12 businesses will have 150Mbgs symmetrical and up to 1 gig speed. Neither the Port or PUD is providing retail service.	Meeting Recording: https://cob.zoom.us/rec/play/Am8RRyWxtCYXHroKjdR32-vArfxcmsZ580GV4A5FMibhaaLurcS3vMivxArLpWCAoat8ePAiaz5Mem5m.dVNfdKCHaE6EcCNW?startTime=1641348007000&_x_zm_rtaid=FLWC9s4WRAy8eRWj5kOKyw.1649203454607.09ea22be86e007b72f09e8588bd2fddc&_x_zm_rhtaid=203
2/1/22	<u>Eric Johnston</u> reported that Ziply is putting forth an application which indicates 40.00 lineal feet of "over-lashed" fiber. Ziply is not intended to provide retail service. Eric also reported that the City Council extended timeline of WG to September 2022. <u>David Roberts</u> proposed a timeline for providing input to the City Council that included dates for completing the following deliverables:	Meeting notes: https://cob.org/wp-content/uploads/Broadband-Meeting-Notes-2.1.2022.pdf Meeting recording:

	1. Broadband definitions 2. Summary of meeting 3. Draft of resolution 4. Draft of report 5. City Council presentation The Working Group said that more time may be needed which would be ok to recommend to the City Council if that is required and agreed to by the Working Group and the Council. The Working Group agreed to the timeline. Magellan provided and update which was a high level of the completed results. There are 1,059 completed surveys, and 786 partial surveys. A neighborhood overlay will occur. The project schedule is too tight for additional outreach. <u>Jory Wolf</u> said the survey responses are appropriate for Bellingham sized city. Typically, a city the size of Bellingham would have 1,200 to 2,400 responses. Working Group was concerned about financial models with the survey. Magellan said that conceptual business model and financial analysis will answer questions. A wide range of business models will be presented. Magellan said it would not recommend the city compete with existing services. Eric Johnston reminded Working Group that the Scope of Work was for Fiber to the Home (FTTH). David Roberts asked for two sub working groups to facilitate resolution. 1. Finalize Broadband Definitions 2. Summary of Meeting Notes	https://cob.zoom.us/rec/play/9j4PdIlkBomh50mbDgvh5EHfCB7vvjbFjZn5e0XGwykY5US3HeVlfKgbOoqIq0NBykwOcpkxTVFNkmy8.YfzEauQqQXJRIwp-?continueMode=true&_x_zm_rtaid=FLWC9s4WRAy8eRWj5kOKyw.1649203454607.09ea22be86e007b72f09e8588bd2fddc&_x_zm_rhtaid=203 Draft Timeline: https://cob.org/wp-content/uploads/2022-Timeline-for-Deliverables-Revised-2.1.22.pdf Consultant Business Model Presentation: https://cob.org/wp-content/uploads/Magellan-Broadband-Business-Plan-Presentation-2.1.22.pdf

3/1/22	The opening of the meeting focused on Broadband Definitions. The subgroup presented the draft of the Definitions. Consensus was reached on the definitions. See link for Draft. Magellan Advisors Bellingham survey report as per the link was not discussed and tabled for April 2022 meeting. This report was not given to the Working Group with ample time to read, digest and discuss. Eric Johnston asked Working Group members for individual comments regarding the Survey to be emailed to him by Friday March 4, 2022. Survey results will be discussed at the April 2022 meeting.	Meeting Notes: https://cob.org/wp-content/uploads/Broadband-Meeting-Notes_3.1.2022.pdf Meeting Recording: https://cob.zoom.us/rec/play/y1I8wrFq1 ReAewSyIx4tfjs3yPF5TwoPh1TdW9oAeY PW6mVwtT_ZxxTdkRAULbNBAYRoUD4B TsofaFh6.UUVkM3vfZz6dzvI8?continue Mode=true&_x_zm_rtaid=FLWC9s4WRA y8eRWj5kOKyw.1649203454607.09ea22 be86e007b72f09e8588bd2fddc&_x_zm_ rhtaid=203 WG Broadband Definitions: https://cob.org/wp-content/uploads/Broadband-Advisory-Workgroup-Definitions-3-1-22.pdf Survey Speed results: https://cob.org/wp-content/uploads/City-of-Bellingham-Internet-Survey-Speed-test-Results.pdf Consultants Survey Report: https://cob.org/wp-content/uploads/City-of-Bellingham-Broadband-Survey-Results-Analysis.pdf

4/5/22	Spencer Moore provided a dry run of his presentation for City Council currently scheduled for April 24th. Members provided a number of helpful suggestions which Spencer intends to incorporate. He requested additional comments by email. David Roberts invited voting members to participate in a final review of the presentation on April 13th. Jory Wolf and Greg Laudeman provided an update on the progress of Magellan's report to the Workgroup. The report will incorporate a conceptual design, cost, coverage estimates, financial analysis, business model information, an asset inventory, and the survey results. Magellan committed to providing a complete draft of the report to the City by end of April and a presentation at May 3rd Broadband Advisory Workgroup meeting. Workgroup will have the month of May to review the report then have a full discussion in June meeting. Eric Johnston shared a standard City Council agenda bill and discussed the typical components, including the Broadband Advisory Workgroup Report, and attached documents, such as the definitions, meeting summaries and the Magellan report. A subgroup was formed to develop a report before the May 3rd meeting.	Meeting Notes: https://cob.org/wp-content/uploads/Broadband-Meeting-Notes_4-5-22.pdf Meeting Recording: https://cob.zoom.us/rec/share/PPZp8F3FRvIDTZcwBzJ9vQCghT7NeQqumhrZ1fAcZhapmSSXf8dgLnDVyU7-q2F_.4UKhCxacMY3YZxaU
5/3/22	Spencer Moore gave the Workgroup presentation to Public Works Committee of the City Council on April 25th and did an excellent job. Eric Johnston suggested the Workgroup complete its work in June or July. Magellan's summary report was posted on the City's website. Workgroup members were encouraged to read the report, listen to Spencer's presentation, and send comments to David Roberts.	Meeting Notes: https://cob.org/wp-content/uploads/Broadband-Meeting-Notes_5-3-22.pdf Meeting Recording: https://cob.zoom.us/rec/share/YztTrjkttr19SpO9qoqCbU55k0JrqEdr-RgqsbivNK-

	Greg Laudeman from Magellan presented an overview of the findings and recommendations in the Magellan report. The bulk of the meeting after the overview was spent answering questions. Eric Johnston requested that the Workgroup send their comments to David Roberts by May 22nd so he can compile and present them to Magellan for consideration in the final draft. David Roberts introduced the meeting summary that was drafted by a subgroup comprised of Steve Spitzer, Michelle Kopcha, and Terry Davis. The subgroup reviewed all of the meeting minutes and capturing the most salient points to tell the story of the Workgroup's activities. Eric Johnston discussed presenting the Workgroup findings to the City Council including the purpose and content of an agenda bill.	jc1pc4KEpzwn7lMZOlzUd.O8wqgeFc1emIdNbD?startTime=1651626024000 Magellan Advisors Draft Report https://cob.org/wp-content/uploads/Magellan-Advisors-Bellingham-Broadband-Study-Report-complete-draft-05-03-2022-1.pdf
6/7/22	The focus of the meeting was on the work of the Report Team Subgroup comprised of Steve Spitzer, Milissa Miller, RB Tewksbury, Terry Davis, Gina Stark, Atul Deshmane. The Subgroup's initial draft included both observations and recommendations. The Workgroup members reviewed the observations and provided edits which were added to the document. The Workgroup also discussed schedule for the upcoming meetings and plans for a presentation for the City Council.	Meeting Notes: https://cob.org/wp-content/uploads/Broadband-Meeting-Notes_6.7.22.pdf Meeting Recording: https://cob.zoom.us/rec/share/bPOAR54nx1FUKGOMifYugQhsnDiA6utPyM6cHiU39BQdsx2KesKK9EpoQI78Nmeg.xnVKcdxWbbjJo79Y?startTime=1654650035000
6/21/22	The Workgroup heard from Eric Johnston on what to expect from City Council as a result of their presentation and how to prepare.	Meeting Notes:

	Workgroup members continued their review of the observations and recommendations document. Edits were captured in the report document. Steve Spitzer asked about providing a glossary in the report. The group agreed and Steve offered to prepare a draft. The schedule and final assignments were made for the remaining tasks to prepare for an August 29 presentation. Milissa Miller, RB Tewksbury, Michelle Kopcha and Kris Keillor volunteered to prepare the presentation. Milissa and Kris volunteered to make the presentation for City Council.	Meeting Recording: https://cob.zoom.us/rec/share/i7rsF9w7KDShpepKFDu0VDr9meilLI5KPoNOL4q_tQz4gob-exwnj3bhFqyxnSFw.HUO-z7XtGDJmkW7s?startTime=1655859621000%20Passcode:%20xjL?WA9$
7/19/22	The Workgroup heard from Eric Johnston about the process moving forward and what was expected in the agenda bill for City Council. The bulk of the meeting was focused on discussion and refinement of the Workgroup's recommendations. Milissa Miller reviewed the content in the presentation slides for City Council. The Workgroup provided comments and suggestions on the slides.	Meeting Notes: https://cob.org/wp-content/uploads/Broadband-Meeting-Notes_7.19.22.pdf Meeting Recording: https://cob.zoom.us/rec/share/Flw8Yd1QSuFJy50CnT2l8_Lq2OJ6XaBtiLSH--1X8q-OrVX-b1VERNupUgiU3ZRz.wYfU83UOI_eKLOuA?startTime=1658278853000
8/2/22	The Workgroup discussed what happens after the recommendations are submitted to City Council and if there is some expectation of a future role for the Workgroup. The discussion focused on further refinement of the Workgroup's recommendations. The only item not decided was the recommendation for a future workgroup.	Meeting Notes: https://cob.org/wp-content/uploads/Broadband-Meeting-Notes_8.2.22.pdf

	<u>Milissa Miller</u> provided a second review of the presentation slides for City Council. The Workgroup provided comments and suggestions on the slides.	Meeting Recording: https://cob.zoom.us/rec/share/HRBPIP9a_FVT2RvGpF51nNI9aVu6nSA5km4GnsKmNmpkq9UWKniwadtg_YOFo_RY.yXIJfaFKtgwVayE2?startTime=1659488423000
9/6/22	This final meeting accomplished the following two things: 1) The Workgroup agreed to the language of the recommendation a future advisory role for the Workgroup; 2) The Workgroup agreed to the final contents of the agenda bill.	<mark>Meeting notes</mark> <mark>Meeting recording</mark>

Section 7

Glossary of Terms

Bellingham Broadband Working Group

Glossary of Terms 2022

Affordability - (As defined by the Bellingham Broadband Working Group) Affordability means every Bellingham resident (housed and unhoused) and business should be able to afford high-speed broadband that meets their financial criteria and is sufficient for their respective welfare needs (i.e. telehealth, remote learning, remote work, business web apps, teleconferencing).

The City's goal is to ensure that services should be cost-competitive with reasonable rates based on those achieved by other comparable US cities (by the metric of Gbps/month/$).

AMI - Advanced Metering Infrastructure is a two-way communication system that can reach every device in the distribution space.

AON – Active Optical Network - The primary differences are the number of fibers per user required and the splitter component used in PON architectures. AONs use a powered (or "active") router or aggregated switch to distribute data from service provider to customers, and each user service requires a dedicated fiber and router/switch port. By contrast, PONs use one router/switch port and a single fiber between router/switch and the passive splitter to serve multiple subscribers, sharing the capacity of the wavelength. (See PON below)

Availability - (As defined by the Bellingham Broadband Working Group) Availability means that every resident (housed and unhoused), visitor, and business within the city limits and its Urban Growth Area, regardless of demographics or digital literacy, has available a net-neutral, reliable, quality high-speed broadband system.

The City's goal is to ensure at a minimum, broadband services are available for residents (housed and unhoused), visitors, and businesses through access points such as residences, libraries, public facilities, parks, schools, shelters, and service agencies and organizations.

Asymmetrical - Internet connections have two components - a downstream and upstream. When the two speeds are not comparable, the connection is termed asymmetric. (See Symmetrical below)

Backbone - The Internet backbone may be defined by the principal data routes between large, interconnected computer networks and core routers of the Internet. These data routes are hosted by commercial, government, academic and other high-capacity network centers.

Bandwidth - The rate at which the network can transmit information across it. Generally, higher bandwidth is desirable. The amount of bandwidth available can determine whether you download a photo in 2 seconds or 2 minutes.

Bit - The base unit of information in computing. A bit is considered to be the smallest unit of data measurement. A bit can be either 0 or 1. Bits are usually assembled into a group of eight to form a byte. Bits equals the internet connection speed. Bit is generally abbreviated with a lower case b.

Broadband - (As defined by the Bellingham Broadband Working Group) In telecommunications, broadband is wide bandwidth data transmission which transports multiple signals at a wide range of frequencies and Internet traffic types, that enables messages to be sent

simultaneously, used in fast internet connections. The medium can be coaxial cable, optical fiber, wireless Internet (radio), twisted pair or satellite.

In the context of Internet access, broadband is used to mean any high-speed Internet access that is always on and faster than dial-up access over traditional analog services.

The City's goal is to assure a broadband speed for residents (housed and unhoused), visitors, and businesses of 150/150 Mbps today, always available, scalable, and a minimum target of 1 Gbps symmetrical service by 2028.

Broadband Adoption Plan - Broadband adoption is daily access to the Internet:
- At speeds, quality and capacity necessary to accomplish common tasks,
- With the digital skills necessary to participate online, and
- On a personal device and secure, convenient network.

Byte - unit that consists of 8 bits. A byte is the unit most computers use to represent a character such as a letter, number, or typographic symbol. Bytes simply equals an amount data. Byte is generally abbreviated with a capital B.

Carrier grade/class refers to a system, or a hardware or software component that is extremely reliable, well tested and proven in its capabilities. Carrier grade systems are tested and engineered to meet or exceed **"five nines"** (term used for describing the availability of a computer or a service at 99.999 percent of the time it is required) high availability standards, and provide very fast fault recovery through redundancy (normally less than 50 milliseconds). Often, this requires a service provider to leverage a fault-tolerant design that delivers immediate failover through hot standby redundancy so that systems remain running while teams can react to faults (and with enough redundancies, a network can credibly claim 100 percent uptime). But what really distinguishes "carrier-grade" from "consumer-grade" when discussing products and networks is performance. Carrier-grade technologies are expected to perform at a much higher-level than what's widely available in consumer markets.

Dark fiber – Unused fiber infrastructure that has not been "lit" with Internet service. When someone is building a fiber network, the cost of adding more fiber than immediately required is negligible and the cost of having to add more fiber later is very high. Therefore, many include dark fiber in projects – fibers that can be leased to others or held in reserve for a future need.

Digital Equity and Inclusion - (As defined by the Bellingham Broadband Working Group) Digital equity is a condition in which all individuals and communities have the information resources needed for full participation in our society, democracy, and economy. Digital Equity is necessary for civic and cultural participation, employment, lifelong learning, and access to essential services. Digital inclusion requires intentional strategies and investments to reduce and eliminate historical, institutional, and structural barriers to access and use technology.

The City's goal for digital inclusion ensures everyone has access to the information resources necessary to achieve digital equity.

Digital Literacy - is the ability to use, manage, understand, and assess technology. Digital literacy is when a user is proficient in using computers and other digital devices to access the Internet. Digital literacy gives users the ability to use the Internet and use information via

various digital platforms, such as web browsers, databases, online journals, magazines, newspapers, blogs, and social media sites.

Digital Navigators - Digital navigators are trusted guides who assist community members in internet adoption and the use of computing devices. Digital navigators help demystify technology by providing one-on-one, ongoing assistance to connect residents to affordable internet, devices, technical skills, and application support.

Download/Downstream - Downstream refers to the rate at which the user's computer can receive data from the Internet. (See Upload below)

Gbps - Gigabits per second - or one billion bits per second. 8 Gbps means that 8 billion bits are transferred each second. **1000 megabits**

ISP - Internet Service Provider

Lambdas - A fiber path is a set of contiguous strands between two or more points. A lambda is a portion or "color" of laser light within a strand.

Lit fiber - Fiber infrastructure that is being used to provide Internet service.

Latency - The amount of time it takes for a bit to get from point A to point B.

Last mile - Describes the final leg of a connection between a service provider and the customer.

Mbps - Megabits per second - a measure of speed. 8 Mbps means that 8 million bits are transferred each second. Using an 8 Mbps connection, it would take 1 second to transfer a 1 MB (Megabyte) file - a photo, for instance.

Middle mile - Middle mile is a term most often referring to the network connection between the last mile and greater Internet. For instance, in a rural area, the middle mile would likely connect the town's network to a larger metropolitan area where it interconnects with major carriers.

Missing Middle – refers to families that are still in need of financial assistance, but do not quality for any federal or state assistance for broadband access or hardware because their income exceeds the requirements.

Municipal Network - A broadband network owned by a local government.

OLT - Optical Line Terminal - An OLT is the device that serves as your ISPs endpoint of the passive optical network (PON).

ONT/ONU - Optical Network Terminal/Unit - An ONT/ONU is the device that serves as the telecommunication chain's endpoint of the PON on your end.

Open access - An arrangement in which the network is open to independent service providers to offer services. In many cases, the network owner only sells wholesale access to the service providers who offer all retail services. Open access provides much more competition from which potential subscribers can choose.

PON - Passive Optical Network - A passive optical network, or PON, uses fiber-optic technology to deliver data from a single source to multiple endpoints. "Passive" refers to the use of optical fiber cables connected to an unpowered splitter, which in turn transmits data from a service

provider network to multiple customers. Technically, only the splitter is passive, because the network still needs electrical power at the source and receiving ends to function. A PON, then, uses fewer router ports and fiber connections to serve subscribers than an AON. The PON architecture minimizes possible points of failure, making it ideal for service providers needing to supply fast, reliable connectivity to homes, hospitals, hotels, resorts, campuses, and other subscriber locations. (See AON above))

POP - Points of Presence - major carrier points of presence usually for long-haul customers who want as few points of failure as possible

Quality - (As defined by the Bellingham Broadband Working Group) Quality broadband service provides reliable, uninterrupted speed at peak use hours and has latency, jitter, and packet loss low enough to:

> a) conduct clear, natural-feeling two-way teleconferencing with anyone else in the world who also has a high-quality broadband connection, and

> b) to be able to use most—if not all—of the purchased bandwidth, even during peak usage times.

The city's goal is to assure quality broadband service for all based on the residents' or business' choice of service level.

Ring Architecture - The ring architecture is a distributed architecture, with minimal connectivity and a topology of two links connected to every node as shown in Figure and forms unbroken circular configuration.

SCADA, Supervisory control, and data acquisition is a control system architecture comprising computers, networked data communications and graphical user interfaces for high-level supervision of machines and processes. It also covers sensors and other devices, such as programmable logic controllers, which interface with process plant or machinery.

Symmetrical - Internet connections have two components - a downstream and upstream. When the two speeds are comparable, the connection is termed symmetric. Fiber-optic networks more readily offer symmetrical connections than DSL and cable, which are inherently asymmetrical. (See Asymmetrical above)

Upload/upstream - Upstream refers to the rate at which the user's computer can send data to the Internet.

Uptake numbers - calculation of the potential number of users for internet services

Source:

Bellingham Broadband Advisory Group Consensus

Institute for Local Self-Reliance Community Network, Glossary Terms
https://muninetworks.org/glossary

Rhinesmith, Colin. "Digital Inclusion and Meaningful Broadband Adoption Initiatives." Evanston, IL: Benton Foundation, January 2016. benton.org/broadband-inclusion-adoption-report

Wikipedia

Section 8

Magellan Advisors

Municipal Broadband Study Final Report

Municipal Broadband Study

Final Report

August 16, 2022

Magellan
ADVISORS

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Executive Summary

Magellan Advisors studied the Bellingham broadband market, network infrastructure in the area, and the financial viability of various business models. The City of Bellingham has extensive assets that were developed in an ad hoc, project-oriented, tactical manner. These assets can be economically transformed into an integrated backbone infrastructure capable of supporting a wide range of applications and services, including retail broadband. Generally, we recommend the City position itself as catalyst for next generation broadband and digital inclusion facilitator, possibly operating an open access, wholesale transport services network.

Our financial analysis shows that retail broadband services to all premises in the city is not economically viable. Such infrastructure would cost approximately $450M to build and could involve over $600M in debt service. There were multiple providers active in the market, if not offering retail broadband to most residents, and no clear evidence of broadband gaps. Therefore, Magellan Advisors does not recommend the City become a retail broadband provider. Instead, focus on attracting additional investment and partnerships for lower-cost service offerings.

Extensive improvements and complementary investments in equipment and systems will be necessary for the City of Bellingham's existing network infrastructure to be considered "carrier class"—capable of providing services to other parties with specific paths, speeds, and up-time commitments. Additional information will be needed to estimate costs for such improvements and the potential for impact, including direct revenue from wholesale services. Regardless, the extent of assets, goals for digital inclusion, and market opportunities clearly justify pursuing this course of action. Magellan Advisors recommends the City of Bellingham invest in its network infrastructure in a manner that:

- Addresses specific objectives based on local public priorities,
- Capitalizes on existing assets,
- Catalyzes private investment,
- Fulfills specific needs of prospective customers and partners, and
- Creates opportunities for education, employment, health, safety, and other valued outcomes.

This means establishing a broadband department with an enterprise fund and adequate staffing to provide wholesale network services to community anchors, major enterprises, and retail providers. The City should develop detailed plans and

practices to upgrade its network assets into a carrier-class backbone. Make focused investment for specific purposes. Input from prospective customers and partners will be critical for success, as will clear strategic objectives. The City should establish a vision and goals for the network and its impacts on the community. Methodically supplement and transform existing assets into carrier-class backbone infrastructure for wholesale services to achieve the vision and goals.

1. Introduction

The City of Bellingham established the Broadband Advisory Workgroup to evaluate options for municipally owned broadband infrastructure. The objectives were to assess current broadband access and affordability, along with the financial costs and benefits and policy considerations for expansion, improvement and use of the City's fiber optic network. The overall goals of the Workgroup were to increase availability, affordability, and equitable quality of broadband access across the community. The City hired Magellan Advisors to conduct the assessments and provide recommendations for broadband infrastructure policy. This report is the result of that work.

In this report, Magellan Advisors shows how the City of Bellingham might leverage its assets to expand broadband access to its community. The report includes an assessment of the current state of broadband within the City, a conceptual network design for leveraging existing infrastructure and expanding the City's broadband footprint to deploy fiber-to-the-home (FTTH) or fiber-to-the-premise (FTTP), and business model with financial analyses to provide the City with a clear understanding of the sustainability of a municipal broadband program. It culminates in an actionable plan that includes best practice approaches, sample documents, and data-driven recommendations.

BACKGROUND

The City of Bellingham is the county seat of Whatcom County, the most northwestern county in the continental United States, which extends from Bellingham Bay on the Salish Sea to the North Cascades mountains. With less than 40K households housing a population of 91.5K, 45% of whom have bachelor's degree or higher, Bellingham is a well-educated, large "small city." See Table 1-1 for other key demographic statistics. Unfortunately, the City has a relatively high poverty rate (relative to 12.8% nationwide poverty) and low household incomes (relative to $65k median nationwide household incomes), as shown in the table below.

Table 1-1. Key Demographic Statistics for Bellingham, WA[1]

TOPIC	STATISTIC
Total population	91,482
Annual growth rate	1.9%
Under 18 years	13.9%
65 years or over	15.7%
Population 25 years and over	56,569
Less than high school	5.8%
High school graduate or equivalent	17.0%
Some college, no degree	21.3%
Associate's degree	10.6%
Bachelor's degree	27.2%
Graduate or professional degree	18.2%
Population in households	86,305
Percentage in poverty	20.0%
Total households	38,680
With a computer	94.9%
With a broadband Internet subscription	89.7%
Mean household income	$73,555
Median household income	$56,198

The local economy has a strong base of professional services establishments, as shown in Table 1-2, particularly when administrative, health care, social assistance sectors are included. Wholesale trade is particularly strong in growth and presence. The arts, entertainment, and recreation sector also had solid growth in number of firms, followed by educational services, and administrative and support services.

Overall, with an annual establishments growth rate of 2.8%, Bellingham has 5.6k establishments at the writing of this report and should have nearly 5.7k in five years. The City is home to the Port of Bellingham, which has evolved into a recreation and tourism destination but maintains its mariner ties. The two largest employers are St. Joseph's Hospital (2.2K employees) and Western

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[1] Source: U.S. Census Bureau, American Community Survey (ACS), 2020 5-year Estimates, https://data.census.gov/cedsci/

Washington University (1.5K employees), both of which have large campuses in the City.

Table 1-2. Projected Number of Establishments by Sector Based on U.S. Bureau Estimates by Percentage of Total[2]

Sector	2022	2027	Percent	Growth
All sectors	**5,608**	**5,663**	**100%**	**2.8%**
Professional, scientific, and technical services	744	776	14%	1.0%
Construction	770	770	14%	NA
Wholesale trade	510	678	12%	7.4%
Retail trade	648	577	10%	-2.9%
Health care and social assistance	563	520	9%	-2.0%
Accommodation and food services	478	462	8%	-0.8%
Administrative and support services	368	417	7%	3.2%
Manufacturing	342	348	6%	0.5%
Real estate and rental and leasing	271	250	4%	-1.9%
Arts, entertainment, and recreation	175	217	4%	5.4%
Other services (except public administration)	265	214	4%	-5.1%
Transportation and warehousing	154	135	2%	-3.3%
Educational services	90	104	2%	3.4%
Information	98	101	2%	0.8%
Finance and insurance	76	39	1%	-15.6%
Industries not classified	34	34	1%	NA
Management of companies and enterprises	21	21	0%	NA

The demographic and economic statistics provide important context for broadband planning. They define the size of the market to be served and suggest how they might use and value broadband. This background also informs the conceptual design, estimates and projections for costs, coverage, and revenue.

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[2] Source: U.S. Census Bureau, 2012 and 2017, Annual Business Survey: Statistics for Employer Firms by Industry, Sex, Ethnicity, Race, and Veteran Status for the U.S., States, Metro Areas, Counties, and Places (Table AB1700CSA01). Estimates were not available for Agriculture, forestry, fishing and hunting, Mining, quarrying, and oil and gas extraction, or Utilities sectors.

2. Community Survey

To gain insight into the current state of broadband and need for future connectivity, Magellan Advisors and the City of Bellingham conducted a broadband survey among businesses and residents. The survey was open for approximately eight weeks between November 2021 and January 2022 and received a total of 1625 unique responses. As shown in the table below, most responses came from households in Bellingham.

While this was not a systematic survey with random sampling and non-response bias testing, the results can be considered statistically reliable. With a study population of approximately 44k business establishments and residential households, a sample of 381 is required for 95% confidence level with 5% margin of error. Not all respondents responded to all items on the survey. Specifically, 146 respondents did not have broadband. To address these issues, we report the number of responses per question and demographic characteristics of respondents. Geographic analysis of responses, below, shows responses from across the city.

Table 2-1. Survey Responses by Type

Response Type	Count
Household	1557
Organization	42
Individual without a physical address	26
Total	**1625**

Among residential respondents, the average household size was 2.58 people, very close to the 2.28 average size according to Census data. The median age of the youngest person in respondent households was 30 and the oldest was 48, compared to the median age of 31.5 years as reported in Census data, indicating that respondents were somewhat older than the population. Twenty five percent (261) of respondents indicated that they were retired or otherwise out of the workforce, which is somewhat lower than Census data estimates that 35.8% of Bellingham residents ages 16+ are no longer in the workforce.

Top industries included about 32% of respondents (329) who worked in Arts, Business, Management, or Science, 19% who worked in Service (189), and 14% who worked in Office or Sales (144). Nearly 80% of respondents (819) had Bachelor's

degrees or higher compared to Census data indicating that 44.3% have a Bachelor's degree or higher, indicating that respondents have higher educational attainment than the general population. These statistics indicate substantial response from across the socioeconomic spectrum, albeit skewed toward better educated working age adults. The survey specifically asked about the highest educational level in the household and the occupation of the primary breadwinner, so such distribution of these characteristics among respondents is in line with expectations.

BROADBAND ADOPTION

Most of the respondents (91%) had broadband connections, defined as high-speed, always on service. Approximately 6% of respondents had low-speed service including cellular, dial-up, or satellite, and 2% were unsure of whether they had broadband. Approximately 1% (20 respondents) reported not having internet service.
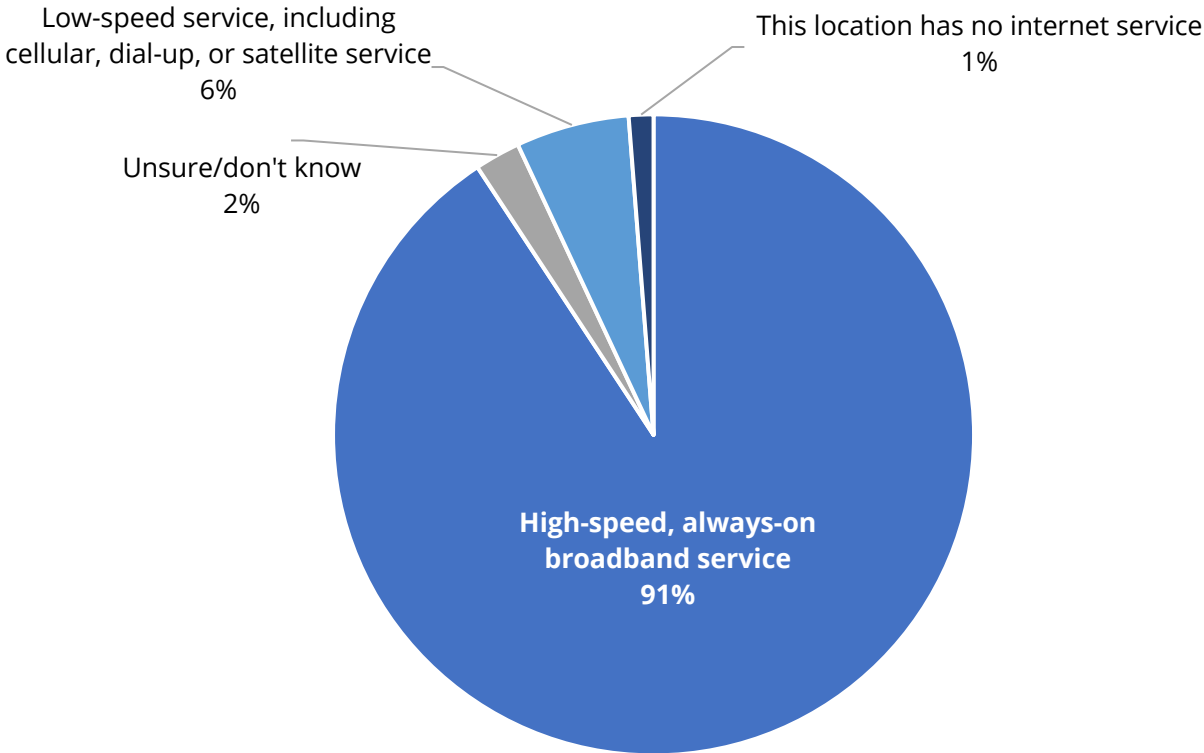
Figure 2-1. Respondents' Type of Connection by Percentage of 1609 Responses

Among respondents who did not have broadband, the top reason was that broadband was not available at their location. The second most cited reason was that available services are too expensive.
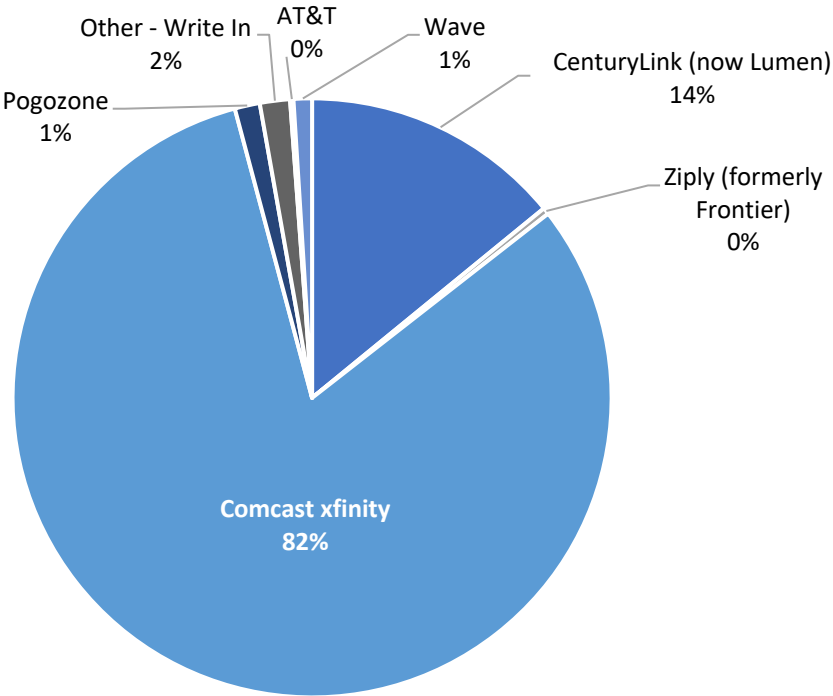
Figure 2-2. Respondents' Internet Service Provider by Percentage of 1107 Responses

Most respondents (901) were served by Comcast, as illustrated in Figure 2-2, followed by Lumen/Centurylink (156). Respondents also had service through a handful of other companies including Pogozone (15), Wave (11), Ziply (4), and AT&T (2). Eighteen respondents wrote in providers including Starlink, T-Mobile, and Verizon.

PERFORMANCE

Respondents were asked how much they paid for broadband and related services and what contracted speeds they paid for. These were "best guesses" by the person responsible for choosing and paying for the service. Variance would diminish with more responses but should be assumed high in this situation. Actual performance was recorded automatically via a speed test integrated into the survey. But performance will vary over time based on network congestion and other factors. Therefore, we report a full set of descriptive statistics, including average, maximum, median, and minimum speeds.

On average, survey respondents reported contracted to receive speeds of approximately 323 Mbps download and 127 Mbps upload. The actual speed test

results were much lower than contracted speeds, with an average download speed of 150 Mbps and an upload speed of 24 Mbps.[3]

Table 2-2. Descriptive Statistics for Broadband Cost and Performance Among Survey Respondents

| | Contracted | | Actual | | | Cost Per |
	Download	Upload	Download	Upload	MRC	Mbps[4]
Average	322.73	126.54	149.92	23.93	$113.81	$0.65
Median	150	15	92.08	6.67	$75.00	$0.76
Mode	100	5	6.29	3.25	$100.00	$10.48
Max	3000	5007	1218.89	914.66	$25,000.00	$11.72
Min	1	0.1	0.22	0.11	$1.00	$3.03
			Averages By Provider			
AT&T	60	47.5	44.02	7.04	$50.00	$0.98
Lumen	335.46	340.74	114.49	64.19	$63.48	$0.36
Comcast	328.33	88.28	159.17	15.99	$115.55	$0.66
Pogozone	123.77	129.23	37.34	17.11	$57.76	$1.06
Wave	251.25	192.14	161.89	161.86	$866.00	$2.67
Ziply	13.5	252.75	5.41	1.39	$61.67	$9.06

On average, respondents who subscribed to services through Comcast were paying more than Lumen/Centurylink customers, although their average upload speeds were much lower. Respondents who identified Ziply as their provider were paying the most per Mbps, and respondents who identified Lumen/Centurylink as their provider were getting the best value per Mbps per month.

The following images show the general location of internet survey responses' speed test results, including locations where broadband was not available, comparable to Washington State's new broadband standard of 100 Mbps download and 20 Mbps upload or 120 Mbps aggregate throughput. These maps indicate that lower speed

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[3] In some cases, the speed test created results that were clear outliers with questionable accuracy. These responses were removed from the speed test analysis.

[4] Cost per Mbps is calculated by dividing the cost by the total throughput (actual download plus actual upload speed).

connections are dispersed throughout the City and do not point to any specific neighborhoods or areas that are underserved compared to their surroundings.
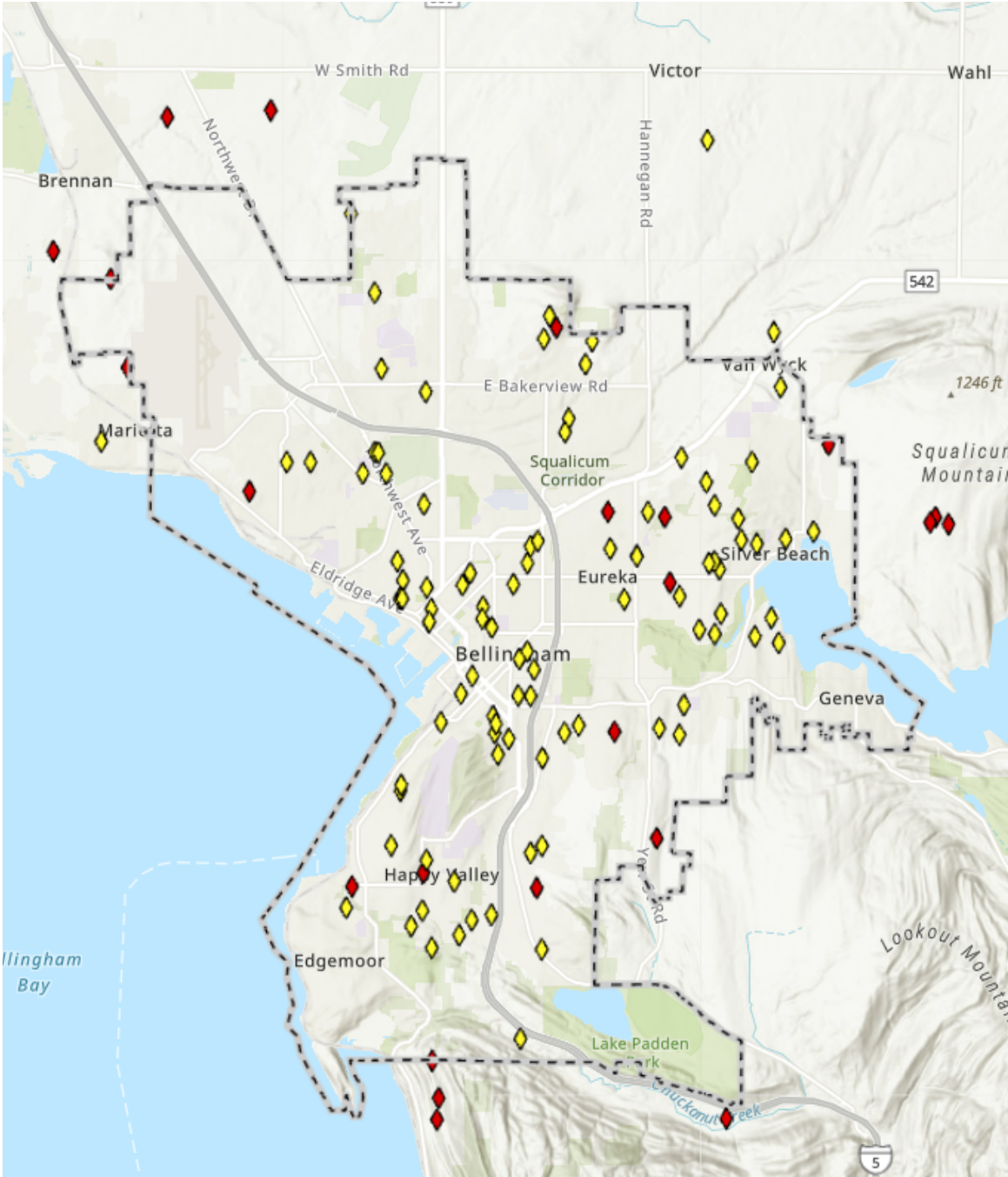
◆ Broadband Not Available   ◇ Less than 28 Mbps aggregate throughput

Figure 2-3. Locations of Speed Test Results Below the FCC Broadband Standard
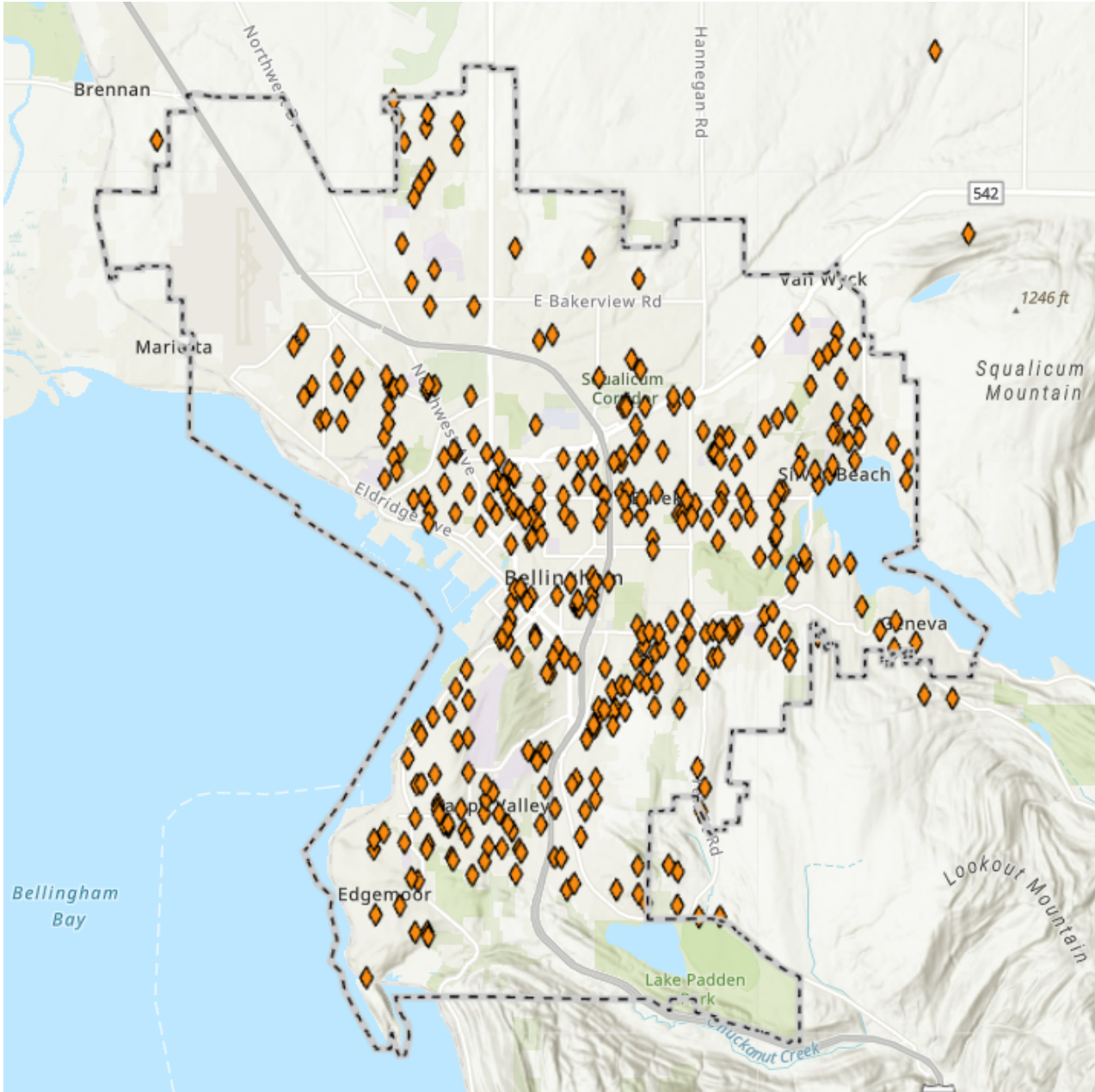
◇ 28 Mbps but less than 120 Mbps aggregate throughput

Figure 2-4. Locations of Speed Test Results Below Washington State Broadband Standard but over FCC standard
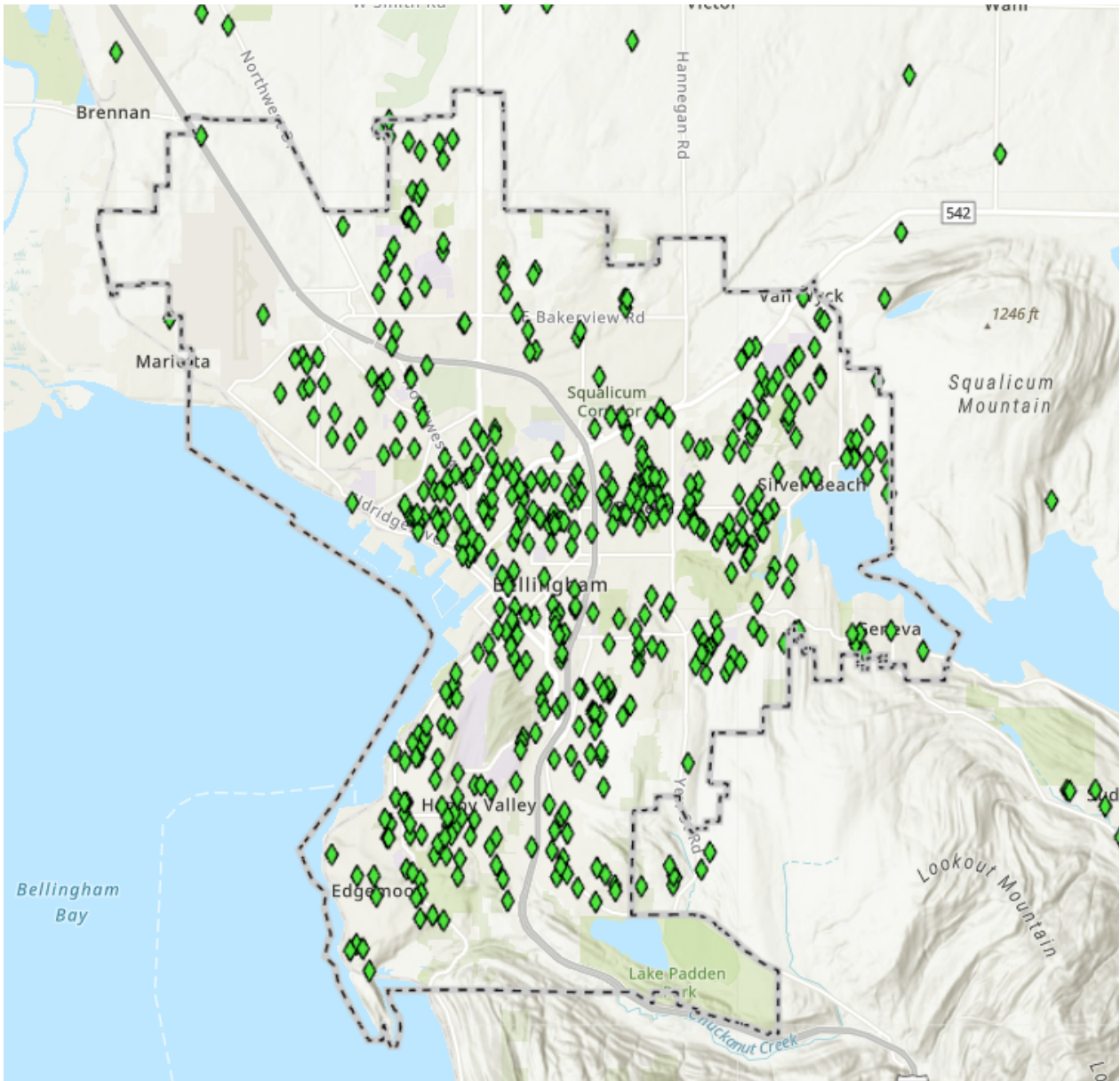
◆   120 Mbps aggregate throughput or higher

Figure 2-5. Locations of Speed Test Results Above Washington State Broadband Standard

To further assess whether any specific neighborhoods are unserved or underserved, the numbers of each tier of speed test results were analyzed by neighborhood, as shown in the table below. The larger proportion of results (8.1%) came from the Roosevelt neighborhood, which is home to 9% of the City's population. On average each neighborhood contributed 4.2% of speed test results. Fairhaven, which has 600 residents, and Meridian, which is largely commercial and industrial, had the lowest percentage of speed tests. Less than 3% came from the

South, King Mountain, City Center, Edgemoor, and Sehome neighborhoods. The neighborhoods with no results were a newer one that is zoned industrial (Irongate) and the campus of Western Washington University. Cornwall Park, Edgemoor, and Lettered Streets had the highest numbers of very slow speed test results.

Table 2-3. Speed Test Results by Neighborhood[5]

Neighborhood	Fast	Slow	Very Slow	None	Total	Percent
Lettered Streets	18	16	9	0	43	4.3%
Silver Beach	21	24	8	0	53	5.3%
Columbia	28	13	7	0	48	4.8%
Alabama Hill	24	14	7	0	45	4.5%
Sehome	14	8	6	0	28	2.8%
King Mountain	9	9	6	1	25	2.5%
Barkley	35	16	5	1	57	5.7%
Happy Valley	27	28	5	1	61	6.1%
Birchwood	18	21	5	0	44	4.4%
York	13	13	5	0	31	3.1%
Roosevelt	39	36	4	2	81	8.1%
Sunnyland	20	13	4	0	37	3.7%
South	11	7	4	0	22	2.2%
Outside	38	25	3	3	69	6.9%
Samish	33	25	3	1	62	6.2%
Cordata	27	15	3	0	45	4.5%
Puget	23	22	3	1	49	4.9%
South Hill	21	19	3	0	43	4.3%
Whatcom Falls	20	21	3	0	44	4.4%
City Center	12	11	2	0	25	2.5%
Meridian	12	4	1	0	17	1.7%
Fairhaven	9	4	1	1	15	1.5%
Cornwall Park	21	10	0	0	31	3.1%
Edgemoor	17	10	0	0	27	2.7%
Irongate	0	0	0	0	0	0.0%
WWU	0	0	0	0	0	0.0%

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[5] Table headings are minimal due to space limitations. "Fast" refers to at least 120 Mbps throughput, "Slow" is between 28 Mbps and 120 Mbps, "Very Slow" is less than 28 Mbps, and "None" is where respondents indicated they had no internet because it was not available.

CONSUMER SENTIMENTS

The survey also asked respondents to rank their current internet service on a variety of factors, as shown below. More than half of respondents ranked their services as good or excellent across all factors, except price and customer service. Nearly half (46%) of respondents rated Price as either bad or terrible; similarly, nearly half (42.7%) rated customer service and support as bad or terrible.

Table 2-4. Respondents' Assessment of Current Internet Service Performance

Topic	Terrible	Bad	Neither/ Not Sure	Good	Excellent	All
Overall	29 (2.8%)	125 (12%)	169 (16.2%)	579 (55.6%)	139 (13.4%)	1041
Performance/ Speed	27 (2.6%)	154 (14.8%)	168 (16.2%)	553 (53.3%)	136 (13.1%)	1038
Price	141 (13.6%)	335 (32.4%)	274 (26.5%)	225 (21.7%)	60 (5.8%)	1035
Reliability	32 (3.1%)	120 (11.5%)	220 (21.2%)	532 (51.2%)	136 (13.1%)	1040
Customer Service & Support	229 (22.3%)	210 (20.4%)	312 (30.3%)	223 (21.7%)	55 (5.3%)	1029

Most respondents reported slowdowns and service outages. Slowdowns appear to occur every few days to once a year and service goes out for an hour or two every few months to about once a year. About 13% of respondents did experience slow downs on a daily basis and about 3% of respondents were seeing brief outages on every day.

USE

To better understand how internet is being used, we asked household respondents to identify how essential it is for a variety of common uses. Most respondents found internet to be extremely useful or essential across all tasks, except generating income or selling things, for which only about 40% of respondents found it to be essential.

We also asked respondents how often someone in their household was using internet for critical services such as schoolwork or training, telecommuting, operating a home-based business, or health monitoring. The most common of these uses was telecommuting, with nearly half (46.9%) of respondents indicating that someone in their household used internet for this purpose more than once a week. More than a quarter (32%) of respondent households had someone in their household who did online schoolwork or training more than once a week, and a similar percentage (29.8%) had someone who used it for operating a home-based business including "gig" work. Few respondents (2.0%) had someone in their household who used it more than once a week for consulting a healthcare professional, but more than half of respondents (56.3%) did use it a few times a year for this purpose.

Among organizational respondents, digital technologies were absolutely essential or very useful for all uses including management and operations and supporting customers. To understand just how critical broadband is, we asked organizational respondents whether they would be willing to move their business for much faster, less expensive internet services. Of the 24 respondents, nearly one third (29.2%) said they definitely would not move, but the majority of respondents fell somewhere in the middle indicating that they would consider moving.

CONCLUSIONS

Generally, affluent consumers (relatively older and better educated) in Bellingham have reasonably fast broadband. Unfortunately, younger residents with lower levels of educational achievement did not respond so we cannot draw any conclusions about their connectivity. Broadband is available in most locations and although Comcast dominates the market, several other service providers also have offerings for residents and businesses.

Overall, respondents were happy with their current services, although price and customer service were an issue for some respondents. Although broadband speeds were acceptable in most locations, some neighborhoods had a relatively high number of low-speed tests, indicating that they may be underserved. The neighborhoods of Cornwall Park, Edgemoor, and Lettered Streets had the highest number of low speed tests, some of which did not meet the definition of broadband by Washington's standards, and several of which fell below Federal standards.

3. Asset Assessment

The City of Bellingham has a substantial amount of assets that are currently or could be used for communication purposes. These include both public and private assets. There are also key City locations and public facilities that are on a public high-speed fiber-optic network and many more that could be. This memo reviews the communication assets owned by the City and major private sector network infrastructure that exists today.

PUBLIC ASSETS[6]

The City currently has a wide array of assets that are being used for communications or could be used for communications. These include towers, over 850,000 feet of conduit and over 535,000 feet of fiber-optic cables.

Conduit and Fiber-Optic Cables

Bellingham has substantial conduit and fiber-optic assets deployed throughout the City. The scope and scale of the City of Bellingham's network assets are illustrated on the next few pages. The City of Bellingham has 853,945 feet (162 miles) of conduit. There is 89,500 feet of aerial conduit and 764K feet of underground conduit segments with an average length of 102 feet. Most of the conduit is 1.5" and 2" in diameter. The conduit network is shown in Figure 3-2, below.

Of all the conduit east of I-5, 22% contain fiber optics with an average length of 254 feet. This fiber-filled conduit totals 420K feet or 49% of the total length of conduit. Much of the conduit contains copper wire for traffic signal interconnects. All but 2 of the 80 aerial conduits[7] contain fiber. Conduit west of I-5 has yet to be inspected for fiber.

The City of Bellingham has 101.3 route miles (534,860 feet) of fiber-optic cable. These are comprised of 403 individual spans of which 269 are underground, 62 are aerial, 23 are in cabinets and 9 are in ceilings. The number of fiber-optic cables in each strand ranges from 6 to 288, with 12 fibers being the most common. There are a total

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[6] Numbers included in this section come from analysis of geographic data provided by the City, some of which were revised by City staff.

[7] City of Bellingham documentation indicates aerial conduit, which we assume is laterally reinforced duct.

of 12,768 strands of fiber in the cable spans. The locations of these fibers is shown in Figure 3-3.
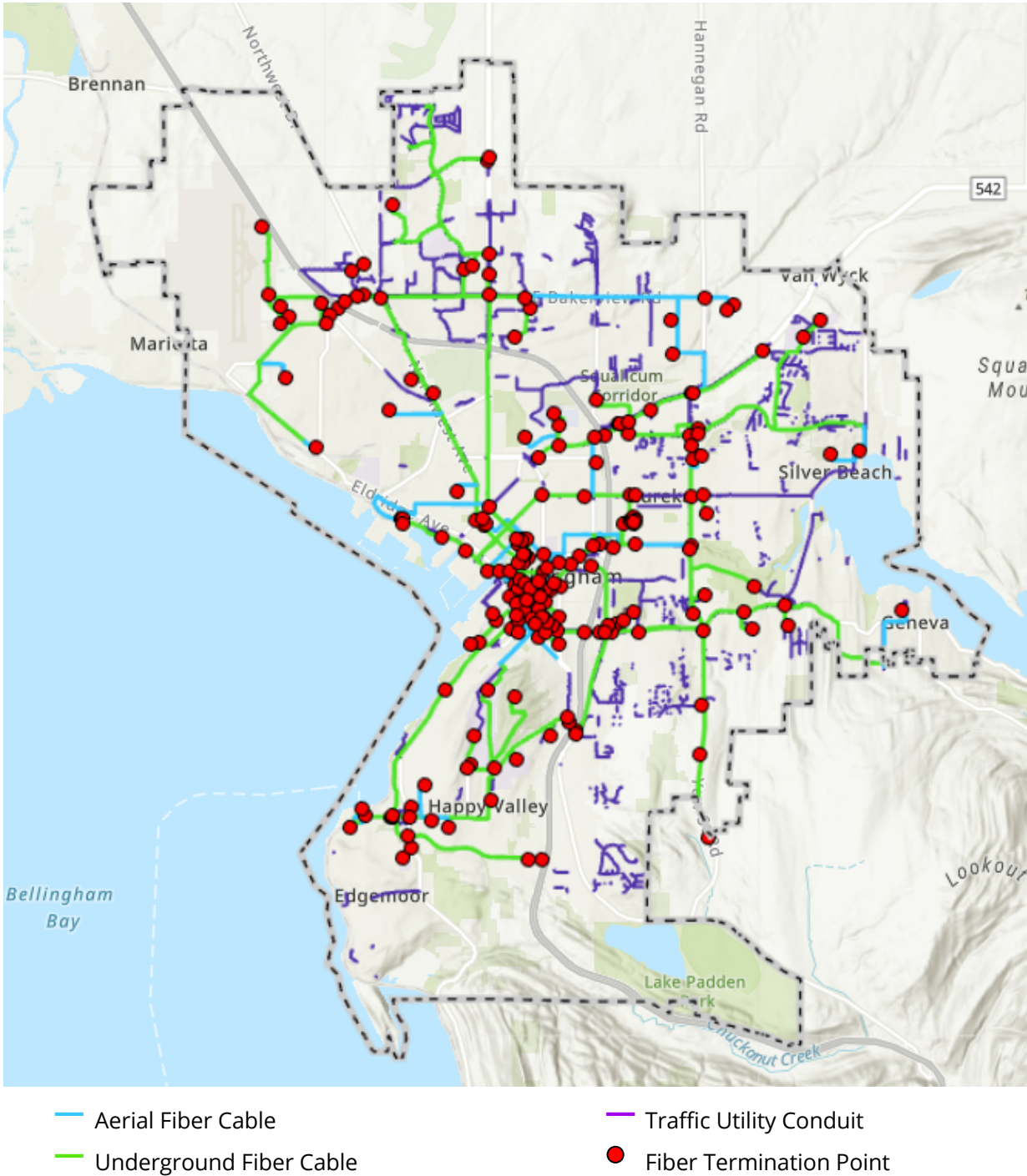
Figure 3-1. City of Bellingham Network Infrastructure Assets
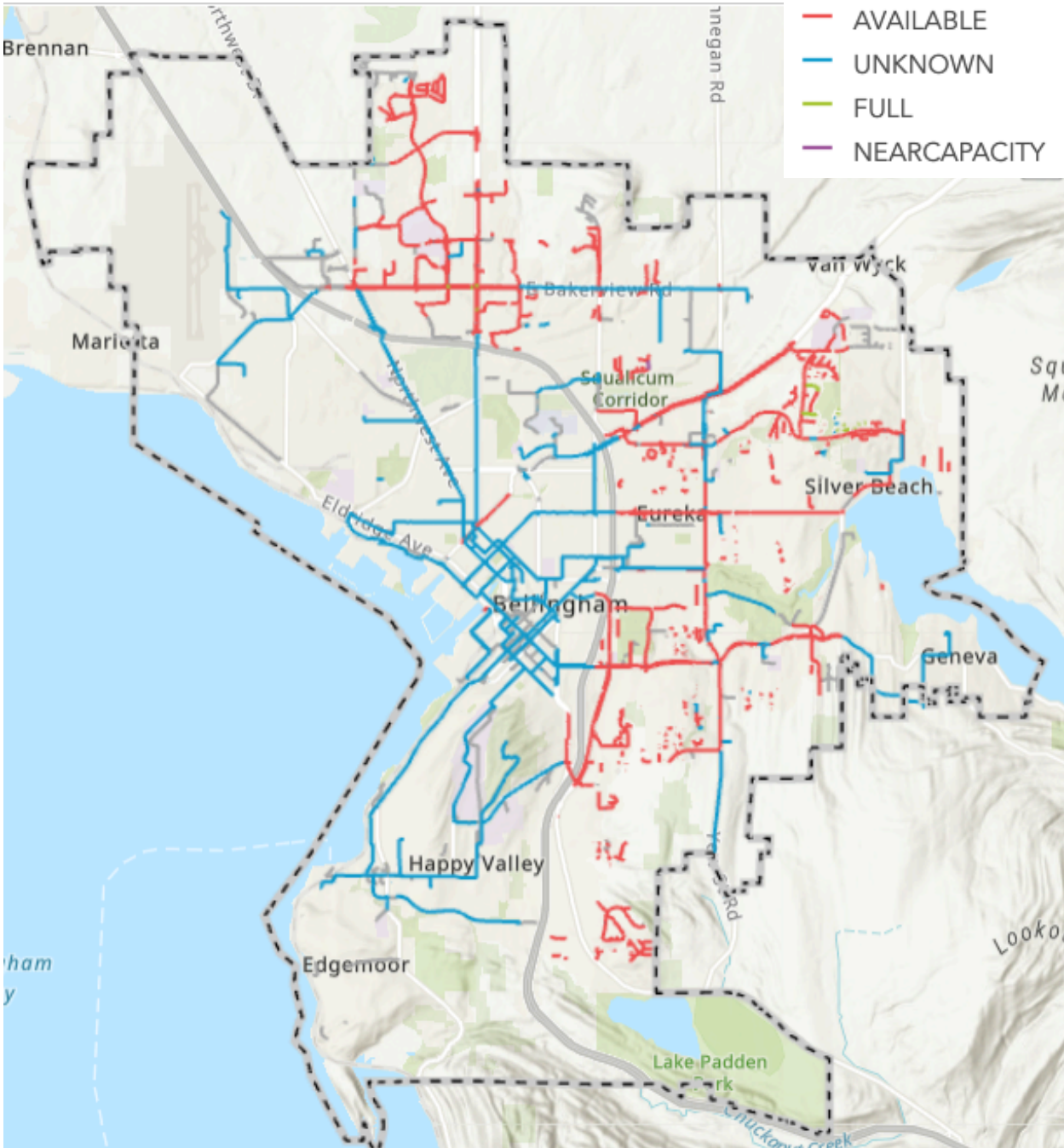
Figure 3-2. City of Bellingham Conduit Assets

There were 91 sites connected to the City's fiber-optic network. According to the data provided to Magellan Advisors, there are 577 buildings and locations that are considered "public." Of these, the City owns 223 or 38% of them. Educational institutions account for 235 (40%) of the public locations. The Bellingham School District has 113 sites, Western Washington University has 105, and Whatcom

Community College has 7. Governments and Authorities account for 13.4% of public locations. The County owns 38, the State owns 36 and the Port owns 3 buildings or public locations.
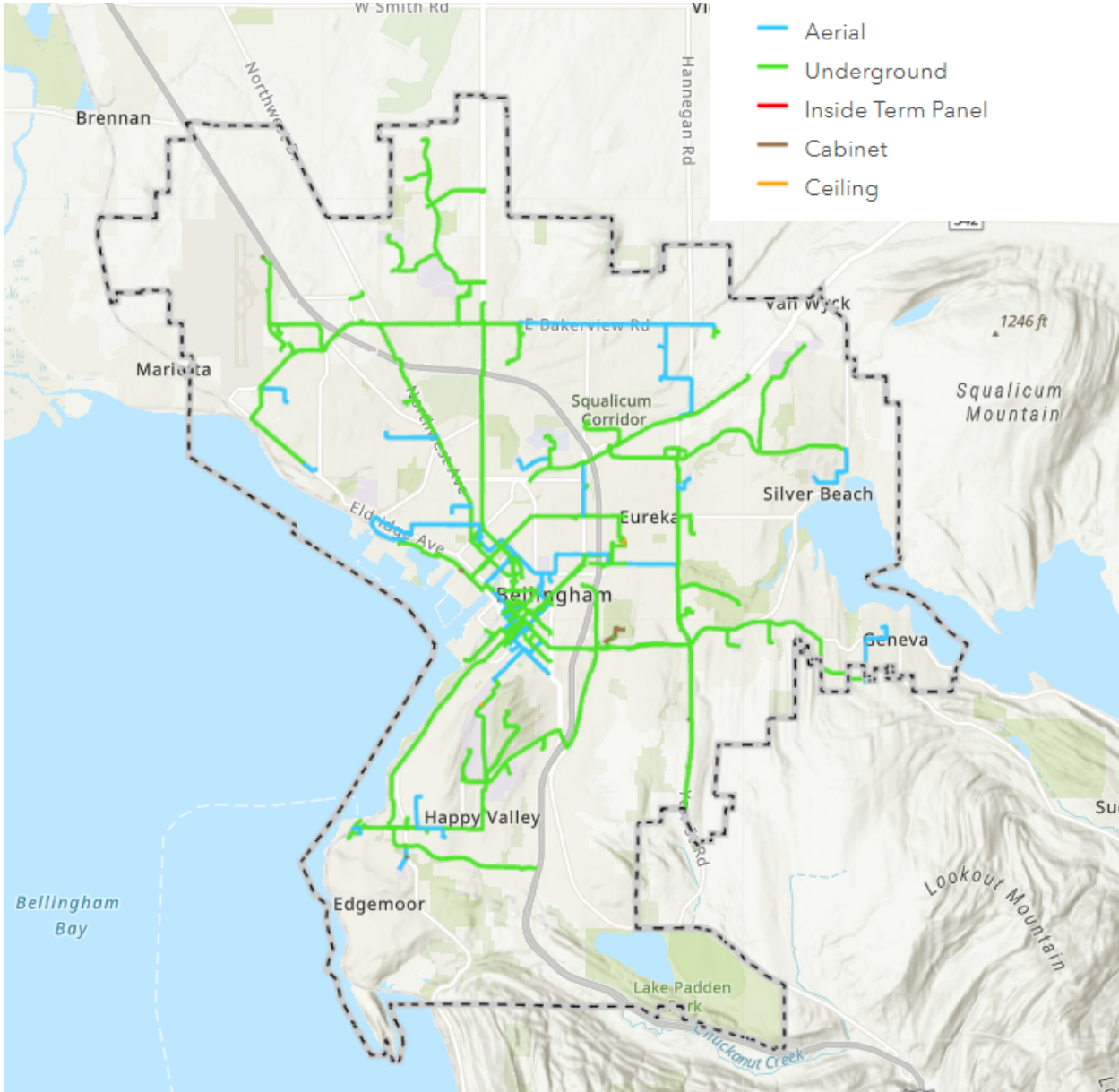
Figure 3-3. City of Bellingham Fiber Distribution

Lit Versus Dark Fiber

The 344 cable spans in Bellingham represent 12,768 individual strands of fiber. Of these, 42% are active, or lit. The remainder are unlit, or dark, and may be available for use. Of the 344 cable spans, 19 (6%) have only dark fiber. 53 (15%) spans have half lit and half dark and 44.4% have 50% or more of their strands active or lit. 26

spans are over 88% lit. The scale and scope of the dark fiber network is shown in Figure 3-4, below.
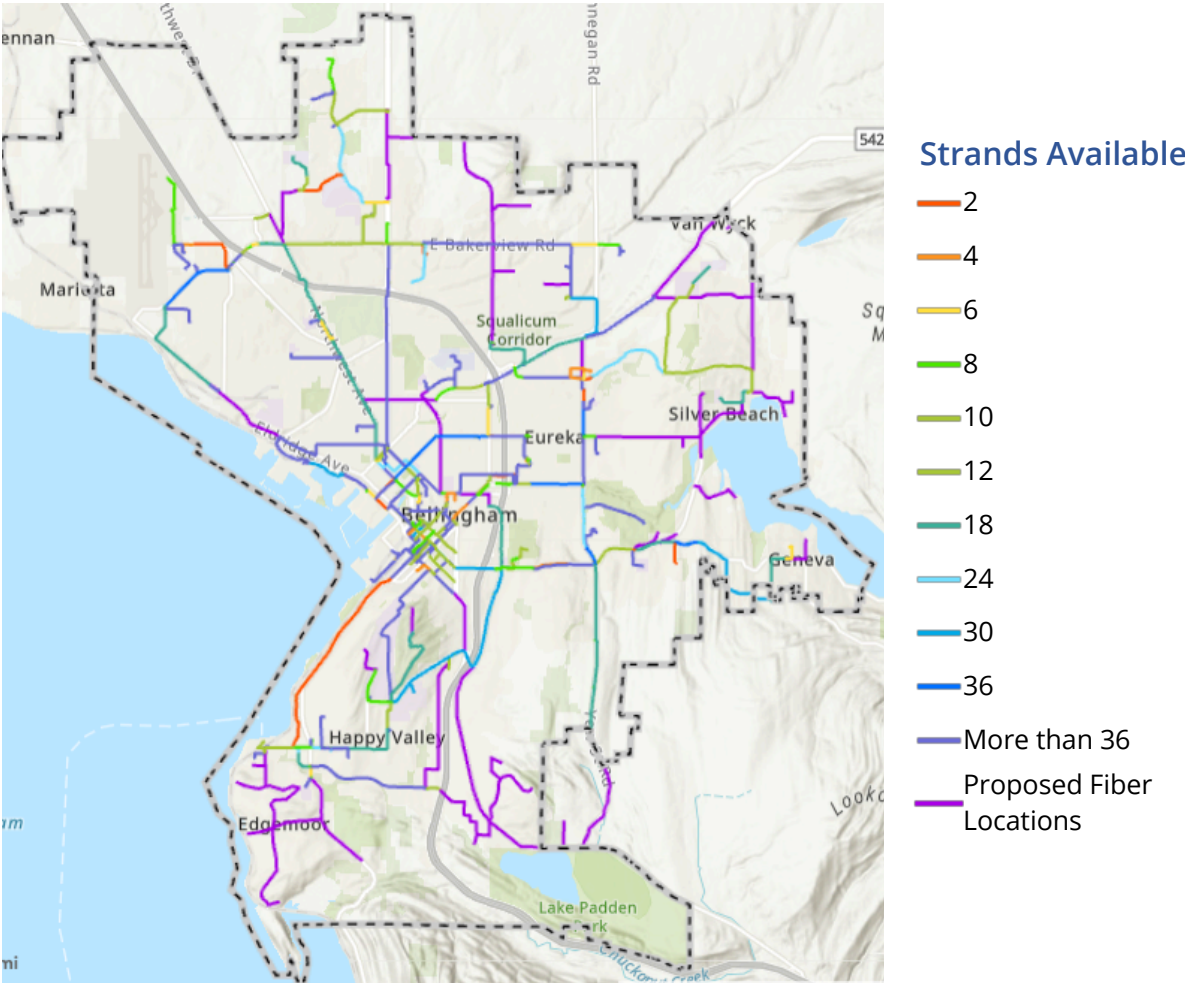
Figure 3-4. City of Bellingham Dark Fiber Strand Count

Usefulness of Fiber and Conduit Assets

The City owns many conduit and fiber assets, but there are some general issues regarding their usefulness for a Citywide network. Most notably, the existing segments of conduit and fiber do not constitute a well-defined backbone network. There are redundant rings interconnecting the network segments in some locations, but generally segments appear to be connected in an ad-hoc manner. Strategically filling in gaps to create additional rings throughout the City would allow Bellingham to more effectively use its existing assets.

It is also unclear whether existing conduit assets have room for pulling new fiber. In some cases, user of the conduit is unknown, as shown in Figure 3-2. Copper cable,

although essentially outdated, can be costly to pull out. Fiber can be pulled in with pre-existing copper if the conduit is large enough to house both. If the conduit size is insufficient to pull fiber due to existing copper, the existing copper may need to be extracted to make room for fiber.

Finally, the strand count on the existing fiber is generally quite low to serve as a backbone. As shown in Figure 3-4, most of the existing fiber is less than 48 strands, which is insufficient to support a backbone network to serve the entire City. Magellan recommends that the backbone should ideally consist of at least 144 strand count fiber and in general, all network segments need additional fiber counts. The existing infrastructure will need to be augmented in a strategic manner.

Other Assets

In addition to the conduit and cable spans, Bellingham has numerous structures that facilitate access to the cable. According to data provided by the City of Bellingham, there 280 OSP access points. These are predominantly traffic cabinets (101; 96 "live" and 10 "old"), vaults (75), and junction boxes (22).[8]

Figure 3-5. Signal Control Cabinet (State and Maple Sts, Bellingham, WA)[9]

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[8] These numbers are counts of items from the City's geographic information system based on type (the "typ" attribute).

[9] Google Street View was used as a source of images to illustrate city assets in lieu of a site visit or client-provided images.

Data provided by the City indicate there are a total of 386 traffic cabinets, similar to the example in Figure 3-5. The City owns 357 of these and maintains most of the others (16; 12 are owned and maintained by the state department of transportation). At least nine of these have fiber terminated in them, based on data from the City's geographic information system. It was not clear if these were in addition to or a subset of the 101 with OSP access points.

There are 6,219 streetlights, some of which are operated via controllers such as those shown in Figure 3-6. The City of Bellingham Public Works department owns and maintains 4,083 (64.3%) of the streetlights and the City of Bellingham Parks Department owns and maintains 125. PSE owns and maintains 27.4% (1,704) of the Bellingham traffic lights. Other owners include the Washington Department of Transportation (WSDOT) (179 lights), the Port (22), Whatcom Transportation Authority (WTA) (6) and Western Washington University (30).

2200 E. Lopez Street.   3617 Lemon Grove Drive

Figure 3-6. Examples of Streetlight Control Cabinets[10]

There are 21 traffic cameras in the City. Sixteen are owned by the City of Bellingham Public Works Department and 5 are owned by the Department of Transportation. Information was not provided about how they are connected. Based on our research around the country, the number of cameras in urban applications is increasing, as is the resolution of the cameras with 1K and 4K resolutions becoming the standard. This increase in resolution translates into higher bandwidth requirements that are best served with direct connect fiber.

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[10] Source: Google Street View

PRIVATE COMMUNICATION ASSETS

Multiple private service providers have network assets in Bellingham. These include the incumbent last mile providers, Comcast and Lumen Technologies (formerly CenturyLink). It also includes metro fiber providers serving local businesses such as Wave and Ziply Fiber and long-haul fiber providers such as Mox Networks and Zayo.

As the legacy cable TV provider in Bellingham, Comcast has near 100% coverage of the City. They provide the traditional "Triple-Play Bundle" of voice, cable TV and internet over their hybrid fiber-coax (HFC) network. The HFC network deploys fiber from their centralized head-ends and hubs to neighborhood nodes serving 250 to 500 homes. At the node, the fiber is terminated, and the remaining network is coaxial cable. Their stated plans are to deploy additional fiber deeper into the network (closer to homes) and eliminate their aging coaxial cable. For internet access service, Comcast's offerings range from 50 Mbps for $20/month to 2 Gbps for $300/month.

The Incumbent Local Exchange Carrier (ILEC) is Centurylink, who recently renamed themselves to Lumen Technologies. As the ILEC, Lumen has close to 100% coverage of the City. In Bellingham, Lumen started deploying Fiber-to-the-Premises (FTTP) in the 2015-2016 timeframe. Based on our research, Lumen has gigabit fiber offerings in the City, though it appears to be only of the west side of Route 5. Their stated strategy is to deploy as much fiber as possible, making them a potential user of the current City of Bellingham-owned assets.

Where they have fiber, their offerings are very competitive. They offer up to 940 Mbps/940 Mbps symmetrical service for $65/month. This includes free installation and a free modem. They also do not have data caps. Where they do not have fiber, Lumen offers DSL services. Bellingham ZIP codes of 98226 and 98229 appear to be just DSL capable. Data rates range from 1.5 Mbps to 60 Mbps and are all priced at $50/mo. with a $15/mo. modem rental fee.

Metro Fiber

Fiber-optic networks are classified by the types of access they accommodate. Metro networks, as the name implies, are designed to connect major sites in relatively dense metropolitan areas to each other, to long-haul networks, and to other service providers, typically via colocation data centers or exchange facilities. Middle-mile networks are like metro networks but typically extend access to interconnection points in major cities.
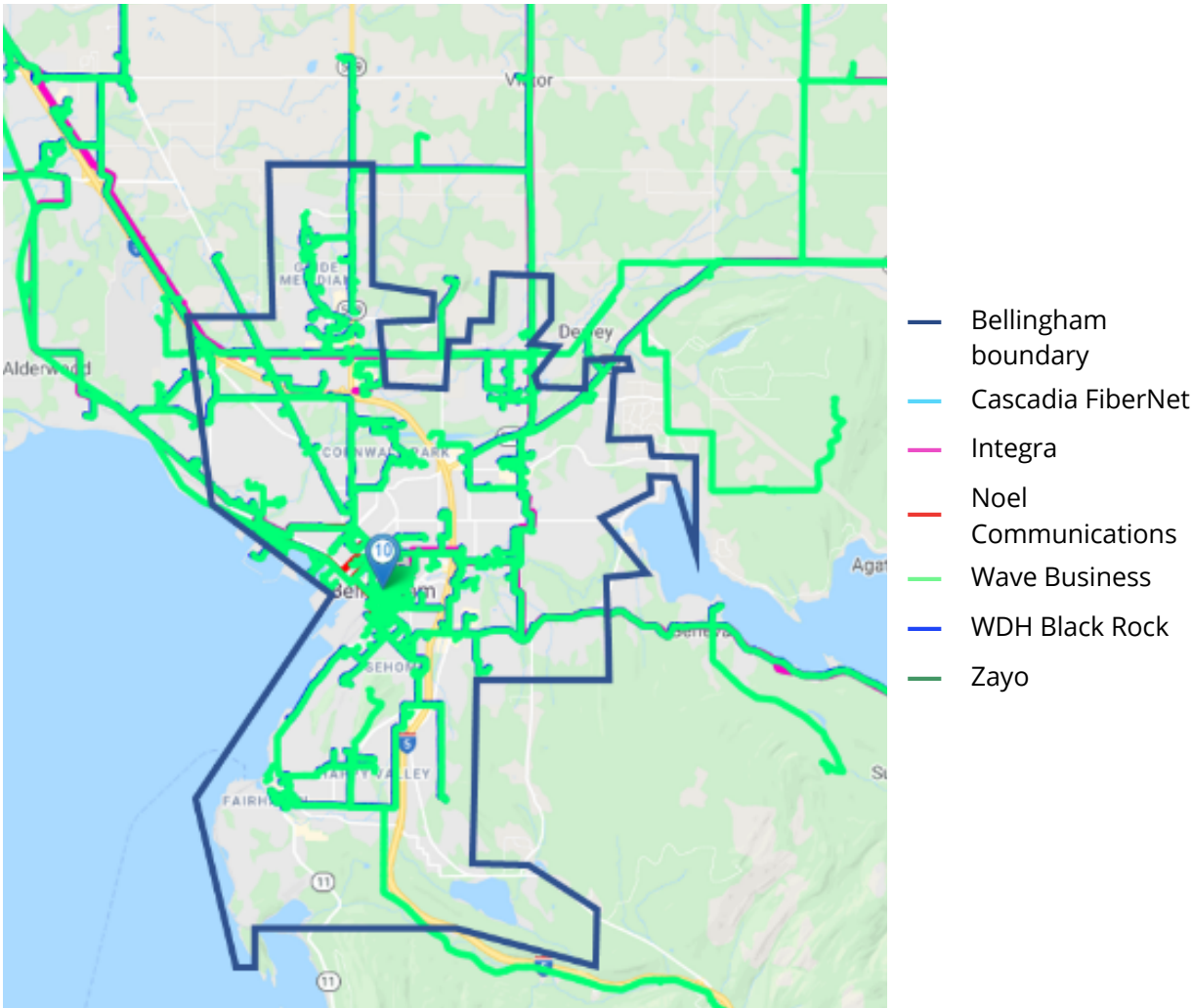
Figure 3-7. Metro Fiber in The City of Bellingham[11]

As illustrated in Figure 3-6 above, there is a substantial amount of metro, or local, fiber in the City of Bellingham. What is not evident is that there are multiple companies that own fiber along the same fiber route. Although it appears that Wave is the only provider, the other companies', such as Zayo's, fiber is shown beneath the bright green fiber of Wave. The companies likely own (as long-term capital lease) fiber strands within a single cable sheath or have separate cables in a shared conduit. Two key providers are Wave and Ziply due to their entrepreneurial approach and retail broadband operations in other areas of the western United States.

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[11] Source: FiberLocator.com

Ziply Fiber

Ziply Fiber is owed by Northwest Fiber, who also owns Wholesale Networks. In Bellingham, Wholesale Networks has applied for a franchise as a competitive local exchange carrier (CLEC). Ziply, which is an ILEC, has not. Wholesale Networks plans to deploy fiber to commercial customers in the City with a focus on those companies with regional connectivity needs. They are not structured to serve residential customers and at this time have no plans to address the residential market within the City of Bellingham.

Wave Broadband

Wave, founded in 2003, is part of Wave Division Holdings, LLC, which currently serves over 455,000 residential and business customers in Washington, Oregon, Sacramento, and the San Francisco Bay Area. Wave is part of Astound Broadband, which was acquired by Private Equity firm Stonepeak Infrastructure Partners in 4q2020.

Wave's strategy in Bellingham is to focus on serving small and medium businesses (SMB), large enterprises and data centers with fiber connections. They are not currently planning to deploy fiber to residential households since there are already two gigabit providers in the City and they do not want to compete as the third. Wave does serve residences with fiber in smaller under-served communities.

Long Haul Fiber

Long-haul networks allow access only at major carrier points-of-presence (POPs). Long-haul customers want as few points of failure as possible, which translates into limited access. For the City of Bellingham, long-haul fiber is important for both private and public entities to connect to major internet and cloud peering, or interconnect, sites in Seattle and to a lesser extent, Vancouver, British Columbia. These assets are illustrated in Figure 3-7, although we know of at least one provider—Mox Networks— that was not included in the source.
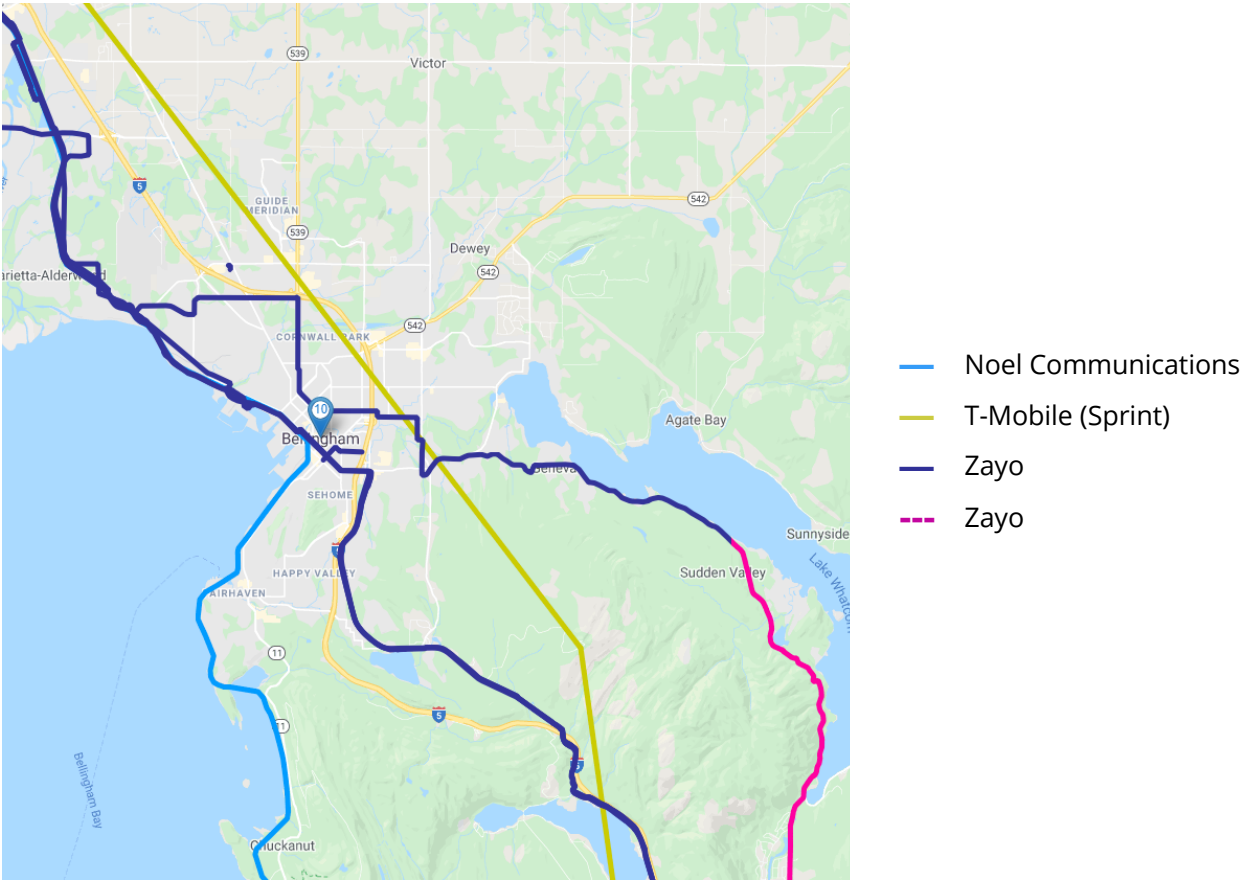
Figure 3-8. Long Haul Fiber in Bellingham[12]

Long-haul and metro/middle-mile connectivity are priced on an individual case basis, based on the service level, number of sites, distance, and bandwidth required. Some of these companies—especially long-haul providers—will lease dark fiber strands on some routes, but these are generally lit services. Many of the companies prefer to sell connectivity as part of a suite of managed services.

Edge Data Centers

Currently, there is one public or neutral data center in Bellingham. Lunavi on Coho Way is an enterprise-class data center with fully redundant facilities for both hosted managed services and co-location space. Wave and Zayo provide connectivity including high-speed connections to Seattle's Tier 1 locations.

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[12] Source: FiberLocator.com

MOBILE COMMUNICATION ASSETS

Scattered throughout Bellingham's 27.7 square miles are 43 wireless communications towers. These include 7 lattice towers such as the ones at 2600 Mcleod Road and 600 25th St.
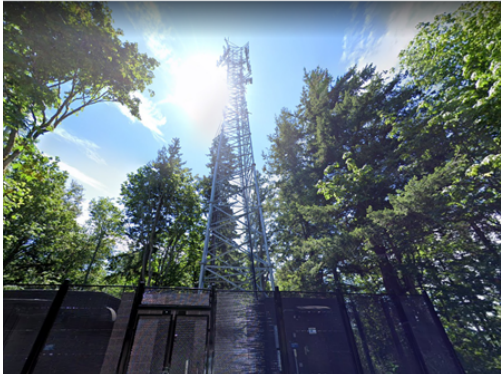
2600 Mcleod   600 25th St.

Figure 3-9. Examples of Cellular Telephone Sites with Towers[13]

1400 12thSt.   2501 E. St.

Figure 3-10. Examples of Antenna Attached to Buildings[14]

Also included are 16 rooftop antennas, such as those at 1400 12th Street and 2501 E. Street. In these locations, the mobile network operators lease space on rooftops, and they deploy their antennas. In many cases the operators attempt to camouflage the antennas to make them less obvious as shown in Figure 3-9, below.

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[13] Source: Google Street View

[14] Source: Google Street View

There are 7 monopoles in Bellingham such as the one at 716 Alabama Street and an additional 7 flag poles used for radio communications (see Figure 3-10, below). There are also 2 pseudo trees and 1 Obelisk at 231 Highland Drive.

716 Alabama St.   231 Highland Drive.

Figure 3-11. Examples of Monopole Small Cell Sites[15]

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[15] Source: Google Street View

4. Business Model Options

Various business models can be used to develop broadband, ranging from policy-only to full retail service provider, summarized in Table 4-1. A fundamental characteristic of these business models is that they necessarily involve addressing development in the public rights-of-way (PROW). Business models can be seen as a continuum of increasing scope of services, involving additional assets, that starts with managing public space.

Broadband impacts quality of life and quality of place as well as the PROW. Therefore, it is clearly in the jurisdiction of local governments to address access to, construction in, and restoration of public property in a manner that fosters greater availability, better performance, and lower costs. To these ends, the City of Bellingham may invest in infrastructure for its own purposes (as it has done already), layer on services for other institutions and commercial providers, or even provide full retail, residential, broadband services.

Table 4-1. Broadband Business Models Compared

Model	Description	Pros	Cons	Examples
Public Policy Only	City uses policy tools and standards to streamline construction and reduce the cost of building infrastructure.	Low risk/reward option to support incentives to accelerate broadband investment	No "quick wins" to improve services	• Santa Cruz County, CA • Knoxville, TN • Monroe County, NY
Infrastructure-Only	City leases conduit and/or dark fiber to businesses, broadband providers, institutions, and	Improves the cost and availability of fiber infrastructure to providers, businesses,	Low impact on availability of retail broadband; no actual services	• Santa Monica, CA • Palo Alto, CA[16] • Lakeland, FL

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[16] Palo Alto has recently begun developing municipal retail fiber broadband services.

Model	Description	Pros	Cons	Examples
	public agencies; no lit services	and community organizations		
Public Sector Connectivity	Lit data/transport services to community-based organizations, institutions and public agencies	Improves access and costs for public organizations, promotes collaboration	Little to no pressure or support for private broadband providers	• Seminole County, FL • Leesburg, FL • Columbia County, GA
Open Access Wholesale	City financed and operated. Wholesale services only to retail broadband providers.	Enables more competition and choice of retail provider	Requires operations and active marketing to providers	• Palm Coast, FL • Danville, VA • Provo, UT
Commercial	City financed and operated; Fiber services, Internet and often telephone and data services to businesses	Enables the city to directly improve services to businesses	Requires competing with incumbent providers and operating the network.	• Fort Pierce, FL • Hudson, OH
Full Retail	Broadband internet, including voice possibly video services	Directly increases options for residential services	Requires substantial investment and operational capabilities	• Ashland, OR • Bristol, VA • Morristown, TN • Anacortes, WA • Mt. Vernon, WA

As illustrated in Figure 4-1, the amount of investment involved increases with service offerings. Revenue potential increases but so does risk. Organizational capacity is part of the investment needed for optimal outcomes. The risk depends on where the infrastructure is deployed but also the level of effort put into selling physical connections and services. Focus on revenue, return on investment, and profits runs the risk of missing other benefits and impacts. Good governance reduces these risks as do strong, clear partnerships.
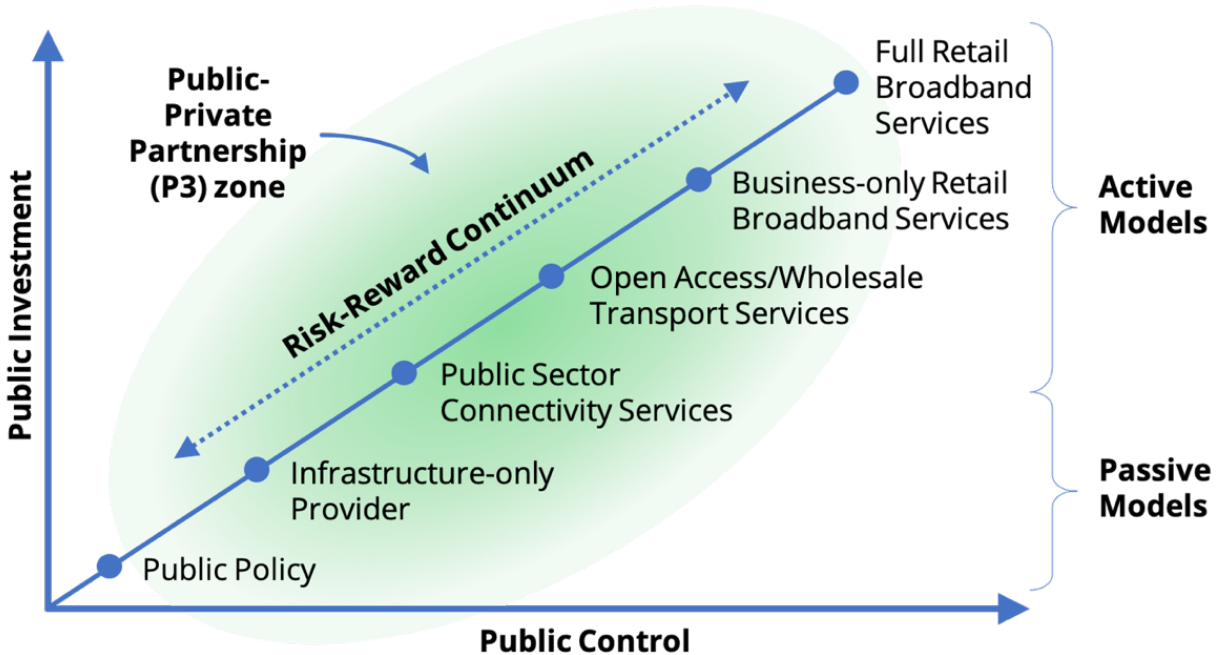
Figure 4-1. Broadband business models compared

The critical considerations for selecting a model are shown in Figure 4-2. Most of these are analyzed in detail in other sections of this report. Others are open issues to be decided by City officials. Conclusions and recommendations about the most appropriate model for the City based on these considerations follow analysis of a conceptual network design and associated financial estimates, below.

Figure 4-2. Considerations for a Broadband Business Model

Broadband is a means to access culture, education, health, recreation, and work resources, not an end in and of itself. Network services such as broadband have traditionally been evaluated simply in terms of price and performance. With increasing importance of digital connectivity, equity and inclusion have become critical issues, as have social outcomes. Broadband planning involves assessing and addressing all the considerations based on overall goals and priorities. Evaluation of broadband business models requires economic and social metrics, such as types, numbers, locations, and demographics of subscribers, as well as basic price/performance metrics, specifically cost per Mbps per month.

A fundamental business issue for the City of Bellingham is its purpose for investing in broadband and related assets. While the goal of more affordable and equitably of available quality broadband access across the community is admirable, it needs a purpose or a "why" as a basis for evaluating impacts. The purpose also provides a basis for engaging community members, particularly vis-a-vis municipal operations. "Why" determines "how." A practical implication is it may be necessary to expand the City's organization and services if the purpose does not fit within the mission of an existing department.

5. Conceptual Network Design

A conceptual network design identifies the components and scale of a broadband system to estimate cost, coverage, and revenue potential. For this study, the scope of the network is the entire City of Bellingham, including areas within its urban growth boundaries. The City is considering the full range of business options; therefore the scope of services includes retail broadband. Such network infrastructure would be necessary to deliver broadband as defined by the City's Broadband Workgroup for all residents and businesses, municipal agencies and smart city initiatives, and anchor institutions.

The network design described in this section can provide multi-gigabit services (10 Gbps and faster with additional equipment). It is designed to be administratively lean, highly reliable—with carrier-class resilience and redundancy—and scalable. The design can accommodate increased demand, cyber-security systems, and multiple network technologies. The design addresses the City's existing network assets—although more information about those assets is necessary to fully incorporate those assets into a detailed design—allowing them to be monetized, as appropriate. The design can be executed via "dig once," joint-build, and other tactics to optimize right-of-way access including incorporation with other municipal capital improvement projects and private developments.

Given the amount and diversity of local public assets, our analytical approach is to start with full fiber-to-the-premise (FTTP) design,[17] to understand the maximum scale of the investment, then consider how costs might be reduced. Broadband networks typically have a hierarchical architecture with a very high-capacity core network, feeder network deployed in rings for redundancy and reliability, and distribution network extending to access hubs in neighborhoods. Passive Optical Network (PON) is the standard for FTTP access infrastructure capable of gigabit-speed broadband. This section describes each element of that design, along with total "full build" costs. These costs can be greatly reduced by various tactics, including use of existing public assets.

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[17] FTTP includes fiber-to-the-home (FTTH), which specifically refers to residential services. The architecture and technologies are the same. The geographic scope and market reach are simply more constrained for FTTH.

NETWORK ARCHITECTURE

The Bellingham Conceptual Network is a backbone for access and transport services via PON and active Ethernet. The basic requirements are to interconnect distributed customer access equipment and commercial data centers and retail ISPs. Fiber should be deployed in a ring topology to minimize impact of an equipment failure or fiber cut. The basic architecture is interconnecting rings—like a length of chain—of high-capacity fiber cable in underground conduit with access points (hand holes, pull boxes, vaults) at regular intervals.

Fiber Backbone
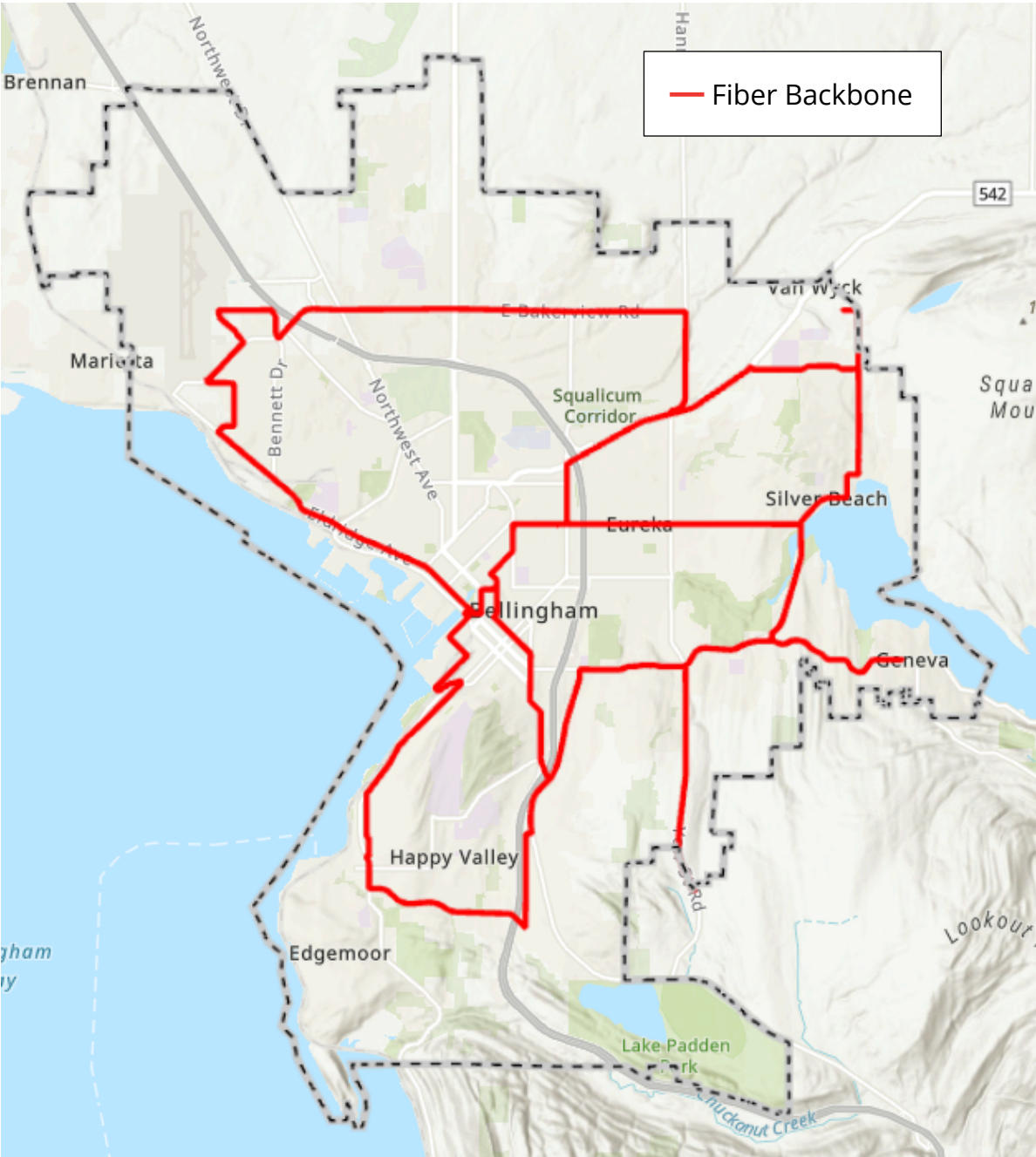
Figure 5-1. Bellingham Municipal Backbone Conceptual Network

The conceptual design is for "backbone" network infrastructure, illustrated in Figure 5-1, which interconnects and support multiple other networks. The routes follow major thoroughfares, as well as some secondary streets, where appropriate, to complete a ring. There are a few spurs to water plants and wireless tower infrastructure. The rings can be grouped into phases for financial and practical

purposes. The routes are designed to connect as many City and community assets as practical with this architecture. Therefore, the conceptual network design is very extensive and is intended to generate maximum cost estimates for budgeting and planning purposes.

Typically, broadband networks have a core network that forms a ring between a few key sites. For Bellingham, we designed four rings throughout the City, with two legs extending into its eastern neighborhoods resulting in 44.4 route miles of high strand-count (e.g., 144-strand) fiber cable for the backbone. The backbone in this conceptual design is entirely underground because this is the most financially conservative approach for costing and risk avoidance. It also tends to be more aesthetically acceptable**.** Underground has a higher initial cost to build but can be less costly to maintain (although this varies by specific method: bore verses trench verses direct bury/micro-trench). It would cost approximately $12.4M to build this backbone in its entirety from scratch, including 20% construction contingency, without using existing assets or incorporating network assets into other capital improvement projects.

The City of Bellingham has substantial fiber assets currently that could be integrated into the backbone. Indeed, the total length of cable spans along the backbone route with dark fibers is greater than the backbone's total length. See Table 5-1. Some available conduit and much of the planned fiber also follow backbone routes. Construction costs can be greatly reduced by developing the backbone incrementally and opportunistically, along with other infrastructure projects, as well as using existing assets.

Table 5-1. City of Bellingham Fiber Cable Spans Along Backbone Conceptual Design Route

Dark Strands	Cables Spans	Total Length
Up to 12	136	144,133
Over 12 to 24	27	58,462
Over 24 to 36	17	45,835
Over 36 to 48	10	32,957
Over 48 to 60	3	3,486
Over 60 to 100	6	15,095
More than 100	7	6,902
All	**206**	**306,870**

The backbone infrastructure can be used to directly serve or enable services to customers. There are 149 community anchor institution locations within 750 feet of the backbone illustrated above, as shown in Table 5-2. These would require additional distribution infrastructure—drops or laterals, as described below. Most could be economically connected to via a backbone like the conceptual design.

Table 5-2. Community Anchor Locations on the Backbone

Stakeholder	COUNT
Bellingham School District 501	37
Bellingham-Whatcom County Library	2
City Of Bellingham	50
City Of Bellingham Housing Authority	9
City Of Bellingham Parks	8
Community and Technical Colleges	14
Fire Stations	4
Other	9
St. Joseph's Hospital	3
Western Washington University	1
Whatcom County	6
Whatcom County Parks	2
Whatcom Transportation Authority	2
Whatcom YMCA	2
Total	**149**

Transport Equipment and Facilities

Traffic from across the network is aggregated to core network sites with powerful equipment to route data to the global network. At least one, ideally two, sites must connect to high-capacity dedicated internet services, ideally via different providers with fiber following separate routes, for bulk IP. These sites must be secure, with high reliability power, and preferably centrally located.

The network equipment required to deliver broadband services to customers is comprised of several functional groups and multiple components within each group. Each functional group and a brief overview of how it is used to deliver service to the end customer follows below. Retail internet service providers (ISPs) may operate a mix of access network consisting of both PON and active Ethernet services. The diagram below demonstrates the functional components of the network and how customers connect to the network to receive services. The total estimated costs for

a Bellingham Broadband Department to deploy transport equipment, including upgrading an existing building to function as a central office/co-location facility, is $2.8M. The City should expect to budget at least $225K annually for core/transport network maintenance and operations.
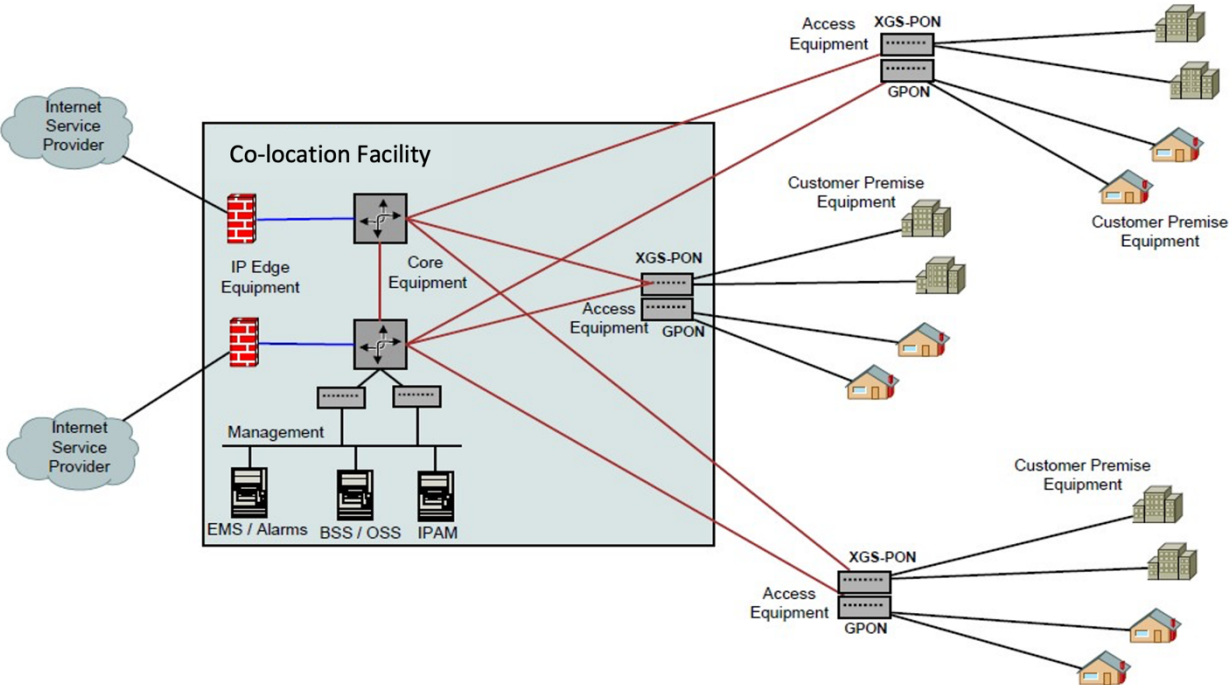
Figure 5-2. Passive Optical Network Broadband Model

Core Equipment

The core equipment aggregates traffic from all access equipment, connecting customers and routing their data to and from the IP edge equipment or other end-point destinations. Standard network protocols provide link redundancy and dynamic traffic re-routing in the event of an equipment failure or fiber cut. Core equipment can easily support thousands of customers and hundreds of gigabits of traffic throughput at deployment and will accommodate future system growth through the addition of service modules, optical interfaces, and/or software licenses. Figure 5-2 shows the key components and how they are integrated into a broadband system.

Optical Network Terminal

An Optical Network Unit (ONU), sometimes called an Optical Network Terminal (ONT), serves as the demarcation point between the retail fiber network and the router or firewall connecting to the customer's local area network (LAN). There are

two general methods for installing ONTs. The first method involves mounting an outdoor rated ONT on an exterior wall of the structure and extending service wiring inside the premise. The second method involves extending the fiber into the premise and installing an indoor-rated ONU inside.

In either case, the ONT is typically installed somewhere near the fiber entrance and an AC power source. The ONT terminates the fiber based PON signals and provides customer access to their services through traditional copper interfaces. The conceptual design is based on XGS-PON with ONTs that support greater than 1 Gbps data service may also support optical small form-factor pluggable (SFP) interfaces for connection to enterprise-class LAN equipment. The outside plant of conceptual design could accommodate Active Ethernet but XGS-PON is more economical, flexible, and reliable, although the equipment is more expensive.

Internet Protocol Edge (IP Edge) Equipment

Separate from the core switches, the Municipal Network should maintain an "internet perimeter." The internet perimeter will include internet routers and internet firewalls to be used to manage routing throughout the network. Firewalls will be utilized to protect critical back-office systems, including provisioning, network management, data storage, and mission-critical functions. The Department's two core switches will be interconnected to two internet routers providing redundancy for internet services in the event of a single interface or equipment failure. As mentioned above, the Department should acquire bulk IP from at least two providers using diverse paths, one of which should be a Tier 1 provider.

Fiber Distribution Infrastructure

The backbone will traverse the entire City to customer premises via access equipment and distribution hubs. Feeder lines, which are also typically deployed in rings, connect the core sites to distribution hubs. Distribution lines are branches from the hubs. Access lines drop off the distribution lines—hence the term "fiber drops"—into customer premises. Major sites can be directly connected to the core. These lines are referred to as "laterals" rather than feeders. Radio access networks (RANs) may also serve as broadband access infrastructure, with cell sites as hubs. The 144 strands of fiber in one cable of backbone infrastructure may be used for a feeder network and/or laterals, as well as core network. The particular use of specific fiber strands is a matter of how they are spliced together and where they terminate.
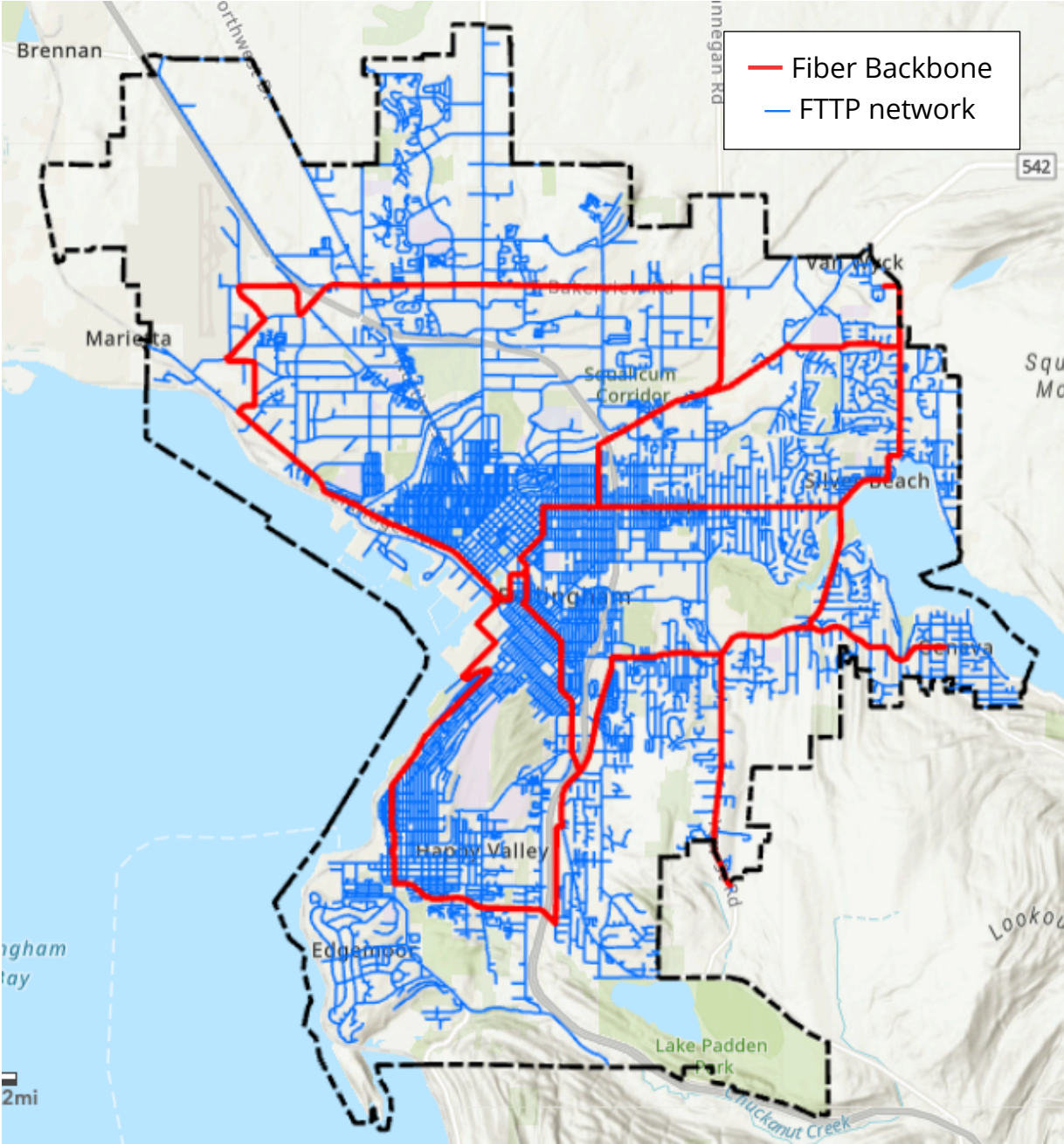
Figure 5-3. Bellingham Fiber-to-the-Home Broadband Network Conceptual Design for Full Digital Inclusion

The distribution infrastructure, shown in Figure 5-3, enables retail services to all parts of Bellingham. The backbone network provides redundant feeder fiber connections to hubs. POPs require powered cabinets, prefabricated shelters, or existing structures with sufficient space for equipment racks and other components. The conceptual network is designed to connect POPs via diverse routes to multiple bulk upstream providers for fault protection.

This distribution infrastructure design includes 29 powered cabinets, 421 passive hubs, and 678.1 route miles of underground fiber, in addition to the backbone infrastructure. This design would enable retail broadband service delivery to nearly 43K customers, including 4.2K businesses and effectively all community institution sites within the City's urban growth boundaries. It would cost approximately $400.1M to build, would require approximately $21.2M in equipment, and $1M annual operating budget.

This design is for a "full-build" approach that accommodates all business models, including advanced retail broadband to the entire City including urban growth areas. It can be scaled back based on City priorities; little if any of the distribution network would be necessary for wholesale. The backbone routes cover many City assets and other systems, including traffic, surveillance cameras, SCADA, and AMI, for example, to reduce operating costs and increase operational benefits. The Department may provide limited access infrastructure for enterprise/wholesale services, so investment can be very targeted. The conceptual design also accommodates various partnership arrangements, including open access, pick-your-provider broadband services.

Feeder Fiber

Feeder fiber extends from the POPs to neighborhoods and business districts, connecting OLT ports to passive splitters located in outdoor cabinet enclosures called fiber distribution hubs (FDHs), placed strategically throughout the service area. Splitters may also be located within the access POP itself. In areas where aerial fiber deployment may be used, FDHs may be placed aerially or transitioned from the aerial pole to a ground-mounted FDH. Distribution fibers are sized based on the demand forecast and sizing of each enclosure to ensure that each service area is well equipped for both PON and Active Ethernet services. These details are set in the high-level design and engineering processes.

Distribution fiber

Distribution fiber, illustrated in Figure 5-3 on page 42 extends from the splitters in the FDHs to network access points (NAPs) which provide access to the individual fibers required for customer connections. NAPs may be attached to aerial strand, located in ground level pedestals or placed in underground vaults or hand holes located near the sidewalk or curb in residential neighborhoods or business districts. Fiber distribution to NAPs will be sized based on the service area density to provide service to between 8-12 premises per NAP.

Fiber Service Drops

Fiber drops connect from each NAP to the customer premise equipment that delivers broadband service. At the customer premise, the drop cable terminates in a protective "clamshell" enclosure attached to a home or building for storage of slack and connection to the home equipment. Drop fiber may be installed aerially or underground, typically for a flat fee. Providers may charge additional drop costs for special circumstances such as burying fiber through difficult landscapes or under driveways.

OPERATIONAL REQUIREMENTS

A retail broadband enterprise has substantial overhead and operating costs. Payroll can account for 90% or more of ongoing costs for a broadband enterprise. Equipment licenses, maintenance, refresh, and upgrades create recurring costs and large periodic costs. Management and marketing are much less for wholesale. Limiting operations to underground backbone also greatly reduces on-going costs. The network is designed to provide 10 Gbps and faster to the entire community. It also supports the full range of cyber-security practices, although these functions would require substantial additional investment.

Management

The City of Bellingham should plan to add a Broadband Director on day one. The Director will need a part-time Marketing Manager by the end of year one. The Director should have some experience with or knowledge of broadband and fiber but must have strong understanding of facilities leasing and maintenance. The Director will be responsible for overall organizational performance, focused on finances and governance.

Operations and Maintenance

A Network Infrastructure Manager is already on staff with the City and is required for any business model on day one. This individual will be responsible for any customer adds, changes, or moves to the backbone. The Broadband Department must purchase a fiber management system (FMS) and should have a maintenance fund to cover repair costs.

Costs for software vary greatly so we recommend budgeting approximately $75,000 for one-time costs with annual fees of 15%. Major maintenance or repair tasks—anything requiring excavation—may be contracted out or may be handled by Public

Works. For the purpose of this analysis, we assume the City funds maintenance and repairs in lieu of network service charges or lease payments. Just to be conservative, we assume the Department will need a dedicated full-time Network Engineer by year four.

Marketing

The Marketing Manager would be responsible for identifying and managing lessees, so this person should know the community well and have basic knowledge of the broadband industry. The Marketing Manager may also work with wholesale customers to promote their internet services to the community. The City of Bellingham should budget for marketing and other professional services as appropriate. We use $20,000 per year as an estimate for events, materials, and services, including research, social media, and web presence.

Other operating costs, beyond salaries, include facilities leases and maintenance. As discussed below, various equipment and systems are required for lit services, which generates additional operating costs. The Broadband Department should budget approximately $450,000 to $500,000 per year for operating expenses.

Table 5-3. Staff Positions and Fully Loaded Annual Cost Estimates

Position	Annual Cost
Telecom Director	$178,200
Accounting Manager	$126,360
OSP/Engineering Supervisor	$157,140
Sales & Marketing Manager	$129,600
Headend/Network Engineer	$113,400
Customer Support Manager	$105,300
Technical/NOC Support Manager	$129,600
Business/Enterprise Account Manager	$72,900
Network/NOC Technician (Data Center/Inside)	$97,718
Technical Service Rep Level 1	$50,544
Technical Service Rep Level 2	$60,653
Field Services Technician (in-house)	$77,501
Field Locates Technician (in-house)	$72,446

6. Financial Analysis

Full FTTH across the City of Bellingham could require a total capital investment of as much as $512M. The issues for financial analysis are how much revenue the network might generate and how revenues stack up against expenses over time. The fundamental question is whether and when the revenue will exceed the expenses. Of course, there are broader impact considerations, including increasing digital inclusion and support for key municipal operations—emergency preparedness, public safety, recreational facilities, traffic, etc. Broadband investment could keep more capital in the local economy even as it spurs additional private investment in technology infrastructure. Direct revenue can come from dark fiber leasing, enterprise/wholesale transport, and retail broadband. Because retail is the most demanding, we look at three scenarios for it.

INFRASTRUCTURE LEASING

The infrastructure leasing business model involves only providing backbone fiber or conduit for monthly or long-term capital leases. Demand for dark fiber can be a challenge to estimate due to evolving markets. Conduit (2-inch) in core urban areas outside major metros leases for $3.00 to $5.00 per foot. Generally, Magellan Advisors does not recommend leasing entire conduits because it reduces ability and flexibility to capitalize on the asset. Where the City has 3-inch or larger conduits, it is possible to install inner-duct and lease one or more of those. We recommend only leasing larger conduit to a private partner committed to building out fiber-to-the-premises for the entire area and providing deeply discounted services to anchor institutions.

Fiber leases can be boiled down to a cost per strand-mile. So, for example, a 10-mile long 432-strand backbone would have 4,320 strand miles, each of which could be leased separately.[18] Typically, fiber leases have a minimum distance amount and an annual maintenance fee. A wide range of discounts may be offered, including leasing an entire buffer tube within the cable, entire end-to-end strands (rather than a portion), entire rings, and/or for longer terms. If structured as a long-term (20 years

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[18] Leasing a portion of a fiber strand can physically strand the rest of that strand. For example, if a 1-mile section of a strand is leased in the middle of a cable, the remainder on each end may be practically unusable. This is another reason for deploying fiber in rings: It reduces risk of stranded strands.

or more) capital lease—also known as indefeasible right to use or IRU—lessees pay the entire lease amount upfront.

Table 6-1. Dark Fiber Lease Rates for Bellingham Broadband Department Revenue Projections

Service Component	Cost	Per
Monthly Dark Fiber Lease	$150	Strand Mile
20-year Dark Fiber IRU	$3,500	Strand Mile
Minimum Lease	3	Strand Miles
Annual Fee	$250	Route Mile

Based on our analysis of the Bellingham market and lease rates in other cities, particularly on the West Coast, the rates shown in Table 6-1 are reasonable. Three scenarios for various levels of dark fiber leasing are shown in Table 6-2. For these scenarios, we assume all lessors lease equal portions of the backbone, which has 144 strands over 44.4 miles for a total of 6,389 strand-miles. We also assume that each monthly lessor has 4 strands, and each long-term capital lessor has 12 strands.

Table 6-2. Dark Fiber Lease Scenarios

	Scenario		
Revenue Factor	1	2	3
Monthly Lessors	5	10	15
Backbone Leased	1%	5%	10%
Annual Revenue	$595,002	$5,950,017	$17,850,051
Capital Lessors	1	2	3
Backbone Leased	10%	30%	50%
Annual Revenue	$2,012,623	$6,037,870	$10,063,116
Total Annual Revenue	**$2,607,625**	**$11,987,887**	**$27,913,167**

ENTERPRISE/WHOLESALE TRANSPORT SERVICES

Rather than separate retail services into commercial and residential, we recommend wholesale transport services with dedicated bandwidth and a service agreement as a separate service from retail. Wholesale revenue may generally come from either

leasing capacity—fiber paths and lambdas[19]—or from a revenue share by wholesale customers, i.e., retail ISPs. Generally, enterprise customers pay per circuit—a lit fiber or a portion thereof (a lambda)—connecting one or more sites along with other services such as dedicated internet or firewall. Actual fees can vary greatly depending on market conditions, service levels, and other factors. A simple approach is to charge a premium—such as 150%—of dark fiber rates. See Table 6-3 for revenue scenarios for this business model. Typically, each customer would purchase dedicated internet as well as site interconnections.

Table 6-3. Enterprise Transport Services Revenue Scenarios

Revenue Factor	Scenario		
	1	2	3
Enterprise Customers	20	40	60
Average Path Length (mi.)	2	2	2
Average Paths per Customer	3	4	5
Annual Revenue	**$354,000**	**$944,000**	**$1,770,000**

Revenue share can make sense where the City owns all infrastructure including access and distribution lines. This approach ensures the City has stake in providers' success and providers only pay for actual revenue. Typical revenue shares are between 20% and 40% or around $30 average per residential subscriber. It isn't practical to provide meaningful estimates for revenue sharing due to complex dependencies, including build-out strategy.

RETAIL BROADBAND

Retail broadband involves full operations as well as backbone and distribution infrastructure, transport equipment, and access equipment. The outside plant can be deployed either overhead, which typically involves some underground, or entirely underground. The scale of this investment is such that construction will need to be financed, so any estimates must include the cost of money. For this business model we looked at three scenarios based on take rate for both mostly overhead and entirely underground deployment. All six used the assumptions about services laid out in Table 6-4.

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[19] A fiber path is a set of contiguous strands between two or more points. A lambda is a portion or "color" of laser light within a strand.

Table 6-4. Retail Broadband Service Assumptions

Tier	Speed Symmetrical	Percentage of Subscribers	Monthly Charge
Basic	100 Mbps	45%	$39.99
Enhanced	500 Mbps	35%	$69.95
Fast	1 Gbps	19%	$79.99
Ultimate	10 Gbps	1%	$499.99

Table 6-5 lays out costs of underground infrastructure and equipment for three take rate scenarios, each of which assumes the City finances approximately 90% of the capital expenses. The bottom line is that cumulative end of year cash flow after 30 years is negative, approaching total capital outlays and exceeding revenue.

Table 6-5. Long-run Financial Performance of Entirely Underground Infrastructure for Retail Broadband Scenarios

Financial Consideration	Take Rate 25%	Take Rate 35%	Take Rate 45%
Fiber Plant/Facilities	$388,009,717	$391,456,438	$394,898,085
Network Equipment & Buildings	$16,312,520	$16,312,520	$16,312,520
Home Equipment	$24,897,172	$34,868,918	$44,825,677
Total Investment	$429,219,409	$442,637,876	$456,036,282
Amount Financed	$388,211,818	$396,029,554	$403,836,359
30-year Cumulative			
Revenue	$265,795,202	$371,239,339	$476,837,578
Costs of Services	$123,557,068	$125,252,692	$126,953,117
Interest Expenses	$200,946,100	$203,620,150	$206,290,372
EBITDA	-$326,363,745	-$235,602,531	-$144,681,867
Net Income	-$527,309,845	-$415,269,604	-$319,376,112
End of Year Cash Flow	**-$511,012,434**	**-$415,269,604**	**-$319,376,112**

A similar analysis is presented in Table 6-6 using the same assumptions but the bulk of outside plant—the distribution and access lines—deployed overhead. While the cost to build is somewhat lower, the project still doesn't make business sense.

Table 6-6. Long-run Financial Performance of Overhead Infrastructure for Retail Broadband Scenarios

| Financial Consideration	Take Rate		
	25%	**35%**	**45%**
Fiber Plant/Facilities	$185,086,342	$188,370,244	$191,650,758
Network Equipment & Buildings	$14,290,520	$14,290,520	$14,290,520
Home Equipment	$10,397,182	$14,560,399	$18,720,458
Total Investment	$209,774,045	$217,221,163	$224,661,735
Amount Financed	$184,774,045	$192,221,163	$199,661,735
30-year Cumulative			
Revenue	$263,692,900	$368,201,682	$473,501,087
Costs of Services and SGA	$171,687,881	$176,425,355	$181,198,755
Interest Expenses	$105,211,553	$107,759,037	$110,304,106
EBITDA	($148,342,261)	($58,037,862)	$32,961,230
Net Income	($253,553,814)	($165,796,899)	($77,342,875)
End of Year Cash Flow	**($237,609,514)**	**($142,271,850)**	**($46,163,829)**
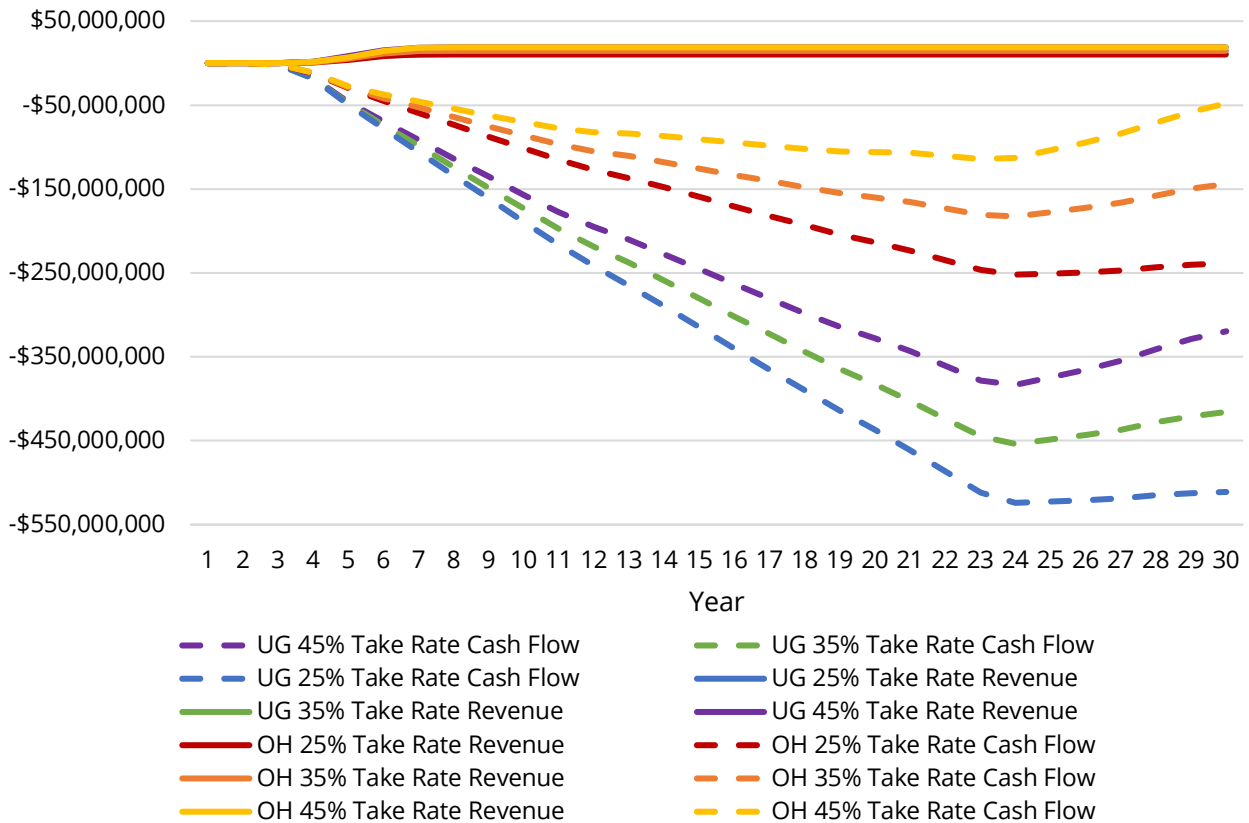
Figure 6-1. Revenue and Cash Flow for Retail Broadband Scenarios Compared

Figure 6-1 illustrates the fundamental issue with the retail broadband business model: the scale of investment and consequent debt service keeps them from breakeven. The marginal cash flow changes from negative to positive around year 24 but it is too little, too late even in the best scenario.

COST REDUCTION TACTICS

There are numerous ways to reduce the actual construction costs. Fiber route optimization could reduce mileage by a third off the road center-line routing used in the conceptual design. Much of the City's existing and planned conduit and fiber aligns with the conceptual design backbone route, as shown in figures 6-2.
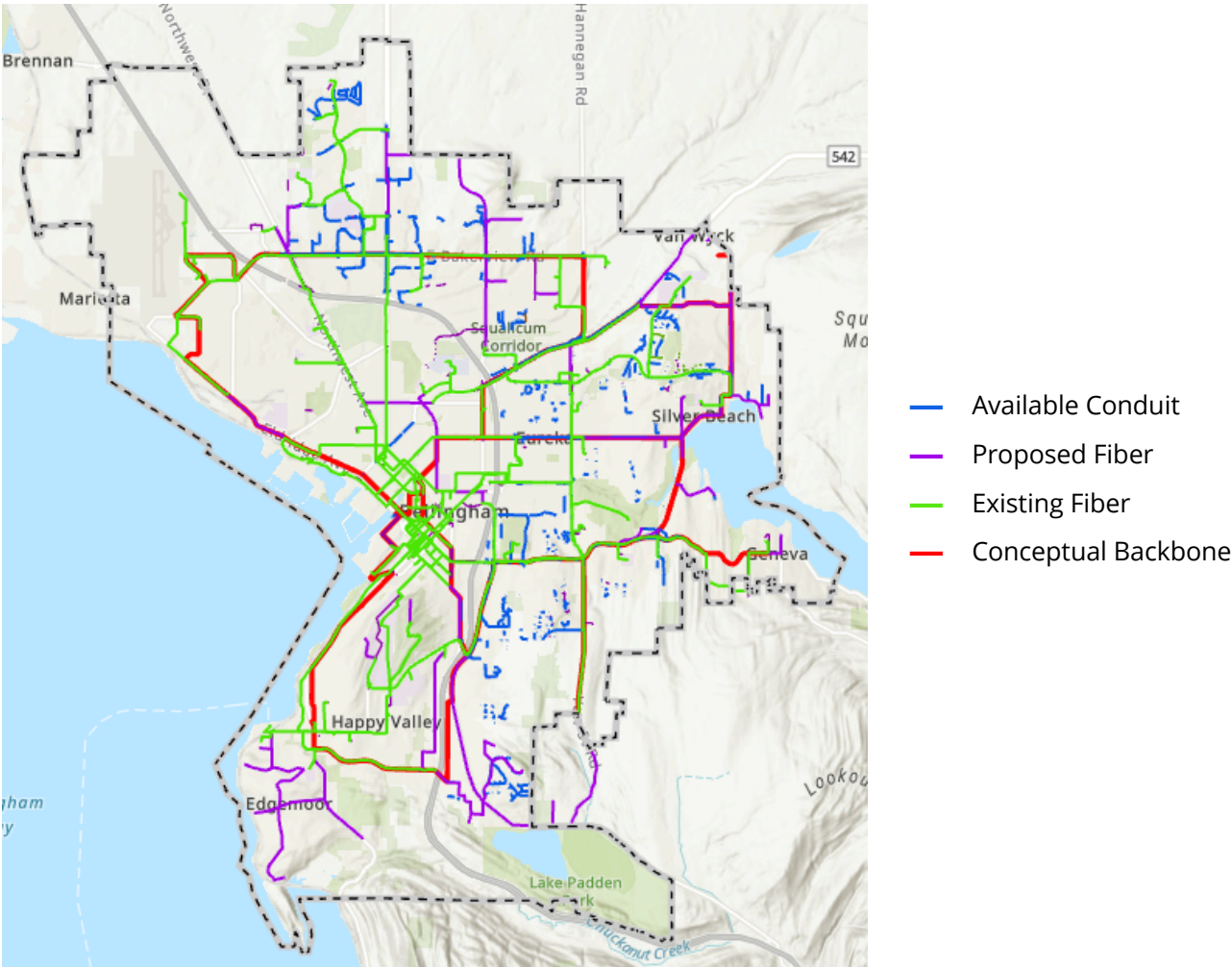

Figure 6-2. Conceptual Backbone Network Design Compared to City of Bellingham Conduit and Fiber Assets

Additional, more detailed assessment is needed to determine how many of these assets would be useable. For the financial analysis we assumed 50% of the backbone could be deployed in existing conduit. Use of additional conduit and use of existing fiber could further reduce costs. There are numerous economical, new access technologies and construction methods emerging that could increase flexibility while decreasing costs.

Incremental, opportunistic development can greatly reduce deployment costs, combining network infrastructure with other types of capital projects. This approach requires broadband-friendly policies and consistent practices, and it benefits greatly from an overall strategy. A dedicated network enterprise fund is strongly recommended to ensure capital is available to cover incremental costs. Such a fund can also be used for internal charge backs and external customer fees to fund network development.

Joint-builds and other public partnerships may be the best way to improve financial performance. Such partnerships vary with business model. At one extreme the City may build fiber where providers need it and then lease it to them or have a revenue sharing agreement. Demand-driven development can be very economical but doesn't generally help with digital inclusion. A similar approach is to focus public investment on under-served, low-income areas based on commitment of provider partners to serve those areas. Generally, for these approaches the City should own the assets to ensure maximum return on public investment.

A more practical partnership approach, especially with current availability of private dollars, is to commit to lease portions of infrastructure built by private providers. This can be particularly effective where there are specific locations or clusters that need connectivity. The downside of this approach is that at the end of the lease period the City would have to relinquish the assets and would not own them. There are hybrid approaches such as the City deploying conduit then leasing it to providers with fiber access in lieu of monetary payment.

Of course, grant funding can greatly reduce cost by eliminating the need for financing. Other means to generate capital for broadband development without taking on debt include local improvement districts and special option taxes. The former is best for targeted development and latter is best suited for general improvement, although each must be carefully governed if digital inclusion is an important goal.

7. Conclusions and Recommendations

Strategies for Bellingham to develop comprehensive FTTP network are limited due to the scale of investment required. The local market has the cable/telco retail broadband duopoly, dominated by Comcast, that is common across the country. There are other active providers, including local startup PogoZone, T-Mobile wading into residential wireless broadband, and Whatcom County PUD focusing on under-served areas. The City of Bellingham has extensive assets and capacity to effectively manage those assets. Actionable steps for the City to expand its broadband infrastructure to support a municipal broadband offering to its community are relatively simple depending on strategic priorities.

For this study we assessed market conditions by surveying the community about internet services. Results show there are multiple providers in the area but options for retail broadband are limited to the traditional cable and telephone companies. Comcast, the legacy cable TV provider, serves most of the City with gigabit broadband via their hybrid fiber-coax network. Lumen Technologies, the legacy telephone company, also serves most of the City. Their fiber-based gigabit offering appears to be limited to the west of Route 5. Zip codes of 98226 and 98229 appear to be just DSL capable.

Overall, respondents were happy with their current services, although price and customer service were an issue for some respondents. Although broadband speeds were acceptable in most locations, some neighborhoods had a relatively high number of low-speed tests, indicating low affordability. The neighborhoods of Cornwall Park, Edgemoor, and Lettered Streets had the highest number of low speed tests. Many results did not meet the definition of broadband by Washington's standards, and several fell below Federal standards.

Existing network assets were assessed during this study to determine infrastructure supply and gaps. There is substantial private fiber in the City, portions of which are owned by multiple companies. Several fiber routes connect Bellingham area assets to the Seattle Internet Exchange where top-level peering connections are available. The City of Bellingham's extensive public network assets are currently used for internal City purposes. They could be used to accelerate fiber deployment to less affluent neighborhoods, capitalize on traffic, utility, and other assets, generate revenue, and support community institutions and economic development.

It seems the City developed its network infrastructure in an as-needed, project-driven manner, which inevitably results in gaps, overlaps, and inconsistencies. A carrier-class network, capable of providing high-capacity/high-reliability services to other parties, requires careful design, consistent equipment, materials, and practices, and management system. While the City has a great base of assets, major improvements are needed to create coherent, consistent, fully usable fiber infrastructure. Processes for thorough evaluation and prioritization are required along with adequate capital financing and staffing.

Our assessment of various broadband business models shows that it would not be economical build a fiber optic network that reaches all premises with debt financing. Leasing conduit and dark fiber have limited revenue opportunities that do not outweigh limits on control and flexibility. A wholesale model focused on business enterprises and retail broadband providers could be both economical and impactful. The key to this is evolving the City's fiber infrastructure into a carrier-class backbone that increases bandwidth availability. This approach enables the City to guide private investment to disadvantaged areas.

Generally, converged and integrated networks make sense because they are more economical. Having separate infrastructure for various applications or user groups multiplies costs. Unconnected networks with separate management systems reduces benefits and reliability. Private carriers understand these points but tend to want their own infrastructure as capital assets increase their stock value. This means huge amounts of capital are necessary for new market entrants. The City of Bellingham has the relatively unusual opportunity to provide shared infrastructure, which could open up the local market to more providers, generate revenue to the City from an under-utilized asset, and improve the availability, cost, and range of network services for the community.

A backbone is simply high-capacity fiber that traverses the area through major corridors. Fiber strands in the backbone are primarily for core and feeder network and transport across the area. Backbone fibers can also be used for a distribution network and laterals into major sites. A clear ring architecture provides high levels of resilience and flexibility, allowing for multiple paths to major sites and distribution hubs. High-strand-count fiber literally multiplies the value of a backbone, including for distribution and access infrastructure, and can be very economically deployed in existing conduit, even when replacing smaller fiber cables.

The essential issue is how much the community values network infrastructure. How much broadband is adequate, and is "adequate" enough for digital inclusion and innovation-based economic development? Public investment in network infrastructure could be a catalyst for additional private investment. It is likely to increase options, drive down costs, and boost performance—and customer service, too. Economic benefits would accrue to the City in the form of lower costs, new revenue, and operational improvements, as well as to residents. All of this depends on the community valuing these outcomes and investing in network infrastructure to ensure the area's digital development. If these are the goals, Magellan Advisors recommends the following:

1. Develop a carrier-class city-wide backbone network infrastructure focused on anchor institutions, business enterprises, and retail broadband providers as customers. Invest in access infrastructure where necessary to achieve digital inclusion in partnership with wholesale customers.
    a. Clearly define goals for the network and develop a plan to achieve them.
    b. Establish an enterprise fund or similar to ensure the network can be developed according to plan.
    c. Engage prospective customers and partners in the network development process.
    d. Transform existing assets into a comprehensive, integrated carrier class network infrastructure.
2. Leverage the existing network, including adding redundancy and resiliency, to build to carrier-class network, monetizing current assets including leasing infrastructure.
    a. Establish a network team that includes economic development "sales and marketing" capabilities.
    b. Conduct detailed assessment of assets and prioritize for improvements and inclusion in the backbone.
    c. Use fiber management system to identify short-term needs and opportunities for network asset development.
    d. Make targeted investment to address specific customer/partner needs and opportunities, particularly as a catalyst for additional investment that increases digital inclusion.
3. Build on existing "Dig Once" policies to create joint-trench and other shared development in the public right-of-way, particularly any relevant capital

improvement projects and private development conditioning to expand network infrastructure.

    a. Condition new develop with network assets, establish a wireless master license agreement, provide expedited permitting, and implement other broadband-friendly policies and practices.

    b. Establish means to inform relevant stakeholders about construction activities, if not already in place, and carrot-and-stick mechanisms for encouraging joint builds (lower restoration costs, construction moratorium following joint build opportunities, etc.).

    c. Integrate broadband into the range of municipal planning processes, including land use, transportation, and water/wastewater.

4. Develop network services as well as infrastructure in an incremental, methodical, strategic manner, focused on the goals from recommendation 1.a.

    a. Invest in software infrastructure and staff capabilities to meet operational and security requirements of this approach.

Section 9

ISP Response to Broadband Advisory Group Conclusions and Recommendations

Participant Statement, Spencer Moore

August 12, 2022

Eric Johnston
Public Works Director, City of Bellingham

Re: ISP Response to Broadband Advisory Workgroup Conclusions and Recommendations

Dear Mr. Johnston,

The City of Bellingham Broadband Advisory Workgroup consists of three ex-officio members, Comcast, Lumen and Astound, that are also Internet Service Providers (ISPs) providing high speed Internet access and transport services to Bellingham residents and business. We provide this letter to give feedback on the Broadband Advisory Workgroup's process and recommendations to City Council, including Magellan Advisor's Draft Municipal Broadband Study.

First, we want to thank the City for allowing us to participate in and be part of the Broadband Advisory Workgroup. We have appreciated the inclusive nature of the process. The Workgroup's leadership always maintained open and respectful conversations, helping the group find better understanding and agreement to keep the process moving forward. A great example of this was the ISP ex-officio members' presentation and conversation at the October 2021 meeting, where we discussed our existing networks, our COVID crisis response, our efforts to bridge the digital divide, and how we will continue to innovate our networks to address the future needs of the communities in which we serve.

Second, we support the City's survey and study results and recommendations. For the record, we note that Magellan Advisors interviewed no ISP ex-officio members, and to the best of our knowledge asked no questions regarding the status and offerings of our broadband services in the City. We may not agree with Magellan's methodologies, but their study does validate that the City has a highly competitive ISP marketplace with broad coverage. We also acknowledge and agree with Magellan's conclusion that the City becoming a retail broadband service provider is not economically viable.

We were a little surprised by Magellan's failure to address digital equity and adoption in their recommendations. Comcast, Lumen and Astound are all approved participating providers under the Federal Communication Commission's Affordable Connectivity Program (ACP), an important and significant program for helping unconnected members of the community gain access to the Internet's vast educational and economic resources.

Finally, and in view of the foregoing, we fully support the recommendations of the Broadband Advisory Workgroup to the City Council to create a plan for digital equity and adoption. This will best position the City to take advantage of upcoming federal funding opportunities. Again, as three existing authorized FCC ACP vendors, we are committed to partnering with the City in helping develop such a plan.

Thank you again for including us in the Broadband Advisory Workgroup process and conversations.

Participant Statement from Spencer Moore, Member, Broadband Advisory Workgroup

August 12, 2022

I would like to take an opportunity to make a comment outside of the conclusions of the work group's consensus and make remarks related to Bellingham's future development and the ethical questions therein. I'm extremely proud of what we have accomplished in the Broadband Advisory Workgroup over the last two years. I have had the privilege of working with motivated, experienced, and compassionate people of all different backgrounds and expertise in this workgroup. City staff, ex-officio, and official voting members have consistently taught me how complex services and city processes shape the world we live in. I stand by our work, and I stand by our document. It is a collective effort over two years and many meetings and policy discussions. I believe that with this document and the BAG recommendations within, we will be able to further develop Bellingham's broadband access to those who are most vulnerable, and further develop efforts to utilize Bellingham's assets to increase access to broadband throughout Whatcom County.

To those who have tuned into the workgroup meetings, and to anyone who would spare me an ear, I have consistently spoken about equity as a driving force for policy. When we are discussing policy and municipal investment for city services, we tend to frame these discussions in a technocratic framework. How much fiber, how much conduit, overbuilding, strand count, etc. What we are actually discussing is who gets access to these resources. We must concern ourselves with uplifting those who are most vulnerable and most underserved. Beyond broadband, we must broaden the scope of what this question encompasses. Who are the most vulnerable people in Bellingham? What kind of city do we want to be? Who are we forgetting?

You should not have to have an engineering degree or a remote tech job to be able to afford a place to live in Bellingham. We must take active steps to decouple moralized notions of poverty. We must do better than generalized apathy when we see housing prices swallow any notion of affordability in Bellingham. Homelessness and housing cost are directly corelated. If we ignore the hard conversations that surround wealth inequality and class, we will force those on the margins further and further into poverty. If we do not start working on a long-term policy time frame, those questions will be answered by individuals and businesses who prioritize profit motive over compassion for neighbors.

The City of Bellingham enacted a housing affordability group in 2017 that discussed equitable investment in below market housing for residents of the city, and methods to curb homelessness. Clearly there is a push for equity in all aspects of our government. We should continue to address the concerns of the most vulnerable and prioritize people who cannot afford market rate services and housing. Third party non profits are not enough to effectively handle these issues. The City of Bellingham needs to aggressively increase access to affordable housing that is well below market rate.

Again, we must ask ourselves what we are actually trying to do: are we trying to build structures for people to live in, or are we trying to help vulnerable houseless people get steady housing? Are we trying to put fiber optic cable in the ground, or are we trying to give access to the 21st century to those who have not been readily able to access it? Who is responsible for the wellbeing of our community? Aren't we all?