REPORT of the TASK FORCE on TELECOMMUNICATIONS INNOVATION

City of Seattle

HOW THE CITY OF SEATTLE CAN PROMOTE DEVELOPMENT OF AN ADVANCED COMMUNICATIONS NETWORK

Task Force on Telecommunications Innovation

Steve Clifford
Task Force Chair
Former CEO, King Broadcasting

William F. Baron
Foster Pepper & Shefelman

Art Butler
Ater Wynne, LLP

Reuven M. Carlyle
Washington2, Inc.

William Covington
University of Washington

Toni Cramer
City of Bellevue

Ronald A. Johnson
University of Washington

Huat Chye Lim
Microsoft

Gregory B. Maffei
360networks

Dennis I. Okamoto
Former Regional Vice President
US West Communications

William M. (Bill) Schrier
City of Seattle

Ann Suter
Seattle Community Access Network (SCAN)

Commission Staff

Anne Fennessy
Cocker Fennessy

Sarah Driggs
Cocker Fennessy

City Staff

Tony Perez
Department of Information Technology

David Docter
Seattle City Light

City of Seattle
Greg Nickels, Mayor

May 2005

www.seattle.gov/cable

Contents

Chairman's Letter

May 2005

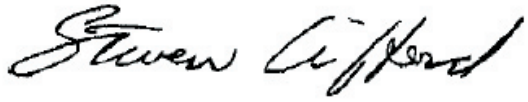
The Task Force on Telecommunications Innovation, established pursuant to a resolution sponsored by Seattle City Council Member Jim Compton, has completed its work. I am pleased to submit this report to Mayor Greg Nickels, the Seattle City Council and the citizens of Seattle.

The task force believes Seattle must act now to foster the development of advanced broadband facilities and services for our community.

Seattle cannot afford to dawdle. Broadband networks will soon become what roads, electric systems and telephone networks are today: core infrastructure of society. Lacking advanced broadband, Seattle is unlikely to maintain a competitive economy, a vibrant culture, quality schools and efficient government.

Private markets, left alone, are unlikely to favor Seattle. City government must become a catalyst: working with the private sector to encourage their deployment of high-capacity broadband; developing the municipal network to enhance government functions and services, as well as to provide the basis for a municipal buildout, should that become necessary; monitoring emerging technologies and adopting those that work for Seattle; and supporting new broadband enterprises.

Together these will accelerate the deployment of broadband, enhancing Seattle's leadership position in technology, entrepreneurial innovation, education, health, public/private sector co-operation, and government service.



Steven Clifford, Chair
Task Force on Telecommunications Innovation

Executive Summary

The Internet has sparked a communications revolution that will accelerate as advanced voice, data and video services emerge. Interactive, high-speed broadband networks with the capacity to deliver next-generation applications will become essential to businesses, schools, health care providers, government and individuals. Such a network is not available to most of Seattle today. If Seattle is to compete in the new world of enhanced communications, it must have an affordable, open, universally available, state-of-the-art broadband network.

Recognizing that Seattle faces this challenge, the Seattle City Council, with the concurrence of Mayor Greg Nickels, adopted a resolution sponsored by Councilman Jim Compton establishing the Task Force on Telecommunications Innovation in 2004. Its purpose was to explore the feasibility of using the City's broadband assets in a network available to the public. The Task Force gathered and analyzed information over a seven-month period, and submitted this report of its findings and recommendations to the City in May 2005.

The Task Force concluded that if Seattle is to have the broadband infrastructure it needs, city government must lead the way. ***The City of Seattle must act now to encourage the development of a robust broadband network capable of fast, simultaneous, two-way delivery of advanced voice, data, and video services.***

By actively encouraging broadband development, Seattle would join a growing number of municipalities that are initiating broadband projects, including Minneapolis, Philadelphia, and San Francisco.

The Task Force recommends that the City immediately adopt this goal:

2015: Broadband for All

Within a decade, all of Seattle will have affordable access to an interactive, open, broadband network capable of supporting applications and services using integrated layers of voice, video and data, with sufficient capacity to meet the ongoing information, communications and entertainment needs of the city's citizens, businesses, institutions and municipal government.

The Task Force asked private companies about their current plans to offer the level of broadband that will meet Seattle's long-term needs. The companies did not present plans to provide this level of service. The Task Force concluded that market forces, left alone, probably will not provide the broadband networks and services Seattle needs.

The Task Force considered how commonly available technologies might be able to achieve our goal. Fiber-optic cable extended to the premises (FTTP) has the capacity to meet the ever increasing demand for bandwidth far into the future, while other wired and wireless technologies have much more limited capabilities. Other technologies could serve as interim solutions or provide mobile connectivity, but are unlikely to provide the citywide broadband network we envision.

While a citywide FTTP network would meet the goal of

How will broadband make Seattle a better city? Here are a few images we envision:

A second-grade student, during a long recuperation at home after surgery, participates in classroom activities daily over a two-way, full-motion video hook-up.

The City Council meets on an issue that affects neighborhood businesses. Many citizens attend the hearing over two-way video—from home and from community centers. During the hearing, the Council uses instant-polling software to gather opinions.

A gene-mapping company relocates to Seattle, drawn by proximity to our burgeoning health sciences community and the city's affordable, robust data network that it uses for video collaboration with other businesses and researchers.

A radiologist finds he can better balance professional and family responsibilities by working from home two days a week. Using the network, he can quickly summon digital X-rays from diagnostic imaging services, as well as patient records, to his home office computer.

An aerospace engineer begins the day in her home office, working on a complicated engineering drawing. She collaborates with other engineers and business partners who can see the same drawing via their networks and HDTV-quality monitors. The drawing resides on her employer's computer server in south Seattle. She'll drive there later, after the morning rush hour is over.

The children in an immigrant family do not yet speak English. They are able to go to their local school in West Seattle, yet take classes in their native language using an HDTV video conference connecting several Seattle schools.

broadband for all by 2015, the path to this network is uncertain. An incumbent telecommunications provider, Comcast or Qwest, might build an FTTP network. Alternatively, the City might negotiate with a third party to build an entirely new system, or use the City's existing fiber plant as the base for a FTTP system. Finally, a new technology could emerge that would allow true broadband to the premises without a new wired connection.

The City should explore, and encourage development of, each of these paths. While the ultimate path is uncertain, the initial steps are clear—and they are inexpensive and effective.

As first steps, we recommend that the City:

- Work actively with incumbent telecommunications providers and other private companies to encourage them to develop the broadband network we envision. The City should identify obstacles it might remove, or incentives it might offer, toward this end.

- Continue developing the City's own broadband network, both to support municipal functions and possibly to serve as an open public network, should that become necessary. The City should study the feasibility of alternative means to that end: providing its own network for public and commercial use; or partnering with private enterprise, perhaps through use of the City's fiber network.

- Monitor and evaluate emerging broadband technologies, and take advantage of opportunities that make sense for Seattle. Currently, FTTP appears to be the best long-term solution for a Seattle network. Nevertheless, the City should explore other technologies as they evolve.

- Work with information-technology entrepreneurs to make Seattle the nation's leading broadband incubator for private enterprises.

The Task Force recommends that the City establish an Office of Broadband to give these efforts a focal point, to ensure efficient and far-sighted development of a communications network, and to underline the City's commitment to the goal. An advisory committee should be established to provide advice and support to the Office. The Office should report annually to the Mayor and City Council on progress toward the broadband goal.

Connecting Seattle to the Future

The Internet, along with other new communication technologies, has become a dominant force in public life, bringing about dramatic changes in the decade since it emerged. In coming years, it will drive a continuing evolution in the ways people work, play, learn and communicate. Advanced services—such as high-definition TV, voice over Internet phone service, and interactive video—will be increasingly deployed when broadband networks are available to support them. New services will be developed.

These advanced services will transform our lives, just as e-mail and web-browsing swept over our culture in the past 10 years. With interactive HDTV, for example, video conferencing will improve dramatically. Telecommuting, distance learning, and remote health care services will become much more effective options than they are today.

To enable these services, communities will have an increasing need for broadband—communication networks that have enough capacity to support fast, two-way, simultaneous delivery of advanced voice, data and video communications. This is a level of broadband beyond what is provided over cable and phone lines in Seattle today.

Broadband networks will become in the 21st century what electricity became in the 20th: a part of the core infrastructure. Just as Seattle needed an electricity system to thrive over the past hundred years, it must have an affordable, universally available, state–of-the-art broadband system to remain vibrant and prosperous in the future.

Such a broadband system, an essential condition for our material well-being, also promises to make Seattle a better city. It could:

- Allow all economic groups to have full access to the Internet, cable television, and other communications services.
- Reduce traffic congestion and reduce air pollution by supporting telecommuting.
- Increase citizen participation in government and enable the City to offer improved services.
- Make more jobs available because the city would become a more attractive business environment.
- Allow businesses to thrive because of increased opportunities for collaboration and telecommuting.
- Enrich people's lives by enabling them to use the latest technology to communicate with friends and family in new ways, and to access their choice of information and entertainment.

The Situation Today

Seattle currently does not have a network that can make this vision a reality. The bandwidth needed for delivery of multiple advanced services is not available in most parts of Seattle, or costs too much.

Before the Task Force moved forward to make its recommendations on how to change the current situation, it spent six months gaining a better understanding of:

- Current and emerging broadband technologies
- Existing and future services and applications
- How other cities are encouraging or building broadband networks
- Cable and telephone companies' plans to provide advanced broadband services
- The City of Seattle's current broadband assets, and plans to develop its fiber-optic network
- The economics of broadband deployment

Findings

Based on the information it gathered, the Task Force came to the following conclusions:

For the next half century, a city's economic, social, and cultural success will depend, in part, on its broadband infrastructure. Advanced broadband networks and applications enable new business opportunities, remote provision of medical services, expanded educational options, enhanced personal communications and entertainment, and many more benefits. Broadband enables government entities to provide new and improved public services, to operate more efficiently, and to offer better ways for citizens to participate in democratic processes.

Seattle, in particular, would benefit from the availability of increased bandwidth because it is a leader in the information economy. The Seattle area is home to pioneering information-technology companies, skilled professionals and technology-savvy residents. If broadband is available to allow entrepreneurs to develop and test advanced applications, Seattle could achieve national prominence as a broadband technology incubator.

Seattle could gain competitive advantages by becoming an early adopter of broadband. Seattle's economy will grow if broadband gives local businesses advantages that aren't available elsewhere. Many Seattle businesses are "spin-offs" or suppliers of the several large employers in the area. These businesses use high-speed voice, video and data networking to collaborate with one another and with the larger firms to develop and market their products.

A majority of Seattle residents use networked information technology today, and their demand for access to state-of-the-art technologies and services will continue and increase. Research conducted by the City of Seattle found that 83 percent of Seattle's citizens have computers and use the Internet—higher than the national average. The research found a high level of interest—especially among younger residents—in using cutting-edge applications that require high bandwidth.

To serve future needs, networks must be available with bandwidth capable of simultaneously delivering voice, switched video and data. Simultaneous provision of switched HDTV video, Internet access and voice service to a household would require a minimum of 20-25 megabits per second (Mbps) downstream and a sufficient level of upstream bandwidth (this will vary based on application requirements). Bandwidth available to most homes in Seattle today is 1.5-4.0 Mbps downstream, and 256-386 kilobits per second (Kbps) upstream. This upstream bandwidth in particular is insufficient to support increased interactivity.

Fiber-optic cable extended to the premises is the only technology available today with the capacity to meet all of Seattle's long-term needs. Fiber has significantly more capacity than any other existing or emerging broadband technology, and is unlikely to become obsolete in the foreseeable future. Other wire and wireless technologies the Task Force studied cannot provide comparable bandwidth, and many have interference or security problems. However, the Task Force recognized that due to the expense of providing fiber to the premises, other technologies might have to be employed as interim steps.

Incumbent cable and phone companies do not provide, and have not presented plans to develop, the high-speed network that Seattle will need in the future. The coaxial cable and copper-wire infrastructures currently used by the cable and phone companies do not provide sufficient bandwidth to support all current and future broadband applications. Although the incumbent cable and telephone companies plan modest upgrades, the incumbents have no plans to develop the kind of high-speed network the Task Force envisions. Furthermore, these are national firms – as they do develop high-speed technologies and applications, the companies will first deploy them in markets where they must maintain a competitive edge, not necessarily in Seattle.

The City of Seattle has substantial broadband resources and capabilities, and could play a leadership role in the development of public broadband systems by encouraging private investment or using City assets in a public network. The City of Seattle has developed fiber-optic, radio, and Ethernet networks. The City has employees with expertise and experience in communications technology. The City owns and manages other assets that could be important in a broadband network, including buildings, utility poles and right-of-way. The City has financing capabilities.

The City's fiber network would be especially attractive to companies that are developing and testing broadband applications. Seattle—already home to many talented information technology professionals and residents who use networked information technology—could become a nationally prominent test bed and incubator for broadband entrepreneurs.

Based on these conclusions, the Task Force believes the City of Seattle should take an active leadership role in fostering development of a robust broadband network. The following recommendations for City action will not lead to an overnight solution. Development of a broadband network will be a complex and costly challenge. It is not clear today who will build the system, what is the best technology, and how it should be financed. The steps we recommend will set the City on a path toward resolution of these issues; as we proceed, it will become evident what more must be done to ensure that Seattle has a 21st century broadband infrastructure.

Recommendations

The Task Force recommends that the City adopt this goal:

2015: Broadband for All
Within a decade all of Seattle will have affordable access to an interactive, open, broadband network capable of supporting applications and services using integrated layers of voice, video and data, with sufficient capacity to meet the ongoing information, communications and entertainment needs of the city's citizens, businesses, institutions and municipal government.

The Task Force proposes that the City take the following steps to move toward the goal:

1. **The City should work with private companies to encourage them to develop high-speed networks for Seattle.**

   The Task Force began a dialogue with the incumbent cable and phone companies. We asked how the City could help them develop a broadband network meeting the goal of broadband for all by 2015. The companies have provided ideas and indicated their willingness to continue working with the City. The City should pursue this effort.

2. **The City should develop its own network for municipal purposes, and potentially to support the creation of an open network available to the public.**

   The City already has done much to develop a broadband network for municipal purposes, and should continue developing this network both to support the functions and services of municipal government, and potentially to support the creation of an open network available to the public.

   The City should centralize planning, construction and management of broadband for all divisions of the City to ensure that its system is developed in a coordinated way.

   Network development should be consistent with the goal of having a state-of-the-art broadband system available to all of Seattle's residences, businesses and institutions. The City should explore the economic feasibility of a municipal build-out of a system available to the public.

   The City should encourage all its departments, as well as other governments and public agencies, to explore emerging technologies and applications that will improve service to citizens, decrease City costs, and increase City revenues.

The City should work with Seattle's businesses, major institutions and underserved neighborhoods to identify needs and conduct tests and demonstrations of broadband applications for meeting those needs.

A number of government entities and schools are developing and using broadband within Seattle and in the Puget Sound region. The City should continue cooperating with other local governments and institutions as it develops its network. Such cooperation could leverage Seattle's resources. It also could promote the development of broadband in surrounding communities where Seattle citizens go for work, school, and other activities.

3. The City should make its communications network available to private service providers, when feasible.

Wireless Internet service providers, for example, might be interested in using the City's fiber network to transmit data from remote sites to the Internet. Such uses would generate revenue for the City while increasing competition, bringing more choices to citizens.

4. The City should monitor emerging Internet technologies, and take advantage of opportunities that make sense for Seattle.

Fiber-optic cable installed to the premises currently appears to be the best long-term solution for a Seattle network; however, its expense should prompt the City to explore other technologies for possible interim deployment. Of particular interest are wireless and fiber connecting to existing copper, bypassing phone company central offices.

5. The City should encourage local broadband enterprises that are developing next-generation applications, services and technologies.

The City should actively promote experimentation, innovation and entrepreneurial activity in broadband technology, deployment and applications by facilitating companies' access to City facilities, property, right-of-way, etc., consistent with City regulations.

6. The City should establish an Office of Broadband, with the authority and funding necessary to successfully carry out these recommendations.

The City should provide a focal point for these recommendations by creating an Office of Broadband within the Department of Information Technology. By forming this office, the City will establish accountability for following through on the recommended strategies, ensure that the City develops its internal broadband network in the most efficient and far-sighted way, and underline the importance of the effort to develop broadband.

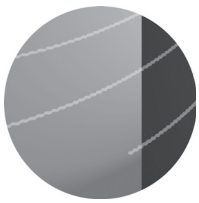
Recommendations for the Office of Broadband's specific responsibilities are included in appendix B.

7. The City should create an advisory committee to provide advice and support to the Office of Broadband.

The committee should include individuals who can contribute expertise related to the Office's functions, as well as people who can keep the Office connected with constituents and business.

8. The City should monitor progress toward 2015: Broadband for All.

The Office of Broadband should submit annual reports to the Mayor and City Council. In addition to reporting on the accomplishments of the Office, the report should assess the status of broadband competition in Seattle, the competitive position of Seattle compared to other cities, incumbent providers' progress and ability to meet the City's broadband goal, the state of citizen access and the digital divide, and the City's experience with private-sector-driven broadband tests and pilots.



Background Information

The Task Force gathered information from a variety of sources: written materials assembled by staff; presentations by communication technology experts, representatives of companies and municipalities that provide broadband services, and City of Seattle staff; as well as meetings with managers of Tacoma Power's public broadband system, Seattle City Light, and the City of Seattle Finance Department. The following is a summary of information the Task Force gathered, which forms the basis of our recommendations to the City.

Broadband

The Task Force began by gathering basic information about broadband. What developments lead to the need for broadband? How is the term defined? How much capacity is needed?

Before development of Internet Protocol (IP), people used separate, single-purpose communications networks when they talked to one another on the phone, exchanged data between computers, or received video TV programs. For example, phone service was provided over the telephone company's copper wire, while video was delivered over the cable company's coaxial cable.

With the development of IP, voice, data and video information can all be transmitted as digital packets over a single network or over a variety of networks, no matter what the physical media (copper wire, fiber-optic cable, wireless, etc.). Computer data as well as voice can travel over telephone lines; coaxial cable can support VoIP phone service as well as video. Wireless networks support not only cellular telephone, but data applications such as web surfing and e-mail.

Broadband is a common term for high-speed, always-on, interactive communication networks that have enough bandwidth to deliver digital data, voice and video communications simultaneously and quickly, to and from users.

The speed at which data bits can be transported by a broadband network is measured in megabits per second (Mbps), and is referred to as bandwidth. On a network with a bandwidth of 1 Mbps, this entire report could be transferred between any two points in a split-second. A bandwidth of 3-4 Mbps would support transmission of a continuous feed of TV-quality video.

Most residential broadband services available in Seattle today offer download speeds between 1.5 – 4 Mbps, and 256-384 Kbps upstream.

The Task Force found that to support next-generation applications, broadband networks should have bandwidth capable of simultaneously delivering voice, switched video and data. Simultaneous provision of switched HDTV video, Internet access and VoIP service to a household could require at least 20-25 Mbps downstream; upstream

The Task Force found that fiber-optic cable that runs all the way to the user's home or business has significantly more capacity than other broadband technologies. FTTP has the lowest Mbps cost, has a long life, can be upgraded to higher speeds as better electronic components are developed, and is unlikely to be rendered obsolete in the foreseeable future.

FTTP will best meet the City's and the public's growing demand for bandwidth. However, due to the expense of deploying fiber to every home and business in Seattle, other technologies, such as wireless, may make sense as interim solutions.

Relative Downstream Broadband Speeds

Source: City of Seattle Department of Information Technology, April 2005

bandwidth requirements would vary depending upon the applications being used, but much more than 384 Kbps would be required. Twenty-five (25) Mbps should be considered a minimum requirement for a Seattle network in the near term.

Broadband technologies

Reasoning that users will demand more and more bandwidth as IP-based applications are developed and adopted, the Task Force asked what is the best technology to meet ever-increasing demand? After extensive review, the Task Force found that fiber-optic cable installed to the premises currently appears to be the most desirable technology for the long term.

The Task Force studied the range of wired and wireless broadband technologies available now or being developed. Wire technologies include fiber-optic cable to the premises (FTTP) or to the curb (FTTC), coaxial cable, hybrid fiber optic/coax (HFC), digital subscriber line (DSL, ADSL, ADSL2+), and broadband over power lines (BPL). An emerging approach, which we refer to as "bypass," is one in which fiber would be connected to DSLAMs[1], bypassing ILEC[2] central offices, leveraging existing twisted-pair copper wire connecting to homes.

The Task Force found that incumbent commercial wireline providers are in an early stage in the evolution of broadband networks and are unable to present plans for investment in facilities, technologies or services that will allow the broadband connectivity and applications to reach the goal of the Task Force.

Wireless systems include wireless fidelity (Wi-Fi), WiMax, Multichannel Multipoint Distribution Systems (MMDS), and satellite. Wireless options have become more visible recently because of the emergence and popularity of Wi-Fi. Wireless phone companies are experimenting with 3- 4-G networks to provide mobile broadband access. More wireless broadband options are expected to emerge as broadcasters begin to release existing analog spectrum as they move to digital broadcast. Some experts believe that some wireless technologies, such as WiMax, could be low-cost solutions for providing a high-speed broadband network to the premises, avoiding expensive construction of last-mile fiber.

The Task Force found that wireless technologies available today or under development will not meet projected future needs because they do not have the capacity to simultaneously deliver advanced voice, video and data communications—a minimum of about 25 megabits per second. Wireless systems also have security and interference problems. However, wireless could be valuable as part of a hybrid system, as a short-term solution, or as a way to provide mobile and portable connectivity.

Copper wire and coaxial cable also have limited potential. Seattle City Light (SCL) advised the Task Force that the BPL technology currently available is designed for a lower-voltage electricity system than SCL's 26 kV system. SCL would encounter engineering challenges, and additional costs as a result, if it were to employ current BPL technology.

Current and planned broadband networks and services

The Task Force found that fiber-optic cable running all the way to the user's home or business has significantly more capacity than other existing or nascent broadband technology. While installation of fiber to the premises throughout Seattle would be more expensive than other types of networks, fiber has the lowest Mbps cost compared to other technologies. Fiber-optic cable has a long, 40-year life. A fiber-to-the-premises network can be upgraded to higher speeds as better and cheaper electronic components are developed; the fiber itself will not need to be upgraded. No alternative broadband technology is on the horizon that would render fiber obsolete in the future. For these reasons, FTTP is currently seen as the most effective way to meet the City's and the public's growing demand for bandwidth. However, due to the expense of deploying FTTP, other technologies, such

1 Short for Digital Subscriber Line Access Multiplexer, a mechanism at a phone company's central location that links many customer DSL connections to a single high-speed ATM line. (ATM is short for Asynchronous Transfer Mode, a network technology based on transferring data in cells or packets of a fixed size.)
When the phone company receives a DSL signal, a modem detects voice calls and data. Voice calls are sent to the public switched telephone network, and data are sent to the DSLAM, where it passes through the ATM to the Internet, then back through the DSLAM and ADSL modem before returning to the customer's PC.

2 Short for Incumbent Local Exchange Carrier. An ILEC is a telephone company that was providing local service when the Telecommunications Act of 1996 was enacted.

as wireless, may make sense as interim solutions while a fiber network is being developed.

Private companies and the City of Seattle presented information to the Task Force about their current networks and plans for the future.

Wired networks, wireless facilities, and hybrid systems have been deployed in Seattle. A variety of entities have installed a fiber ring around the downtown that would be available for "backhaul"—the transmission of data between the Internet and a local-access network. Currently "last-mile" infrastructure—the connection to premises throughout the city—is inadequate to support high-bandwidth services.

Private wireline providers

Residential wired service to high-speed Internet is provided by cable companies and the incumbent telephone companies (ILECs). The Task Force found that incumbent commercial wireline providers are in an early stage in the evolution of broadband networks and are unable to present plans for investment in facilities, technologies or services that will allow the broadband connectivity and applications to reach the goal of broadband for all by 2015.

Seattle is served by two cable operators, Comcast and Millennium Digital Media. Comcast is the largest cable operator in Seattle, with about 160,000 customers; Millennium serves 16,000 subscribers. Millennium is the sole provider of cable service in the central area of the City. Both serve in the downtown core.

High-speed access to the Internet over cable is available to all Seattle residents; there are about 80,000 cable modem customers in the city. Comcast currently provides up to 3-4 Mbps to residential customers for about $42.95 per month ($52.95 if not subscribing to cable service) and is offering higher speeds to business customers. Advances in cable modem technology (DOCSIS 2) are expected to allow the cable companies to increase bandwidth in both directions. Within several years the Comcast network could be all-digital—including video, but will still be limited by its underlying hybrid-fiber-optic-coaxial cable infrastructure.

Seattle's primary phone company is Qwest. Several competitive phone providers, such as Level 3 Communications and 360networks, serve businesses with fiber in the downtown core. Qwest provides high-speed Internet service to residential customers for under $30.00 for 256 Kbps in each direction. Qwest also provides access to its network for independent Internet Service Providers for both dial-up and high-speed access.

Comcast is beginning to compete with Qwest's core voice business and later this year will roll out Voice over Internet Protocol service (VoIP). Qwest, in turn, is making alliances with DirecTV to add broadcast video to its service package.

> The City of Seattle has significant broadband facilities and services in place today. Opportunities exist for the City to enhance its functions and the services it provides to citizens, as well as to facilitate the development of private broadband networks and services, through further development of its broadband resources.

Qwest currently provides some private VoIP networks for business customers, and offers integrated voice and data T-1 access for smaller businesses. It is not clear when Qwest intends to introduce VoIP to residential customers. Qwest representatives told the Task Force that download speeds in Seattle will not exceed 7 Mbps for the foreseeable future. It has only a few pilots for higher-speed service in progress in its entire 14 state service region, and no pilots in the Seattle area.

Unlike cable modem service, DSL service offered by Qwest is not available in all parts of Seattle, so in some areas cable modem service is the only choice for high-speed Internet access. DSL service is available only to customers who live within 1-2 miles of a Qwest switch.

Verizon and SBC plan to spend or are spending billions of dollars to provide fiber-to-the-premises or to the curb to certain specific cities, not including Seattle. These investments will dramatically increase the bandwidth available to residents of these cities. Qwest's ability to make such an investment will be highly constrained by the age of much of its plant in Seattle and by its large debt load relative to other phone companies. These facts support the Task Force's concern that Seattle could be left behind other states and cities in deployment of broadband.

A subcommittee of the Task Force asked Comcast and Qwest to provide information about their future business plans for improving broadband services to Seattle. Their responses are included in the appendices.

Private wireless providers

Currently a number of wireless companies provide service in Seattle today. Cellular/PCS, Wi-Fi, and satellite services—including Internet connectivity—are available. WiMax or pre-WiMax services may become available shortly.

The number of providers is expected to grow, creating new choices for consumers. Speakeasy plans to launch WiMax service to business customers later this year. Clearwire, a

new company founded by Seattle's Craig McCaw, plans to provide wireless broadband access to residential customers later this year. Cellular companies have invested in next generation networks (3G) that will provide a broad range of coverage for data and allow for mobile high-speed Internet connections.

Certain characteristics of wireless technology limit its usefulness in a network intended to best meet the needs of all Seattle's citizens, businesses and institutions. It is doubtful, for example that wireless technology can support interactive HDTV-quality video to large numbers of people.

City of Seattle broadband assets and services

The City of Seattle has significant municipal broadband facilities, including fiber-optic cable that extends to neighborhoods throughout the city.

The City also operates, or participates in, radio networks, land-line and cellular phones, and an Ethernet network. The City has some video conferencing and monitoring facilities. These broadband resources will enable the City to operate more efficiently and enhance the services it provides to citizens. The City's assets, especially its fiber-optic network, could be developed and used in a network available to the public.

The City cooperates with other local government entities and schools in developing communication networks. It will, for example, build fiber-optic cable to every elementary school in Seattle, using $3 million in funds provided by the Seattle Schools' technology levy.

A majority of Seattle residents use networked information technology today, and their demand for access to affordable, state-of-the-art technologies and services will continue and increase.

A greater percentage of younger residents use the Internet than older citizens do, so the rate of Internet use is likely to increase over time.

City networks are used for a variety of purposes, including public safety (police and fire functions and video surveillance of critical infrastructure), Seattle City Light command and control, employee communications, traffic control, traffic cameras, records management, and a small amount of video conferencing. The City has over 10,000 telephones, 10,000 computers, and 4,000+ radios which use these networks.

The City anticipates using new networked applications in the future. In the near term, the City is planning new information services for police and fire departments, enhanced traffic management tools, Seattle City Light automated meter reading pilots, and a video network for Homeland Security. Longer-term possibilities for new applications include expanded video conferencing, digital video wireless from City vehicles, applications that support interactivity with constituents, and real-time utility meter reading.

City of Seattle 2004 Estimated Telecommunications Expenses	
Cellular services	$1,728,934
Internet	$106,316
Leased circuits	$2,078,368
Local dial tone	$857,189
Long Distance	$108,140
Paging	$223,590
Wireless modem services	$143,294

The current estimated annual cost of the City of Seattle telecommunications services paid to outside providers (cellular services, Internet, Leased circuits, local dial-tone, long distance, paging, wireless modem services) is $5,245,830.

In addition to owning and operating networks, the City controls a variety of assets, and has established a number of laws and policies, related to broadband networks. For example, the Seattle Department of Transportation (SDOT) controls and regulates the right-of-way—the public corridors through which broadband facilities could be constructed. No one may do construction on or under the ROW without a permit issued by SDOT. The City also leases its property for wireless facilities. With the exception of Seattle City Light, the City has not yet entered into many wireless leases, but the number is expected to increase.

Public demand for broadband in Seattle

A key question the Task Force explored was what is the public demand for broadband? It was found that a majority of Seattle residents use networked information technology today, and that their demand for access to affordable, state-of-the-art technologies and services will continue and increase.

The City of Seattle conducted research in 2004 and 2005 to learn how citizens use information technology, what services they are interested in having available in the future, and related matters. The facts in this section are based primarily on the results of this research.

Two research projects were conducted. In 2004, the Department of Information Technology surveyed Seattle residents to assess the current level of information technology access and literacy, explore residents' perceptions about information technology, and assist in assessing community needs and interests for use in the cable franchise renewal process. Beginning in 2004 and continuing in 2005, the Office of Cable Communications held public meetings, conducted surveys, and consulted with City of Seattle departments and other government entities to ascertain community needs and interests in cable television and broadband Internet services.[3]

Two-thirds of Seattle citizens think cable service and high-speed Internet service are too expensive.

The City's research found that 83 percent of Seattleites have a computer at home, and 91 percent of home computer users have Internet access (76 percent of Seattle's population overall). Eighty-three percent of Seattle's residents use the Internet somewhere. Sixty-five percent subscribe to cable television.

A greater percentage of younger residents use the Internet than older citizens do, so the rate of Internet use is likely to increase over time.

Younger residents also could drive demand for more-advanced technology. According to the Information Technology Residential Survey, "…younger respondents seem to lead the way in adopting new technologies and expressing interest in technology coming to the market that is not yet widely available, indicating that Seattleites are likely to continue to demand access to cutting-edge technology into the future."

Younger residents subscribe to cable at a lower rate than senior citizens, but younger survey respondents as a group were most interested in potential new cable services that require higher bandwidth. Four out of five respondents to the technology survey—cable subscribers and non-subscribers alike—said they would be somewhat or very likely to subscribe to at least one new service that requires higher bandwidth, should it become available.

The Office of Cable Communications research also found citizen interest in advanced technology. According to the draft Needs Assessment Report, citizens frequently expressed interest in Seattle having a state-of-the-art system capable of delivering advanced services that foster economic development and community.

The City's research found that citizens today use the Internet to keep in touch with family and friends (92 percent), to get news (81 percent), for education (71 percent), and to find health or medical information (almost 70 percent).

The studies found that citizens also use the Internet for business transactions, which could yield benefits for local businesses. Eighty-five percent of respondents to the technology survey said they use the Internet to research prices and products; 82 percent made purchases. One out of five residents said they use the Internet to sell goods or services from home, and more people are looking online for information about local businesses.

By developing a broadband network and taking other steps to support IT entrepreneurs, Seattle could distinguish itself as the nation's leading business incubator for advanced communication technology and applications.

About half (55 percent) of the technology survey respondents said they prefer to access City services online, and 63 percent said they used the Internet to get information from some government entity in the past year. The online government services most frequently cited were paying bills, fees or taxes (26 percent); applying for a license or permit (24 percent), finding maps (21 percent), and expressing opinions (20 percent).

Citizens also use the Internet as a tool for community involvement and civic participation. Nearly three-fourths (71 percent) are involved in some type of group or organization, the great majority of which (77 percent) use e-mail or a web page to communicate with their members.

The technology survey found that two-thirds of Seattle citizens think cable service and high-speed Internet

3 Reports on these research projects can be found online at http://seattle.gov/tech/indicators/2004 residentialsurvey.htm and http://www.seattle.gov/cable/.

service are too expensive. Thirty-seven percent said they don't subscribe because of the cost.

Seattle's potential to be a leading broadband incubator

Task Force members considered special opportunities available to Seattle because of its reputation as a world leader in the information economy, its wealth of talented information-technology (IT) professionals, and its many tech-savvy citizens. They concluded that, by developing a broadband network and taking other steps to support IT entrepreneurs, Seattle could distinguish itself as the nation's leading business incubator for advanced communication technology and applications.

A study[4] prepared for the City of Seattle's Office of Economic Development put it this way: "Tech infrastructure fosters innovation. Maintaining cutting edge bandwidth infrastructure attracts the software development community."

The study also points to the economic benefits Seattle could reap by supporting IT entrepreneurs. It found that jobs in the information and communications cluster in 2002 generated more than $3.5 billion in annual revenues and employed 18,000 people in the city, with wages over twice the average.

Other cities' involvement in the provision of broadband

The Task Force heard presentations about other cities' broadband strategies, investments and services, and learned that a number of major cities are deploying, or planning, advanced broadband networks. Philadelphia is actively pursuing development of a citywide municipal Wi-Fi network. UTOPIA, a consortium of 14 suburban Salt Lake City, Utah, cities, is funding and building an FTTP network that will serve up to 160,000 subscribers. Tacoma's municipal electric utility, Tacoma Power, installed, operates, and provides some retail services over a hybrid fiber-coax network. (After Click! entered the market, Comcast's rates in Tacoma went down. Today the cost of Comcast's most popular service tier is 35 percent lower in Tacoma than in Seattle.) Spokane is developing a Wi-Fi network that will support the city government's mobile workforce and others. Chelan Public Utility District is building a fiber-optic network that is available to retail service providers to offer services to the public. In March 2005, the San Francisco Public Utilities Commission unanimously approved a $300,000 feasibility study for implementation of a municipally-run broadband/ Internet project. Tokyo and cities in South Korea have invested heavily in public fiber-optic networks. Amsterdam is building a public network.

The economics of a municipal broadband network

While the Task Force was not able to conduct a full study of the economic feasibility and possible business models for a City-owned public broadband network, it did gather information on this topic from several sources. Several speakers addressed cost issues. A Task Force subcommittee investigated several questions concerning possible private business partners and cost of services. (See Appendix E for the subcommittee's report.) City staff provided information about possible municipal financing options.

The City of Seattle, in partnership with other public entities, has installed over 450 miles of fiber-optic cable in Seattle. This fiber is in the downtown area and also extends to many City facilities and schools in neighborhoods. Within a few years, City fiber will connect to all neighborhoods; however, the fiber will not be installed on every street. The cost to extend fiber from City neighborhood hubs to all residents and businesses will be substantial. However, the Task Force believes that a business model may be available that would allow such a project to be self-sustaining and to provide services at competitive prices.

The Task Force found that the economics of broadband are different for a city than for private enterprise. When a private company decides what network and services to provide, it tends to seek a return on investment over just a few years. A city can take a longer view. In addition to the direct return on investment (from selling data transport services over its network), a city can expect the indirect benefit of increased tax revenues as broadband improves the city's business climate. Cities also have responsibilities that motivate them to consider non-monetary factors: better-educated citizens, a more-efficient government, greater citizen participation, decreasing demand for highway construction, and elimination of the digital divide.

4 Cluster Study: Seattle's Information and Communications Technologies Cluster for City of Seattle Office of Economic Development, 2005.

Appendix A: Seattle City Council Resolution Establishing the Task Force

Resolution Number: 30684

A RESOLUTION creating the Task Force on **Telecommunications Innovation** to explore and report on the feasibility of using municipal resources in a network that is available to the public using broadband technologies, broadband over power lines, Wi-Fi, WiMax, and other wireless applications, end-user fiber build out, and other **telecommunications** technologies.

Date introduced/referred: Jun 7, 2004
Date adopted: Jun 28, 2004
Status: Adopted
Vote: 9-0

Committee: Utilities & Technology
Sponsor: COMPTON

Index Terms: CITIZENS-ADVISORY-COMMITTEES, TELECOMMUNICATIONS, INFRASTRUCTURE, INFORMATION-SYSTEMS, COMPUTER-SYSTEMS

Text
A RESOLUTION creating the Task Force on Telecommunications Innovation to explore and report on the feasibility of using municipal resources in a network that is available to the public using broadband technologies, broadband over power lines, Wi-Fi, WiMax, and other wireless applications, end-user fiber build out, and other telecommunications technologies.

WHEREAS, the City of Seattle and the entire Puget Sound region are world-renowned as leading technology centers and incubators for technological innovation; and

WHEREAS, the City Council is committed to maintaining and expanding the City's position as a world leader in technology, to expanding the variety and lowering the cost of services provided to its citizens, to providing all communities in the City with greater access to technology, and to providing and using, when appropriate, the most advanced technologies available; and
WHEREAS, equal access for all citizens to media, Internet, and other digital technologies is critical to bridging the "digital divide," reconnecting citizens to government and community, invigorating public discourse and private enterprise, and promoting greater civic engagement, participation, and transparency in government; and

WHEREAS, the City Council believes that technological innovations and expanded access to services can be major catalysts for economic development within the City, and have the potential to bolster the City's economy, spur the growth of private businesses and generate revenue for the City; and

WHEREAS, the City and surrounding area are home to world-class technology experts in both the public and private sector, whose vision and vast experiences are substantial resources upon which the City Council would like to draw, and whose collaborative efforts would likely have a major impact on technological advancements in the City; and

WHEREAS, the City Council has been considering offering various types of new technology and services to citizens through a number of different business models, and is interested in moving forward in that endeavor in order to further the goals set forth in these recitals;

NOW THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF SEATTLE, THE MAYOR CONCURRING, THAT:

Section 1. The Seattle City Council establishes the Task Force on Telecommunications Innovation ("Task Force") to assist the City Council in examining and evaluating the feasibility of and options for providing broadband technology and advanced telecommunications and information services in the City in order to further the goals set forth in this Resolution. The composition, purpose, and scope of work of the Task Force are described below.

A. Composition. The Task Force shall be composed of the City's Chief Technology Officer ("CTO") or his designee(s), at least one member of the Citizens' Telecommunications and Technology Advisory Board ("CTTAB"), and the following types of members who shall be appointed by the Utilities and Technology Committee ("Committee") in its discretion:

1. Members of the business, technology, and telecommunication communities;
2. Persons with a background in community technology;
3. Persons with expertise in technology and telecommunications law and regulation;
4. Citizens with an interest in technology, telecommunications, and the delivery of services to residents and businesses in Seattle; and
5. Such other members as the Committee determines.

B. Purpose. The purpose of the Task Force is to explore the feasibility of using municipal resources in a network that is available to the public and allows public data access and transmission, and to make recommendations to the Committee about which technologies the City should pursue, if any.

C. Scope of Work. The Task Force shall:

1. Explore and evaluate broadband technologies, broadband over power lines, Wi-Fi, WiMax, and other wireless applications, end-user fiber build out, and other telecommunications technologies that provide public Internet and data access and transmission, and explore and evaluate the types of advanced telecommunications and information services such technologies would enable the City to use and/or offer to its citizens;
2. Explore various business models by which the City could use and/or offer these technologies and services, such as public/private partnerships, contract or lease arrangements, and other models, and examine what role(s) the City might play in such models;
3. Consider these and any related questions that might assist the Task Force in fulfilling its purpose:

a. Is it possible to create a network using municipal resources that is available to the public and that offers public data access and transmission and advanced telecommunications and information services? What City resources might be utilized?
b. What technologies/applications would best achieve the goal of creating such a network ("preferred alternatives")?
c. What is the fiscal viability of the preferred alternative(s)?
d. What are the direct benefits of providing this service through the preferred alternative(s)? What might be some of the indirect benefits or consequences?
e. Could such a network be revenue generating?
f. What are alternative sources to fund the network? If City funds were needed, what funding source(s) would be used? Would new funding source(s) be created?
g. Does the Task Force think proposed City capital expenditures would be a wise investment? (Would the network be too expensive? Or a bargain?)
h. What are the risks of creating such a network? Would it be a low risk project? A high risk project?
i. What role would the City play in such a network: owner, lessor, partner with private business, etc.?
j. To what extent could the network further the goals discussed above, including expanding the choice and lowering the costs of services provided to citizens, promoting economic development, enhancing access to and public participation in government, generating revenue, promoting technological innovation, and bolstering the City's position as a world leader in technology?
k. Should the City pursue a small pilot program first?

4. Invite a wide array of experts and persons knowledgeable in the issues to be studied by the Task Force to inform its discussions and evaluation, including but not limited to

Department of Information Technology ("DoIT") staff, representatives of Tacoma's Click! Network, and various technology vendors and service providers;

5. Prepare a preliminary report, to be authored with the assistance of the CTO or his designee(s), reflecting the preliminary conclusions of the Task Force on the questions identified in subsection 3 above, in a format of the Task Force's choosing that contains the following elements and any other elements that the Task Force believes warrant further consideration:

a. An analysis of the financial and technological feasibility of the services and technologies examined, and a list of other services and technologies that were not considered;

b. Possible business models, including capital costs, funding sources (including grants if available), and possible opportunities for revenue generation;

c. Estimated time frames and implementation schedules for deploying the services and technologies examined;

d. Any federal and/or state regulatory or legal parameters affecting the services and technologies the City might offer, or the business models the City could use, including specific constraints, unresolved regulatory or legal issues, and other pertinent regulatory legal issues;

e. Physical and/or electronic security concerns, and proposals for addressing those concerns;

f. A list of options and specific recommendations for technologies, services, and/or business models that would best serve the goals set forth in the recitals of this Resolution (including possible pilot programs), and that the Task Force recommends that the City pursue;

g. Requirements for minimum capabilities that the network should possess at launch, 5 years after launch, and 10 years after launch; and

h. The data, research materials, and resources used to compile the report.

6. Submit the final version of the preliminary report to the Committee no later than October 15, 2004.

Section 2. In serving on the Task Force, the CTO or his designee(s) shall:

A. Assist in drafting the report of the Task Force as described in Section 1 of this Resolution;

B. Recommend prospective Task Force members to the Committee in consultation with the Executive; and

C. Make available to Task Force members any maps, charts, diagrams, or similar materials showing the City's existing fiber and network infrastructure; any studies, investigations, evaluations, reports, findings, surveys, consultant reports, business or vendor materials or proposals, and/or other information that DoIT has concerning broadband technologies, broadband over power lines, Wi-Fi, WiMax, and other wireless applications, end-user fiber build out, other telecommunications technologies that provide public Internet access, and/or any similar technologies, related services, and/or Internet network development.

Adopted by the City Council the _____ day of _____, 2004, and signed by me in open session in authentication of its adoption this _____ day of _____, 2004. _____ _____ President _____ of the City Council.

THE MAYOR CONCURRING:

_____

Mayor

Filed by me this _____ day of _____, 2004.

_____

City Clerk

06/21/04(Ver. 11)

Appendix B: Recommended Responsibilities for the Office of Broadband

Office of Broadband Responsibilities Related to the City of Seattle's Municipal Purposes

1. The Office should centralize planning, construction and management of broadband for all divisions of the City, including Seattle City Light and Seattle Public Utilities, to ensure that the City's broadband system is developed in an efficient, coordinated way.

2. The Office should design the City's broadband system so that it can support emerging technologies and applications that will improve service to citizens, decrease City costs, and increase City revenues.

   The Office should actively move forward to build a wireless system connecting to existing City fiber for use by the Police Department, Fire Department, City Light, and other government departments. The Office should work with the private sector to ensure the creation of a wireless broadband network in Seattle enabling citizens to use laptops and other wireless devices in public areas.

3. The Office should encourage the City's use of broadband applications that will improve City services and operations. Possible applications include:

- Public-safety applications, such as two-way (interactive) video cameras in police cars, capability to take fingerprints and mug shots from remote locations, and video surveillance;
- Utility applications, such as smart electric meters, remote meter reading, monitoring to detect and reduce power theft, remote electricity outage reporting, remote utility service connects and disconnects, availability of real-time pricing for electricity, and demand control to reduce electricity consumption;
- Government-operations applications, such as connectivity giving employees who work in the field access to information and other employees, telecommuting, VoIP[5] and internal teleconferencing to allow City employees to reduce travel time for meetings;
- Applications that provide opportunities for citizens to participate in government, such as two-way, real-time, high-definition video that allows citizens to participate in City Council hearings from remote locations; and
- Applications that support services provided at libraries and community centers.

Office of Broadband Responsibilities Related to Fostering a Network Available to the Public

4. The Office should design and develop the City's municipal broadband system consistent with the goal of having a state-of-the-art broadband system available to all of Seattle's residences, businesses and institutions. By developing the municipal system with this broader goal in mind, the City will have the option of participating in or building a broadband infrastructure that will serve the public on an open, nondiscriminatory basis. This might be necessary if the private sector is unable to meet the goal of broadband for all by 2015.

   Specific steps the Office should take include:
   - Lay fiber-optic cable when opportunities arise as other broadband providers install fiber in City right-of-way;
   - Complete the installation of fiber to all neighborhoods while meeting City needs by installing fiber to police stations, other City facilities and public schools; and
   - Continue the City's participation in the consortium of public institutions—including schools and colleges—that are cooperating in the installation and utilization of fiber. Enhance this effort by expanding it to include other nonprofit institutions, and by supporting advanced applications for public education purposes.
   - Determine whether changes are needed in municipal policy or regulations to allow the municipal broadband network to be used by other nonprofit or commercial entities on an open-access basis.

---

[5]Short for Voice over Internet Protocol, a category of hardware and software that enables people to use the Internet as the transmission medium for telephone calls by sending voice data in packets using IP rather than by traditional circuit transmissions of the public switched telephone network.

5. The Office should work with private broadband providers to increase competition and expand the broadband facilities and services available to Seattle residences, businesses and others; and to generate revenue and decrease costs for the City. Specifically, the Office should do the following:

- Work with incumbent wireline providers, Comcast and Qwest, to assist and encourage them to provide broadband access meeting the City's goal of broadband for all by 2015. Attempt to move Seattle to the head of the line for new investment and upgraded services.
- Monitor incumbents' and other private companies' ability and intention to deploy an advanced high-speed network that will meet the goal of broadband for all by 2015 and maintain Seattle's technology edge.
- Work with private companies that might use City broadband resources. For example, the Office might lease City-owned fiber to WiMAX and other wireless providers to use for backhaul, or work with CLECs[6] and other competitors to incumbents to use City fiber in combination with existing copper-wire infrastructure from the distribution box, bypassing ILEC central offices.

6. The Office should study the legal, economic, and technical feasibility of building a broadband system using the City's existing and planned fiber as the backbone.

Specifically, the Office should:

- Evaluate broadband technologies that might be used in a public network, especially FTTP, the bypass strategy, and use of wireless "last mile" as an interim step. An interim solution might produce revenue for the City, increase competition, demonstrate the City's commitment to meeting its broadband goal, and serve as a first step towards an eventual FTTP build-out.
- Contact service providers to verify their interest and capabilities. The City should not, on its own, provide retail services—such as video entertainment or Internet access that are unrelated to functions of City government—to consumers and businesses.
- Explore public/private partnerships for build-out.
- Consider the feasibility and desirability of the City building a public broadband network and providing wholesale data-transport services in light of private industry's plans and ability to meet the City's goals.

Office of Broadband Responsibilities Related to Making Seattle a Leading Broadband Incubator

7. The Office should actively promote experimentation, innovation and entrepreneurial activity in broadband technology, deployment and applications by facilitating companies' access to City facilities, property, right-of-way, etc. These activities should, when technically and logistically possible to assess, be at least revenue neutral. Activities associated with commercial deployments of applications and services should, when possible, be revenue-producing, for the City. Use of City resources by private firms should be consistent with City regulations.

8. The Office should review City ordinances, regulations and procedures to identify and recommend changes that should be made to make it easier for private companies to conduct broadband trials and offer services. All appropriate incentives should be explored to encourage companies to develop innovative public sector applications.

9. The Office should issue RFPs, and make decisions that are timely and efficient, for innovative broadband applications using City facilities.

10. The Office should serve as a central clearinghouse for private providers to secure City support for market trials, tests and evaluations of new broadband applications, services and technologies. The Office should make all reasonable efforts to quickly and efficiently determine the viability of supporting such tests.

Recommendations Related to Overall Responsibilities of the Office of Broadband

11. The Office should coordinate the City's broadband development and use with other governmental and quasi-governmental agencies.

12. Responsibility for negotiation of franchise agreements should be placed in the Office of Broadband.

13. The Office should monitor technical, economic and competitive trends in broadband delivery in Seattle. Beginning in 2006, the Office should report annually to the Mayor and City Council on progress toward the broadband goal for Seattle and recommended actions the City should take to advance the goal. The report should address the following:
    - The status of broadband competition in Seattle
    - The competitive position of Seattle vs. other cities
    - Incumbent providers' ability to meet the City's broadband goal, and their progress toward meeting it
    - The accomplishments of the Office of Broadband
    - An assessment of access and the digital divide with regard to broadband
    - An assessment of how technology has changed, insofar as it affects the goal
    - The number, type and success or failure of private sector-driven broadband tests, trials, product assessments and pilots, and the benefit to the City for hosting such experimentation

14. The City should establish a citizens' advisory commission, including members with experience in business, economics, public policy, technology and telecommunicaitons to work with the Office on broadband policy matters.

Legislation

15. The City should monitor proposed state legislation and actively oppose any that would curtail the powers of the City to provide broadband infrastructure and services, and work with the Association of Washington Cities, the Washington Association of Telecommunications Officer and Advisors and others on advocacy efforts.

Finance

16. Within a few years, revenue produced by the Office of Broadband—such as fees collected from private companies for use of City facilities—should exceed the costs of running the Office.

17. The City should allocate seed money to cover the Office's operating costs for a few years. As previously noted, after a short start-up period, we believe the Office will more than cover its costs.

Appendix C: Task Force Members and Staff

The Task Force was formed in September 2004. Mayor Greg Nickels and Councilmember Jim Compton jointly chose members from a pool of individuals who volunteered or were recruited for the committee. They selected individuals with backgrounds in business, information technology, telecommunications law, community organizations that use information technology, and other areas. Steve Clifford was appointed Task Force chairman. Members are listed below. (Affiliations are for identification purposes only and are not meant to imply that the affiliated businesses or organizations endorse or share the views expressed in this report.)

Steve Clifford, Chairman

Steve Clifford currently is chairman of National Mobile Television; he also served as CEO from 1992-2000). Previously he was president and CEO of King Broadcasting Company (1987-1992); vice president and CFO of King Broadcasting Company (1978-1987); vice president of Bankers Trust Company (1978); and deputy controller of the City of New York (1974-1977).

Clifford serves on the boards of National Mobile Television, Harbor Properties, Laird Norton Co., Vigilos, Todd Shipyards, Mosaica Education, Inc., and KING-FM.

Clifford is a trustee of the Seattle Opera, Seattle Parks Foundation and Institute
for Systems Biology.

He studied at Columbia University, where he earned a BA in art history in 1964, and Harvard Business School, where he earned an MBA with distinction in 1968.

William F. Baron

William Baron is an attorney with Foster Pepper & Shefelman. He specializes in technology law; intellectual property law; law relating to software, computers, and the Internet; licensing transactions, and arbitration of commercial disputes, especially those relating to technology. Clients have included businesses and governmental units of all sizes. He has represented both technology owners and technology users.

Baron also has maintained a private practice as an arbitrator and mediator since 1979.

Previously he practiced with Garvey, Schubert & Barer (1995-1998); Baron Lieberworth & Warner (1991-1995); Cary & Baron (1979-1991); and Perkins Coie (1974-1979).

He has served as a lecturer and as director of the Intellectual Property Law Clinic at University of Washington Law School, and has been an instructor for many continuing legal education and arbitration training courses.

He is a member of the Washington State Bar Association and the Association for Conflict Resolution.

Baron earned a BS in physics from Princeton University in 1969, an MS in physics from California Institute of Technology in 1971, and a JD from Stanford University in 1974.

Baron is a member of the City of Seattle Citizens Telecommunications and Technology Advisory Board and also has served on the Judicial Candidate Evaluation Committee of the Municipal League of King County, on the Seattle Chamber Music Festival board of directors, and as leader of the Classics Book Group for the Princeton Alumni Club of Western Washington.

Art Butler

Art Butler is an attorney and shareholder with Ater Wynne, LLP. His practice focuses on telecommunications. Previously he worked for Skellenger & Bender (1976-87); for the Washington State Supreme Court (1975) and for the Washington State Court of Appeals (1973-75) as law clerk to the Hon. Charles Horowitz; and for the Municipal Research and Services Center (1971-72).

Butler received a JD degree from the University of Washington in 1972, and a BA from Yale in 1967.

He is a member of the American Bar Association, Washington State Bar Association
Seattle-King County Bar Association, Telecommunications Association, and Federal Communications Bar Association.

Reuven M. Carlyle

Reuven Carlyle is the CEO of Washington2, Inc., which offers strategic business development and public policy consulting for commercial and public sector projects. Previously he served as director, officer and senior executive for UIEvolution, Inc., a wireless software company (2001-2002); as vice president for external affairs and business development for XYPoint Corporation, a provider of wireless location technology (1996-2001); as external affairs manager of AT&T Wireless Services, Inc. (1995-1996); as special projects representative for McCaw Cellular Communications, Inc. (1993-95); as deputy press secretary in the Office of the Governor, Columbus, Ohio (1989-1991); and as public information officer for the Washington House of Representatives (1987-1989).

He received a master's degree in public administration from the John F. Kennedy School of Government, Harvard University in 1993, and a BA in communications from the University of Massachusetts in 1987.

He has been active in City Year of Seattle & King County and the Hillel Foundation.

William Covington

William Covington is assistant professor and director of the Technology Law and Public Policy Clinic for the University of Washington School of Law. He also is an instructor at Edmonds Community College. Previously he was the principal of North Star Group, a telecommunications consulting firm (1999-2003); corporate counsel for AT&T Wireless Services (1989-1999); regional counsel for TCI Cable Television (1984-1989); director of King County's Cable Television Office (1980-1984); and staff attorney for Evergreen Legal Services (1977-1980).

Covington has been a tutor at the Seattle African American Academy and is a member of the Washington State Bar Association, Leadership Tomorrow, United Negro College Fund and Center for Community Alternatives.

He received a JD degree from the University of Michigan School of Law in 1977, and a BA from New York University in 1972.

Toni Cramer

Toni Cramer is chief information officer for the City of Bellevue. Her accomplishments include development and implementation of agreements with surrounding cities, school districts, hospitals and the University of Washington to develop fiber connectivity rings that link key eastside institutions and networks, and implementation of wireless networks and applications to enhance public safety coordination and information sharing among 14 eastside public safety agencies.

Previously she held progressively responsible positions in planning and building services for the City of Bellevue (1983-present); was a graduate teaching assistant for the Department of Urban Planning at the University of Washington; and was an environmental land-use planner with Carter and Pounds, Inc.(1979-1981).

She serves as co-chair of the board of the eGov Alliance, vice president of the
Washington City/County Management Association Information Services, member of the Telecom and Communications Task Force of Public Technology Institute, and member of the Government Technology Advisory Board.

She earned a bachelor's degree (1981) and a master's degree (1983) in urban planning from the University of Washington, and also did undergraduate and graduate studies at the University of Kansas (1971 – 1976).

Ronald A. Johnson

Ronald Johnson is vice president for computing and communications, vice provost, and professor at the University of Washington. Previously he was director of information systems for UCLA (1977-87).

Johnson has been a leader in a number of initiatives, including the creation of NorthWestNet, the regional network that is the primary high-speed Internet provider for a wide variety of clients in the Northwest; the Disabilities-Opportunities-Internetworking Technologies (DO-IT) project; the (Information Network for Public Health Professionals (INPHO) project; the UWired information literacy initiative; ResearchTV; and the SONET-based statewide K-20 network for the state of Washington.

He has played a leadership role in the development of software, including Pine, an e-mail information-access system; IMAP, the Internet Message Access Protocol; the University of Washington Information Navigator; WILLOW; HDTV. He has been involved in a large body of video and TV productions, including many award winners.

Johnson is an advisory board member for Sun, DEC, IBM, Apple & Xerox; San Diego Supercomputer Center, and others. He has served on the boards of UCAID/Internet2's Network Planning and Policy Advisory Committee, Corporation for Educational Networking in California (CENIC), NorthWestNET, Washington Statewide K20-Network, and EDUCOM; and as a management consultant on architecture and management issues to firms such as Cedars-Sinai Medical Center and Los Angeles County Museum of Art.

He received a master's degree in philosophy from the University of Chicago in 1972; Ph.D. candidate in philosophy of science and logic, University of Chicago in 1974; M.S., L.S. from USC in 1975. He has nearly completed an MBA from UCLA.

Huat Chye Lim

Huat Chye Lim is a Program Manager in the Windows Division at Microsoft.

He studied computer science at Stanford University, receiving a B.S. degree in 2001 and a M.S. in 2002. While at Stanford he was a teaching assistant and section leader in the Computer Science Department, worked as a software engineer intern, completed an award-winning computer science senior project, participated in a simulated technology startup project in Hong Kong, and wrote a weekly technology opinion column for the Sunday Mail in Kuala Lumpur, Malaysia.

Huat is a member of the City of Seattle Citizens Telecommunications and Technology Advisory Board.

Gregory B. Maffei

Greg Maffei is chairman and chief executive officer of 360networks, a broadband telecom services provider. Previously, he was chief financial officer of Microsoft and also served as chairman of the board of Expedia.

Maffei has an MBA from Harvard Business School, where he was a Baker Scholar, and an AB from Dartmouth College.

He currently serves as a director of Electronic Arts and Starbucks Coffee. Maffei also is president of the Board of Trustees of the Seattle Public Library.

Dennis I. Okamoto

Dennis Okamoto is chairman of the board of Watermark Credit Union and of AAA Washington–Inland. He retired as top executive for US WEST (now Qwest) for Washington (1993-96), and previously held the positions of treasurer, controller, and vice president of strategic planning for the company (1985-90). He also served as director of the Washington Department of Revenue (1990-92); and as president and CEO of an Internet startup company, ZAMA Networks, involved with the next generation Internet and Voice Over Internet Protocol (VoIP) (1998-2001).

He received a bachelor's degree in general business from the University of Washington in 1970, and a certificate in data processing in 1968.

He also served as chairman of the board for University of Washington Medicine; as board member for Farmers New World Life Insurance, Corporate Council for the Arts, Fifth Avenue Theatre, Japanese American Chamber of Commerce, United Way of King County; as past president of the Japan-America Society; and as treasurer of the Greater Seattle Chamber of Commerce.

William M. (Bill) Schrier

Bill Schrier has been Chief Technology Officer and Director of the City of Seattle Department of Information Technology (DoIT) since 2003.. He held progressively responsible positions in communications and network services for the City beginning in 1992.

At DOIT Schrier has overseen the installation of a fiber-optic cable network in downtown Seattle to support multiple local, state and federal government agencies; the installation of a SONET network on the fiber network to support telephony and radio; the acquisition of an improved Internet link at 23 megabits per second for Seattle City government, in partnership with King County and the Seattle Public Library; installation of a three-site simulcast capability for the City's 800 MHz public safety (police, fire, public utilities) radio network; and additional communications-technology installations and improvements.

He earned a master's degree in public administration from the University of Washington (2001); did graduate work in applied physics at the University of Wisconsin, Madison; and received a B. S. in physics and mathematics from Loras College.

Schrier served for twenty-two years with the United States Army and Army Reserve, retiring with the rank of Major, USAR. He has been a volunteer with parish elementary schools and with the Catholic Schools Office of the Catholic Archdiocese of Seattle. He also is active in the Washington City-County Management Association.

Ann Suter

Ann Suter is Executive Director of SCAN Community Media, a non-profit organization that manages the public access channel. Previously she was executive director of the Leadership Institute (2002); senior specialist/education technology & telecommunications and then director of distance learning (1993-99) for Washington Community & Technical Colleges; program director for Cablearn Channel 27, UW (1985-93); curriculum specialist, UW Extension (1982-85); district supervisor, Arlington County Parks and Recreation (1972-78). She is president of PriZma Services and Products (1999-present).

Suter studied at the University of Washington, receiving an Ed.C. in educational communications and technology (1993) and a Master of Public Affairs degree (1981); and at the University of Illinois, receiving a Master of Arts in children's theatre and creative drama (1970) and a B.S. in recreation administration (1969).

She serves on the Advisory Committee, University of Washington Extension Distance Learning Certificate Program; Alliance for Community Media; and the Citizen's Advisory Committee, Public Counsel in the Attorney General's Office. She also is involved as a volunteer with Pratt Fine Arts Center, Mount Baker Community Club; Foundation for Family Television, Puget Sound Illini Club, Seattle Citizens Cable Advisory Board, DSHS Region IV Oversight Committee, Seattle Children's' Museum, and Hawthorne PSTS.

Staff

Staff support to the Task Force was provided by Anne Fennessy and Sarah Driggs of Cocker Fennessy, a regional public affairs consulting firm; and by Tony Perez, Director, Office of Cable Communications and Gina Hooks, senior management systems analyst, both with the Department of Information Technology, City of Seattle. David Docter, Strategic Advisor, Finance/Business Unit, Seattle City Light, regularly participated in the Task Force's work.

Appendix D: The Task Force's Work

The full Task Force met twice each month beginning October 13, 2004 and ending April 20, 2005.

In the first phase of its work, the Task Force focused on building a common understanding of broadband technologies and learning about examples of public broadband networks. The group gathered information from a variety of sources. City staff prepared a binder of written materials about broadband technologies, the status of broadband deployment, the City of Seattle's resources, and other topics. (Contents are listed below.) The Task Force heard presentations by communication technology experts, representatives of companies and municipalities that provide broadband services, and City of Seattle staff. (Speakers are listed below.) Four members of the Task Force toured the facilities of Tacoma Power's public broadband system—the Click! Network—and met with network managers. Task Force members also met with Seattle City Light management and City of Seattle Finance Department staff.

As the Task Force began the process of developing recommendations, the chairman appointed subcommittees that investigated key questions in depth:

- What should be the City's goal for broadband, and what are the most important future broadband services and applications that could benefit the citizens of Seattle?
- Would bypass (a network using fiber backbone connected to existing copper wire at the DSLAM) be a viable option for Seattle?
- If the City provided a competitive broadband infrastructure, what private companies might have the interest and ability to manage the network, and what companies might offer services?
- What would it take for the incumbent telecommunications providers to reach the broadband goal established by the Task Force for Seattle, and how could the City work with them to improve and increase the broadband facilities available here?

This work, and Task Force discussion of the information gathered, formed the basis of the final report.

Materials provided to the Task Force

Angel, Mike and Reinhardt Krause. "Broadband Providers Monitor Philly's Plans to Offer Citywide Wi-Fi." Investor's Business Daily. September 10, 2004. www.investors.com

Arneson, Carol and Robert Herbst. "Broadband Over Power-Line: A Mid-Term Grade." NATOAS Journal. Fall 2004.

Asbrand, Deborah. "Who Pays for Wireless Cities?" Technology Review.com. September 21, 2004. www.technologyreview.com

Borland, John and Jim Hu. "A Life-Saving Technology." CNET News.com. July 26, 2004.

Borland, John. "Why Policies Must Change." CNET News.com. July 27, 2004.

Borland, John and Michael Kanellos. "South Korea Leads the Way." CNET News.com. July 28, 2004.

"Bandwidth Roundtable." CNET News.com. July 26, 2004.

Black, Roger. "The UTOPIA Story: Wholesale Telecommunication Services and Regional Development." Paper prepared for the Law Seminars International Conference on The New Face of Wireless Broadband. Seattle: September 30-October 2, 2004.

Birnbaum, Jay. "BPL: A Third Alternative for Broadband Access." NATOAS Journal. Fall 2004.

Caruso, David B. "Philly Considers Wireless Internet for All." Netscape News with CNN. Accessed September 2, 2004. http://cnn.netscape.cnn.com

Federal Communications Commission. Availability of Advanced Telecommunications Capability in the United States, FCC 04-208, GN Docket No. 04-54, Fourth Report to Congress. Washington, D.C., September 9, 2004. www.fcc.gov

Gillett, Sharon E., William H. Lehr and Carlos Osorio. Local Government Broadband Initiatives. Massachusetts Institute of Technology Program on Internet and Telecoms Convergence, 2003.

Hu, Jim. “Cable, DSL Face Threats.” CNET News.com. July 29, 2004.

Information Technology Residential Survey. City of Seattle. 2004.

“Intel and WiMax: Accelerating Wireless Broadband.” Intel.com. Accessed September 3, 2004.

Tedeschi, Bob. “Big Wi-Fi Project for Philadelphia.” New York Times. September 27, 2004.

“Understanding Broadband Demand: A Review of Critical Issues.” Office of Technology Policy, U.S. Department of Commerce, September 23, 2002.

“Welcome to Broadband City.” BusinessWeek online. October 4, 2004

Yi, Matthew. “Widening Wireless: New WiMax Technology Allows Broadband Users to Access Internet from More Places.” SFGate.com. September 27, 2004.

Speakers

Jonathan L. Kramer, nationally recognized expert on cable television and wireless technology, law and regulation

Mark Anderson, nationally recognized information-technology expert

Rick Coma, vice president, product, 360networks Corp.

Harminder Gill, vice president, network architecture at 360networks Corp. and engineer with experience in wireless, voice, and data networking

Joel Sybrowky, executive vice president of DynamicCity

D. Keith Wilson, CEO of DynamicCity

Joel Hobson, network services manager for the City of Spokane

John Smith, director of telecommunication services for Chelan County Public Utility District

Steven J. Klein, Tacoma Power superintendent who lead development of the Click! Network

Michael Bookey, consultant assisting communities in building and operating open-access community fiber networks

Mike Apgar, chairman and founder of Speakeasy

Mark Schmidt, Qwest technical director of technology management and network architectures

Len Rozek, senior vice president of the Washington market for Comcast Cable’s Western Division

City of Seattle speakers:

- **Stan Wu,** Department of Information Technology
- **Rich Richmire,** Seattle Department of Transportation
- **Hillary Hamilton,** Fleets and Facilities Department
- **David Docter,** Seattle City Light
- **Tony Perez,** Office of Cable Communications, Department of Information Technology
- **Dean Arnold,** Department of Information Technology

Appendix E: Subcommittee Reports

Report of Subcommittee on Goal and Applications

This committee was charged with developing the City's goals and objectives, in keeping with the potential for future applications. The committee was unanimous in its belief that the City must stretch to ensure that the long-term deployment of broadband technologies will provide a firm foundation for a digital tomorrow. Further, the committee agreed that given present circumstances, the likelihood of real market competition capable of attaining this goal was negligible in the short term. Further, the committee believes that a monopoly provider has no incentive to deploy a more capable network other than to achieve its own profitability, and that this situation could be detrimental to the long-term interests of the City, its organizations and its residents. As a result, the Task Force recommends that the City adopt the following goal:

> **Within a decade, all of Seattle will have access to an advanced, interactive, open broadband network offering affordable connectivity with sufficient bandwidth and quality of service to meet the information, communications and entertainments needs of the City's citizens, businesses and institutions.**

The Task Force recognizes that we are in an early stage in the evolution of broadband networks. The current HFC (hybrid fiber/coaxial) and DSL (digital subscriber line) systems deployed by cable and phone companies provide limited and highly asymmetric bandwidth. Currently, Comcast offers a maximum of 3-4 Mbps, and Qwest 1.5 Mbps, in the downstream direction to residents. Both offer very limited bandwidth in the upstream direction. The current HFC cable network experiences severe bandwidth bottlenecks at the last mile connection to the home, and Qwest DSL service is not expected to increase beyond 7 Mbps in the foreseeable future. True broadband connectivity, and the innovative and transforming applications it will engender, will not be achievable at these relatively meager throughput levels. We agree with the following statement from the US Department of Commerce:

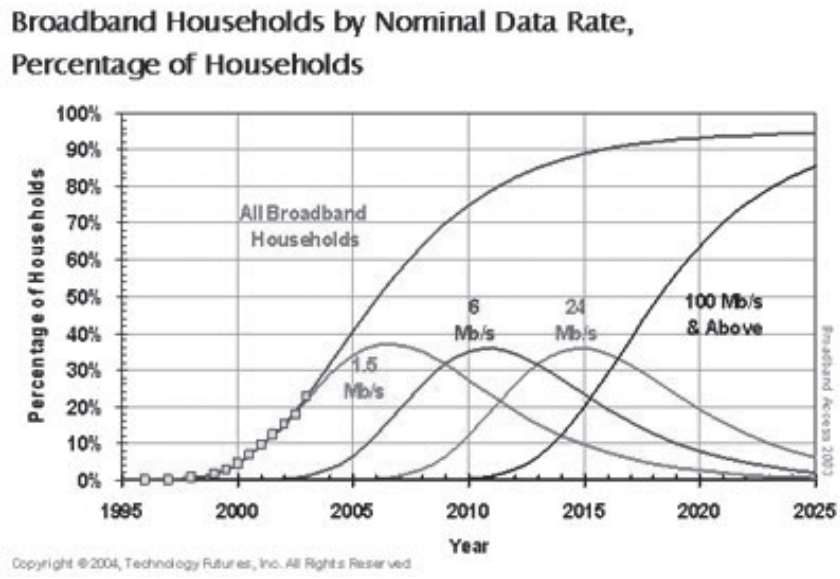
> *It is important to note here that the current generation of broadband technologies (cable and DSL) may prove woefully insufficient to carry many of the advanced applications driving future demand. Today's broadband will be tomorrow's traffic jam, and the need for speed will persist as new applications and services gobble up existing bandwidth.*

The current broadband providers in Seattle may eventually make the necessary investments to their networks to allow for substantial more bandwidth to end users, as profits are generated from existing applications. However; it is uncertain when, and if, they will. More likely, incumbent operators will want to maximize return on their investment in current plant facilities and will gradually introduce new services requiring only incremental increases in bandwidth that can be supported by existing networks. It is also possible that incumbents will resist making more bandwidth available if new applications might threaten their current business models. If the City leaves its broadband future solely in the hands of private operators, it is possible that the long-term bandwidth demands of its businesses and residents will go unmet.

Young people today are the early adopters of new technology and will be workers within the next few years. The recently-completed Seattle residential phone survey shows that they will be using applications that require more and more bandwidth. We are heading towards an inflection point at which demand for bandwidth, computing power and memory; lower prices for fiber and optical equipment; and capital will converge. The City must begin to create the conditions that will result in an advanced broadband network so that it will be well-positioned when that moment arrives. Decisive actions that the City takes now will preserve our standing as a technology leader and sustain the competitive advantages Seattle enjoys as a result of high technology.

Increasing bandwidth demand

While this paper emphasizes that demand for bandwidth-hungry applications will continue to rise over time, we should also note that many new or enhanced applications will only be possible when there is a network with sufficient bandwidth in both directions. It is important to understand that many of the most innovative Internet applications we take for granted today, such as e-mail, the World Wide Web, browsers and peer-to-peer file sharing, were created by people experimenting with the bandwidth available to them, not the owners of the networks. Future applications will expand as the capabilities of networks and end-user devices are improved. These applications will only be achieved in an interactive, open and affordable high-speed environment. Limitations in our current environment will hinder or delay these advances.



As the graph illustrates, demand for applications requiring more bandwidth will spur the development of networks offering higher data rates. By 2006, 24 Mbps connectivity will require fiber to, or close to, the home. By 2010, construction of 100 Mbps fiber-to-the-home (FTTH) networks will begin to take hold.

Broadband applications for our future

The saying is "You can never be too rich or too thin." In the world of telecommunications networks and technologies, your network can never be too fast or too wide. Imagine this future:

Your child attends the neighborhood school because of your expressed preference that he have a social network close by. But he has qualified for the gifted classes offered at one of three schools, none of which is in your neighborhood. Through the municipal broadband network, he and dozens of other children can videoconference together for advanced learning opportunities. He can see and be seen by all of the other youngsters in this program.

Your neighborhood association meets each month, but the timing is inconvenient for you, with your late-night work or child care responsibilities. You and your neighbors can watch and listen from other locations and even participate online seamlessly, should you have a question or comment.

You don't want your construction timetable to lag due to a late inspection. Over the wires, your contractor can provide a step-by-step visual tour of your foundation, wiring or plumbing, and archive the information for the residential database. Both your municipal government and you will save time and money.

You have a small claims case and a court date, and require a sign language interpreter. The court, the interpreter and you are videoconferenced together visually, avoiding an appearance in the downtown court for both you and the interpreter.

Your mother is visiting, but seems to have developed a complication of an existing medical skin ailment. Rather than visiting your doctor, you are able to network with her physician for observation, diagnosis and determination of ongoing treatment.

Broadband applications will drive demand for bandwidth

IP Video Programming

IP video distribution will be one of the primary applications driving future bandwidth demand. Two-way video distribution and interactive video could begin to strain the capacities of existing networks, as on-demand feature films, advertising clips, educational programs and other content grow in popularity. As consumer electronics, particularly digital video equipment, become cheaper and more sophisticated, more users will become creators and distributors of video content.

HDTV could eventually replace the NTSC standard as the dominant viewing format. As HDTV becomes more prevalent, consumers will also want to access HD IP video streams. Regular digital movies can be delivered using 1.5-3 Mbps under current compression standards, while fast-action sports will take about twice that much. It will require about 10-19 Mbps to stream HDTV video, and double that if progressive instead of interlaced scanning is used. If two or more televisions are being used at the same time to watch different HDTV programs, additional bandwidth will be required.

There are currently 8-9 million HD-capable households in the U.S., with projected growth to 60 million households

(approximately half of all TV-watching households) by 2008. Consumers who paid top dollar for these televisions will want to watch HDTV programming.

Home Networking

Leading consumer technology companies (e.g., Microsoft) and pundits have speculated, and are developing products to ensure, that the home of the future is one in which intra-home networking will play a significant role. IP-enabled devices will be commonplace throughout the home and will all be networked: for example, interactive TVs in multiple rooms will be able to stream video content off a central server, and Internet capabilities built into ordinary appliances will enable users to videoconference with relatives while working in the kitchen. The fact that in the future, high-bandwidth applications will be available from many more locations and in many more situations in the home than is the case today makes it all the more critical that high-bandwidth connections to the home exist. Although the term "home networking" refers specifically to network infrastructure within the home, the applications that that infrastructure enables will only realize their full potential if there is sufficient connectivity between the home and the outside world.

Increased numbers of home consumer devices (not just computers and televisions) will be connected by wireless networks. These networks will communicate with the Internet via nodes or residential gateways connected to broadband connections.

Telemedicine

The high cost of access to advanced medical services provides the value proposition for telemedicine, which broadly refers to the provision of such services remotely over broadband networks, for a cost that is often significantly lower than if caregivers and patients were in the same location. These services include:

- Remote monitoring and assessment of the health of patients at home
- Videoconferencing between patients and caregivers
- Timely remote transmission of X-rays, medical imaging, and other data-intensive medical information
- Remote training for medical professionals

Broadband networks that supports telemedicine will also drive economic activity by creating markets for new medical informatics devices that utilize these networks.

E-Government/E-Democracy

The small scale of municipal government makes it especially well-suited to direct civic participation, such as citizens making their voices heard at City Council meetings or sitting on city advisory boards. Currently, one major limiting factor on civic participation is the logistical difficulty involved: citizens may find it challenging or impossible to attend City Council sessions held during business hours, for example. E-government technologies are intended to bridge that gap by making it easier for citizens to virtually participate in government discussion, such as through videoconferencing, and thereby make their voices heard in ways that would be impossible for them to do in person. Broadband is important to these technologies because they often involve two-way video transmission, to offer citizens a literal view into government activity, as well as allow City officials to more richly perceive and better understand citizens who remotely participate in government. In significant ways, e-government applications enable municipal governments to become governments of the people, and therefore democracies in the truest sense of the word.

Education and Distance Learning

Educational applications are expected to make robust use of future broadband networks. When educators and students are situated in different locations but could benefit from being united in the same "virtual classroom," the potential exists for broadband networks to enable remote education to take place. Remote education programs that utilize the Internet, such as the Education Program for Gifted Youth (EPGY) at Stanford University, do exist today, allowing, in the EPGY case, gifted students to attend classes to which they otherwise would not have access in their local area. Higher-bandwidth networks will open new horizons for these students and their teachers by enabling new types of assignments and interaction that would not have been conceivable before. Consider the following examples:

- Students engaging in a "virtual discussion section," a high-definition videoconference with one another as well as the instructor
- Students in a geography class participating in an interactive, 3-D streaming simulation of the area of the world they are currently studying
- Expert, field-leading instructors being able to provide face-to-face high-definition advice in real time to students around the world
- Students taking a remote examination that involves a component in which remote proctors administer a verbal quiz to each student in real-time

Digital Media Production
Audio and imaging professionals, as well as consumers, are increasingly moving from analog to digital equipment: from film to digital still cameras, cassette-based to digital video cameras, and tape-based to digital audio recording systems. As digital technologies increase their market share in these segments, two developments will occur:

1. On the production side, the need for bandwidth will increase. As these technologies develop and become capable of supporting higher quality and resolutions, the size of the media files involved will only grow. The larger these files, the more bandwidth will be needed by digital media professionals, who will use broadband networks to transfer content between offices, studios or recording locations. This demand will increase as the trend for media professionals to create content in diverse locations, and for individuals and organizations around the world to collaborate on creating works of content, takes off.

2. On the consumer side, the need for bandwidth will increase. Future trends in media consumption include the increased availability of live programming from concert or show venues, programming from other countries, and the purchase of media content directly from producers, who may be individuals or small businesses. All of these consumption trends demand increased bandwidth.

The following are trends unique to specific segments of the digital media industry:

Digital photography. At the top end of the digital photography market today, one can purchase cameras that appeal to both amateur and professional photographers and are capable of shooting images comprised of 6-12 million pixels. The "mega pixel" count in digital cameras is aggressively trending upward. The more pixels an image or video file consists of, the more bandwidth will be needed to transfer it across a network in an acceptable amount of time.

Digital movies or television. Television programming is increasingly moving to high-definition television (HDTV), as well as digital video on demand, not only for standard programming but increasingly also for programming that is live or comes directly from the content creator. Both of these trends require high bandwidth.

Digital audio. While audio generally requires lower bandwidth than images or video, the increased popularity of audio books and other on-demand audio content will drive the need for more bandwidth.

Telecommuting
Telecommuting has many advantageous implications for Seattle and its residents. It allows knowledge-based workers to better balance the demands of family and work, and also promises to reduce traffic congestion and air pollution. One current obstacle to increased telecommuting is that not all managers are convinced that employees can be as efficient at home as they are at the office, partly because most businesses LANs are connected at 100 Mbps or more, while residential bandwidth, particularly upstream, is typically a fraction of that. When residential bandwidth increases, employees working from home will be able to access corporate network resources faster and will therefore be more efficient. In addition, telecommuting will create more job opportunities for people with physical disabilities.

Interactive Entertainment
It may come as a surprise to some, but demand for bandwidth in South Korea, the country with the world's highest broadband penetration as well as some of its most affordable broadband rates, was spurred by the popularity of "PC bangs," or community clubs where people congregate to play online computer games. Many online games experience performance problems due to the low quality of service (low availability, or high latency or jitter) of the network.

Remote Museums
There will be interest in having sufficient bandwidth to conduct virtual tours of the world's art treasures. Some entrepreneurs are purchasing digital rights to art pieces; in the near future, it is conceivable that residents will be able to display selected works of art on digital "frames" within their houses. Instead of regular frames containing pictures, these frames will be flat-panel screens capable of displaying, say, the Mona Lisa. When residents tire of contemplating her enigmatic smile, they can switch to a Picasso, Monet, or any work of art available digitally. Broadband networks are important to this application because they will enable art images to be transferred more quickly and in higher resolution from central servers to the homes of art consumers.

Simultaneous Use of Applications

Finally we should note that the digital home of the future will use many of the above applications simultaneously, putting increased demand on the network, particularly at peak periods. If one child is watching an HDTV film and another is playing an online game, all while one parent is teleconferencing with a teacher and the other is watching a video clip on the Internet, bandwidth demands increase substantially.

Principles for Seattle's Future Broadband Network

Openness

It is important that the City have a network that is technically open—one that is agnostic regarding the organizations delivering content and the types of content being delivered over it.

The history of the Internet demonstrates that one of the key elements of its success was that it was architected from an early stage with transparency in mind. The modern Internet utilizes open networking protocols (Ethernet, IP, TCP, HTTP and others) that are nondiscriminatory by design, as well as a decentralized system of routers that implement these protocols. Combined, these factors make it difficult, if not impossible, for the network to discriminate for or against different types of content. The "dumbness" of the network, in which all the intelligence resides in the client and server computers on either end, guarantees a level playing field for Internet commerce in which any company that provides a useful service, regardless of its size or influence, will be able to reach a global audience—a fact that has enabled Internet entrepreneurship to flourish in ways that have changed the lives of many.

The City should take to heart this lesson that openness is key to a healthy and successful network, be it on a municipal or a global scale. It should develop a network that is open in at least two important respects:

1. **The network should support multiple protocols and providers, at least at the logical layer and possibly also at the data link layer.** It is essential that multiple service providers be able to utilize City infrastructure to provide retail services, as competition among service providers will necessarily lead over time to improved service and lower rates. An open architecture at the logical layer should be adequate to enable service providers to provide competitive offerings. Openness at the data link layer would be even better, giving service providers increased flexibility and more dimensions along which to compete.

2. **The network should utilize open, industry-standard protocols.** While service providers will be able to determine most of the protocols utilized, the City may need to select protocols at the data link layer if the network is designed such that that layer is not open. In that case, an open protocol such as Ethernet should absolutely be selected for that purpose.

Affordability

We must do more to lower the price per megabit. Broadband prices of $45 for a theoretical maximum of 3-4 Mbps of asymmetric bandwidth are beyond the reach of many. In Japan, citizens can pay $25 per month for 10 Mbps of bandwidth. Cable TV operator rates have increased by over three times the rate of inflation over the last seven to eight years, and in Seattle, the price of the most popular tier of cable TV service is now $42.99. The "Law of 72" tells us that in ten years (of annual 7% increases), that price will double. Since wages will not increase at these rates, more citizens will be increasingly unable to afford services that are becoming necessities. Our residential survey establishes a correlation between income and high-speed Internet access. Will some of Seattle's children go home to do their homework assisted by broadband connections with rich full-motion video and quick access to the world's information, while others use dial-up?

Ubiquity

To achieve widespread use of advanced and high-bandwidth applications, to encourage the development and implementation of new applications, and to realize the efficiencies and outcomes, a sizable percentage of users must have access to the network at an affordable price. "In other words, as more people adopt broadband, the market is likely to devote more resources toward the provision of innovative advanced services that encourage more people adopt broadband." (Availability of Advanced Telecommunications Capability in the United States, FCC04208, Fourth Report to Congress, September 9, 2004.)

In addition, computer scientist Robert Metcalfe posited the widely-accepted notion that **the value of a network increases as the square of the number of its users.** In other words, for each new user who joins a network, the total number of interconnections in the network—and therefore its overall communicative potential—increases by the number of current users. This is another reason why it is important that the City develop a network that is accessible, affordable, open and ubiquitous: so that it will appeal to the maximal number of Seattleites. The more Seattle residents are on the network—the more Seattleites telecommute, take classes, or participate in electronic government forums over it—the more effective it will prove to the community.

Interactivity

The promise of broadband lies in its ability to deliver applications that are both content-rich and interactive. Telecommunications systems today offer one but not the other: for example, cable TV networks offer rich content featuring no interactivity save the ability to switch among channels, whereas telephone networks offer significant interactivity over a very narrow bandwidth. The interactive, high-bandwidth nature of broadband will enable the new types of applications discussed elsewhere in this section.

Quality of Service

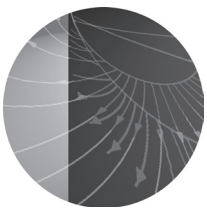
Our goal is a network that offers not only sufficient bandwidth but also a sufficient quality of service that the experience of utilizing that bandwidth will be pleasurable for Seattle's residents. The "quality of service" of a broadband network refers to those attributes other than bandwidth that define the network's effectiveness. Although there is no standardized definition of the term, the key attributes it encompasses include:

- **Availability.** The percentage of time during which the network is operational. Actual and perceived reliability are key to the effective adoption of any broadband network, for no network, no matter how fast, will be widely adopted or thought pleasurable to use if it cannot be accessed on a regular basis.

- **Latency.** The amount of delay involved in transferring data between any two points on a network. Latency beyond a certain point will make any network unusable for applications in which real-time data transfer is essential, such as telephony or videoconferencing.

- **Jitter.** The "burstiness" of data transfer over the network, which should be kept to a minimum.

Quality of service should be treated, in addition to bandwidth, as a key metric along which the performance of the City's network will be assessed.



Report of Subcommittee on Partners

Introduction

Subcommittee Charge

The Subcommittee on Partners was directed to explore three questions:
If the city provided a competitive broadband infrastructure, what private companies might have the interest and ability to manage the entire business including customer service, marketing, and working with service providers?

What service providers might offer data, voice and video services?

Could the cost of these services be competitive with those available today?

Subcommittee Members

The subcommittee members are Art Butler, Bill Baron, and Huat Chye Lim.

Methodology

Our principal means of data collection were telephone conversations and the web. We spoke to representatives from the various telecommunications companies, and we extracted data from the web sites of planned or existing broadband services. Those broadband services are shown in Appendix 1.

Given the limitations of time and personnel, our data is necessarily anecdotal rather than comprehensive.

Definition of "Business"

We took the word "business" as used in our charge to encompass operation of a citywide broadband network, including provision of voice, video, and data services.

Companies to Manage the Entire Business

If the city provided a competitive broadband infrastructure, what private companies might have the interest and ability to manage the entire business including customer service, marketing, and working with service providers?

This question focuses on the wholesale business of providing data transport over a broadband network, plus handling relationships with retail service providers.

There are three main aspects to managing a wholesale fiber-to-the-premises network. First, network administration -- the day-to-day management of a large Ethernet network: ensuring that the network operates optimally, service quality is maintained, service connections are provisioned, and upgrades are deployed. The City could provide these services itself, as does Provo, Utah, or the function can be contracted out to firms such as Dynamic City, the consultant/project manager for the UTOPIA network, to US Metronets, or to an Ethernet network administrator such as IP Solutions, which provides network administration services remotely.

The second aspect is back-office functions such as recruiting service providers, negotiating agreements with them, monitoring the resulting service level agreements, and tracking payments due; managing procurements; and maintaining compliance with regulations and franchise requirements. Dynamic Cities or US Metronets can provide these services.

The third aspect is customer-related functions, like marketing, billing, and customer service. Typically, marketing and billing are handled by the service providers themselves, due to the provider's desire to "own the customer." In Dynamic Cities' model, first-line customer service is provided by the service providers, with referrals back to Dynamic City if the problem is network-related. US Metronets takes a different approach, handling both billing and first-line customer service.

Private companies are available to provide these services, and they are interested in working with Seattle. Evaluating their technical and financial ability to do so is difficult. The projects in which they are involved are in their early stages, and so technical success has not been demonstrated. Further, those projects are significantly different from Seattle's in size and scope.

Service Providers

What service providers might offer data, voice and video services?

Based on conversations with a number of service providers and consultants, there appears to be substantial interest by service providers in providing services on an FTTP network in Seattle. Service providers have difficulty justifying large capital expenses in smaller communities, where the number of potential subscribers is low. But Seattle's size makes it an attractive market, and Seattle's reputation for technological sophistication adds to that allure.

Data services are widely available from any number of Internet service providers. Twenty are available through Grant County's Zipp service. Conversations with Speakeasy.net suggest that it would certainly be interested in providing ISP services to Seattle.

IP-based telephone services are becoming more widely available. Each of the networks listed on Appendix 1 except Tacoma offers residential telephone service. Grant County's Zipp service lists three providers. Bristol's (VA) Optinet appears to offer businesses more complex telephone service options. US Metronets suggests that it would be wise to allow for TDM connectivity on the network, so that traditional telephone service providers can participate.

Two companies that we have talked to would be eager to provide triple play services (voice, video, and data) to Seattle: MStar and HomeNet. HomeNet, the private partner behind the Provo and Grant County broadband systems, aims to be a non-facilities-based provider of services to FTTP IP municipal networks. It offers data and video on the Grant County system and offers triple-play services on the Provo system. MStar, an established ISP, is providing a triple-play to the Utopia network by contracting for video content and a third-party VoIP service.

We contacted Verizon, MCI, Covad, and Qwest for their views on participating in a Seattle broadband network. At this time, primarily for philosophical reasons, Verizon was not interested in contracting with the City or providing services on a fiber network the City might build.

MCI stated that it is exploring the possibility of being a service provider on the Utah networks and would definitely be interested in being a service provider on a Seattle network if one were built. However, we wonder whether this position will continue if the proposed purchase by Verizon is completed.

Covad says they would be interested in providing voice and data services, and possibly video, but only if the City built its own head end. However, Covad would prefer to be the sole provider for at least a period of time. Key issues with Covad include whether CPE must be provided and whether inside wire can be used.

Qwest did not dismiss the idea out of hand, but stressed that a number of questions would have to be answered before Qwest could decide what its involvement might be. Such issues would include network deployment/management plan and architecture; network ownership and management; ability of Qwest to integrate network architecture into its own systems; regulatory treatment of Qwest in marketing partnership services; status of competing providers; the City's requirements/ expectations regarding take rates, pricing, capital recovery plan, product design, etc. Also, Qwest would be concerned about its ability to manage the network on a deregulated basis, which would be dependent on the types of management services sought by the City and the ability of Qwest to provide efficient services from a deregulated affiliate. A final decision would also depend on the array of management services sought; i.e., marketing, sales, billing and collection, product development, product management, network maintenance and repair, customer care, etc. And the nature and term of any partnership agreement would have to be addressed. Not knowing the architecture of the network, Qwest was not able to comment on the range of services that might be offered; obviously, the higher the bandwidth deployed to customers, the more service options that would be available.

Though we did not speak to them, Eagle Broadband may be of interest. They are a triple-play provider to smaller communities. They recently announced a deal with GlobeCast, the broadcast services division of France Telecom SA, to provide IPTV services. Eagle and GlobeCast would install a remote head end to receive and process video, as well as the other components required to put IPTV content on a broadband network. The network operator would avoid a large upfront cost, paying instead on a monthly basis.

Service providers are available for data, voice, and video. As might be expected, in general the smaller companies are eager for a relationship with Seattle; the larger companies are more reserved.

Cost of Services

Could the cost of these services be competitive with those available today?

Services provided over the broadband networks we have reviewed appear to be cost-competitive.

One broadband cable Internet service available in Seattle (Comcast) costs $46/month (when bundled with cable TV). For the wholesale-competitive systems on Appendix 1, the cost for a comparable speed connection ranges from $35 to $40.

Comcast's cable TV service in Seattle costs about $55. For the wholesale-competitive systems on Appendix 1, the cost for comparable video services is under $40.

For a Seattle consumer, the cost of a triple play might range from about $115 to $140. For the two wholesale-competitive systems offering triple-plays on Appendix 1, the costs for comparable services range from $68 to $110.

A Dynamic Environment

Assessing the interest and ability of private companies to provide these services is particularly difficult at this time. As noted above, many of the players today are relatively small and the projects in which they are involved are in their early phases. Further, no U.S. city comparable in size to Seattle has committed to a major municipally-led FTTP deployment. When and if Seattle or any other city does so, one would expect the market for these services to change substantially. For example, incumbents like Verizon, who today will not consider providing services, might change their philosophy if the marketplace changes significantly. In addition, providers such as Covad or Qwest who might predicate their entrance into the Seattle market on incentives such as a guarantee of exclusivity might roll back or drop such requirements were the marketplace to change.

Given this dynamic situation, we recommend that the City revisit this issue at frequent intervals as consideration of a broadband network proceeds.

Other Issues: Competition

Several service providers raised the issue of unrestrained competition. While most are willing to discuss non-exclusive arrangements, some are wary that "open access" means a wide-open situation where they will be forced to compete against an unlimited number of competitors, some of which will offer cheap services based on an inadequate or under-capitalized business model. We believe the City should give careful consideration to this concern and articulate what it means by "open access." The City may want to intelligently impose guidelines on service providers on an "open" broadband system to protect the interests of citizens as well as the reasonable business interests of providers. Such guidelines may include stringent service level agreements, minimum qualifications for service providers, designated niches for providers, and limitations on the number of providers.

Table 1

	OptiNet Bristol, VA	iProvo Provo, UT	Zipp Grant County, WA	Chelan County Fiber Optics Chelan County, WA	Hometown Utilicom Kutztown, PA	Click! Network Tacoma, WA
Operated by?	MEU (Bristol Virginia Utilities)	Municipality (Provo City)	PUD (Grant County PUD)	PUD (Chelan County PUD)	Municipality (Borough of Kutztown)	MEU (Tacoma Power)
Business Model	Retail noncompetitive	Wholesale competitive	Wholesale competitive	Wholesale competitive	Retail noncompetitive	Retail noncompetitive for video, wholesale competitive for Internet
Internet	Low: 1Mbps down, 256Kbps up/$27 High: 3Mbps down, 256Kbps up/$40	Low: 1.5Mbps down, 1.5Mbps up/$40 High: 10Mbps down, 10Mbps up/$60	$35-40. Speed is unspecified, but is under 5Mbps	3Mbps down, 384Kbps up/$35	Low: 1Mbps down, 64Kbps up/$15 High: 1Mbps down, 1Mbps up/$40	Low: 1Mbps down, 128Kbps up/$30 High: 3Mbps down, 256Kbps up/$45
Video	Broadcast: $12 Extended basic: $37 Premium: $46-$70	Extended basic: $40 Premium: $55+	Basic: $50-$60 Premium: $85 (Note: These prices also include Internet service)	None yet, though the first will roll out soon	Basic: $16 Premium: $60	Broadcast: $7 Basic: $26 Premium: Can add a la carte options; total cost is typically $65+
Voice	Basic line: $15	Basic line: $30	Basic line: $18	Basic line: $12	Basic line: $12	None offered
Triple Play Price Range	$80-$125	$90-$125	$70-$105	N/A	$45-$115	N/A
Notes	Customers assemble their own service package piecemeal; the total cost of offerings must exceed $45/month. Charter Communications is the ILEC.	iProvo is still being built out. Currently, one retail provider has been lined up, HomeNet, which coincidentally also does business in Grant County.	Service is provided by a wide variety of small, regional providers, many of whom also serve Chelan County. There is a total monthly Internet usage limit of 40GB/user.	Service is provided by a wide variety of small, regional providers, many of whom also serve Grant County.		Tacoma Power offers video on a retail basis to customers, but sells fiber wholesale to ISPs, who then offer retail Internet service to customers.

Additional notes
All rates cited above are monthly.
"Retail noncompetitive" means that the network is closed to competition and capacity is sold directly to consumers.
"Wholesale competitive" means that the network is open to competition and capacity is sold on a wholesale basis to service providers that then resell it to consumers.
MEUs are Municipal Electric Utilities.

Letter from Qwest to the Subcommittee on Working with Incumbents

February 17, 2005

Dennis Okamoto
City of Seattle Broadband and Telecommunications Task Force
Department of Information Technology
Key Tower, Suite 2700
700 Fifth Avenue, PO Box 94709
Seattle, WA 98124-4709

Dear Dennis,

I am writing in response to your letter to me dated February 7, 2005. First, let me say that Qwest looks forward to working with the Broadband and Telecommunication Task Force ("Task Force") in pursuing its goal to improve broadband facilities and services in Seattle. In fact, as Mark Schmidt presented at the Task Force's January 12th meeting, Qwest has engaged in significant DSL deployment in the Seattle area over the past 5 years and is currently engaged in evaluating new technologies for broadband deployment in the future. Also, as I'm sure you are aware, Qwest has a significant broadband network investment in the core Seattle area.

Your letter included 5 questions regarding issues that the Task Force is interested in pursing with incumbent broadband providers as it formulates its recommendations to the City. I will respond to each area in order to give you a general perspective on the role that Qwest might play in your plan.

- What would it take for you to meet the Task Force's goal of having Seattle become a leader in having available throughout the city a broadband network capable of supporting simultaneous voice, two-way video, and data applications?

Qwest Response:
In order for Qwest to respond to this question from both a technical and an economic perspective, it would need specific details regarding the scope, scale, and technology envisioned for the network. As previously stated, Qwest has a significant network already deployed in Seattle, however its ability to deploy services capable of supporting simultaneous voice, two-way video, and data applications varies depending on location.

Another consideration is customer demand. As Mark Schmidt intimated in his presentation, Qwest has numerous examples of relatively low utilization of the network facilities it has deployed to offer consumers broadband services. Like any business, Qwest is concerned about its ability to recoup its investment over a reasonable time period.

As a final note on this issue, and this may be the Task Force's next step, Qwest would recommend that the Task Force use a Request for Information or "RFI" format to further develop its plans. The greater specificity in an RFI would allow Qwest and other providers to better match its capabilities to the expectations of the Task Force.

- What could the City of Seattle or other public entities do to facilitate the provision of broadband by your company? and,
- Are there incentives that might be offered, or obstacles that might be removed, to encourage you company to upgrade its broadband facilities?

Qwest Response:
Qwest is always receptive to ways to reduce costs and deploy its services more efficiently. Following is a non-exhaustive list of some ideas to achieve these ends:

o Minimize restrictions on the size of the equipment we place in the right-of-way (cabinets etc.)
o Minimize the level of restoration required for street cuts (street or concrete patch in lieu of full panel replacement).
o Remove the requirement to change cabinet colors when placing equipment in the right-of-way (cabinets are often required to be repainted a color other than tan or brown).
o Convert existing City easements to utility easements (e.g., Seattle City Light type easements).

o Allow placement of cabinets and equipment in the public right-of-way in those instances where we cannot secure a private easement.
o Minimize or eliminate site set-up space fee. This fee increases cost on large projects that require large work areas.
o Facilitate speedy provisioning (from City's power division) of electricity to satisfy DSL/electronic cabinet power requirements.

- Would your company consider entering into a partnership with the City of Seattle, to operate a city-owned broadband network?

Qwest Response:
Qwest would prefer that the City of Seattle allow the telecommunications industry the opportunity to respond to the market for broadband services in an open and unfettered environment. As a general rule, Qwest opposes government intervention, by way of infrastructure ownership, because of the adverse economic effects such action has on private industry. Notwithstanding those concerns, if the City of Seattle chooses to proceed with broadband infrastructure deployment and wishes to employ a telecommunications company to manage the associated network and services, Qwest would certainly be interested in evaluating the opportunity. Consistent with some of my previous statements, however, before Qwest can commit to any type of partnership it would need to better understand the scope, scale, and technology of the network deployment and the target market. It should also be noted that as a regulated utility, Qwest is subject to a number of regulatory and legal requirements that will need to be considered for this type of project. These requirements include, but are not limited to; nondiscrimination statutes, service quality rules, resale and unbundling requirements, public safety requirements (911), and network performance requirements. Until Qwest has a better understanding of what a 'partnership' with the City entails, it cannot determine with any specificity whether such an arrangement would be in the best interests of its shareholders.

- Would your company consider exploring with the City a partnership to develop and test applications using state-of-the-art broadband that benefit citizens (e.g., two-way-video allowing citizens to participate in government hearing)?

Qwest Response:
Qwest would be interested in working with the City on such applications, but would need more information on the program prior to committing personnel and resources.

Hopefully, these responses will be helpful in your initial deliberations on this project. Please feel free to call me should you have any questions in regard to Qwest's position on these or other issues. We look forward to working with you as the project proceeds.

Letter from Comcast to the Subcommittee on Working with Incumbents

February 21, 2005

Mr. Dennis Okamoto
City of Seattle, Broadband and Telecommunications Task Force
Key Tower, Suite 2700
700 Fifth Ave.
Seattle, WA 98124-4709

Dear Mr. Okamoto,

I am writing in response to your letter of February 3, 2005. We appreciate the opportunity to work with the City of Seattle's Telecommunications and Broadband Task Force. We believe that our network has far greater capabilities than was initially anticipated by the City.

We believe we address below the questions posed in your letter. However, we would both benefit from continuing to work together. This would allow us to better understand the specifics of the City's vision and allow us to more specifically address

those initiatives.

The following is organized based on the questions included in your letter:

1. What would it take for you to meet the Task Force's goal of having Seattle become a leader in having available throughout the City a broadband network capable of supporting simultaneous voice, two-way video, and data applications?

RESPONSE: While we generally understand the Task Force's overall goal, we would need additional specifics on the applications that you don't believe we are capable of providing with our network. We believe that the network we have in place is either already providing these services today (as generally described above), or capable of providing these services in the next year. I've attached a copy of the presentation we made to the Broadband and Telecommunications Task Force on January 26, 2005 as reference material.

Additionally, as we migrate to an IP Platform our ability to offer new and differentiated products will continue to develop and grow in the future.

2. What could the City of Seattle or other public entities do to facilitate the provision of broadband by your company?

RESPONSE: As noted in our answer to Question #1, we need to understand the specific services that the City has concerns about Comcast delivering with our existing platform. The company currently operates a broadband network that offers high-speed Internet, enhanced television and telephone services (later this year) to our customers.

3. Are there incentives that might be offered, or obstacles that might be removed to encourage your company to upgrade its broadband facilities and services?

RESPONSE: We believe our network provides all of the capabilities and capacity necessary for the foreseeable future. We will continue to enhance our network as needed for deployment of enhanced services and that process could be expedited by streamlining the permit processes, reducing costs around any right-of-way work such a power supply installation and activation, underground drop replacements, and tree trimming near Comcast aerial plant.

Further, we are open to discussions of incentives and access to existing conduits that could make an investment in expanding our service territory commercially feasible. Our view is that incentives for us, as an existing broadband provider with the network and resources already in place to operate in Seattle, would be far less expensive and far faster to market than attempting to create a new telecommunications system.

4. Would your company consider entering into a partnership with the City of Seattle, to operate a city-owned broadband network?

RESPONSE: We believe that economic incentives to expand our existing operations would be far more cost effective for the City, and result in a far faster implementation (with no operating risk for the City) than attempting to create a separate City owned network.

5. Would your company consider exploring with the City a partnership to develop and test applications using state-of-the-art broadband that benefit citizens (e.g. two-way-video allowing citizens to participate in government hearing)?

RESPONSE: We are certainly interested in exploring applications that the City believes would benefit citizens. Our network has the capability and capacity to provide applications to reach this objective and we remain open to discussing this further with the City.

We look forward to continuing to discuss ways that Comcast can work with the City of Seattle.

Sincerely,

Len Rozek
Senior Vice President
Comcast – Washington Market

Glossary of Terms Used in this Report

Bypass

A term used by the Task Force to describe an emerging approach to providing a broadband network, in which fiber would be connected to existing copper-wire at DSLAMs, bypassing ILEC central offices.

CLEC

Pronounced see-lek. Short for competitive local exchange carrier, a telephone company that competes with an incumbent local exchange carrier (ILEC) such as a Regional Bell Operating Company, GTE, ALLNET, etc.
The Telecommunications Act of 1996 allows companies with CLEC status to use ILEC infrastructure in two ways:
1) Access to UNEs
The availability of unbundled network elements (UNEs) is important to CLEC telecommunications networking. UNEs are defined by the Act as any "facility or equipment used in the provision of a telecommunications service," as well as "features, functions, and capabilities that are provided by means of such facility or equipment." For CLECs the most important UNE available to them is the local loop, which connects the ILEC switches to the ILEC's present customers. With the local loop, CLECs will be able to connect their switches with the ILEC's switches, thus giving them access to ILEC customers.
2) Resale
Another option open to CLECs is the resale strategy. The Act states that any telecommunications services ILECs offer at retail, must be offered to CLECs at a wholesale discount. This saves the CLEC from having to invest in switches, fiber optic transmission facilities, or collocation arrangements.
In any case, a CLEC may decide on one or the other or even both. CLEC status is very beneficial, especially for ISPs, who may easily get access to the copper loops and other switching elements necessary to provide xDSL services.

DOCSIS

Short for Data Over Cable Service Interface Specification. DOCSIS defines interface standards for cable modems and supporting equipment.

Downstream

A transmission from a server to an end user across a network.

DSLAM

Short for Digital Subscriber Line Access Multiplexer, a mechanism at a phone company's central location that links many customer DSL connections to a single high-speed ATM line. (ATM is short for Asynchronous Transfer Mode, a network technology based on transferring data in cells or packets of a fixed size.)
When the phone company receives a DSL signal, a modem detects voice calls and data. Voice calls are sent to the public switched telephone network, and data are sent to the DSLAM, where it passes through the ATM to the Internet, then back through the DSLAM and ADSL modem before returning to the customer's PC.

Ethernet

A local-area network (LAN) architecture that uses a bus or star topology and supports data transfer rates of 10 Mbps. The Ethernet specification served as the basis for the IEEE 802.3 standard, which specifies the physical and lower software layers. Ethernet uses the CSMA/CD access method to handle simultaneous demands. It is one of the most widely implemented LAN standards.
A newer version of Ethernet, called 100Base-T (or Fast Ethernet), supports data transfer rates of 100 Mbps. And the newest version, Gigabit Ethernet supports data rates of 1 gigabit (1,000 megabits) per second.

Fiber, or fiber optics

A technology that uses glass (or plastic) threads (fibers) to transmit data. A fiber-optic cable consists of a bundle of glass threads, each of which is capable of transmitting messages modulated onto light waves. Fiber optics has several advantages over traditional metal communications lines:

- Fiber-optic cables have a much greater bandwidth than metal cables. This means they can carry more data.
- Fiber-optic cables are less susceptible than metal cables to interference.
- Fiber-optic cables are much thinner and lighter than metal wires.
- Data can be transmitted digitally (the natural form for computer data) rather than analogically.

In the future, almost all communications will employ fiber optics.

FTTP

Short for Fiber-To-The-Premises, the installation of fiber-optic cable from a telephone switch directly into the subscriber's home or business.

ILEC

Short for Incumbent Local Exchange Carrier. An ILEC is a telephone company that was providing local service when the Telecommunications Act of 1996 was enacted. Compare with CLEC, a company that competes with the already established local telephone business.

IP

(pronounced as separate letters) Short for Internet Protocol. IP specifies the format of packets, also called datagrams, and the addressing scheme. Most networks combine IP with a higher-level protocol called Transmission Control Protocol (TCP), which establishes a virtual connection between a destination and a source.
IP by itself is something like the postal system. It allows a user to address a package and drop it in the system, but there's no direct link between you and the recipient. TCP/IP, on the other hand, establishes a connection between two hosts so that they can send messages back and forth for a period of time.

Mbps

Short for megabits per second, a measure of data transfer speed (a megabit is equal to one million bits). Network transmissions are generally measured in Mbps.

MMDS

Short for Multipoint Multichannel Distribution System, MMDS is a wireless broadband technology for Internet access. MMDS channels come in 6 MHz chunks and run on frequencies licensed exclusively by the Federal Communications Commission. MMDS is a line-of-sight service, so it won't work well in areas with hills or tall buildings that would interfere.

Packet

A piece of a message transmitted over a packet-switching network. One of the key features of a packet is that it contains the destination address in addition to the data. In IP networks, packets are often called datagrams.

Switch

In networks, a device that filters and forwards packets between local area network (LAN) segments. LANs that use switches to join segments are called switched LANs or, in the case of Ethernet networks, switched Ethernet LANs.

Switched video

Technology that allows a user to choose to download a video stream from any of a variety of servers, as opposed to selecting among videos broadcast or available from a cable company.

UNE

Short for unbundled network element, parts of a network that ILECs are required to offer to their customers on an unbundled basis.

Upstream

A transmission from an end user to a server across a network.

VoIP

Short for Voice over Internet Protocol, a category of hardware and software that enables people to use the Internet as the transmission medium for telephone calls by sending voice data in packets using IP rather than by traditional circuit transmissions of the public switched telephone network. One advantage of VoIP is that the telephone calls over the Internet do not incur a surcharge beyond what the user is paying for Internet access, much in the same way that the user doesn't pay for sending individual e-mails over the Internet.

Wi-Fi

Short for wireless fidelity, refers to any type of 802.11 network, whether 802.11b, 802.11a, dual-band, etc.

WiMax

WiMAX is a standards-based wireless technology that provides high-throughput broadband connections over long distances. WiMAX can be used for a number of applications, including "last mile" broadband connections, hotspot and cellular backhaul, and high-speed enterprise connectivity for businesses.
An implementation of the IEEE 802.16 standard, WiMAX provides metropolitan area network connectivity at speeds of up to 75 Mb/sec. WiMAX systems can be used to transmit signal as far as 30 miles. However, on the average a WiMAX base-station installation will likely cover between three to five miles.