Fiscal Feasibility Analysis

of a

Municipally-Owned

Citywide Wireless Broadband Network

Prepared for the

Board of Supervisors
of the City and County of San Francisco

by the

San Francisco Budget Analyst

January 11, 2007

CITY AND COUNTY OF SAN FRANCISCO

BOARD OF SUPERVISORS

BUDGET ANALYST

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January 11, 2007

Honorable Tom Ammiano, Chair
Government Audit and Oversight Committee
and Honorable Jake McGoldrick
and Members of the Board of Supervisors
City and County of San Francisco
Room 244, City Hall
1 Dr. Carlton B. Goodlett Place
San Francisco, CA 94102-4689

Dear Supervisor Ammiano, Supervisor McGoldrick, and Members of the Board of Supervisors:

The Budget Analyst's Office has been directed by the Board of Supervisors to conduct an analysis of a Citywide municipally-owned wireless broadband network to determine whether it is fiscally feasible for the City and County of San Francisco to own and operate its own wireless broadband network (Motion MO6-0109).

This study concludes that it may be fiscally feasible to build a municipally-owned wireless network. However, to assure initial fiscal feasibility and sustain future fiscal feasibility, the City would need to continually work to contain and manage financial risk in the future in order to maintain a viable wireless service for all of San Francisco.

To assess the fiscal feasibility of deploying a municipally-owned and operated wireless network, the Budget Analyst reviewed projected wireless network capital expenditure needs and operational costs and weighed these estimates against projected revenue streams. The Budget Analyst's conclusion that a municipally owned wireless network may be fiscally viable is predicated on estimated costs and revenues that would need to be tested and verified through competitive bids and proposals and future policy decisions by the City on a variety of issues.

The Budget Analyst considers the fiscal feasibility of any wireless network to include that the project independently produces enough revenue to fund maintenance and operations, and also produce net revenue in order to (a) fulfill its mission, as determined in advance by the City, and (b) to enable future innovation. This would require generating enough net revenue to maintain state-of-the-art technology and continually attract innovative users and suppliers to the network.

The Table below provides a summary of our evaluation on the various models for implementing a Citywide wireless broadband network.

An Evaluation of Models for Implementation of a Citywide Wireless Broadband Network

	Municipally-owned and Operated Model	Nonprofit Model	Public-Private Partnership Model
Estimated Capital costs incurred by the City	$6 million to $10 million	Variable. Dependent on City's financial commitment.	$0
Estimated On-going Operations & Maintenance Costs incurred by the City	$1.5 million to $2 million annually	Variable. Dependent on City's financial commitment.	$0
City's Revenue Source #1	Savings from replacement of existing City technological systems	Savings from replacement of existing City technological systems; however, such savings would be less than under a Municipally-owned model.	Revenue-sharing agreement
City's Revenue Source #2	Access Fees to Users	Revenue-sharing agreement (e.g., 5 to 20 percent of total revenues)	Pole access fees
City's Revenue Source #3	Advertising, grants, and other sources	Pole access fees	
Costs incurred by City residents	- Cost of CPE's[1]: $80 to $200, which could be subsidized through grants or other City resources - Premium service tier - $0 to $10 per month	- Costs of CPE's - $80 to $200 - Premium service tier - $10 to $20 per month	- Cost of CPE's - $80 to $200 - Premium service tier - $20 per month
Advantages	- This model gives the City the most control over the network, its operation and the services it provides to ensure that the City's objectives are fulfilled. - Could generate subscriber revenues which can be used to fund on-going and one-time wireless network costs, as well as to fund digital inclusion programs. - The City would have full management over marketing and advertising services in order to attract subscribers in a competitive broadband Internet service environment.	- City staff would not be required to operate and support the network. - Capital funding is not required from the City; however, the City could assist the nonprofit entity in acquiring such funding. - The City could maintain short- and long-term control over execution, management, operations, and public-private partnerships.	- The City assumes no financial risk. - The City does not have to be involved with the marketing, deployment, revenue generation, and the around-the-clock customer service required to sustain the network.

[1] "CPE" stands for Customer Premises Equipment, which is needed by network users to connect to the wireless network (see "Connection Equipment Costs" section in Chapter 2 of this report).

	Municipally-owned and Operated Model	Nonprofit Model	Public-Private Partnership Model
Disadvantages	- Sources of capital to fund the engineering, design, testing and construction of the network would need to be identified. - This model puts the City in direct competition with private telecommunications and cable companies for the provision of broadband access.	- Sources of capital would need to be identified to fund the wireless network via the nonprofit organization. - The nonprofit organization must assume some market, technology, demand, and funding risks, as well as potentially significant political, legal, and execution risks.	- The City is reliant upon a private company to provide "last mile" access to areas of the City where the company may have no profit incentive to provide a consistent, high-quality service either due to (a) insufficient numbers of network users in those areas, and/or (b) insufficient revenues generated by the users of the network in those areas.

The Budget Analyst has reviewed the City's effort, to date, to evaluate the provision of fiber optic and wireless broadband internet access, which is described in Section 1 of this report. With respect to this effort, the Budget Analyst makes the following points:

a) Through staff discussions within the Department of Telecommunications and Information Services and the Public Utilities Commission, it was decided that the Mayor's goal of providing free wireless internet access would proceed separately and more quickly than a separate study of providing fiber optic broadband internet access to residents and businesses in San Francisco, which is currently being conducted by Civitium and Columbia Telecommunications Corporation;

b) Between the time of issuance of a Request for Proposals for a broadband feasibility study, which was to include all forms of broadband access, both fiber optic and wireless, and the signing of an agreement with Civitium, the purpose of such agreement was narrowed to focus exclusively on the feasibility of a wireless broadband network, and does not address the feasibility of other offerings such as fiber optic broadband access;

c) A Request for Information and Comment, which was issued on August 16, 2005, and expired on September 30, 2005, received approximately 200-300 public comments and 28 commercial responses. According to the Department of Telecommunications and Information Services, this Request for Information and Comment was issued instead of a formal analysis of wireless broadband feasibility;

d) On December 22, 2005, the Department of Telecommunications and Information Services issued a Request for Proposals for construction of a Citywide wireless broadband network to "provide free or affordable broadband internet access to all San Franciscans." This Request for Proposals was issued without a formal analysis of the

feasibility of wireless broadband to include the feasibility of a municipally owned wireless network instead of contracting with a private entity; and,

e) Although a Civitium white paper recommends that the City should sufficiently examine all alternative approaches to promoting digital inclusion in San Francisco, the Department of Telecommunications and Information Services moved forward with negotiations with EarthLink for the proposed wireless network without conducting a more formal analysis of the feasibility of wireless broadband or a completed study of the feasibility of wired networks.

Section 2 to this report discusses the results of a survey of several jurisdictions that have implemented or are presently implementing wireless services, conducted by the Office of the Legislative Analyst. Section 2 also identifies the advantages and disadvantages of the various models that have been employed by such other jurisdictions.

Section 3 to this report includes the Budget Analyst's analysis of the fiscal feasibility of a municipally-owned and operated wireless network in San Francisco and identifies estimated costs of building a wireless network, and ongoing costs of operating, maintaining and upgrading a wireless network on a continuing basis.

Recognizing that substantial revenue would be required to fund the implementation and operation of a wireless network in San Francisco, Section 3 also discusses estimates of revenues and City operating savings that are potentially available as a source of funding.

Section 3 summarizes the fiscal feasibility of a City-owned wireless network, accounting for all costs of deployment, operation, maintenance, and upgrades of such a network as well as the revenues and return on investment opportunities quantified above. The Budget Analyst estimates a range of outcomes from (a) an annual net funding shortfall of $1,444,835 to (b) an annual net revenue gain of $923,390. The Budget Analyst notes that (a) a number of revenue-producing opportunities discussed in this report could not be quantified with the data available for the report, and, (b) total network operations, maintenance, and upgrade costs could increase over time.

The Budget Analyst further notes that the City would likely face competition from private interests and risk a wireless network's obsolescence due to technological change in the future, despite efforts to invest in system upgrades on a four-year cycle. These risk factors should be carefully considered in weighing the costs and benefits of a municipally-owned wireless broadband network.

Appendix I to this report provides an analysis of the proposed EarthLink agreement for the provision of a Citywide wireless network. Under its proposed agreement, EarthLink will partner with (a) Google, to be the internet service provider on the Basic service tier; (b) Tropos, to provide the nodes which transmit a signal to and from users of the network; and, (c) Motorola, to

provide the canopy nodes, which would serve as the backhaul layer of the proposed wireless network. The analysis of the proposed EarthLink agreement, contained in Appendix I, is offered for a better understanding of (a) how this agreement may or may not be able to address the City's goal of "bridging the digital divide;" and, (b) how a municipally-owned wireless network could differ from the wireless network proposed under this agreement.

The Budget Analyst notes that the City has completed negotiations on a proposed agreement with EarthLink which will be presented to the Board of Supervisors in January 2007. The Budget Analyst will review the proposed EarthLink agreement when such agreement is submitted to the Board of Supervisors for approval.

In summary, the Budget Analyst raises the following concerns with respect to the proposed EarthLink agreement:

a) EarthLink's wireless network would limit potential competition in the unlicensed radio frequency bands, as any competitors would have to contend with EarthLink's existing wireless signals;

b) Google, as the sole internet service provider on the Basic service tier of the EarthLink wireless network, would be granted exclusive access to users of the Basic service tier;

c) EarthLink serving as both a wholesale network provider and one of the available internet service providers may appear to create a conflict of interest for EarthLink, the result of which could limit competition among internet service providers and result in stifled innovation, limited user interest and accessibility, and inflated costs to network users;

d) The Basic service tier provided by EarthLink under the proposed agreement is slower than existing Digital Subscriber Line (DSL) and cable internet technology;

e) In order to receive service roughly comparable to existing technology and similar wireless networks being implemented in other cities, network users would have to pay an estimated monthly fee of $21.95, while 3,200 network users who qualify under a proposed "Digital Inclusion Product" would pay a monthly fee of $12.95;

f) Low-income residents would need to either (a) enter into a service agreement with Earthlink for access to the wireless network Basic service tier, or (b) rely on the City to pay for the Customer Premise Equipment, in order to avoid paying $80 to $200 for Customer Premise Equipment; and,

g) The sale and usage of user data for private purposes exposes those utilizing the EarthLink wireless network to the wide dissemination of their personal data, even if such users opt out of the receipt of marketing materials.

The Budget Analyst makes the following recommendations for consideration by the Board of Supervisors as a result of this review and analysis:

1. Should the Board of Supervisors wish to further investigate the potential of a municipally-owned wireless broadband network, the Board should then direct the City to reissue a Request for Proposals that allows for any of the three business models discussed in Section 3 of this report and summarized in the table on pages 2 and 3 of this transmittal letter. By allowing for any of these three business models, the City would encourage creativity and innovation and be able to choose the proposal that best fits the City's financial constraints. For example, such a Request for Proposals should:

    a) Include specific requirements that would effectively bridge the digital divide in San Francisco by providing wireless broadband access to low-income San Francisco residents that is both high-quality and free-of-charge to residents;

    b) Require proposers to offer state-of-the-art connectivity to San Franciscans that is, at a minimum, equal in technological capability to other nearby offerings;

    c) Require the effective leveraging of existing public and private infrastructure assets, including, to the extent practicable, the City's existing fiber infrastructure and other unused existing fiber infrastructure;

    d) Allow proposers to provide the City with operational savings opportunities;

    e) Ensure that the model being proposed encourages new uses and attracts many users; and

    f) Ensure that the model proposed is flexible to adapt easily to changing technologies.

2. To the extent that it is practicable, the City should incorporate the results of the fiber-to-the-premises feasibility study, presently being conducted by Civitium and Columbia Telecommunications Corporation, into the revised Request for Proposals.

3. The City should engage in greater community outreach throughout the entire process, through the Task Force on Digital Inclusion and/or other means, in order to ensure:

    a) Achievement of the City's goal to bridge the digital divide;

    b) Enhanced community understanding of and participation in any Citywide wireless broadband network; and

    c) Better understanding by the City of its residents' and businesses' needs and how they can be met with a wireless network.

In conclusion, the Budget Analyst notes that while a self-supporting, municipally-owned and operated wireless network is potentially fiscally feasible, such an endeavor faces inherent risks which would need to be overcome to assure its viability. The City's need to mitigate financial risks may result in the need to face difficult policy choices over tradeoffs between the need to produce substantial revenue through the provision of wireless broadband services and the goal of providing high quality services at no cost to financially disadvantaged users and a reasonable, and highly competitive cost for all other users.

We would like to thank the Director of Telecommunications and Information Services, his staff, representatives from other City departments, and various industry experts for their cooperation and assistance throughout this analysis. In addition, the Budget Analyst would like to acknowledge the collaboration of the Office of the Legislative Analyst, who conducted the survey of jurisdictions implementing Citywide wireless networks, for their valuable contribution to this report.

Respectfully submitted,

Harvey M. Rose
Budget Analyst

cc: President Peskin
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Supervisor Daly
Supervisor Dufty
Supervisor Elsbernd
Supervisor Jew
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Objective, Scope and Methodology

In October 2006, the Government Audit and Oversight Committee approved Motion 06-0109, which directed the Budget Analyst to conduct, on a priority basis, an analysis of a City-owned wireless network which includes "an analysis of the fiscal feasibility of a City-owned wireless ["Wi-Fi"] network." In order to provide the Board of Supervisors with sufficient information regarding the City's ability to own and operate its own wireless network, the Budget Analyst:

- Reviewed the history of efforts and decisions made by the City to analyze broadband, including wireless broadband, and the selection of the EarthLink wireless broadband network proposal;
- Evaluated the advantages and disadvantages of the different business models that are most commonly used by municipalities in implementing Citywide wireless broadband networks, as well as the business and technological specifications of the EarthLink agreement; and
- Analyzed the estimated costs and benefits of a municipally-owned wireless broadband network to determine the fiscal feasibility of this particular business model.

As part of this study, the Budget Analyst:

- Interviewed various industry experts, community leaders, and City staff with knowledge and experience related to wireless broadband networks;
- In collaboration with the Office of the Legislative Analyst, conducted a survey of nineteen cities that have implemented or are currently implementing citywide wireless networks for information on each city's (a) business model, (b) rationale for a particular business model, (c) costs associated with the wireless network's deployment and operation, (d) revenues associated with the wireless network, and (e) relative success in implementation;
- Reviewed documents and secondary research pertaining to broadband wireless technology, emerging applications, other municipalities' business and technological models, and the responses to the City and County of San Francisco's Request for Information/Comments and Request for Proposal to implement a Citywide wireless network; and
- Collected and analyzed data and information on the approximate costs and benefits of implementing a municipally-owned and operated Citywide wireless network.

The Budget Analyst was not able to obtain exact cost estimates to install and operate a Citywide wireless network in the City of San Francisco from other vendors or jurisdictions because vendor information is proprietary, cost factors differ among different jurisdictions due to density and geographical variations, and data were not readily available for relatively new municipal wireless networks. As a result, the Budget Analyst relied on responses to the City's Request for Proposals and estimates provided by industry experts in order to develop wireless network installation and operation costs, as well as estimates of potential revenues. Therefore, total costs and revenues from deployment and operation of a municipally-owned Citywide wireless network will vary to the extent that actual costs and revenues may vary from these estimates and will therefore require further verification through competitive bids and proposals, in order to be found reliable.

Section 1. The City's Effort to Evaluate the Provision of Fiber and Wireless Broadband Internet Access

The City and County of San Francisco is seeking to provide broadband access to all San Franciscans in order to bridge the digital divide. To further this effort, the Board of Supervisors has adopted resolutions to evaluate all options to provide broadband access, while the Mayor has made one of his administration's goals the provision of free wireless broadband access for every San Franciscan. Under the direction of the Mayor and the Board of Supervisors, the Department of Telecommunications and Information Services and the San Francisco Public Utilities Commission simultaneously sought to develop an understanding of the best means available for the provision of broadband access to all San Franciscans.

The Department of Telecommunications and Information Services expects to submit to the Board of Supervisors in January 2007 a proposed agreement between the City and a private service provider, EarthLink, operating in a joint venture with another private company, Google, to install a Citywide wireless broadband network. Meanwhile, the Department of Telecommunications and Information Services, in June 2006, began an analysis of broadband provided through fiber-to-the-premises, or "wired" broadband, the results of which should be submitted to the Board of Supervisors in January 2007 or February 2007.

The Board of Supervisors Resolution to Evaluate Broadband Internet Access

During the FY 2004-2005 budget review, the Board of Supervisors appropriated $300,000 to the San Francisco Public Utilities Commission's operating budget and placed such funds on reserve for a study of deploying a Citywide broadband system, which would be installed concurrent with repairs to the City's water and sewer infrastructure. The Board of Supervisors reserved the funds pending additional details on the proposed study.

On October 5, 2004, the Board of Supervisors approved Resolution 617-04, which authorized:

(a) A Department of Telecommunications and Information Services analysis and report on fiber-to-the-premises [home/business], as well as other high-speed communications options, including an analysis of the City's existing facilities, mechanisms to promote community participation, providers which might participate, best-practices research, potential demand and costs for such a system, alternative methods, and public benefits;

(b) A Public Utilities Commission analysis and report on the location and timing of sewers to be replaced or upgraded, and the ability to coordinate these efforts with installation of a City-owned high-speed communications system;

(c) A Department of Public Works analysis and report on a City-owned high-speed communications system's impact on street construction and excavation; and

(d) Financing models for such a system, which would be prepared by the Mayor's Office of Public Finance.

Resolution 617-04 did not specify whether the analysis should focus on the feasibility of fiber-to-the-premises ("wired")[1] versus wireless broadband, and authorized instead an analysis which was to study the feasibility of both types of broadband, wired and wireless.

On October 21, 2004, the Mayor announced in his State of the City address that it was his administration's goal to bring free wireless internet access to every San Franciscan. Through staff discussions within the Department of Telecommunication and Information Services and the Public Utilities Commission, it was decided that the Mayor's goal of providing free wireless internet access would proceed separately and more quickly than a separate study of fiber to the premises.

The Broadband Feasibility Study Request for Proposal

In accordance with Resolution 617-04, the Department of Telecommunications and Information Services issued a Request for Proposal and selected a consultant, Civitium LLC, in May 2005 to:

a) prepare an inventory of the communications facilities installed in and owned by the City;

b) examine other local governments that have installed broadband communications systems;

c) identify what services would be offered over the system and whether these services would be offered directly to the public on a retail basis or to service providers on a wholesale basis;

d) prepare a plan for a high-speed communications system;

e) estimate the costs of installing and maintaining such a system;

f) estimate demand for services by all potential users, including residents, businesses, and the City; and,

g) identify potential financing mechanisms that do not rely on the General Fund.

The Broadband Feasibility Report

The Budget Analyst notes that the contract agreement, which was signed on October 3, 2005, between the Department of Telecommunications and Information Services and Civitium specified that the purpose of the agreement was for Civitium "to provide services that will assist the City in determining the best approach for City participation in [a] wireless community broadband network." Therefore, between the time of issuance of a Request for Proposals for a broadband feasibility study, which was to include all forms of broadband access, both wired and wireless, and the signing of an agreement with Civitium, the purpose of such agreement was narrowed to focus exclusively on the feasibility of a wireless broadband network, and does not address the feasibility of other offerings.

[1] "Wired" broadband refers to broadband connectivity that is transmitted over wires that connect directly to the premises, unlike wireless broadband, which is transmitted over radio bandwidths to the premises.

Civitium states that they have performed the following tasks for the City since May 2005:

- Attendance at meetings and on teleconference calls;
- Advice and guidance on strategy, policy, technology and communications planning issues;
- Multiple reviews of, and comments to, various project materials;
- A framework for the overall evaluation process for the Request for Information and Comments and the Request for Proposals;
- Multiple drafts and a final version of the Request for Information and Comments;
- Multiple drafts and a final version of the Request for Proposals;
- A matrix of key partnership terms and City positions;
- A radio frequency study;
- Market comparable analysis for street light pole attachments and electricity rates[2];
- Copies and analysis of project materials and agreements from other cities; and
- A fiber feasibility study.

With respect to the final task listed above, the fiber ("wired") feasibility study, in June 2006 Civitium selected Columbia Telecommunications Company to perform a broadband feasibility study on fiber-to-the-premises.[3] According to the Department of Telecommunication and Information Services, the Department expects to release the report on fiber-to-the-premises in January or February 2007.

The Wireless Broadband Network Initiative

The Department of Telecommunication and Information Services issued a Request for Information and Comment to provide universal, affordable wireless broadband access for every San Franciscan before Civitium conducted or completed a broadband feasibility study. This Request for Information and Comment, which was issued on August 16, 2005, and expired on September 30, 2005, received approximately 200-300 public comments and 28 commercial responses. According to the Department of Telecommunications and Information Services, this Request for Information and Comment was issued instead of a formal analysis of wireless broadband feasibility or a formal review of options such as municipal ownership of a wireless broadband network.

Subsequently, on December 22, 2005, the Department of Telecommunications and Information Services issued a Request for Proposals for construction of a Citywide wireless broadband network to "provide free or affordable broadband internet access to all San Franciscans." Again, this Request for Proposals was issued without a formal analysis of the feasibility of wireless broadband.

[2] According to the San Francisco Public Utilities Commission, while the San Francisco Public Utilities Commission was provided with the Civitium market comparable analysis for street light pole attachments and electricity rates, the pole attachment and electricity rates calculated for the proposed EarthLink agreement by the San Francisco Public Utilities Commission were done independently of the market comparable analysis provided by Civitium to the City.

[3] "Fiber-to-the-premises" involves the installation of fiber wires to all residential and commercial properties in the City.

In response to the Request for Proposals, the Department of Telecommunication and Information Services received six proposals, three of which were selected to be interviewed, including SeaKay, MetroFi, and EarthLink. In the scoring worksheet, EarthLink's proposal scored highest in the firm qualifications, and MetroFi's proposal scored highest in the degree of compliance with the Request for Proposals' specifications. EarthLink's proposal scored highest in the interviews as well. EarthLink's proposal was announced as the selected proposal on April 5, 2006. On January 5, 2007, the Department of Telecommunications and Information Services announced that it had finalized an agreement with EarthLink, which will be submitted to the Board of Supervisors for approval. Appendix I of this report discusses several components of the EarthLink agreement.

In July 2005, Civitium issued a white paper on best practices for issuing a Request for Proposal for a municipal wireless broadband network. According to this white paper, the City should ensure that it leverages the knowledge and assets of the vendor community to learn about new innovative approaches for addressing the City's needs and that the City should collect multiple and diverse proposals that can be evaluated to strike favorable terms during contract negotiations. Although Civitium's white paper recommends that the City should sufficiently examine all alternative approaches to promoting digital inclusion in San Francisco, the Department of Telecommunications and Information Services moved forward with negotiations with EarthLink for a wireless network without conducting a more formal analysis of the feasibility of wireless broadband or a completed study of the feasibility of wired networks.

The Task Force on Digital Inclusion

On April 20, 2006, the City announced the creation of the Task Force on Digital Inclusion, whose role was to "assist and advise the City and County of San Francisco on digital inclusion programs that would complement the deployment of a citywide wireless Internet network." Task Force members include local community leaders from businesses, non-profit organizations, and philanthropic groups with experience in technology, media, affordable housing, community development, and human and social services. Task Force members were selected after the Department of Telecommunications issued a Request for Applications in early 2006 and followed up on this request with specific outreach in order to achieve adequate and diverse Citywide representation on the Task Force. The Department of Telecommunications and Information Services did not invite the Task Force to participate directly in the contract negotiations between the City and EarthLink because of potential conflicts of interest for individual members of the Task Force in the ongoing contract negotiations. The project manager for Project TechConnect[4] has served as a liaison between the Task Force on Digital Inclusion and the negotiations between the Department of Telecommunication and Information Services and EarthLink over the wireless network agreement.

[4] "Project TechConnect" is the Mayor's Office's term for the proposed Citywide wireless broadband effort.

Section 2. Existing Models For Citywide Wireless Networks

In their efforts to deploy Citywide wireless networks, local governments have utilized a variety of technologies, organizational structures and business models, taking into account their respective governments' primary objectives, constraints, resources, and internal analyses. These models range from a private consortium to a public community enterprise, from a cooperative wholesale to a public authority, from a nonprofit to a public-private partnership, and hybrids that combine features of these models.[5] Beginning on the following page, a summary is provided of the results of the survey conducted by the Office of the Legislative Analyst which shows the different wireless network business models currently being developed and deployed by twelve cities.[6]

The table contains (a) narrative details on the wireless network business model; (b) the City's role in deployment and operation of the wireless network; and, (c) summary details of the wireless network, including (1) the status of deployment of the network, (2) the speed of the network (if available), and (3) the cost to the end user of the wireless network (if available). Network throughput speeds are offered for (a) comparison to the proposed EarthLink agreement (see Appendix I), and (b) an understanding of what the current business models consider to be an appropriate network user cost for a particular network speed.

As noted in Appendix I, the proposed EarthLink agreement includes a Basic, free service tier which would operate at symmetrical[7] throughput speeds of 300 Kilobits-per-second (Kbps). By comparison, the most recent version of Digital Subscriber Line (or DSL) service offered by AT&T to residential customers in San Francisco operates at a download throughput speed of 1.5 Megabits-per-second (Mbps) - which is five times faster than the download throughput speed 300 Kbps offered in the Basic service tier of the proposed EarthLink agreement - and an upload throughput speed of 384 Kbps - which is marginally faster than the upload throughput speed of EarthLink's proposed Basic service tier. By further comparison, since the late 1990's, dial-up modems have operated at symmetrical throughput speeds of 56 Kbps, and, currently, Comcast high-speed cable internet operates at download throughput speeds of up to 6 Mbps.

The wireless networks in Table 2.1 are organized by type of business model. The business model offered in the proposed EarthLink agreement with the City of San Francisco most closely resembles the Mountain View, California, wireless network business model. The primary difference between that model and the EarthLink proposal is that the Mountain View wireless network offers throughput speeds of 1 Mbps to Mountain View residents with no network user

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[5] Source: "Municipal Wi-Fi Networks: The Goals, Practices, and Policy Implications of the U.S. Case" from Communications and Strategies No. 61, 1st Quarter 2006, p. 107. Francois Bar and Namkee Park; The Annenberg School of Communication University of California, Los Angeles.

[6] Only twelve of the nineteen cities surveyed by the Office of the Legislative Analyst were included in this summary, as the remaining seven cities either (a) were implementing a wireless model that was different from a Citywide wireless network, such as a "hot spots" model; or (b) had not yet selected a vendor or business model for deployment of a wireless network. Surveyed cities excluded from the summary in Table 2.1 include: Austin, TX; Denver, CO; Houston, TX; Lexington, KY; Los Angeles, CA; New York, NY; and San Antonio, TX.

[7] "Symmetrical throughput speed" means that download and upload throughput speeds are the same. "Asymmetrical throughput speed" means that download and upload throughput speeds are different, typically with higher download speed than upload speeds.

fee, while throughput speeds of 1 Mbps would be available to San Francisco residents in the proposed EarthLink agreement for an estimated monthly fee of $21.95, except for the up to 3,200 users which qualify for the "Digital Inclusion Product" offering throughput speeds of 1 Mbps for a monthly fee of $12.95. Further, none of the business models below include throughput speeds of less than 750 Kbps, and the Basic service tier offered in the EarthLink proposal would operate at throughput speeds of only 300 Kbps.

Table 2.1
Survey of Business Models Used By Other Cities for Citywide Wireless Network Deployment

City	Summary Details	Business Model	City's Role
St. Cloud, FL	Pop: 30,000 Size: 15 sq mi Status: Fully implemented and operational Speed: 1 Mbps User Cost: Free	**City-Owned and Operated.** St. Cloud built, operates, and maintains its own municipal wireless broadband system called Cyber Spot at no cost to the consumers for a maximum speed of up to 1 Mbps. The network's construction costs, including first year operating costs, totaled $3.1 million, and were paid from the City's economic development fund. Estimated annual costs for ongoing operations, for which the city contracts with Hewlett-Packard, are $500,000 per year.	The City of St. Cloud owns and operates its own wireless network, with Hewlett-Packard serving as the contractor for ongoing operations of the system.
Chaska, MN	Pop: 22,820 Size: 16 sq mi Status: Fully implemented and operational Speed: 1 to 1.2 Mbps User Cost: $15.99 per month for residents	**City-Owned and Operated.** The City of Chaska owns chaska.net, a wireless internet service provider that is partnered with private entities. Chaska.net is operated by Siemens Communications. Chaska.net financed the entire $535,000 capital investment needed for the wireless network. Subscriber access in Chaska is available at $15.99 per month for residents and $24.99 per month for businesses. The download and upload throughput speeds of this network range between 1 Mbps to 1.2 Mbps.	The City of Chaska owns and operates its own wireless network. Workers from the city's utility installed the outdoor wireless cells in city-owned fixtures.
Boston, MA	Pop: 569,165 Size: 48.43 sq mi land area Status: A model has been chosen and implementation is pending Speed: 1.5 Mbps User Cost: $15/month	**Nonprofit Model.** The City will identify a nonprofit organization that will construct, own and operate a citywide wireless broadband network. The nonprofit will have to raise between $16 and $20 million to fund the network's construction and initial operations. If the deployment is implemented as planned, the end user price will be less than $15 per month at speeds of at least 1.5 Mbps.	The City of Boston will grant the nonprofit access to necessary infrastructure to build network. No city funds will be used in this project.
Corpus Christi, TX	Pop: 281,196 Size: 147 sq mi Status: Final stages of implementation Speed: 1 to 1.5 Mbps User Cost: $20/month	**Municipal ownership sold to EarthLink.** A nonprofit created by the city had been working with EarthLink to manage the City-owned wireless network. The city now plans to sell EarthLink its wireless network, offering access at $20 per month. The nonprofit was created by the city to leverage its information infrastructure. The network will provide throughput speeds of 1.0 Mbps to 1.5 Mbps.	The city formed a non-profit corporation, called Corpus Christi Digital Community, in order to sell wholesale capacity to private service providers. The City has since decided to sell its wireless network to EarthLink.

City	Summary Details	Business Model	City's Role
Philadelphia, PA	Pop: 1,470,151 Size: 135 sq mi Status: In the process of implementation Speed: 750 Kbps to 1.25 Mbps User Cost: $15/month to $25/month	**Public-Private Nonprofit in Partnership with EarthLink.** In February 2006, Wireless Philadelphia (a city government-chartered nonprofit) signed an agreement with EarthLink to build, manage, and maintain a wireless network. The average upload download throughput speeds of the network will be between 750 Kbps and 1.25 Mbps.	The City of Philadelphia granted the Philadelphia Authority for Industrial Development the rights to allow EarthLink to use the city's streetlights for the operation of the wireless system.
Minneapolis, MN	Pop: 373,943 Size: 59 sq mi Status: In the process of implementation Speed: 1 Mbps User cost: Free	**Public/Private Partnership With City as Anchor Tenant.** In September 2006, the Minneapolis City Council approved US Internet Wireless as the vendor to build and manage a citywide broadband wireless network. US Internet will contribute in advance $500,000 to the Digital Inclusion Fund. US Internet will also pay the City fees for use of city-owned buildings, rooftops, traffic signals, and other hanging assets for installation of equipment. Network will provide download and upload throughput speeds of 1 Mbps.	The City will pay US Internet a minimum annual commitment of $1.25 million for 10 years so that City facilities and police and fire emergency services can become anchor tenants on the wireless network.
Anaheim, CA	Pop: 333,776 Size: 50 sq mi Status: Partially implemented and operational Speed: 1 Mbps User Cost: $22/month	**Privately-owned, exclusive franchise granted to EarthLink.** EarthLink installed, operates, and maintains the citywide wireless network at EarthLink's sole cost and expense. EarthLink must pay the City of Anaheim 5% of net access revenues. In addition, EarthLink must pay the City pole attachment fees, electricity fees, and fiber connectivity fees. The monthly cost of subscription is $22 per month to access the network, which provides upload and download throughput speeds of 1 Mbps.	The City of Anaheim pays EarthLink a discounted rate for access by municipal employees.
Sunnyvale, CA	Pop: 128,012 Size: 21.9 sq mi Status: Fully implemented and operational Speed: 1 Mbps User Cost: Free ad-supported or $20 per month without ads	**Privately-owned non-exclusive franchise with MetroFi.** In December 2004, the City of Sunnyvale entered into a franchise agreement with MetroFi to use approximately 100 City-owned streetlight poles to provide free and subscription-based wireless network services. Customers accessing the free wireless services see online advertising as part of their user experience. Customers who want do not want advertising may connect to MetroFi network premium service for approximately $20 per month.	The City of Sunnyvale collects various fees from MetroFi for use of its infrastructure, including streetlight pole fees.
Santa Clara, CA	Pop: 104,001 Size: 19 sq mi Status: Mostly implemented and operational Speed: 1 Mbps User Cost: Free	**Privately-owned nonexclusive agreement with MetroFi.** MetroFi installed, operates, and maintains Santa Clara's wireless network at no cost to the city. The system (which includes online advertising as part of the user experience) is free to everyone in Santa Clara and has a download throughput speed of 1 Mbps.	The City of Santa Clara collects various fees from MetroFi for use of its infrastructure, including streetlight pole fees and energy charges.

City	Summary Details	Business Model	City's Role
Mountain View, CA	Pop: 69,276 Size: 12.1 sq mi Status: Fully implemented and operational Speed: 1 Mbps User Cost: Free	**Privately-owned non-exclusive agreement with Google.** In January 2006, the City of Mountain View entered into an agreement with Google to install wireless transmitters on City-owned streetlight poles to create a "no-cost" citywide wireless network (i.e., free to all users in Mountain View). The municipal network provides download and upload throughput speeds of up to 1 Mbps to its users depending on variables such as distance from the nearest radio and current network usage.	The City of Mountain View was approached by Google to establish this no-cost (to the city and to users) wireless network. Google must pay the city for the use of streetlight poles and for all electrical utility and connection charges.
Foster City, CA	Pop: 29,000 Size: 3.8 sq mi Status: Fully implemented and operational Speed: 1 Mbps User Cost: Free, ad-supported or $20 per month without ads	**Privately-owned non-exclusive franchise with MetroFi.** In April 2006, Foster City entered into a franchise agreement with MetroFi, Inc. to use approx. 100 city-owned street light poles to provide wireless network services. Customers accessing the wireless services with online advertising as part of their user experience do not pay a fee (with speed of up to 1 Mbps), while those who want to connect to the Internet without ads pay approximately $20 per month.	Foster City receives compensation for MetroFi's use of its infrastructure, such as light poles and electrical usage.
Tulsa, OK	Pop: 383,764 Size: 181 sq mi Status: Fully implemented and operational Speed: 1.5Mbps download and 786 Kbps upload User Cost: $24.95/month	**Entirely Privately-Owned.** Tulsa MetroNet, a private company, provides subscription-based wireless services in the Tulsa metro area. In order to secure the rights-of-way, Tulsa MetroNet signed an exclusive contract with an outdoor sign company to mount outdoor Tropos Network routers and a non-exclusive contract with the local power company. Tulsa MetroNet decided to pursue this project without the city government to get to the market "quicker" and to "avoid the legal battles that many joint private/public ventures now find themselves enmeshed in with incumbent communications providers." Monthly fees for residents start at $24.95 with download throughput speed of up to 1.5 Mbps and upload throughput speed of 786 Kbps.	The City of Tulsa is not involved in this project.

Choosing a business model that best enables the City and County of San Francisco to meet its key objectives is critical to a successful Citywide wireless network. As evident from the table above, there are many different types of business models that have been used during the last few years in the development and deployment of Citywide wireless networks, all of which fall into two generic business model categories: (1) privately-owned and (2) publicly-owned. This report, which aims to determine whether a municipally-owned and operated Citywide wireless network is fiscally feasible for the City of San Francisco, examines the following three business models that involve the City owning its own wireless network: (1) a municipally-owned and operated model, (2) a nonprofit model, and (2) a public-private partnership model.

Municipally-owned Business Models

In a municipally-owned and operated model, a municipality is primarily responsible for designing, funding, implementing, operating and maintaining the wireless broadband network. Deployment and operations of the network could be contracted out to private entities; however, the municipality remains principally responsible for the ongoing financing of the wireless

network. A municipality may offer wireless broadband as an amenity for residents, businesses, or tourists, or to enhance other municipal services directly using taxpayer dollars. The most prominent reason for adopting this model is to take advantage of the past experience of public utility companies in the provision of other public infrastructure. Through such an arrangement, cities can leverage their existing resources for subscriber acquisition, customer service, technical support, and billing.

The few cities that have actually used this municipally-owned and operated model thus far have typically contracted with a wireless network equipment provider to install network equipment on city-owned sites. These cities have typically been relatively small cities where private telecommunications and cable companies were not already providing broadband access. According to the Wireless Silicon Valley Task Force, municipally-owned and operated wireless networks have been successful where there is little public opposition to use of taxpayer's monies to fund the deployment and operations of such networks.

If the City were to use the municipally-owned business model, it could contract with a private entity for installation, operation, and maintenance of the wireless network. Some of the cities that have a municipally-owned and operated Citywide wireless network include St. Cloud, Florida; Chaska, Minnesota; and Nevada, Missouri.

Advantages of a Municipally-Owned and Operated Model

- This model gives the City the greatest control over the network, its operation and the services it provides to ensure that the City's objectives (e.g., to promote digital inclusion, by ensuring affordable internet access, affordable hardware, community-sensitive training and support, and relevant content to all San Franciscans, especially low-income and disadvantaged residents) are fulfilled.

- This approach could generate subscriber revenues which can be used to fund on-going and one-time wireless network costs, as well as to fund digital inclusion programs.

- The City would have full management over marketing and advertising services in order to attract subscribers in a competitive broadband Internet service environment.

- The City maintains long-term control of the network, so that it can ensure the network continues to bridge the digital divide over time and so that it can benefit from future technological innovations which utilize the network.

Disadvantages/Risks of a Municipally Owned and Operated Model

- Sources of funding for the engineering, design, testing and construction of the network need to be identified, and ongoing operations and periodic upgrades need to be funded by subscriber and advertising revenues in order to avoid the need for taxpayer subsidy.

- The municipality assumes all financial risks associated with the wireless network by having to compete with private technology vendors for the provision of broadband services, both wireless and wired, to residents and businesses.

Nonprofit Model

Under this operating model, a nonprofit organization selected and/or established by the City would organize, fund, deploy, operate, and maintain a wireless network on behalf of the City.[8] The nonprofit could raise funds from charitable donations or grants or secure loans from private institutions or the City. The nonprofit would (a) negotiate with the City to secure rights-of-way access to streetlights, traffic lights, or other buildings, and (b) outsource the design, deployment and management of the network to private companies. The nonprofit could further have a mission to reduce the digital divide and may engage in other activities (e.g., coordination of training resources, programs to get computers into the homes of low-income families, etc.).

At a minimum, the City could negotiate a right-of-way agreement for the use of City-owned infrastructure, including streetlights, traffic signals and other municipal buildings. Boston is an example of a nonprofit business model that is a carrier-neutral, open access, and wholesale-only business model. A carrier-neutral, open access, wholesale-only model would avoid the potential conflict of interest that is a concern with the proposed EarthLink agreement, as discussed in Appendix I to this report, as the wireless network provider does not have a financial interest in one of the internet service providers which will be utilizing the wireless network.

Advantages of the Nonprofit Model

- City staff would not be required to operate and support the network.
- Capital funding is not required from the City; however, the City could assist the nonprofit entity in acquiring such funding.
- The City could maintain short- and long-term control over execution, management, operations, and partnerships under this model.

Disadvantages/Risks of the Nonprofit Model

- Sources of capital would need to be identified to fund the wireless network via the nonprofit organization.
- The nonprofit organization must assume some market, technology, demand, and funding risks, as well as potentially significant political, legal, and execution risks.

Public-Private Partnership Model

In a public-private partnership model, the City selects a private-sector partner to finance, design, deploy, and/or maintain a Citywide wireless broadband network. The City enters into agreements with the private-sector partner that allows the use of certain assets such as traffic signal/light poles, rooftops, and other assets. The private-sector partner also makes access to the network available on a wholesale basis to multiple and competing retail service providers, who market the service to residents and businesses, perform billing, and provide customer care functions. Under

[8] One of the proposals received by the City during the Request for Proposal process for a Citywide wireless broadband network involved the establishment of a nonprofit organization to deploy and maintain such a network.

this form of a public-private partnership, the City maintains ownership of the network, with the private sector partner serving solely as a wholesaler and not as an internet service provider, which is a key distinction between this model and the EarthLink model. Under the public-private partnership model, a municipality may negotiate with the private partner to regulate rates.

In October 2005, Philadelphia announced that it would partner with EarthLink to fund, deploy, operate, maintain, and own the network's hardware. In January 2006, the parties reached a ten-year agreement.

Advantages of a Public/Private Partnership Model

- The City assumes no financial risk, since capital investment and operations and maintenance costs, as well as wireless technology replacement costs, would be borne by the private partner.

- The City will not have to be involved in the marketing, sales, revenue generation and the around-the-clock customer service required to sustain the network.

Disadvantages of a Public/Private Partnership Model

- The City is reliant upon a private company to provide "last mile" access to areas of the City where the company may have no profit incentive to provide a consistent, high-quality service either due to (a) insufficient numbers of network users in those areas, and/or (b) insufficient revenues generated by the users of the network in those areas

Some Lessons Learned From Other Cities

Below are just some of the lessons learned from other cities' experiences and expert opinion regarding the deployment of wireless broadband networks:

Advantages and Disadvantages of A Privately-Owned Network

- According to the Wireless Silicon Valley Task Force, privately-owned wireless networks have been successful because there is a profit motive. The profit motive provides a form of discipline when it comes to coverage areas and the types of wireless service they can provide. There are a few problems with the profit-based wireless model though. In many cases, service providers are not willing to provide wireless coverage in low-income or sparsely populated areas. Another problem with private ownership is the case where the wireless network owner and the service provider are the same. In this situation, there is little incentive and no competition to offer new or upgraded wireless services.

- The Boston Task Force learned that privately-owned and operated networks minimally supported by the city currently are the most popular business models. However, although these models seem promising in the short term, the Task Force believes that such models may lead to a situation in which the goals of the City and network operator diverge over time, and thus lead to increasingly difficult contract negotiations.

- According to Wireless Philadelphia, a public-only or a private-only implementation will find it difficult to overcome potential regulatory, implementation, financing, costing, technical, and management hurdles.

The City's Roles and Responsibilities

- According to Wireless Philadelphia, there needs to be substantial involvement by the City to ensure that any Citywide wireless network gets off the ground and that underserved populations are targeted, regardless of the proposed wireless network's business model.

- The Boston Task Force also learned that the cities that included input from the public in their planning and implementation process were the most successful. This approach allowed these cities to be better informed about constituent needs and to avoid pitfalls. The Boston wireless network project incorporated community input from its inception.

- The City of Boulder learned that a critical part of any community's exploration of a municipal broadband initiative is to collect and align community needs, requirements and concerns from a diverse set of stakeholders. City staff identified and enrolled a comprehensive set of stakeholder groups to participate in workshops, phone interviews, and surveys. The intent of this effort was to identify and validate goals and objectives and to gain valuable insights into potential issues and benefits that may result from a municipally sponsored wireless network.

- Jupiter Research suggests that wireless networks are best executed by joint participation of governments and commercial enterprises because each entity brings different sets of capabilities and assets to the table, and because the benefits these enterprises are trying to reap from wireless network projects are so different as to be non-competitive.

- The revenue models used in the deployment of wireless network elsewhere are typically (1) free service, advertising supported; (2) subscription service, often with various tiers or options; or (3) hybrid with free service in some areas or some users, and fee-based services elsewhere. In addition, some cities require revenue sharing with the wireless network providers in return for the provision of free or discounted access to City infrastructure such as light poles.

Best Practices in Decision Making

- The City of St. Cloud, Florida, learned that there are no short cuts nor should any short cuts be attempted in the process of building grassroots community consensus for a municipally-owned wireless network. To quote Mayor Glenn Sangiovanni "It's not about technology, it's about community. By carefully building that community support and ownership along with educating the public, St. Cloud was able to develop nearly unanimous citizen support to move forward which made the allocation of funding an easy decision."

- According to a September 2006 Federal Trade Commission (FTC) report titled "Municipal Provision of Wireless Internet," the decision of whether, and through what vehicle, a municipality should facilitate or provide wireless broadband service requires a highly fact-specific analysis that is not amendable to a one-size-fits-all policy recommendation. For

example, the situation of a large metropolitan area served by multiple wireline telecommunications providers ("wireline" providers offer communications technology over wires which connect direct to the premises, such as telephone and cable broadband) and high-speed cellular Internet technology is quite different from that of a small rural town with only one or no wireline telecommunications providers and low-speed cellular service.

- According to Civitium, most of the effort to make the process work is done prior to ever writing any of the Request for Proposal. The following are the five areas of input that should result from the planning process: (1) stakeholder feedback, (2) demand assessment, (3) business model assumptions, (4) requirements definition, and (5) asset inventory.

Section 3. The Fiscal Feasibility of a Municipally-Owned Wireless Network

This study concludes that it may be fiscally feasible to build a municipally-owned wireless network. However, to assure initial fiscal feasibility and sustain future fiscal feasibility, the City would need to continually work to contain and manage financial risk in the future in order to maintain a viable wireless service for all of San Francisco.

To assess the fiscal feasibility of deploying a municipally-owned and operated wireless network, the Budget Analyst reviewed projected wireless network capital expenditure needs and operational costs and weighed these estimates against projected revenue streams. However, the Budget Analyst's conclusion is predicated on estimated costs and revenues that would need to be tested and verified through competitive bids and proposals and future policy decisions by the City on a variety of issues.

The Budget Analyst considers the fiscal feasibility of any wireless network to include that the project independently produces enough revenue to fund maintenance and operations, and also to produce net revenue in order to (a) fulfill its mission, as determined in advance by the City, and (b) to enable future innovation. This would require generating enough net revenue to maintain state-of-the-art technology and continually attract innovative users and suppliers to the network. To assess the fiscal feasibility of deploying a municipally-owned and operated wireless network, the Budget Analyst reviewed projected wireless network's capital expenditure needs and operational costs and weighed these estimates against projected revenue streams.

Costs of a Wireless Network

Based on study results, the Budget Analyst estimates that the total capital expense, in present value dollars, to design and launch a wireless broadband network in the City of San Francisco would be between $6.0 million and $10.0 million for the network build-out and the first year of operations. This range of cost is broad because the Budget Analyst was not able to obtain exact cost estimates to install and operate a municipal wireless network in the City of San Francisco from vendors or other jurisdictions as vendor information is proprietary, cost factors differ among different jurisdictions due to density and geographical variations, and data were not readily available for relatively new municipal wireless networks. However the estimate of $6.0 million to $10.0 million is based on information received from several sources interviewed for this report as well as information available from the EarthLink proposal. For the purpose of this fiscal feasibility analysis and based on information provided by several industry experts, the Budget Analyst assumes that a wireless broadband network would be upgraded every four years, at costs approximately equal to the initial total capital costs of $6.0 million to $10.0 million, as a result of changing technologies and the need to keep the wireless network competitive technologically with competing ventures. Ongoing operations and maintenance costs thereafter would be approximately $1.5 million to $2.0 million annually, again in present value dollars.

The Budget Analyst notes that labor costs for wireless network operations and maintenance would likely increase faster than the annual consumer price index, resulting in an increase in total operations and maintenance costs. Therefore, over time the City would likely need to

identify new or increased sources of financing for a municipally-owned and operated Citywide wireless network.

The distinction among the three wireless network models discussed in the previous section, including the (1) municipally-owned, (2) nonprofit, and (3) public-private partnership models, is primarily found in the source of funds for capital and ongoing expenses. Further, while a City can benefit financially from all three of these models, the benefit which accrues to the City diminishes commensurate with a reduced initial investment and subsequent reinvestment by the City in the wireless network. The preceding section offers additional details concerning opportunities for revenues and return on investment which can be realized through the municipally-owned and nonprofit models of network ownership.

Potential Revenue Sources for a City-owned or Nonprofit Wireless Network

If the City and County of San Francisco were to either (a) own and operate its own wireless network or (b) contract with a nonprofit entity for ownership and operation of a wireless network, the City would have several opportunities for financing which could partially or fully pay for the deployment, operations, and upgrade costs of a wireless network, including (1) user fees, (2) advertising, and (3) grant monies. If the City pursues instead a public-private partnership business model, similar to the proposed EarthLink agreement, none of the revenues discussed below would be available to the City, unless some revenue-sharing provision were incorporated into the agreement with the private entity providing the wireless network.[9]

User Fees from Businesses, Tourists, and Residents

A municipally-owned wireless network could provide high-speed broadband connectivity to all geographic areas of San Francisco at throughput speeds which exceed the existing wired connectivity available to most San Francisco businesses, tourists, and residents. As a result, the City could charge user access fees, the amount of which would not be legally limited to recovery of the City's cost of providing access to the network, as provision of such a network is not considered an essential government function and fees would be paid voluntarily.

Available technology for wireless networks would allow the City to provide fixed wireless service with throughput speeds of 3.0 to 5.0 Mbps to businesses, which is faster than existing T-1 connections (which generally operate at throughput speeds of 1.5 Mbps) to which many businesses currently have access, at prices ranging from $300 to $1,000 per month. As a result, it would not be unreasonable to charge businesses $200 per month for such 3.0 to 5.0 Mbps throughput speed connectivity to the wireless network. If even just 500 of San Francisco's 80,000 registered businesses were to pay for such connectivity, it would result in annual revenues of $1,200,000.

It is unclear how many tourists who travel through San Francisco would take advantage of a wireless network. In order to attract tourists, such a network would have to be competitive with existing wireless hotspots provided by most coffee shops and other local businesses. Further, given the need for a Customer Premise Equipment (CPE) device to enhance signal transmission

[9] The EarthLink proposal contains no revenue-sharing provisions.

from a user's computer to the wireless network's access nodes, it is unclear just how many tourists would take advantage of ubiquitous wireless access. However, such access could be incorporated into existing products offered to tourists, such as the City Pass, which bundles discounted access to several tourist destinations into one ticket. Further, network access could be enhanced at tourist-friendly hotspots, like Union Square and the Fisherman's Wharf, in order to eliminate the need for a Customer Premise Equipment device.

Given potential operational savings opportunities for the City, discussed later in this report, and revenues which can be received by the City for operating a municipally-owned network, the City could deploy a fiscally feasible high-speed Citywide wireless network with symmetrical throughput speeds of 1.0 Mbps or greater at no cost to City residents, meaning that the City's costs would be paid by revenues and operational savings which do not include fees levied on residents. However, if the City were to levy access fees on residents, and if 3 to 5 percent of San Francisco's approximately 360,000 households[10] were to pay for wireless network access at $10 per month, the resulting revenues would be $1,296,000 to $2,160,000 annually (10,800 to 18,000 households times $10 per month times 12 months). Further, if the City preferred to provide free wireless broadband access to residents who were unable to pay $10 per month, the City could develop one of the following systems: (1) two tiers of service, similar to the proposed EarthLink agreement, which provide (a) basic, free access at one throughput speed and (b) higher-throughput speed access for a fee; (2) two types of service, both utilizing the same throughput speed, in which one type of service is (a) a free, ad-based network, and the other is (b) an ad-free network available for a fee; or (3) free access for those residents who qualify for existing City programs for financially disadvantaged residents, such as the Working Families Credit.

Advertising Revenues

The Budget Analyst is unable to estimate potential advertising revenues which would be available to the City for a municipally-owned wireless network. However, such a network would enable local businesses to advertise to network users located within the immediate neighborhoods surrounding the advertising businesses. This location-specific advertising will be implemented in the proposed EarthLink agreement. Given the greater control the City would have over a municipally-owned wireless network, location-specific advertising could be implemented without the issues raised in the proposed EarthLink agreement specific to the tracking of individual network users and potential violations of user anonymity which are discussed in Appendix I to this report. Moreover, under a City-owned wireless network, the City would have total control over the types of advertising offered to residents.

Grant Funds

As a public entity providing wireless accessibility to underserved communities, the City could take advantage of private grant monies to defray the costs of (a) wireless network deployment in underserved communities, and (b) Customer Premises Equipment devices needed by individual users to access the wireless network. Recently, a $60 million fund – named the California Emerging Technology Fund (CETF) – was created using monies contributed by the

[10] The experience of existing Citywide wireless network deployments is that approximately 10 to 25 percent of households utilize the wireless network; therefore, a 3 to 5 percent utilization rate is considered to be a conservative estimate.

telecommunication companies, AT&T and SBC, as a condition imposed on them by the Federal Government for approval of their merger. However, monies from the California Emerging Technology Fund have not yet been allocated, and the criteria for usage of such funds have not yet been determined.

Operational Savings Opportunities for the City

Should the City invest in a municipally-owned wireless network, or participate as an anchor tenant in such a network provided by a third-party,[11] it could realize substantial savings as a result, including (1) replacement of existing T1 connections, (2) replacement of existing mobile devices, (3) increased efficiency of existing City functions and wireless systems enhancement, and (4) other San Francisco-specific savings.

Replacement of Existing T1 Connections

Currently, the entire City of San Francisco spends $3,432,000 annually for approximately 642 T1 connections, or $5,346 annually per T1 connection. Each T1 connection is capable of holding up to 24 phone lines. Under a municipally-owned wireless network, many of these T1 connections could be eliminated in lieu of higher throughput speeds available through a wireless network at limited cost to the City. The City's cost to replace up to one-half of these T1 connections with wireless connectivity is estimated to be approximately $500,000, or $1,558 per connection replacement. Under a municipally-owned network, once a T1 connection has been replaced, the City would incur no cost for the connectivity provided by that connection into the municipally-owned wireless network. The Department of Telecommunications and Information Services advises that, where possible, the City is currently in the process of replacing existing T1 connections with fiber, resulting in an indeterminate number of remaining T1 connections that cannot be replaced by fiber but could be replaced by connection to a Citywide wireless network. Therefore, if the City were to replace 100 of the existing 642 T1 connections, at an estimated one-time cost of approximately $500,000,[12] the City could save an estimated $534,600 annually thereafter (100 replaced T1 connections times savings of $5,346 per T1 connection).

The Budget Analyst notes that there may be security issues regarding the usage of wireless technologies for City telecommunications. These issues could inhibit the City's ability to realize return on investment from replacement of T1 connections through a municipally-owned wireless network. However, the Budget Analyst further notes the case of Minneapolis, Minnesota, in which Minneapolis is serving as an anchor tenant for the Citywide wireless network and has specified technological thresholds for security purposes, including Temporary Key Identification Protocol and Advanced Encryption Standard. Such technological standards were also required in San Francisco's Request for Proposals and were met by the top three proposals.

[11] The option of the City serving as an "anchor tenant" is an alternative to a City-owned network in which the City pays a third-party provider, either a nonprofit or for-profit entity, for usage of that provider's wireless network to conduct City business. An example of anchor tenancy is the City of Minneapolis wireless network, in which the City of Minneapolis is making a minimum annual payment of $1,250,000 to the wireless network provider for usage of that network as an anchor tenant.

[12] The estimate of $500,000 was provided by one industry expert as a conservative (i.e. high) estimate of the infrastructure costs that would need to be paid by the City to replace one-half of the City's existing T1 connections by utilizing a Citywide wireless network.

Replacement of Existing Mobile Devices

Currently, the City of San Francisco pays an average cost of approximately $324,480 annually for usage of 676 mobile voice and data devices, or $480 per device. Under a municipally-owned wireless network, the City could replace some portion of these devices with Voice-over Internet Protocol (VoIP) mobile devices. If the City were to replace half of these devices, or 338 devices, under a municipally-owned network the City could incur no cost for usage of the wireless network for Voice-over Internet Protocol and pay only for the replacement devices. Replacement of these devices would be approximately $100-150 per device, or $33,800 to $50,700 for the replacement of 338 devices. Therefore, if the City were to replace half of the mobile voice and data devices, for approximately $33,800 to $50,700, the City could save an estimated $162,240 (338 replaced mobile devices times savings of $480 per device).

Increased Efficiency of City Functions and Wireless Systems Enhancement

Currently, nearly all San Francisco City departments, if they utilize wireless technologies, are limited to using proprietary networks provided by third-party vendors. Additionally, a number of City departments would have the opportunity to increase their capabilities by utilizing wireless technologies where currently they do not have access to such wireless technologies. Examples of possible operational savings for the City include the following opportunities.

- Wireless technologies would allow building and planning code enforcement personnel, and street inspectors to enter and receive data in real-time, rather than being confined to a City department's physical location to receive information and input inspection results.

- A wireless system could allow for tracking of all Municipal Railway bus and train lines in real time, and not simply those few lines on Muni's NextBus system, which could increase the Municipal Railway's ability to prioritize line service and reduce overtime costs by providing dispatchers with real-time bus and train information.

- The Public Utilities Commission could utilize a wireless network for water meter reading, an option which the Public Utilities Commission is currently considering to undertake with a third-party vendor.

- The Department of Parking and Traffic could utilize a wireless system for real-time data (a) to track timed street-parking locations in conjunction with the new Mobile License Plate Recognition system currently being tested for Citywide usage for the Department of Parking and Traffic's boot/scofflaw[13] program; and, (b) to provide real-time traffic data to City residents and CalTrans.

    a) In the case of the boot/scofflaw program, utilizing both a wireless system and the Mobile License Plate Recognition system could help Department of Parking and Traffic to quickly identify and ticket parking violators (a) without the need for chalk (thus saving on work-related injuries and workers' compensation claims) and (b) in real-time (thus increasing the number of tickets which can be issued and the number of delinquent vehicle owners which can be booted).

[13] "Scofflaws" are vehicle owners with five or more unpaid parking tickets.

b) In the case of the real-time traffic data, a Citywide wireless network would enable the Department of Parking and Traffic to place wireless traffic cameras at any intersection at any time, without the expense of installation of wires to such cameras, thus providing Department of Parking and Traffic with the ability to (a) prioritize particular intersections and (b) move cameras to different locations as traffic flows change over time or due to specific events or street closures.

- With the new 311 Call Center, the City will be able to consolidate the tracking of Department actions (e.g., from the time a request for a specific task is made to the time such requested task is completed) into a centralized Customer Relations Management (CRM) database. Should the City implement a municipally-owned wireless network, City department field staff could receive 311 requests in real-time, potentially shortening the time elapsed between the initial task request and completion of the requested task.

While the City can expect efficiency savings to result from consolidation of City services through a municipally-owned wireless network, such efficiency savings are difficult to quantify and could take time to implement. Therefore, the Budget Analyst will not attempt to quantify such savings, except to note that such savings would be possible, given (a) different City departments' current reliance on proprietary, redundant wireless networks for different functions and (b) the City's ability to enhance current services with real-time data, whether for the Department of Public Works, the Department of Parking and Traffic, or any other City departments.

Other San Francisco-Specific Savings

The above potential savings are not considered to be an exhaustive list of savings which could be realized by the City through a municipally-owned wireless network. Other opportunities for savings do exist, and would be realized only as the City controls a network and can identify additional ways to utilize such a network to enhance, replace, and create new services.

One potential area for additional savings is with the San Francisco Unified School District. Under Proposition H, which was approved by San Francisco voters in March of 2004, the City must identify and provide support to San Francisco Unified School District either through General Fund monies paid to San Francisco Unified School District and/or in-kind support which has an equivalent monetary value. With a municipally-owned network, the City could provide free wireless broadband access to all San Francisco Unified School District schools, thus replacing the need for current wired connectivity, resulting in a savings to the San Francisco Unified School District with an equivalent value of the cost previously paid by San Francisco Unified School District for such connectivity. As of the writing of this report, the Budget Analyst was unable to obtain an estimated value for connectivity savings which could be realized by the San Francisco Unified School District. However, such savings could reduce the City's total Proposition H General Fund contribution.

Sections Two and Three Summary

In summary, given the discussions in Sections 2 and 3 above regarding the three main business models being used for deployment of a wireless broadband network and the estimated costs and

revenues and return on investment for such a network, the Budget Analyst notes several key trade-offs among the business models, which include costs, control, risk, and revenues and return on investment. These tradeoffs are manifested in various ways and degrees, depending on the business model employed:

- Municipally-Owned Model: For a municipally-owned network, the City would incur nearly all costs and risks for deployment, operations, and upgrades of the wireless network, but the City would also be the beneficiary of maximum control and maximum revenues and return on investment opportunities.

- Non-Profit Model: Depending on how a nonprofit-owned network is developed, the City would incur some portion of total costs and risks, while the nonprofit entity would assume the balance. As a result of shared costs and risks, the City would also have less control, if any, over the network and fewer revenues and return on investment opportunities than it would under the municipally-owned business model.

- Public-Private Partnership Model: In a public-private partnership model, the City would incur little costs and few risks, but also would have little control over the operations and development of the network as well as limited revenue and return on investment opportunities.

Given the tradeoff between the costs incurred by the City and the total control available to the City in the deployment of a Citywide wireless network, the City's goal of bridging the digital divide may prove to be incompatible with its desire to provide free wireless broadband at no cost to the City. As stated previously, the City's intent to provide a public good may diverge, if not immediately then over time, from the profit motive of a private entity providing a wireless network at no cost to the City.

Conversely, under a municipally-owned and operated Citywide wireless network, the City would incur all financial risk, including the risk that the wireless network will be a net loss in City operational revenues. The City would be responsible for all deployment costs, ongoing operational and maintenance costs, and the costs of network upgrades needed to keep the network competitive with alternative technologies. This financial risk is difficult to quantify but is a substantial consideration in whether or not, and the degree to which, the City chooses to develop a municipally-owned and operated wireless network.

The table below summarizes the fiscal feasibility of a municipally-owned wireless network, accounting for all costs of deployment, operation, maintenance, and upgrades of such a network as well as the revenues and return on investment opportunities quantified above. As shown in the table, the Budget Analyst estimates a range of outcomes from (a) an annual funding shortfall of $1,444,835 to (b) an annual net revenue gain of $923,390. The Budget Analyst notes that (a) a number of revenue-producing opportunities discussed in this report could not be quantified with the data available for the report, and, (b) as noted above, total network operations, maintenance, and upgrade costs could increase over time.

Table 3.1
Fiscal Feasibility of a Municipally-Owned Wireless Network
(Present Value Dollars)

Annual Costs	**Worst-Cast Scenario**	**Best-Case Scenario**
Annualized Capital Infrastructure Investments Required of the City (Total)*	$2,500,000	$1,500,000
Operating and Maintenance Costs Paid by the City	$2,000,000	$1,500,000
TOTAL ANNUAL COSTS	**$4,500,000**	**$3,000,000**
Annual Revenues and Operational Savings		
Business Fees	$1,200,000	$1,200,000
City Resident Fees	$1,296,000	$2,160,000
Replacement of T1 Connections**	$409,600	$409,600
Replacement of Mobile Devices***	$149,565	$153,790
Other Revenues and Operational Savings (e.g., Tourist Fees, Advertising, Grant Funds, Increased Efficiency of City Functions and Wireless Systems Enhancement, and Other San Francisco-Specific Savings)	Variable	Variable
TOTAL ANNUAL REVENUES AND OPERATIONAL SAVINGS****	**$3,055,165**	**$3,923,390**
Net Annual Funding Shortfall or Revenue Gain of a Municipally-Owned Wireless Network		
Maximum Net Funding Shortfall (Minimum Revenues Minus Maximum Costs)		**($1,444,835)**
Maximum Net Revenue Gain (Maximum Revenues Minus Minimum Costs)		**$923,390**

* Assumes annualized network upgrade costs of $6,000,000 to $10,000,000 for capital infrastructure investments every four years.

** Annualizes infrastructure replacement costs $500,000 over four years, or $125,000 every year. Total return on investment amount of $409,600 includes (a) total estimated return on investment of $534,600 minus (b) total annualized costs of $125,000.

*** Annualizes infrastructure replacement costs of $33,800 to $50,700 over four years, or $8,450 to $12,675 every year. Total return on investment amounts of $149,565 to $153,790 include (a) total estimated operational savings of $162,240 minus (b) total annualized costs of $8,450 to 12,675.

****Total annual revenues and operational savings includes no specific amounts for "other revenues and operational savings."

The Budget Analyst notes that the City would likely face competition from private interests and risk a wireless network's obsolescence due to technological change in the future, despite efforts to invest in system upgrades on a four-year cycle. These risk factors should be carefully considered in weighing the costs and benefits of a municipally-owned wireless broadband network.

Section 4. Conclusion

The primary goal of the City and County of San Francisco's wireless broadband initiative is to promote digital inclusion by ensuring affordable broadband access, affordable hardware, community-sensitive training and support, and relevant content to all San Franciscans, especially low-income and disadvantaged residents. Affordable access to services available over broadband is becoming increasingly recognized as an important contributor to social and economic development and as a catalyst for bringing extraordinary digital benefits to residents. In moving forward with the implementation of a citywide wireless network, the City, and in particular the Department of Telecommunications and Information Services, should ensure that the goal of bridging the digital divide is not entirely lost in the process and that the community's needs, requirements, and concerns are aligned with the municipal broadband initiative's goals and specifications.

As evident from our survey of cities and evaluation of relevant research studies on this topic, diverse cities are serving as testing grounds, exploring alternative allocations of roles and responsibilities, and are pursuing a variety of organizational arrangements and business models for implementing citywide wireless network systems. One major lesson that is learned from other cities' experiences is that the decision of whether and through what vehicle a municipality should provide wireless broadband service requires a highly fact-specific analysis that is not amenable to any short cuts or a one-size-fits-all policy recommendations.

The City has a proposed agreement with EarthLink for the provision of a Citywide wireless broadband network. As previously noted, despite the fact that the City assumes no financial risk and does not have to be involved with marketing, deployment, and the customer service function required to operate the network, certain issues should be considered under the proposed EarthLink agreement, including (a) the appearance of a conflict of interest, (b) the quality of the technology being proposed, (c) the intended and unintended costs to residents, and (d) privacy issues (See discussion in Appendix I). As such, in determining the best approach to implement the City's wireless project, the City should more carefully evaluate (i.e., beyond issuing a Request for Information and Comments) all potential business and technological models - and the issues associated with each - to ensure that the City employs the best possible organizational arrangement, solutions and infrastructure assets to build and operate any wireless broadband network.

While a self-supporting, municipally-owned and operated wireless network is potentially fiscally feasible, such an endeavor faces inherent risks which would need to be overcome to assure its viability. The City's need to mitigate financial risks may result in the need to face difficult policy choices over tradeoffs between the need to produce substantial revenue through the provision of wireless broadband services and the goal of providing high quality services at no costs to financially disadvantaged users and a reasonable, and highly competitive cost for all other users.

The estimates used in this report result in a wide range of possible outcomes. Therefore, if the City wishes to examine further the option of a municipally-owned and operated wireless network, cost and revenue benefits would need to be substantially strengthened through competitive bidding and acquisition of firm vendor price information.

Section 5. Recommendations

The Budget Analyst makes the following recommendations for consideration by the Board of Supervisors as a result of this review and analysis:

1. Should the Board of Supervisors wish to investigate further the potential of a municipally-owned wireless broadband network, the Board should then direct the City to reissue a Request for Proposals that allows for any of the three business models discussed in Section 3 of this report. By allowing for any of these three business models, the City would encourage creativity and innovation and be able to choose the proposal that best fits the City's financial constraints. For example, such a Request for Proposals should:

    a) Include specific requirements that would effectively bridge the digital divide in San Francisco by providing wireless broadband access to low-income San Francisco residents that is both high-quality and free-of-charge to residents;

    b) Require proposers to offer state-of-the-art connectivity to San Franciscans that is, at a minimum, equal in technological capability to other nearby offerings;

    c) Require the effective leveraging of existing public and private infrastructure assets, including, to the extent practicable, the City's existing fiber infrastructure and other unused existing fiber infrastructure;

    d) Allow proposers to provide the City with operational savings opportunities;

    e) Ensure that the model being proposed encourages new uses and attracts many users; and

    f) Ensure that the model proposed is flexible to adapt easily to changing technologies.

2. To the extent that it is practicable, the City should incorporate the results of the fiber-to-the-premises feasibility study presently being conducted by Civitium and Columbia Telecommunications Corporation into the revised Request for Proposals.

3. The City should engage in greater community outreach throughout the entire process, through the Task Force on Digital Inclusion and/or other means, in order to ensure:

    a) Achievement of the City's goal to bridge the digital divide;

    b) Enhanced community understanding of and participation in any Citywide wireless broadband network; and

    c) Better understanding by the City of its residents' and businesses' needs and how they can be met with a Citywide wireless network.

Appendix I. The Proposed EarthLink Wireless Broadband Network Agreement

The Department of Telecommunications and Information Services, with the support of Civitium, the City Attorney's Office and outside consultation with several City agencies, has finalized negotiations on an agreement with EarthLink for the provision of a Citywide wireless broadband network.[14] The Department anticipates that it will submit this final agreement to the Board of Supervisors in January 2007 for approval by the Board of Supervisors. This analysis reviews the initial proposal submitted by EarthLink to the Department of Telecommunications and Information Services in response to the Request for Proposals for a Citywide wireless broadband network which was issued in December 2005, and takes the proposed agreement into account where it varies from the initial proposal submitted by EarthLink to the Department of Telecommunications and Information Services.

The Proposal Selection Process

The decision to award EarthLink the agreement currently being negotiated was reached in April of 2006, as described in Section 1 of this report. The proposal submitted by EarthLink was one of six proposals submitted in response to the Department of Telecommunication and Information Services' Request for Proposals, for which three of the proposers were interviewed. The Department of Telecommunication and Information Services brought together a selection panel made up of representatives of the San Francisco Public Utilities Commission, the Department of Telecommunications and Information Services, and Civitium. The Department developed a scoring system for the written proposals based on (a) levels of compliance with 60 requirements in the Request for Proposals, (b) firm qualifications, and (c) interview scores.

Four of the five panelists judging the proposals scored EarthLink's compliance with the proposal specifications lower than the proposal submitted by MetroFi. However, four of the five panelists scored EarthLink's firm qualifications higher than MetroFi's firm qualifications. As a result, EarthLink received the highest ranking of the six written proposals. The selection panel interviewed three of the six proposers. In the interview process, EarthLink scored highest and was awarded the contract for the provision of a Citywide wireless broadband network.

The Summary Details of the EarthLink Agreement

Under the EarthLink agreement, EarthLink would install the wireless network and provide two tiers of wireless broadband network access: (1) a Premium service tier, offering throughput speeds of 1.0 Mbps at an estimated cost of $20 per month, in which EarthLink would serve as (a) the wholesale wireless network provider and (b) one of the available internet service providers; and (2) a Basic, free service tier, offering throughput speeds of 300 Kbps at no cost to network users, in which EarthLink would serve as the wholesale wireless network provider, and Google would serve as the sole internet service provider.

[14] Under the terms of the Request for Proposal, the wireless network would provide wireless internet connectivity to 95 percent of all outdoor areas and 90 percent of all indoor areas up to the second floor, throughout the City of San Francisco.

Under the EarthLink agreement, EarthLink would provide wireless broadband access across the City's entire 47 square miles through an estimated 40 wireless nodes per square mile, including (a) 30 Tropos gateway nodes, which transmit a signal to and from users of the network and (b) 10 Motorola canopy nodes, serving as the entry point to the backhaul layer. The Motorola backhaul layer nodes would transmit the signal back through a backhaul distribution layer, transmitting the signal back to EarthLink's wired internet Point of Presence (POP) at two locations in or near the City's financial district. Further, under the EarthLink agreement there would be approximately 1,500 to 1,900 Tropos and Motorola nodes. These nodes would be mounted primarily on light poles, including approximately 600 to 900 light poles owned by the City and the balance owned by Pacific Gas & Electric.

EarthLink's Near-Exclusive Access to Unlicensed Radio Frequency Bands

The EarthLink wireless broadband network would primarily utilize radio frequency bands which are "unlicensed," meaning that they are available for usage by anyone in the public domain, and not licensed.[15] Given radio frequency band limitations, the design of the EarthLink agreement would almost necessarily exclude any potential competing wireless network providers from entering the market for a Citywide wireless network after EarthLink's network has been deployed, as any potential competitors in the unlicensed spectrum would have to contend with EarthLink's existing wireless signals, which would occupy much of the available unlicensed radio frequency bands in the City of San Francisco. As a result, EarthLink would have near-exclusive access to all of the unlicensed radio frequency bands throughout the City for the provision of its wireless network. For this reason, the EarthLink agreement has the appearance of a franchise, which is defined as "a privilege of a public nature conferred on an individual or body" including "the territory to which such permission extends,"[16] because near-exclusive access to most of the unlicensed radio frequency bands throughout the City and County of San Francisco for the provision of a wireless broadband network would be available to EarthLink, before any potential wireless network competitor.

Google's Exclusive Provision of Free Internet Access

Under the EarthLink agreement, Google would serve as the sole internet service provider for the Basic, free tier of wireless internet access, meaning that users of the Basic service tier, which would operate at throughput speeds of 300 Kilobits-per-second (or Kbps), would have internet access only through Google. Therefore, not only would EarthLink be granted near exclusive access to the bandwidth spectrums mentioned above, but Google would be granted exclusive access to network users as the sole internet service provider for the Basic service tier of the EarthLink wireless network.

For the fee-based Premium service tier, operating at throughput speeds of 1.0 Mbps, EarthLink would serve as a wholesale network provider, selling access to different internet service providers that meet EarthLink's qualifying criteria for internet service providers. EarthLink

[15] The EarthLink proposal calls for usage of the 900 MHz, 2.4 GHz, 5.2 GHz, and 5.7 GHz radio frequency bands for both end user connectivity and wireless backhaul. These frequencies comprise nearly all of the available unlicensed bands currently authorized by the Federal Communications Commission.

[16] The Random House Dictionary of the English Language; Jess Stein, Editor in Chief. Random House: New York. 1973.

would also serve as one of the internet service providers, competing against other internet service providers to provide network access to users of the EarthLink wireless network.

EarthLink's Appearance of a Conflict of Interest

As EarthLink would serve as both a wholesale wireless network provider as well as an internet service provider to provide wireless services from the EarthLink network to users of the Premium service tier, this dual function may appear to create a conflict of interest. To guard against any potential conflict of interest, section 2.5(A) of the City's Request for Proposals stated that "The Network Operator shall provide Open Access to its wireless broadband Internet access transport services to multiple unaffiliated Service Providers." Any conflict of interest could result in at least two disadvantages to the EarthLink agreement:

- As one of the internet service providers utilizing the EarthLink wireless network, EarthLink, as the wholesale network provider, would have an incentive to limit the amount or quality of competition on the network which limits EarthLink's profit margin as an internet service provider.

- As the wholesale wireless network provider, EarthLink could diminish the quality of service that can be delivered by internet service providers in competition with the EarthLink internet service provider.

These disadvantages could limit competition among internet service providers and result in stifled innovation, limited user interest and accessibility, and inflated costs to network users. While the City is seeking to limit the impact of EarthLink's conflict of interest, it has not yet been determined how or if the City can completely guard against the disadvantages that come with EarthLink being both the wireless network provider and one of the internet service providers.

The EarthLink Agreement's Limited Ability to Bridge the Digital Divide

While the City's TechConnect goals call for "bridging the digital divide" (i.e., providing wireless broadband access to those least able to afford and/or be supplied with such access), the EarthLink agreement is limited in its ability to bridge the digital divide, as a result of the (1) relatively slow throughput speeds, (2) connection equipment costs for users, and (3) advertisers' access to user information.

Relatively Slow Throughput Speeds

The proposed throughput speed of the free service tier is a primary concern in consideration of the EarthLink agreement. EarthLink proposes a Basic, free tier of service which would operate at symmetrical[17] throughput speeds of 300 Kbps. By comparison, the most recent version of Digital Subscriber Line (or DSL) offered by AT&T to residential customers in San Francisco operates at an asymmetrical throughput download speed of 1.5 Mbps, which is five times faster than the

[17] "Symmetrical throughput speed" means that download and upload throughput speeds are the same. "Asymmetrical throughput speed" means that download and upload throughput speeds are different, typically with higher download speed than upload speeds.

download speed of EarthLink's proposed Basic service tier, and upload speed of 384 Kbps, which is marginally faster than the upload speed of EarthLink's proposed Basic service tier. As noted in Section 2 of this report, no other Citywide wireless network deployment reviewed for this report operates at speeds slower than 750 Kbps. By further comparison, since the late 1990's, dial-up modems have operated at symmetrical throughput speeds of 56 Kbps, and, currently, Comcast high-speed cable internet operates at download throughput speeds of up to 6 Mbps. The Budget Analyst notes that section 11.1.5 of the EarthLink agreement contains the provision that "EarthLink shall increase the speed of the Basic Service to always be the greater of 300 Kbps or 15 percent of the advertised speed of the Best Selling Wireless Broadband Product."

The Basic service tier provided under the EarthLink agreement would be slower than existing Digital Subscriber Line and cable internet technology. According to Department of Telecommunication and Information Services staff, the appeal of faster speed of 1.0 Mbps in the Premium service tier, relative to the speed of 300 Kbps in the Basic service tier, is an incentive for wireless network users to pay for the Premium service. However, in order to bridge the digital divide and receive service roughly comparable to existing technology and similar wireless networks being implemented in other cities, users which qualify for the Digital Inclusion Product would have to pay a monthly fee of an $12.95. All other users would have to pay the estimated monthly fee of $21.95.

Furthermore, several Bay Area cities, as well as a number of other cities throughout the country, have already introduced free wireless networks with minimum download throughput speeds of 1.0 Mbps. Therefore, the proposed Earthlink wireless network would provide free wireless broadband access at lower throughput speeds than those speeds already provided at other cities. Also, because the EarthLink wireless network would not be fully deployed for at least another two years, the proposed free wireless access could be even slower compared to other cities and services as new innovations are being introduced into the rapidly-changing wireless industry on a regular basis.

Connection Equipment Costs

The EarthLink agreement is intended to provide wireless network signal penetration of (a) 95 percent outdoors and (b) 90 percent indoors, up to the second floor of a given building, or (c) to the extent that signal penetration is practicable. However, most users' computers would be unable to transmit a strong enough signal back to EarthLink's wireless network nodes in order to connect to and use the EarthLink wireless network. As a result, any person who intends to use the EarthLink wireless network will need something known as a Customer Premise Equipment device, or CPE, which strengthens the outgoing signal of the user to connect back to the wireless network nodes. Customer Premise Equipment generally costs between $80 and $200 per device, depending on the signal strength and the quality of the Customer Premise Equipment device. In the EarthLink agreement, the cost for a Customer Premise Equipment device would either (a) be paid entirely by the wireless network user or, in the case of the Digital Inclusion Product, by the City, or (b) be paid in part or in full by EarthLink in exchange for a term of service agreement between EarthLink and the wireless network user. Therefore, low-income residents would need to either (a) enter into a service agreement with Earthlink for access to the wireless network

Basic service tier, or (b) rely on the City to pay for the Customer Premise Equipment, in order to avoid paying $80 to $200 for Customer Premise Equipment.

Advertisers' Access to User Information

EarthLink, as the wireless network provider, and Google, as the internet service provider, will rely on advertising revenues in order to generate adequate revenue for operation of the free service tier. The Department of Telecommunications and Information Services, private citizens, and experts interviewed for this report, have privacy concerns with any design of a network and internet service provider configuration that is primarily supported through advertising revenue, particularly given that users' internet usage can be tracked and stored and made available for sale to interested buyers. Further, due to ongoing issues with "click fraud,"[18] advertisers are becoming more aggressive in their marketing and may make greater efforts to track users of the free network. As a result of concerns around user privacy and advertiser aggressiveness, the Department of Telecommunication and Information Services negotiated four main points in the proposed EarthLink agreement, including that:

(a) EarthLink is legally compelled to provide information to the City that is requested by the City;

(b) Users of the proposed Basic tier of service will remain anonymous;

(c) EarthLink's and Google's abilities to identify the location of a particular wireless network user will be limited; and,

(d) Restrictions on providing user information to third parties will be established, so that users cannot be required to provide their information.

With respect to the latter two points, section 10.3.1.1 of the proposed EarthLink agreement contains the Privacy Policy Standard for users of the EarthLink wireless network which utilize EarthLink as their internet service provider, stating that, "EarthLink will not share Protected Personal Information – defined in section 1.70 of the proposed agreement as including, but not being limited to: name, address, social security number, credit card information, phone and fax numbers, financial profiles, and medical profiles – with any person or entity without the voluntary, affirmative consent of the [network] user, subject to the following exceptions:

1. EarthLink may share Protected Personal Information with EarthLink's Third Party Suppliers to deliver or promote EarthLink's services, provided that [network] users may opt out of receiving marketing communications from EarthLink or EarthLink's Third Party Supplies using Protected Personal Information obtained from use of any EarthLink Fee Service.

2. EarthLink may share Protected Personal Information with Third Party Suppliers for purposes of processing payments, collections, and order fulfillment and service delivery.

[18] Click fraud results from individuals or companies clicking on advertisements in order to give the perception that online advertisements are receiving more real attention from potential customers than they actually are. More information is available in Appendix II.

3. EarthLink may share Protected Personal Information with law enforcement in accordance with section 10.3.1.2.

4. EarthLink may share Protected Personal Information with other persons or entities in connection with civil legal proceedings in accordance with Section 10.3.1.3.

5. EarthLink may share Protected Personal Information with entities that jointly promote EarthLink's service to their customers, provided that users may opt out of receiving marketing communications from such entities or EarthLink using Protected Personal Information obtained from use of any Fee Service.

With respect to exceptions 1 and 5 above, the Budget Analyst is concerned that the sale and usage of network users' personal information – which includes users' social security numbers, credit card information, telephone numbers, financial profiles, and medical information – whether with EarthLink's Third Party Supplies or otherwise, and whether for marketing purposes or otherwise, exposes those utilizing the EarthLink wireless network to the wide dissemination of their personal data, even if such users opt out of the receipt of marketing materials, under the rules established by EarthLink.

The Budget Analyst further notes that the proposed EarthLink agreement contains no specific privacy protections for users of the Basic service tier, as outlined for users of the fee-based Premium service tier. Section 10.4.1 of the proposed EarthLink agreement states that "EarthLink shall require the provider of the Basic Service to maintain a privacy policy that complies with the requirements of the Basic Service Policy Standard 10.4.1." Such requirements state that the personal information of a wireless network user may be provided (a) to law enforcement, in specific circumstances, in compliance with applicable laws; and, (b) in response to a civil legal demand, so long as "reasonable prior notice" has been provided to the wireless network user in advance of fulfillment of such civil legal demand.

The City's Potential Responsibility, Costs, and Cost Savings with the EarthLink Agreement

The City's role in the EarthLink agreement would include (a) contract compliance monitoring, (b) collection of pole usage fees and electricity billing for nodes placed on Public Utilities Commission poles, and (c) identification of qualifying subscribers for the proposed "Digital Inclusion Product." The EarthLink proposal involves placement of nodes on 600 to 900 Public Utilities Commission poles. Placement of these nodes could result in opposition from (a) neighbors who are concerned about radio signals being emitted from such nodes, and (b) cellular companies that face regular opposition and appeals delays in the siting of cellular radios who conclude that the City is giving preferential siting for EarthLink over these cellular providers. Therefore, the City and/or EarthLink may have to engage in a substantially greater implementation effort than currently anticipated due to (a) radio frequency concerns from City residents; and, (b) potential legal challenges from cellular providers who see the City giving preferential siting of radio signal transmission equipment to EarthLink over existing cellular providers. Such unpredictable issues could result in the City incurring substantial costs. The Budget Analyst notes, however, that the costs of node siting appeals are not specific to the

EarthLink proposal and would be incurred regardless of the vendor or business model proposed for a Citywide wireless network.

In addition to the siting of Tropos and Motorola nodes, including 600 to 900 on Public Utilities Commission-owned poles and the balance of the total of approximately 1,500 nodes on PG&E-owned poles, the City may be asked to allow access to City buildings for the siting of one or more of the access towers which will be utilized for backhaul to transport the signal back to the EarthLink Point of Presence (POP). Further, should the City choose to utilize the EarthLink wireless network for City purposes at some later date, it could then do so. There may be a number of cost-saving opportunities available to the City, the total savings from which would vary depending on whether the City chooses to utilize the EarthLink wireless network, implement a different network with a nonprofit or private entity, or implement a municipally-owned wireless network.

Finally, while the short-term benefit of the EarthLink proposal is that the City will incur no direct capital and operations expenditures for the wireless network, the long-term concern may be that the City will have little to no control over the ongoing maintenance and upgrades to this network, deferring those decisions to the profit motives of EarthLink, Google, and the private market. The Budget Analyst considers this long-term concern to be a limitation to the City's ability to provide a public good which bridges the digital divide over time, as technologies change, the City's needs change, and the City seeks to accomplish new and different things with this network that it did not foresee at the time of initial deployment.

Appendix II. Technical Terms

Access Point: A Citywide wireless network would be comprised of an estimated 30 access points (nodes) per square mile. Each access point would provide signal to the several blocks in radius of that point. Access points transmit signals to the backhaul.

Asymmetrical throughput speed: Asymmetrical throughput means that speeds for downloading information are different than speeds for uploading information, typically with download speeds being faster than upload speeds.

Backhaul: The backhaul in a wireless network is the infrastructure, comprised of radio nodes and radio towers, which transmits signals back to one or more Internet Points of Presence. In the EarthLink proposal, there would be approximately one backhaul radio node for every three access point nodes. Several industry experts note that the backhaul of a Citywide wireless broadband network is the primary component which limits the capacity of that network.

Bit: A bit is a measurement of information transmitted electronically. A standard dial-up modem can transmit 56 Kilobits-per-second (56,000 bits-per-second) for both downloading and uploading information, while existing residential Digital Subscriber Line technology allows for 1.5 Megabits-per-second (1,500,000 bits-per-second) download speed and approximately 384 Kilobits-per-second (384,000 bits-per-second) upload speed. See "Kbps" and "Mbps."

Click Fraud: Click fraud results from individuals or companies clicking on advertisements in order to give the perception that online advertisements are receiving more real attention from potential customers than they actually are. Many online advertisers pay ad hosting companies "per click," so that the more clicks the advertisers' ads receive, the more money the advertisers pay to the ad hosting companies. If a specific advertiser is a victim of click fraud, the result would be that the advertiser is paying more money than it is receiving in equivalent exposure from its advertisement. Further, the ad hosting company would be paid more by the advertising company than the ad is "worth," since some portion of the total clicks are fake and do not result in actual customers viewing an advertisers' website. Therefore, the beneficiary of click fraud is an ad hosting company, and the payer is the advertiser.

Customer Premise Equipment (CPE): A CPE is a device which enhances the wireless signal of a computer, in order to allow the computer to connect with a wireless access point.

Digital Subscriber Line: Commonly known as "DSL," Digital Subscriber Line is a technology which delivers high-bandwidth information to homes and small businesses over copper telephone lines. A DSL line can carry both data and voice signals and the data part of the line is continuously connected.

Fiber: Fiber transmits signals using light and a single fiber strand has a current standard throughput speed of 1.0 Gigabit-per-second (Gbps), which is the same as 1,000

Megabits-per-second. In order to both download and upload using fiber, strands are paired, so that one strand is used for uploading information while the other is used for downloading information.

Gbps: Gigabits-per-second. One Gigabit is one-billion bits.

Internet Point of Presence (POP): The Internet Point of Presence is the location at which the wireless backhaul connects with the wired internet.

Kbps: Kilobits-per-second. One Kilobit is one-thousand bits.

Mbps: Megabits-per-second. One Megabit is one-million bits.

Symmetrical throughput speed: Symmetrical throughput means that speeds for downloading information are the same as speeds for uploading information.

Throughput Speed: Throughput speed is the number of bits per second which can be transmitted by a given network. In the case of the proposed EarthLink wireless network, the free service tier would provide symmetrical throughput speeds of 300 Kilobits-per-second (Kbps), while the Premium service tier would provide symmetrical throughput speeds of 1.0 Megabits-per-second (Mbps).

Unlicensed Bandwidths: The Federal Communications Commission authorizes the usage of licensed bandwidths and has made available several bandwidths, including 900 Megahertz (MHz), 2.4 Gigahertz (GHz), 5.2 GHz, and 5.7 GHz, for unlicensed usage. Nearly all cordless telephones, microwaves, baby monitors, wireless internet routers, and other household wireless devices operate in the unlicensed bandwidth spectrum. Conversely, nearly all cell phone, radio, and emergency communications systems operate in the licensed bandwidth spectrum.

Voice-over Internet Protocol (VoIP): Voice-over Internet Protocol is the technology used to transmit voice conversations over a data network using the Internet.

Wireless Access Point (AP): Wireless Access Points are radio nodes which transmit wireless network signals to wireless network users.

Appendix III. Response of the Department of Telecommunications and Information Services

DTIS appreciates the work of the Budget Analyst - in response to the Government Audit and Oversight Committee Motion 06-0109 - to conduct its analysis and prepare this report. Designing, building, and operating a Wi-Fi network must balance a complicated set of policy, business, and technical concerns.

It is clear from reading the draft report that the Budget Analyst approached this project with great care, and attempted to present a balanced view of the project's varied and complex issues. DTIS appreciates the opportunity to review a draft of the report and respond with corrections to factual errors, however the report does more than simply state facts; it also interprets facts, forms opinions and draws conclusions.

Given that any interpretation, opinion or conclusion is inherently subjective, with at least the possibility of being based on incomplete information, bias or facts taken out of context, DTIS requests that the Budget Analyst consider DTIS' entire response to the draft report, not simply the factual errors.

Objective, Scope and Methodology

The understanding of DTIS is that Motion 06-0109 required the Budget Analysts to draft an analysis of the feasibility of a City-owned wireless (Wi-Fi) network. DTIS review a draft report, first submitted on January 3, 2007 and provided comments. DTIS reviewed a second draft report submitted to us on January 9, 2007, in which:

- "The Budget Analyst was not able to obtain exact cost estimates to install and operate a Citywide wireless network in the City of San Francisco . . ."
- "As a result, the Budget Analyst relied on responses to the City's Request for Proposals and estimates provided by industry experts.'
- "Therefore, total costs and revenues from deployment and operation of a municipally-owned Citywide wireless network will vary . . ."
- ". . .will therefore require further verification through competitive bids and proposals, in order to be found reliable."

The Budget Analyst makes several references to "expert advice" it received during its analysis. In the interest of transparency, DTIS proposes that the Budget Analyst, in its report, identify all contributors to its analysis. Given the amount of public interest in this project, DTIS adopted a policy during its negotiations with EarthLink to proactively disclose all discoverable information.

Clarification needed. On page 1, the Budget Analysts refers to a survey of nineteen cities that have implemented or are currently implementing citywide wireless networks, however only twelve cities are referenced on pages 7-9. DTIS asks for clarification on whether additional cities were surveyed, but not included in the report.

Section 1. The City's Effort to Evaluate the Provision of Fiber and Wireless Broadband Internet Access

Request to incorporate prior corrections and comments. DTIS submitted a detailed response to the previous draft report submitted by the Legislative/Budget Analysts. We find that many of the factual corrections we proposed and comments we provided are not reflected in the most recent draft. We ask the Budget Analyst to reconsider these prior corrections and comments in the final report.

Issuance of RFI/C instead of formal feasibility study. On page 4 of the draft report, the Legislative/Budget Analysts states that "this Request for Information and Comment was issued instead of a formal analysis of wireless broadband feasibility or a formal review of options such as municipal ownership of a wireless broadband network."

- Given the need to quickly meet the digital inclusion needs of San Franciscans, the rapid pace of innovation in wireless technology, the "best practices" work of other cities, and evolving business models being experimented by other cities, the City chose to not perform a detailed needs assessment. Indeed, for many of the same reasons, other cities such as Chicago and Houston have not undertaken such assessments. Rather, the City felt that inviting the brightest minds from the public, private, nonprofit and community sectors would provide it with much-needed information to understand its options to achieve the projects goals.

Speed of the Basic (free) tier of service. The Budget Analysts makes various references to the free tier of service, which DTIS wishes to comment on:

- A reference was made to the fact that 300 Kbps is slower than the speed of DSL service from AT&T. While this is true, the Budget Analyst fails to mention that DSL service from AT&T is not free.
- A reference is made to the fact that Comcast's cable modem service is available at 6 Mbps. The Budget Analyst fails to mention that the Wi-Fi service (unlike cable modem or DSL service) provides the additional value of supporting usage anywhere in the city, for nomadic and mobile needs. One cannot use cable modem or DSL Internet access from a police vehicle or from a park bench.
- The Budget Analyst fails to mention that alternative wireless broadband services from cellular/3G providers in San Francisco support speeds of only ~700 Kbps downstream, but are priced in the range of $60-80 per month. These services also routinely require the bundling of voice calling plans.
- The Budget Analyst fails to acknowledge the relationship between the speed of the free tier of service and the revenue generated for addressing the other barriers to digital inclusion (e.g. computer ownership, education). DTIS contends that an increase in the speed of a free tier of service into a market will correspond to a decrease in the uptake-rate of subscribers to the paid-tier, and that this will negatively impact the revenue in a revenue-sharing agreement (like the one described by the Budget Analyst in its survey of other jurisdictions).

Other inaccuracies. On page 4 of the report, the Budget Analysts includes a footnote stating that "According to the San Francisco Public Utilities Commission, the pole attachment and electricity rates analysis conducted by the San Francisco Public Utilities Commission was done

independently and with no support or market comparisons provided by Civitium or any other third party."

- This is incorrect. Civitium provided a detailed pole rate analysis, which was cited by the PUC, distributed to PUC commissioners and cited by Barbara Hale in her presentation to the Commission. The Budget Analyst can locate this in the PUC item or the video archive of the presentation.
- Also, PUC's electricity rates are based on PG&'s tariff (a third party) and the only relevant party, since the PUC matches PG&E rates for external entities. Finally, electricity rates were developed using the American Public Power Association (APPA) formula - another third party.

Section 2. Existing Models for Citywide Wireless Networks

The report identifies a limited set of lessons learned from other cities. Numerous other lessons learned are not in the report that my not support the conclusions and recommendations contained in this report.

Factual errors in survey of other jurisdictions. The report includes several errors in the Budget Analyst's Survey of Business Models Used by Other Cities referenced on pages 7-9:

- For Chaska, Minnesota, the City's Role is incorrectly defined. The City of Chaska originally operated the network, but outsourced it in 2006 to Siemens.
    - See http://www.comnews.com/stories/articles/0606/0606chaska.htm
        - This article states "As the number of chaska.net subscribers grew, Chaska officials realized that the city did not have the resources in place to fully support customers' needs."
        - The article goes on to say "Largely because of the difficulties in providing effective customer support and a more reliable network, chaska.net lost a large number of its subscribers. City managers decided Chaska needed to hire a company that would take over support and provide continuous monitoring of the wireless network."
- For Boston, Massachusetts, the Budget Analyst should note that this is not an operational system. The business model defined in the report is only proposed, but no information is available to demonstrate that it is viable.
- For Corpus Christi, the City's Role is incorrectly defined. Corpus Christi originally funded and owned the network for municipal use, but in December, 2006, reached an agreement with EarthLink to purchase the network and open it for public access.
    - See http://www.ccwifinews.com/blog/?p=98
    - This article quotes City officials "This [sale to EarthLink] provides the city with an ability to bring the Wi-Fi system beyond where it is now."
- For Houston, has selected a business model and is currently in negotiations with a private provider.

Section 3. The Fiscal Feasibility of a Municipally-Owned Wireless Network

Operational Savings Opportunities for the City

While it is true that the City may be able to save money with this type of Wireless Network, the idea that a large part of our telecom expenditures could be avoided using the Wi-Fi/fixed wireless network is overstated and untested.

- In terms of the broadcast Wi-Fi service, this would clearly be beneficial for mobile data needs within the city. Our spending on this currently is not very high, but will most likely be expanding in the future. The advantage here is more of a future cost avoidance than a current one. Even so, this would only be true if the service were only needed within the confines of the City or where roaming arrangements existed. Might be possible down the line.
- VoIP over Wi-Fi on a reliable basis on a citywide scale is untested. I don't think it will be ready on a reliable basis for a while. The geographic limitations also apply.
- In terms of using the fixed wireless network you would need to do a site by site analysis to determine if they were serviceable, i.e., line of sight. You would also need to examine whether there are economies from using the fixed wireless network used to support Wi-Fi backhaul for fixed wireless service.

About anchor tenancy commitment in other cities. First, none have been demonstrated to produce any savings to cities because they are too new. Second, the applicability for either the broadcast or fixed wireless is limited to certain uses, in no case is the wireless service intended to replace all other networks, only to supplement them. A good example of this is Riverside where 50% of the revenue commitment is for non Wi-Fi fixed broadband network services and is instead an increased revenue commitment for AT&T & Cingular products.

Anchor tenancy for this new a service is essentially a subsidy.

DTIS did not have enough time or information to determine errors in the Table titled Fiscal Feasibility of Municipally-Owned Wireless Network.

Section 4. Conclusion

DTIS finds that the analysis performed does not support the stated conclusions.

- The Budget Analysts' own survey, once corrected as noted above, demonstrates a strong precedent for private ownership, particularly in larger cities.

    - 9 out of the 12 cities surveyed selected, or migrated to, private ownership;
    - Only 1 out of the 12 cities surveyed selected a nonprofit-owned model, and not even this network has been deployed. Furthermore, Philadelphia originally chose a nonprofit-owned model, but migrated to private ownership; and
    - Only 2 out of the 12 cities surveyed selected public ownership. Both of these cities outsourced the operation of the network to private providers. And the largest of these cities has a population of only 30,000 residents (4% of the population of San Francisco).

- Missing from the survey are two cities close to San Francisco, Palo Alto and Sacramento, both having municipal utilities, have chosen to follow San Francisco's lead and pursue a public-private partnership.

- Digital inclusion is not lost. The City created a Task Force by engaging a wide-range of distinguished community leaders with expertise and experience in technology, affordable housing, community development and human and social services to advise us on the technology needs of the community.

  The Community Task Force created the San Francisco Digital Inclusion Strategy, with further community input. Their approach is to engage the community in a community driven planning and implementation process, leverage existing community, governmental and business resources whenever possible, and include measurable outcomes and indicators of success. Programs include:

  Implementation will be a collaborative effort among city departments, the Unified School District, community-based nonprofit organization, social services agencies, higher education, business and community volunteers.

  - The 300 Kbps free service is adequate for most Internet tasks such as web browsing, e-mail, and even Voice over IP (VoIP). The speed of the free service is also required to increase in speed during the term of the agreement to be at least 15% of the speed of the best-selling Premium (paid) product.
  - The City anticipates that low-income and disadvantaged residents and small businesses may gain value from this free service by using it to communicate, conduct commerce and enhance educational opportunities. Improving the economic conditions of these residents and businesses may enable and encourage them to subscribe to premium products over time.
  - The agreement with EarthLink also provides up to 3,200 accounts at the discounted rate of $12.95 per month for subscribers who qualify as low income.
  - The one Mbps service is equivalent to DSL service (even faster upload speeds) and is adequate for many Internet uses such as web browsing, e-mail, video and large file sharing, and VoIP. Unlike DSL, this service also will provide the additional benefit of nomadic and mobile use.
  - The issue of a Wi-Fi modem has been discussed in community meetings for some time. DTIS is unaware of any citywide Wi-Fi deployment where free service if offered, whether private or public-owned, where a CPE is made available to users of the free service at no cost.

- San Francisco has undertaken and extensive process involving diverse constituencies and numerous public meetings. By undertaking a community input (RFI/C) and competitive (RFP) process, the City asked the citizens of San Francisco and the best and brightest business and technical minds what they thought it should do, and what solutions were available.

Section 5. Recommendation

DTIS finds that the analysis performed does not support the stated recommendations.

- The RFP included language that provided an opportunity for anyone wishing to submit a proposal based on a municipally-owned or public-private partnership model.
- Fiber and Wi-Fi are different technologies that compliment, but do not replace each other.
- The City has reached out to communities and will continue to do so.

Appendix I. The proposed EarthLink Wireless Broadband Agreement

The Budget Analyst asserts that EarthLink may have a conflict of interest resulting from the fact that they operate the Wi-Fi network, provide wholesale access to other ISPs and retail access to their own subscribers.

- First, the agreement with EarthLink requires EarthLink to offer to any service provider wholesale access on nondiscriminatory terms and conditions.

- Second, there is no evidence to suggest that EarthLink has or will attempt to abuse service providers. In fact, EarthLink has been an outspoken advocate for open access and network neutrality regulations.

- Third, EarthLink has demonstrated a strong commitment to wholesale service provisioning; signing agreements to allow America Online, DIRECTV, PeoplePC and Vonage subscribers to access their municipal broadband networks on a national basis.

The agreement provides the City with a commitment to build the network - the anchor for Project TechConnect – and generates revenues from EarthLink that can be applied directly to bridging the digital divide.

Municipal ownership affords more control. The Budget Analysts provide a thought-provoking discussion on this issue of control over the network, raising many advantages for the City with this model. While some in the community have stressed the need for controls that may come with public ownership, others have raised concerns about the "big brother" or censorship risks of government-owned information networks. Whether these risks are real or perceived, it is inevitable that this City will have to deal with them. Consider the recent case of Culver City, CA, where criticism has been mounting over their decision to block legal content over their municipally-owned network. In one recent article at http://www.paganvigil.com/C322448388/E20060904020023/index.html an opponent of the city's plan says "The city has installed filtering software that blocks access to legal adult sites and, more significantly, prevents peer-to-peer file sharing. Ironically, municipal networks are often touted by activists who say commercial service providers are more likely to interfere with free access to Web content. Let the record show that the first U.S. ISP to censor Internet access was a muni network. "

Appendix IV. Budget Analyst's Comments Concerning the Response of the Department of Telecommunications and Information Services

Following are the Budget Analyst's comments concerning the response of the Department of Telecommunications and Information Services (see Appendix III) to the Budget Analyst's fiscal feasibility analysis of a municipally-owned wireless broadband network.

Objective, Scope and Methodology

Request that the Budget Analyst identify all contributors to its analysis.

The Budget Analyst will prepare a list of names of people inside and outside the City who were consulted for this report for submission to the Board of Supervisors.

Request for clarification on whether additional cities were surveyed, but not included in the report.

The Budget Analyst has added Footnote No. 2, which states the following: "Only twelve of the nineteen cities surveyed by the Office of the Legislative Analyst were included in this summary, as the remaining seven cities either (a) were implementing a wireless model that was different from a Citywide wireless network, such as a "hot spots" model; or (b) had not yet selected a vendor or business model for deployment of a wireless network. Surveyed cities excluded from the summary in Table 2.1 include: Austin, TX; Denver, CO; Houston, TX; Lexington, KY; Los Angeles, CA; New York, NY; and San Antonio, TX."

Section 1. The City's Effort to Evaluate the Provision of Fiber and Wireless Broadband Internet Access

Request to incorporate prior corrections and comments.

The Budget Analyst carefully reviewed each of DTIS' comments on the previous draft and made edits where appropriate, given information either available at the time or obtained through further review.

Issuance of RFI/C instead of formal feasibility study.

The information offered by DTIS does not change the statement that a Request for Information and Comment was issued instead of a formal analysis of wireless broadband feasibility.

Speed of the Basic (free) tier of service.

The Budget Analyst offered comparisons of the proposed EarthLink wireless network to existing internet technologies for better understanding by the reader. The Budget Analyst has not yet prepared a full analysis of the proposed EarthLink wireless network, but will do so when such agreement is submitted to the Board of Supervisors for approval.

Pole attachment and electricity rates analysis conducted by the San Francisco Public Utilities Commission

Per follow-up with the PUC, the Budget Analyst has changed the language in Footnote No. 2 to read as follows: "According to the San Francisco Public Utilities Commission, while the San Francisco Public Utilities Commission was provided with the Civitium market comparable analysis for street light pole attachments and electricity rates, the pole attachment and electricity rates calculated for the proposed EarthLink agreement by the San Francisco Public Utilities Commission were done independently of the market comparable analysis provided by Civitium to the City."

Section 2. Existing Models for Citywide Wireless Networks

Factual errors in survey of other jurisdictions.

The Budget Analyst has updated the report to reflect recent actions by the cities of Chaska, MN, and Corpus Christi, TX. With respect to Boston, MA, Table 2.1 states the following: "Status: A model has been chosen and implementation is pending." With respect to Houston, the Budget Analyst has not had an opportunity to update the report through independent verification with the City of Houston, including the details which were included in Table 2.1 for each of the 12 cities.

Section 3. The Fiscal Feasibility of a Municipally-Owned Wireless Network

Operational Savings Opportunities for the City

The Budget Analyst attempted to quantify potential operational savings as a way to demonstrate how the City might benefit financially from a municipally-owned network, in addition to revenues generated from user fees, advertising, and other sources. It is true that a number of operational savings may or may not be available to the City, and, in recognition of this, the Budget Analyst (a) attempted to provide conservative calculations when quantifying savings from replacement of T1 connections and usage of VoIP devices in replacement of City-owned mobile devices; and, (b) did not quantify other opportunities for operational savings which were mentioned, including at DBI, Planning, DPT, Muni, PUC, and the 311 Call Center.

Section 4. Conclusion

DTIS notes a strong precedent for private ownership in the survey of other cities.

The Budget Analyst makes note of the different available business models and includes the survey of cities performed by the Office of the Legislative Analyst in this report in order to show that different cities have chosen different models, even as, DTIS correctly notes, the majority of cities included in our survey have implemented, or are implementing, a public-private ownership business model. The Budget Analyst further discusses the advantages and disadvantages of the three primary business models.

Digital inclusion

On page 4 of the report, the Budget Analyst describes the Digital Inclusion Task Force that DTIS has implemented. The statement in Section 4 of the report was intended to restate the importance of digital inclusion and that any Citywide wireless network, whether through a public-private partnership, municipally owned, or some alternative business model, should emphasize digital inclusion as a priority.

Section 5. Recommendation

The Budget Analyst notes that, while the RFP issued by DTIS in December 2005 for a Citywide wireless network did include language which stated that that "The Network may be municipally owned, privately owned, or a hybrid," such statement was preceded by the statement that "The Network shall be designed, deployed, operated, maintained, and upgraded at no cost to the City." The Board of Supervisors approved Motion M06-0109, which directed the Budget Analyst to determine whether it is fiscally feasible for the City and County of San Francisco to own and operate its own wireless broadband network, and a key component of such analysis is the extent to which the costs of deployment, operations, and upgrades could be incurred by the City as a fiscally feasible enterprise.

The Budget Analyst offers a recommendation for consideration by the Board of Supervisors to incorporate the fiber-to-the-premises study "to the extent that it is practicable," with the understanding that the results of such study may or may not be a technological complement to a Citywide wireless network.

Appendix I. The Proposed EarthLink Wireless Broadband Network Agreement

Open Access requirements and appearance of conflict of interest

The Budget Analyst notes the examples provided by DTIS regarding EarthLink's commitment to open access and network neutrality regulations; however, the Budget Analyst maintains that the business model included in the EarthLink agreement continues to present the risk of a conflict of

interest, with EarthLink serving as both the wireless network provider and one of the available internet service providers on such wireless network. Further, the proposed agreement with EarthLink specifically excludes Digital Inclusion Products, Occasional Use products, and Basic Service from open access requirements.

Revenue-sharing provision in the proposed EarthLink agreement

The Budget Analyst has not had an opportunity to adequately analyze the revenue-sharing provisions to understand the underlying assumptions and verify the accuracy of the proposed EarthLink agreement. The Budget Analyst is prepared to provide a more detailed analysis of the proposed EarthLink agreement when it is considered for approval by the Board of Supervisors.

Municipal ownership affords more control

DTIS' response to this issue does not directly address the points that the Budget Analyst has raised in its analysis of the fiscal feasibility of a municipally-owned wireless network.