



Report for City of Lakewood, Colorado



Municipal Wireless Broadband and the Digital Community

October 2006

www.lakewood.org/IT/Digital_Community_Feasibility

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1 Introduction & Executive Summary

1.1 Project Background

The City of Lakewood (City), the fourth-largest city in Colorado, was founded in 1969, and is located just minutes from Denver, along the west edge of the metro area against the foothills of the majestic Rocky Mountains. Lakewood is roughly bounded by state highway C-470 to the west, 26th Avenue to the north, Sheridan Boulevard to the east, and Hampden Avenue to the south and covers about 44 square miles with a population of over 144,000 residents as Colorado's fourth largest City.

Lakewood is presently undergoing a renaissance of sorts. Rapid growth and development in the 1990s developed much of the City's available land and helped to create an increasingly diverse community, particularly along the border with Denver.

The award-winning Belmar Downtown District development now shapes a new downtown core. The Colfax Urban renewal district, including five new light rail stations, is one of the largest urban renewal districts in the Country. In the near future, Lakewood will be growing again with the development of 1,400 upscale homes in the Rooney Valley with retail centers along the south side of Green Mountain. A cooperative agreement between the City and the Town of Morrison is in place for Lakewood to provide City services.

Lakewood will become home to a major hospital, Saint Anthony's, serving Denver's western and southwestern suburbs; it's opening is planned for early 2008. The hospital, will be located within a soon to be annexed portion of the Denver Federal Center. The Federal Center is home to 28 agencies and boasts the highest concentration of Federal employees after the Washington DC area.

Lakewood has a Council/Manager form of government. Citizens elect a City Council consisting of the Mayor, who is elected at-large and 10 City Council members, two from each of the city's five geographical wards. The City Council sets the policies for the operation of the City government. The Council appoints the City Manager with administrative responsibility to carry out the Council's policies and the day-to-day operations of the City¹. The City Council's Core Community Values are: Safe Community; Open and Honest Communication; Education and Information; Internal Staffing and Technology Infrastructure; Transportation; Quality Economic Development; Physical Infrastructure; and Quality Living Environment².

¹ <http://www.lakewood.org/index.cfm?&include=/citycouncil/councilcontact.cfm>

² <http://www.lakewood.org/index.cfm?&include=/headlines/2006StateOfCity.cfm>

Consistent with and to advance these core values, the City recently launched its initiative to investigate and evaluate the feasibility of deploying a community wireless broadband network to:

- Stimulate Economic Development:
 - As unprecedented activity is planned for 2007-2010
 - Address the “last mile” of connectivity for high-speed connection to the Internet for businesses of all sizes; existing and new to Lakewood
 - Provide the environment and conditions to allow private industry to move forward with building modern communication infrastructures prior to development occurring.

 - Enhance Public Safety Operations:
 - Support interoperable communications among regional agencies,
 - Support new advanced policing methods, and
 - Enhance community participation

 - Enhance the Efficiency of Government and Service Delivery:
 - Improve productivity by supporting remote real time access to back office systems for government employees, and

 - Offer another means to citizens and businesses to openly communicate with City Hall
 - Promote digital inclusion for all citizens, including access to convenient-self services,
 - Enable seamless communications to the City and to other regional and Federal agencies, and
 - Address the “last mile” of connectivity for high-speed connection to the Internet for residents
-

The City hopes to accomplish these goals through a competitive procurement process aimed at securing private partner(s) to build, own and operate a City-wide network. The City realizes that a cooperative regional approach improves the likelihood of success in meeting these goals.

To this end, the City retained Civitium, LLC, the market-leading consulting firm for Municipal Broadband and Digital Community initiatives, to assist with its initiative by performing data collection and analysis and recommending a course of action consistent with the initiative's objectives.

Civitium conducted a municipal wireless broadband planning process carefully assessing technological, regulatory, political and financial opportunities and challenges, and municipal and local community needs. This effort culminates with the comprehensive Report for Lakewood, attached below. The Report identifies the information, including overall requirements, methodologies and timelines necessary to organize and manage a successful municipal wireless broadband initiative.

The planning process commenced with a series of stakeholder interviews comprised of 47 participants representing 17 internal and external stakeholder groups. Participants provided valuable input and had definite opinions on perceived opportunities, challenges and expectations. In addition to their unique backgrounds, all participants brought overwhelming enthusiasm and interest in support of a wireless broadband initiative.

In summary, of the 47 participants, 39% were City employees representing 7 City departments, and 61% represented 10 community groups, including institutions, economic development entities, the business community, a non-profit agency, a large federal agency and a local Service Provider.

Overall, participating stakeholders rated objectives and motivation, in order of importance, as 1) Efficient Government; 2) Economic Development; 3) Social Inclusion.

Participants were also asked to share perceptions about potential risks and challenges presented by this initiative. Perceived risks and challenges included: 1) Costs and Network Enhancements; 2) State Regulation; 3) Network Performance and User Expectations; 4) Interagency/Regional Cooperation; 5) Industry Opposition; 6) Network Security and End-user Privacy.

Along with Lakewood, several cities in the Denver, Colorado area seek to confirm the premise that their communities would benefit from access to an affordable wireless broadband service. The core Cities of Boulder, Broomfield, Lakewood, and Thornton are collaborating on a regional wireless broadband initiative, Colorado Wireless Communities (CWC), with the belief that the vendor community would find a regional initiative more attractive than individual city initiatives. To this end, each of the CWC cities has launched wireless broadband initiatives. The combined population of the CWC cities, including Lakewood, is approximately 600,000.

Beyond the indirect benefit gained from enhancing the market from the vendor perspective, there are direct benefits to the quality of life in the area that could be achieved through a collaborative regional wireless initiative, including enhanced interoperable communications among emergency mutual aid responders, improved ability to support telecommuting employees residing in one city and employed in another, distance learning, and telemedicine to name just a few.

1.2 Summary of Recommendations

Based on the findings, as summarized here and detailed in the Report below, Civitium makes the following recommendations:

- Support and pursue the overall objectives, community motivations, policy and goals
- Consistent with State law, adopt the public-private partnership business model whereby the City acts as facilitator to attract private-sector companies to provide and operate a community-wide wireless broadband network.
- Develop and issue a Request for Proposal to solicit expressions of interest and proposals from private sector companies.
- Develop a communications strategy in parallel with the RFP to keep policy makers, stakeholders and the public in general informed with the facts.
- Determine jurisdiction over public assets and facilitate agreements to use such assets, and identify power supplier where such assets are powered.
- Continue targeted stakeholder involvement throughout the process.
- Establish a forum for community input utilizing a variety of available mechanisms.
- Continue discussions with CWC cities to identify the appropriate collaborative role for the City of Lakewood.

In conclusion, Civitium finds the City of Lakewood well positioned to implement the above recommendations.

2 City Goals, Objectives, and Broadband Policies

2.1 Goals and Objectives

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 insight into potential issues and benefits that may result from a municipal sponsored project.

2.2 Process Overview

To provide a consistent framework for the analysis, the participants were lead through a four-step process to:

1. Identify important and relevant community issues,
2. Gain feedback from the stakeholders within a workshop setting, socializing potential goals, objectives and needs,
3. Gather options and feedback from potential users of a municipal wireless broadband network, and
4. Produce a Scorecard Survey that highlights and rates general community objectives and benefits.

The City staff identified a total of 19 individuals, representing 7 Internal City stakeholder groups and 28 individuals representing 10 External Community stakeholder groups as participants in the analysis. The interview process considered not only each group's needs and requirements, but also the contributions they could bring to the project. The stakeholder groups were organized as follows:

Internal Stakeholders (City Agencies):

- City Management
- Public Safety - Police and District Fire Department
- Housing and Family Services
- City Planning Commission
- Public Works and Utilities

- City Mayor
- Corporate Services (Finance & Information Technology)

External Stakeholders (Community):

- Trade/Industry Associations
- R1 Jefferson County School District
- Regional Community College
- Downtown Business Incorporated District (Belmar)
- Community Planning and Economic Development Association
- Large Federal Agency
- Local Internet Service Provider (ISP)
- Local Business Leaders
- A Large International Corporation
- Community Non-profits

The stakeholder interviews were designed to gather input about the perception of a municipal wireless broadband project for political, social and economic benefits and include:

- *Introduction/overview* – After a brief market overview, participants were asked to describe how they see the impact of technology, particularly broadband wireless, on the future of Lakewood.
- *Vision* – Participants were asked to share their vision of a citywide wireless network. What are the benefits? Who are the beneficiaries? What potential challenges, obstacles or concerns may exist?
- *City's Role*- Participants were asked what role, should the City play, if any? Should the City fund, own and operate a network or should it be a catalyst for public-private partnership? What value does the City bring? Who should lead such an effort? Why?
- *Scorecard* -At the end of each workshop/interview, participants were asked to fill out a general scorecard, which highlights a list of general objectives for municipal broadband initiatives. Consolidation of the scorecard results helped to define and prioritize important objectives.

2.3 Stakeholder Interview Analysis Summary

Participants in the stakeholder analysis had definite opinions and provided valuable input on the issues and benefits of a municipal project. In addition to their own unique backgrounds, all brought overwhelming enthusiasm and interest for support of such an initiative.

Of the 47 individuals who participated, approximately 39% were City employees. Understandably, participants from this segment rated Enhancing the Delivery of Government Services as the most important motivation for a municipal wireless project. Ancillary benefits were Social Inclusion followed by Economic Development.

Of the remaining participants, 10% represented institutions, 19% represented economic development entities, 22% represented the business community, and 10% represented a community non-profit agency, 5% a large federal agency and 5% a local Service Provider. Overall, this group rated Economic Development as the driving factor, closely followed by Social Inclusion and Efficient Government.

Overall, participating stakeholders rated the following objectives and motivations in order of importance:

1. Efficient Government
2. Economic Development
3. Social Inclusion

Lakewood Scorecard Summary

Goal/Objective	Aggregate Priority	Zero*	One*	Two*	Three*	Total
Promote job/business growth, economic development	HIGH	1	3	13	19	36
Improve efficiency of government service delivery	HIGH		2	20	14	36
Improve public safety through better communication and interoperability	HIGH		9	10	17	36
Provide backup/contingency for disaster response/recovery	HIGH		8	14	14	36
Reduce existing or avoid future government telecom costs	MEDIUM		9	16	11	36
Improve experience for visitors to city, tourists, business travelers	MEDIUM	2	7	15	12	36

Stimulate more private investment and competition for broadband services	MEDIUM	4	7	12	13	36
Enhance education; improve interaction between teacher/student/parent	MEDIUM	2	12	12	10	36
Promote city image/brand	MEDIUM	4	9	13	10	36
Streamline interaction between citizens and government	LOW	2	12	14	8	36
Lower broadband prices for low-income, disadvantaged	LOW	6	8	12	10	36
Enhance health education, telemedicine, patient monitoring, etc.	LOW	5	11	11	9	36
Generate new revenues for city	LOW	7	11	14	4	36

*Of the 47 participants, 36 returned scorecards and the findings below indicate.

*Rating of Importance: Zero (Not a goal); One (Nice to have); Two (Important goal); Three (Critical goal)

2.4 Broadband Policy

In addition to the vision, goals and objectives above, Civitium also worked with key stakeholders to develop the following policy goals for this initiative:

- **Universal Service:** The Network must provide universal service. Providing access in only parts of the City that may be more densely populated or commercially attractive is not an option.
- **Affordability:** Fees for access to the Network must be priced competitively and must be more affordable for low-income and disadvantaged residents and businesses.
- **Commercial Network:** The Network must be privately funded, owned and operated.
- **Open Access:** Open access principles must be adhered to. Multiple, competing Internet service providers (ISP's), who are not affiliated with the Network owner, must be able to gain access at competitively neutral wholesale terms.
- **Consumer Protection:** The Network must protect the rights of users, including respect privacy and consumer choice, and foster diversity of information and ideas.

3 Broadband Technologies

When considering municipal broadband policy, community leaders should investigate all options currently available. Existing technology options for delivering broadband services today include:

- Cable Modem Services
- Cellular/3G Services
- Digital Subscriber Line (DSL)
- Fiber Optic Cable and Network Services
- Satellite Based Services
- Terrestrial Wireless
- Wi-Fi Hotspots

Each of these technology options has benefits and shortfalls. All of them are available in parts of the City today. However, not one of the individual technologies can meet the entire City's anticipated broadband needs. Therefore, wireless broadband will not supplant any of these technologies. Rather, it could provide an affordable business solution to meet future and currently unmet needs of the Lakewood community, including government agencies.

The table below illustrates the transmission speeds and prices of commercial services available in parts of Lakewood today. For the purpose of this report these technologies are considered "broadband technologies":

Lakewood Broadband Technologies

Technology	Maximum Upload Speed (sent by user)	Maximum Download Speed (received by user)	Estimated Price Range (per Month)
T1 Digital Service	1.544 Mbps	1.544 Mbps	\$250 - \$600
Cable Modem	1 Mbps	7 Mbps	\$45 - \$55
ADSL	640 Kbps	2.5 Mbps	\$35 - \$55
Terrestrial Wireless (Residential and Commercial)	1 Mbps	4 Mbps	\$55
2-Way DTH Satellite (Currently available)	128 Kbps	400 Kbps	\$60
Wi-Fi Hotspot	11 Mbps	11 Mbps	\$25
Fiber-optical cabling	1000 Mbps	1000 Mbps	\$5,000

1,024 bits per second = 1 Kilobit per second = 1 Kbps

1,024 Kilobits per second = 1 Megabit per second = 1 Mbps

ADSL: Asynchronous Digital Subscriber Line, DTH: Direct To Home

4 Market Demand

4.1 Municipal Demand

Estimating the demand for municipal use of the network is critical for the City if it elects to issue an RFP. Respondents to the RFP will seek to understand this demand in order to size/scale the network. It may also become important for negotiating anchor tenant services with a winning respondent.

To forecast this demand, Civitium first determined the total annual expenditures for leased telecommunications services. Based on that review, the City of Lakewood spends approximately \$776,000 annually on leased telecommunication services. Civitium also determined the total number of municipal employees by agency group, and applied conservative assumptions about the percentage of mobile employees in each group.

Agency Department	Total # of Employees	% of Mobile Employees	# of Mobile Employees
Police and Fire Services	640	65%	417
Management and Professional / Admin Staff	175	26%	45
Technical Services & Support	30	100%	30
Service and Maintenance (Facilities, Parks)	35	71%	25
Public Works (Streets, Fleet, Traffic)	120	40%	30
Inspections	20	100%	20
Planning/Code & Economic Development	32	75%	24
Board of Education Administration, Support Staff and Principals	n.a.	-	-
Subtotal	1052	56%	591
Other City-Agency Employees	533	10%	53
**Total	1585	41%	644
<p><i>**Estimates based on business applications available in 2007-8</i></p> <p><i>**Number of vehicles not specified (AVL), dependent upon City services needs / season,</i></p> <p><i>**Number of traffic signals or control lines not specified Overall totals include all employees: full-time, part-time and seasonal,</i></p> <p><i>**Numbers represent City of Lakewood and West Metro Fire Protection District</i></p>			

In addition to identifying annual expenditures for leased telecommunications services and forecasting the number of potential municipal employees who may use the network, key stakeholders were also

asked to define the anticipated plans and timing for a candidate list of municipal applications. The following table includes the results of this effort:

Applications/Timeline	Already Deployed	Planned for < 6 Months	Planned for > 6 Months	No Plans
Municipal Operations				
Workforce management		x		
Remote access to email and calendar			x	
Real-time work order issuance			x	
Inventory tracking			x	
Access to GIS records			x	
Law Enforcement				
CDPD/cellular replacement	x			
Access to local databases	x			
Remote access to police reporting system	x			
In-car insurance verification	x			x
Remote issuance of citations			x	
Transmission of video				x
Portable surveillance				x
Fire				
Remote access to current Hazardous Material maps				x
Vehicle location			x	
Firefighter location and transmission of biometric data				x
Fire inspector remote access and report submission			x	
Arson investigators			x	
EMT reporting to firehouse			x	
Transportation				
Coordination of traffic signals	x			
Intelligent Transportation Systems			x	
Variable message signs (Amber Alert)				x
Variable speed limit signs				x
Video monitoring of traffic flow	x			
Electronic tolling				x
Real-time probe vehicles				x
Traffic sensors	x			
Freeway ramp monitoring			x	
Intersection collision avoidance			x	
Red light hold			x	

Mass Transit				
Dispatch management				x
Route adherence				x
“Next bus” applications				x
Wi-Fi hotspots on transit vehicles			x	
Emergency communications			x	
Economic Development				
Ubiquitous access to high-speed data to promote tourism				x
Commercial/industrial infrastructure needs			x	
Discounted rates for small business			x	
Community Development				
Code Enforcement				
Access to current code history			x	
Remote creation of reports and citations			x	
Instant submission of digital photographs of violations				x
Building Inspection				
Remote access to architectural drawings			x	
Homeless Center Connectivity				x
Domestic Violence Emergency Communications			x	
Public Works				
Parking Enforcement	x			
Remote ticketing				x
Sign/Traffic Signals				
Remote access to database				x
Instant reporting of signal outages				x
Fleet Maintenance				
Dispatcher communications				x
Vehicle location (constant communication of GPS coordinates)	x			
Telemetric applications to monitor vehicle performance				x
First Responders/Incident management				
Interoperable communications across agencies and jurisdiction			x	
Eliminates dependence on cellular			x	
Mobile drug data and medical record access			x	
Ability to quickly place cameras at incident scene			x	

4.2 Commercial Demand

A preliminary commercial demand analysis for broadband services throughout the City should be estimated using the kind of demographic data provided below³:

Lakewood Demographics

○ Population	144,126
○ Land Mass (square miles)	44
○ Bachelor Degrees	32.8%
○ Housing Units	62,422
○ In Labor Force	81,904
○ Business Licenses	6,368
○ Median Age	36.5
○ Per-Capita Income (2000)	\$25,575
• Median Family Income (2000)	\$57,171
• Median Household Income (2000)	\$48,109
○ Individuals below the poverty line	7.1%

Residential

A report from the Pew Internet Project estimates that, while nearly 75% of households with an annual income of more than \$75,000 have high-speed Internet access, less than 25% of households with an annual income of less than \$30,000 do not⁴. The median household income in Lakewood is \$48,109, suggesting both a need for and an opportunity to introduce a universal, affordable broadband offering within the City.

Business

According to the City, Lakewood issues approximately 6,368 licenses to businesses. Information about the number of jobs provided by these businesses is not collected at this time.

³ 2000 US Census

⁴ http://www.pewinternet.org/pdfs/PIP_Digital_Divisions_Oct_5_2005.pdf

Lakewood Economic Development is dedicated to sustaining a strong economic base while maintaining quality of life and the vitality of our community. We strive to create and build an environment that preserves, attracts and promotes business growth in Lakewood, Colorado.

Lakewood Economic Development works as an advocate and information resource for businesses. Our mission is to retain existing employers and jobs, and recruit new employers who provide our community with quality employment.

Lakewood Businesses with 500 or more employees⁵:

Jefferson County R-1 School District	11,000
Denver Federal Center	6,200
Gambro	1,500
City of Lakewood	880
Colorado Christian University	700
First Bank of Colorado	642
Qwest	500
Integer Group	500

The stakeholder analysis identified economic development as the key driver for pursuing wireless broadband. This priority driver is supported by a September 2005 study conducted jointly by the Massachusetts Institute of Technology and Carnegie Mellon University, entitled Measuring Broadband's Economic Impact. According to Sharon Gillett, a principal research associate at MIT, the national study strongly suggests that broadband promotes job creation and related benefits include:

- Providing fertile environment for industry investment and innovation,
- Promoting job/business growth,
- Promoting local economic competitiveness,
- Improving experience for visitors to community, tourists, business travelers,
- Improving quality of life and citizen satisfaction, and
- Advancing community image/brand.

⁵ http://www.lakewood-colorado.org/business_climate/employers.asp

5 Business Model Analysis

5.1 Business Models

Choosing a business model that best enables a community to meet its key objectives is critical to a successful municipal wireless broadband initiative. Variations of the five following business models are most commonly seen today.

Public Utility

A “public utility” model is when a city competes on the market as a public utility, providing affordable broadband service directly to businesses and residents, managing subscriptions and billing as it would for municipal water, gas and electricity. This model can simultaneously raise accolades for providing affordable Internet access in the long tradition of municipal utilities and protests of unfair competition from industry service providers. The City of Chaska, Minnesota uses the public utility model. We do not recommend pursuing a Public Utility model for Lakewood based on the following analysis.

Advantages for Lakewood:

- Since the City can tailor the services offered, this approach would ensure that all three overall objectives (efficient government, social inclusion, and economic development) are fulfilled.
- The City would have complete responsibility of network operations, services offered, maintenance and timing of technology upgrades. The City would also have full management over marketing and advertising services in order to attract subscribers in a competitive broadband Internet services environment.
- This approach would generate subscriber revenue, which could be used to offset costs of long-term wireless network operations and services offered by the City.

Disadvantages for Lakewood:

- In order to support the requirements stated in SB 152, a utility model would require a ballot initiative.
- Sources of capital to fund the engineering, design, testing and construction of the network would need to be identified and secured. Possible sources include the City’s general fund, tax initiative, and/or grants. If a Public Utility model were pursued, sources of capital funding would need to

be weighed against other City priorities and long term Capital Improvement Projects (CIP). This could significantly delay the project and subsequent network upgrades.

- The City would have full responsibility for wireless network operations, services, and service quality guarantees offered in a competitive environment.
- An invoicing and billing system would have to be implemented. Though it would be possible to leverage the existing Customer Information System (CIS) in use by the City's water utility, changes and enhancements would be required for the billing details unique to a wireless network utility.
- The City would need to hire new staff skilled in operating, maintaining and supporting a municipal wireless network. A technical support service desk would also need to be created and staffed.
- Since a municipal wireless network would be in direct competition with other local broadband Internet service offerings, the City would need to acquire marketing and sales expertise to differentiate its services.

Cooperative Wholesale

A "cooperative wholesale" model segregates government traffic on a government-owned network so that excess capacity can be leased to wholesale service providers who then offer service directly to the public. The service providers operate and manage the public portion of the network including marketing and billing. This model generates compensation to the city from the wholesale service providers. The City of Corpus Christi, Texas uses the cooperative wholesale model. We do not recommend pursuing a Cooperative Wholesale model for Lakewood based on the following analysis.

Advantages for Lakewood:

- Since this approach focuses primarily on government traffic on the network, the first overall objectives (efficient government) would be met. Furthermore, Public Safety and other government agency use of the network during a disaster or emergency could be prioritized.
- Excess capacity would be sold to the local Internet Service Provider (ISP) market upholding the City's policy goal of an open, or wholesale, network.
- This approach would generate wholesale subscriber revenue which can be used to offset costs of a long-term wireless network operations and services offered by the City.

- Marketing efforts targeted at subscribers would be performed by local ISPs.
- Billing operations would be the responsibility of ISPs reselling wireless service.

Disadvantages for Lakewood:

- In order to support the requirements stated in SB 152, a cooperative wholesale model would require a ballot initiative.
- Sources of capital to fund the engineering, design, testing and construction of the network would need to be identified and secured. Similar to the Public Utility model, the City would also need new staff with proven expertise in managing a municipal wireless network.

Community Network (Free)

Free “community networks” model involves a non-profit or government entity that acquires funding to educate business owners and citizens about the benefits of deploying a Wi-Fi network. The community or entity acts as a catalyst to encourage the organic build-out of a Wi-Fi network in highly populated areas. Since the community or non-profit organization is not funding the network deployment, the capital and operational costs that require community funds are substantially lower. The network, however, may not be ubiquitous. This model is being used in Austin, Texas. We do not recommend pursuing a Community Network model for Lakewood based on the following analysis.

Advantages for Lakewood:

- A non-profit would be established with appropriate staff skills and expertise to manage the implementation, operations and support for municipal wireless network. As such, City staff would not be required to operate and support the network.
- Capital funding would not be required directly from the City; however, City staff could possibly be involved in assisting a non-profit entity to acquire funding.
- A ballot initiative may not be needed for this business model.

Disadvantages for Lakewood:

- Similar to the Public Utility and Cooperative Wholesale models, sources of capital would need to be identified and secured to fund the build-out of a wireless network.

- Expansion of the wireless network would happen organically across the City, most likely constrained due to lack of capital and/or comprehensive citywide network design. One of the City's policy goals of Universal Service (defined in Section 2.4) would be very difficult to attain.
- Lack of Universal Service would result in gaps in coverage. As a result, government services that require ubiquitous wireless broadband coverage (e.g., Public Safety) would not be adequately supported.

Government Use (Internal)

The "government-use" model is deployed to meet a city's wireless telecommunications connectivity needs (Public Safety, Public Works, e-Government, etc.) and in some cases, to replace leased fixed telecom services. The government-use network may be operated and maintained by the city or outsourced to a third party vendor. The City of Miami Beach, Florida is using the government-use model. We do not recommend pursuing a Government Use model for Lakewood based on the following analysis.

Advantages for Lakewood:

- Government Efficiency, the first overall objective identified in the stakeholder focus groups, would be accomplished. Furthermore, a very secure wireless network would strictly ensure use by only the City.

Disadvantages for Lakewood:

- The remaining two overall objectives (social inclusion and economic development) would not be accomplished.
- Capital funds would need to be invested, yet there would be no direct community benefits beyond more efficient government services.
- New staff with the appropriate skills and expertise would be needed by the City to operate and support the network.

Public-Private Partnership

In a public-private partnership model, a city typically takes the role of catalyst and policy setter facilitating the deployment of a wireless broadband network by a third party vendor through a competitive bidding process. The city offers tangibles, such as a streamlined process for granting permission to use the public rights-of-way and city assets, including street poles, rooftops and buildings in support of deploying a wireless broadband network. In exchange the city is entitled to compensation that may come in a variety of forms including free or discounted services, and cash payments. Cities including Portland, San Francisco and Philadelphia are using variations of the public-private partnership model. As detailed in Section 5.2 below, we recommend the City pursue the Public-Private Partnership model.

Advantages for Lakewood:

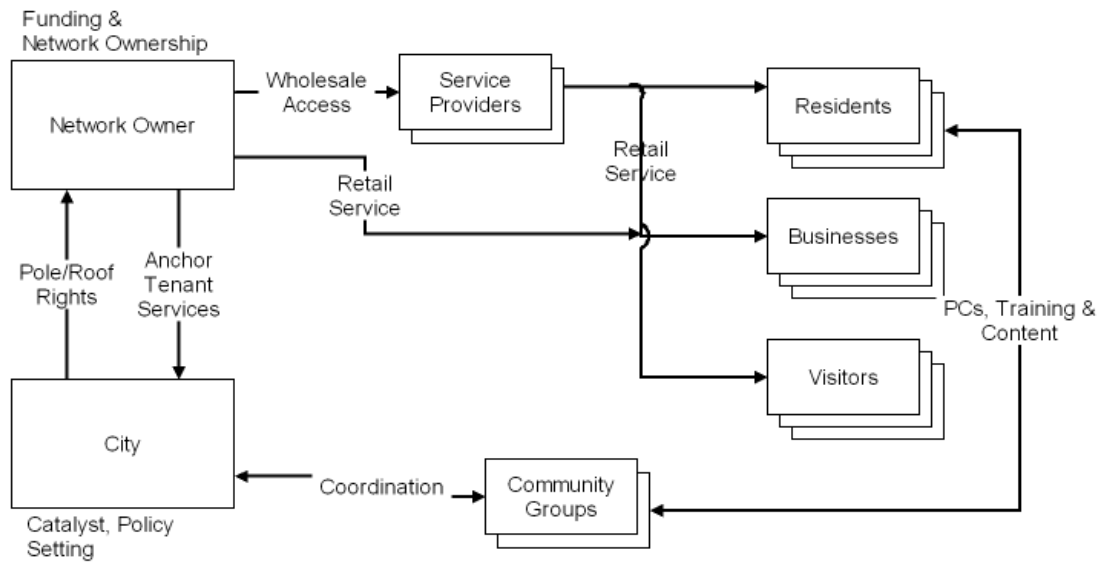
- The private sector would fund, own and operate the wireless network.
- No ballot initiative would be required for this model.
- Ownership of public assets, including the right-of-way, poles, and rooftops would enable the City to negotiate terms that support the overall objectives and policy goals identified in stakeholder focus group meetings and summarized in Sections 2.3 and 2.4 herein.
- A comprehensive competitive Request for Proposal (RFP) process would ensure a qualified service provider with strong financials, capital funding, operational expertise, and municipal wireless experience is selected.

Disadvantages for Lakewood:

- This business model would rely heavily on the market and financial success of the service provider.

5.2 Business Model Analysis

Based on the information collected during this planning process, Civitium recommends the City adopt a public-private partnership business model whereby a private-sector company or group of companies funds, designs, deploys, owns and operates a community-wide wireless broadband network, using asset rights granted by the City to infrastructure such as street lights and municipal buildings. This business model is illustrated and further defined below.



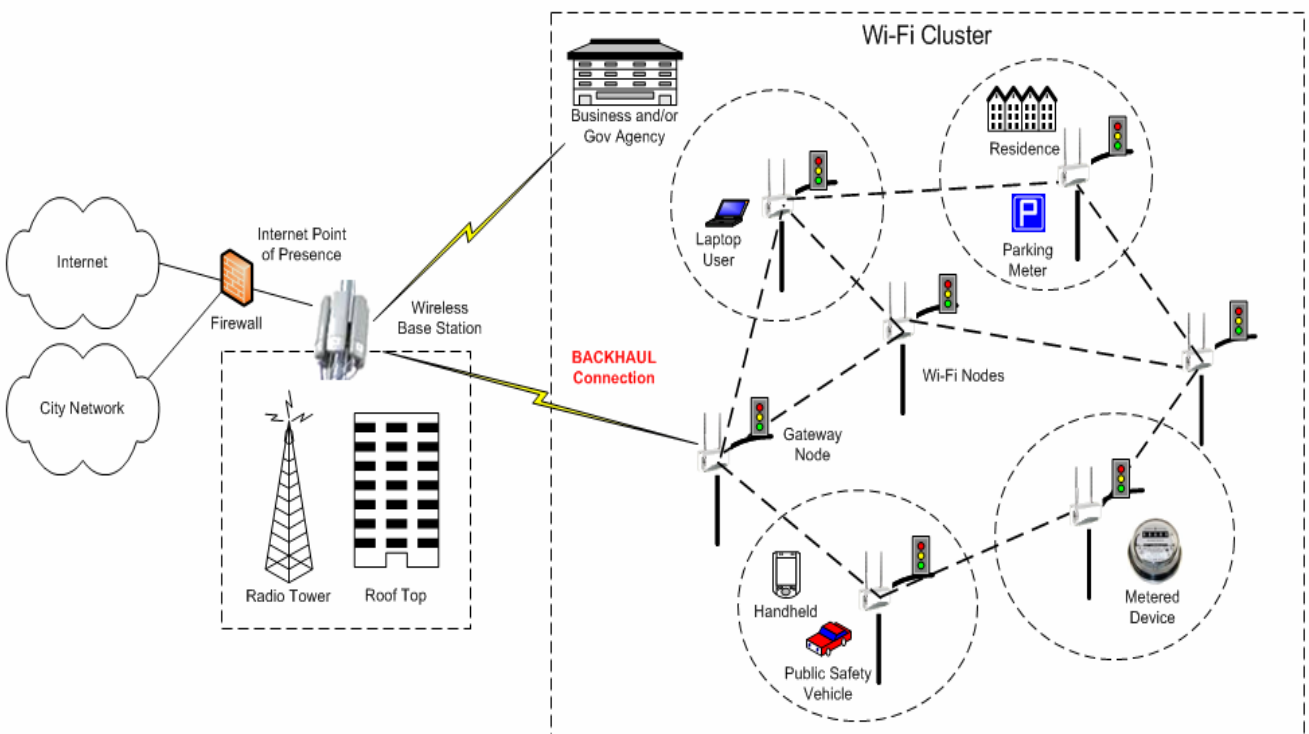
The following points are needed to pursue a public-private partnership business model:

- Through a competitive RFP process, the City solicits, evaluates and selects a private-sector partner (the Network Owner). RFP requirements and proposal evaluation process will be coordinated to support the overall objectives and policy goals identified by the stakeholder meetings outlined in Section 2, City Goals, Objectives and Broadband Policies.
- The Network Owner finances, designs, deploys and maintains a citywide wireless broadband network.
- The City enters into agreements with the Network Owner that allows the use of certain assets such as traffic signal/light poles, rooftops and other assets.
- The Network Owner 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, provide customer care, etc. Wholesale rates may be negotiated between the City and the Network Owner to affect the desired market retail rates.
- The Network Owner may also market retail service over the network.
- The City may commit certain anchor tenant services for municipal use of the network to the Network Owner.
- The City coordinates with social service, nonprofit and other community groups to affect low-cost computer purchase, training and content for low-income and disadvantaged residents.

6 Conceptual Design

Based on the requirements defined during this planning process, Civitium is able to propose the following conceptual design for a community-wide wireless broadband network.

This conceptual design should be considered preliminary only. Should the City elect to proceed with issuance of an RFP, respondents to the RFP may propose different design characteristics to meet the needs of the initiative.



Source: Civitium

- Wi-Fi access points are installed on street light and/or utility poles throughout the City, providing access from 802.11b/g (Wi-Fi) devices such as PCs, laptops, handhelds and unmanned municipal devices (e.g. parking meters, video cameras, etc.) Civitium estimates that approximately 1200 of these devices would be required.
- Fixed point-to-multipoint wireless broadband (e.g. WiMAX) subscriber units are co-located with designated Wi-Fi access points (referred to as gateway nodes) to support aggregation of all Wi-Fi

traffic back to wireless base stations. Civitium estimates that approximately 360 of these subscriber units would be required.

- Fixed point-to-multipoint wireless broadband (e.g. WiMAX) base stations are installed on designated rooftops and/or communications towers to aggregate traffic back from the gateway subscriber units. Civitium estimates that approximately 11-14 of these base stations would be required.
- Multiple base stations are connected together using proprietary, high-speed, point-to-point wireless equipment using licensed (or leased) wireless spectrum. This provides a redundant, high-speed wireless distribution layer for the network.
- All traffic is ultimately switched onto a high-speed Internet backbone circuit at a designated master base station.

This conceptual design has become commonplace in proposals received in connection with other major city RFPs. While the specific implementation details and/or vendor products may vary, the concept is widely considered "state of the art."

7 Challenges and Concerns

Throughout the stakeholder interview process, individuals were asked to identify and discuss potential risks, concerns and obstacles a City sponsored wireless broadband initiative might encounter.

While there was a broad-list identified, summary feedback points to six (6) areas that warrant further consideration. Listed below, and in no particular order of importance, are the six identified risks, obstacles and concerns.

- **Costs and Network Enhancements:** Stakeholders expressed concerns about the investment required to deploy and sustain a viable network and services.
- **State Regulation:** Early in the process, stakeholders identified concerns regarding compliance with Colorado Senate Bill 152 and the City's options to pursue a municipal wireless initiative. A public-private partnership model allows the City to facilitate a competitive RFP selection process and select a municipal wireless service provider. As such, the City is not directly competing in the broadband services market and can avoid the ballot process.
- **Interagency/Regional Cooperation:** A successful initiative will require substantial support and cooperation among intercity agencies. The role of the City in the CWC initiative is unknown at this time. City executives have been actively involved in defining goals and objectives of a regional network. Goals that may be common to both the CWC and the City of Lakewood will be better identified upon completion of the CWC's feasibility report, due in September 2006.
- **Industry Cooperation:** Concerns were raised about the unknown reaction from 1) owners (non-government) of essential vertical assets, 2) power distributors, and 3) the telecommunications industry (Telecom, Cable TV, Cellular, etc.). City executives have ongoing dialog with incumbent telecommunications providers and power distributors in the Lakewood area. Though initial reactions have been positive in support of a citywide wireless network, the long term response and support from incumbents is unknown at this time.
- **Network Performance and User Expectation:** Concerns around network performance and user expectations surfaced during several interviews. The feedback ranged from network coverage to performance on the network. While optimistic, the stakeholders understood the challenges and evolution of such projects and agreed that there should be a realistic expectation of the benefits and limitations of the technologies.
- **Network Security and End-user Privacy:** Some concerns were raised that 1) wireless technology may introduce a measure of risk/threat not present with wired networks, and 2) the privacy of

network subscribers may be compromised. Security of wireless networks and the privacy of subscribers can be designed as secure as wired networks. Details on security needs and policy can be reviewed and engineered once a service provider is selected.

8 Recommendations

Based on Civitium's findings during this planning process, we recommend the City take the following course of action to achieve its stated objectives.

- Support and pursue the overall objectives and community motivations as stated in Section 2.3, Stakeholder Interview Analysis Summary. Also, support the policy goals as stated in Section 2.4, Broadband Policy.
- Consistent with Colorado Senate Bill 152⁶, enacted in 2005, adopt the public-private partnership business model whereby the City acts as facilitator to attract a private-sector company, or group of companies to fund, design, deploy, own and operate a community-wide wireless broadband network, using City assets, such as street lights, towers and municipal buildings.
- Develop and issue a Request for Proposal to solicit expressions of interest and proposals from private sector companies. Based on Civitium's experience working with other communities, we believe an RFP issued by the City that has fully addressed all recommendations in this section would result in multiple competitive and diverse proposals.
- Develop a communications strategy in parallel with the RFP. It is not uncommon for municipal broadband initiatives to draw strong opposition from certain stakeholder groups, such as competitive service providers. Therefore, a communications strategy that gets out in front of anticipated opposition will be critical in order to properly educate and inform the public, the City Council and other stakeholders.
- Determine jurisdiction over the individual assets identified on the Assets Map and facilitate agreements to use such assets, and identify power supplier where such assets are powered.
- Continue targeted stakeholder involvement throughout the process including representatives from public safety, public transportation, chamber of commerce, legal, procurement, press office, school board/district, social services, community not-for-profit agencies, economic/community development, tourism/visitor bureau and utility/energy providers.
- Establish a forum for community input, which may be accomplished through public meetings/hearings or other available mechanisms. Providing a forum for general public input can result in valuable data being collected and can be critical to position this as a community-centric initiative instead of a City-centric project.
- Continue discussions with CWC cities to identify the appropriate collaborative role for the City of Lakewood relative to the CWC initiative briefly described in Section 1.

⁶http://www.leg.state.co.us/clics2005a/csl.nsf/fsbillcont3/FA216226F45192FE87256F41007B483C?open&file=152_01.pdf

9 Conclusion

Consistent with its stated intent, the City has diligently studied the feasibility of deploying a community wireless broadband network to meet the following validated key objectives: 1) Economic Development; 2) Efficient Government; and 3) Social Inclusion.

Civitium assisted the City in this process by conducting a comprehensive planning process that has identified the information necessary to successfully manage a municipal wireless broadband initiative, including overall requirements, methodologies and timelines. Civitium applauds the City of Lakewood for its vision and finds it well poised to pursue its objectives through a competitive procurement process aimed at securing private partner(s) to build, own and operate a City-wide wireless broadband network.

Based on the findings of this report, Civitium recommends that the City take all steps identified in Section 6 above, including “Develop and issue a Request for Proposals to solicit expressions of interest and proposals from private sector companies.”

Now, imagine a community where anyone can be connected, anywhere, anytime and on any standard device, sharing information and content freely, securely and accurately. A community where businesses can reach their customers more efficiently, broadband is more affordable, tourists can quickly and easily integrate into the community and city agencies can efficiently serve their constituents.

Now, imagine this connected community is the City of Lakewood and the greater CWC region.