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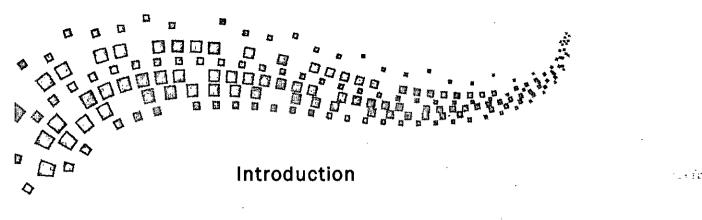
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 Fiber Infrastructure Pilot Project in partnership with City of Oakland.
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The purpose of this document is to:	· · ·	**1	
 provide a snapshot of LightUP OaklandI's overall vision 	a. a. A. S.	. مريكة Cittle من مع	, · ·
 offer a brief background of fiber optics in Oakland 	14 A A	· · · · · · · · · · · ·	· • J
 define the LightUP Oakland! pilot area 		and a star star of the	
 describe key deliverables 		د	
 demonstrate fiber optic need and benefits 	• • • •	· •	
 illustrate project alignment with City economic development 	t and public safet	y objectives	6
 introduce LightUP Oakland! as a public-private collaborative 	e ·	• • •	-
 recommend furtherance of the pilot project 	• * · · ·	· · · · · · · · · · · · · · · · · · ·	r
LightUP Oakland! seeks to build a defined route of fiber optic c	able as the princip	oal component 5	÷ 21.
of a pilot project within the underserved Airport-Coliseum distri	ct of Oakland, spe	cifically the	

of a pilot project within the underserved Airport-Coliseum district of Oakland, specifically the -Oakland Airport Business Park, through a collaborative public-private partnership that includes stakeholder public agencies and a multi-disciplined private sector executive team.

LightUP Oakland! proposes to facilitate technology infrastructure enhancements that serve to the feed the pilot area, a key Oakland opportunity business district, with high-speed broadbandena service in support of fostering its emerging economy, modernizing its industrial and commercial service and retaining companies that might otherwise go elsewhere, and improving the reliability of a critical Oakland emergency response system component.

Access to the speed and capacity only fiber can provide is vital to the continued economication of the business park. Its proximity to San Leandro's now-operational fiber ring are presents a unique opportunity to deploy high speed broadband on a regional basis in keeping of with the stated goals of the East Bay Broadband Consortium.



LightUP Oakland!'s intended provision of digital high-speed, fiber-based broadband infrastructure and access supports and furthers City of Oakland strategic goals in the following areas:

- economic development
- public safety and emergency response
- transportation
- healthcare
- education

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LightUP Oakland! Vision: "Coliseum to City Hail"

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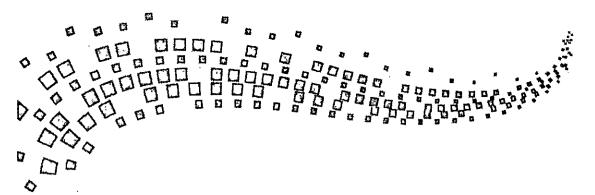
Figure 1

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The Lit San Leandro project serves as a major catalyst for LightUP Oakland! In its second year of operation, the fiber ring encircling San Leandro's commercial zone feeds high speed broadband to a commercial and industrial base hungry for access. The project continues to make national headlines as industry in San Leandro begins to show signs of revitalization. Emulation of best access are practices employed by Lit San Leandro in developing its fiber ring and successful business model.

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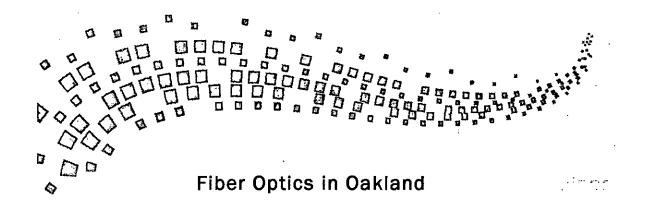
Mission Statement

To promote investment, attract and retain business, improve public safety, and support City df Oakland strategic economic development objectives through development of fiber infrastructure that delivers affordable and reliable high speed broadband to end users in Oakland's majdr eommercial corridors,

Coliseum to City Hall

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Oakland's existing fiber assets have been built and expanded upon over the past 40 years as a city government-led and public sector endeavor.

Beginning in the 1970's, the City's Department of Information Technology (DIT) installed the statistic first City-owned fiber lines in downtown, laying the groundwork for Oakland's eventual access of to the internet in the 1990's and use of computers as a standard business tool.

BART's incorporation of fiber optic conduit and cable throughout its system since the early 1990's led to a 1998 Executive Decision document being approved by the BART board of directors, authorizing license agreements with various companies for cellular and other telecommunications use of BART right-of-way. While BART's initial purpose for installing fiber within its system was to provide a superior transportation experience for its customers, it has since executed license agreements with ISP's and other organizations to lease access to its fiber optic infrastructure. The execution of these agreements has proven to be a revenue stream that generates upwards of \$6 million per year for the agency.

DIT received approval from the City Council in 2006 to execute a comprehensive study that the made recommendations for potential implementation of a city-wide Wi-Fi network. The study, where released in 2009, revealed that downtown is well-connected to fiber. However, the remainder of Oakland lacks sufficient fiber optic connections to meet the requirements of a fiber comprehensive Wi-Fi network, resulting in a non-cost-effective implementation structure is taken to the requirement of the structure is taken to take the structure is tak

DIT assembled a collaborative in 2010 comprised of CEDA, Cisco Systems and IP Networks (a) 2000 that made efforts to win a \$25 million Broadband Technology Opportunity Program ARRA 25 million grant to construct a \$35 million Middle Mile Fiber Optic Network that was; for various indused AP a reasons, not approved.

Recognizing fiber as a viable economic development tool, a January 2012.CEDA staff.report 50(0) is indicates the objective to, "Improve telecom infrastructure for info-intensive industries," in 1908 a

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consideration of, "...making underutilized fiber optic facilities available to businesses at a reasonable cost."

Presently, the deployment of fiber optics and high speed broadband complements the City's goal to, "...build the infrastructure to attract larger-scale tech and life science facilities;" that focuses on key industry sectors it wishes to attract, including clean tech, specialty food, internationaltrade and logistics, and creative arts and media, as highlighted on the City's website. Construction and the city's website.

A 2013 Economic Indicators report, prepared by City of Oakland's Office of Economic and Construction and Construction of the Workforce Development also states an objective of "...focusing its business retention, and attraction efforts on the economic sectors which are most dynamic," including and the economic sectors which are most dynamic," including and the economy of the "Creative Economy" comprised of technology and its ecosystem of software; hardware, have a first of the economic sectors which are most dynamic, and architecture economy and its ecosystem of software; hardware, have a first of the economic sectors which are most dynamic, and architecture economy and its ecosystem of software; hardware, have a first of the economy and its ecosystem of software; hardware, have a first of the economy ec

Data collected in 2013 by City of Oakland consultant Kimley-Horn and Associates indicates in the Collected in 2013 by City of Oakland consultant Kimley-Horn and Associates indicates in the Collected Collect

In its December 2012 Draft Intelligent Strategic Plan (ITS) Update, Kimley-Horn also states; Sector and the city is to establish a communication network that extends throughout the city," and continues that, "Proposed projects also emphasize network redundancy by Sector and the city," and continues that, "Proposed projects also emphasize network redundancy by Sector and the city," and continues that, "Proposed projects also emphasize network redundancy by Sector and the city," and continues that, "Proposed projects also emphasize network redundancy by Sector and the city," and continues that, "Proposed projects also emphasize network redundancy by Sector and the city," and continues that would provide failover protection due to broken or failed and the contract of the communication links." Kimley-Horn recommends, as two of three potential projects along y Horn to the contract of the contract of the installation of new fiber optic corridors, and 2) upgrading and the contract of the contract o

Even as the City continues expansion of fiber optic connectivity throughout Oakland in specials and the control keeping with its overall economic development policy and as part of initiatives that purposely does not the provide fiber conduit in new telecommunications and public works projects, no overarching the special does not the advance of the control of the c

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For decades, City of Oakland and the city's public agencies have recognized the value of installing fiber optic infrastructure as a means of improving the long-term reliability and functionality of key municipal systems. The LightUP Oakland! project builds upon this foresight by expanding the City's existing fiber conduit into a comprehensive network wither a positive report portion operator practical application for every major commercial end user in the Oakland Airport Business a comprehension as and a positive report of the second state.

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Kimley-Horn 2013 Mapping of Existing and Proposed Fiber in Oakland

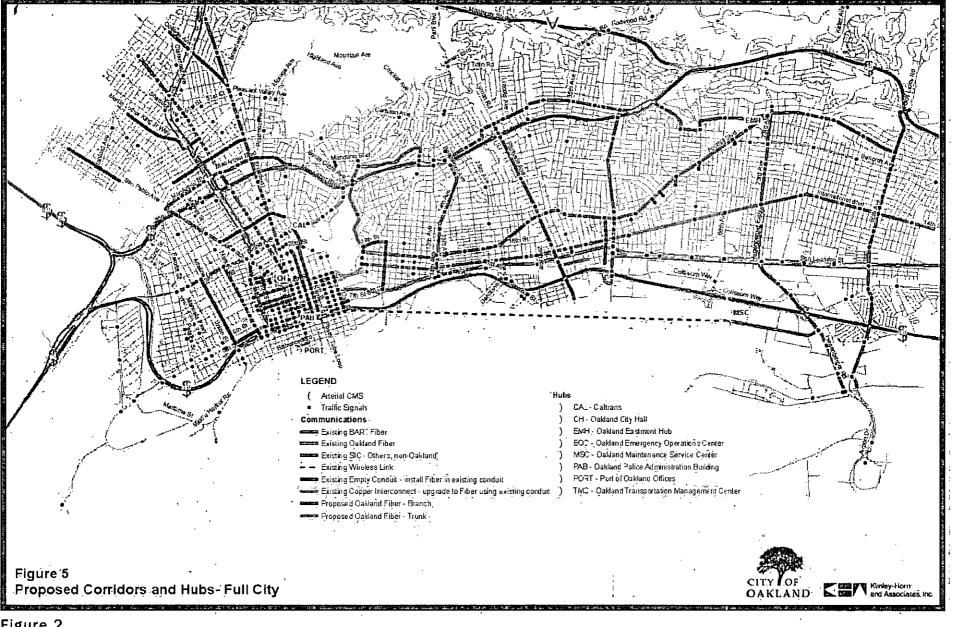


Figure 2



Pilot Area Profile

Oakland Airport Business Park

- Overview
- Geographic Location
- Lit San Leandro
- Oakland International Airport
- Ó Oakland Airport Connector
- 911 Dispatch Center
- Coliseum City
- Area Master Planning
- Companies and Real Estate

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Overview

The LightUP Oakland! pilot area is home to three championship sports teams, world-class <u>server</u> at a subentertainment, and a major commercial and industrial employment center. Also the site of two <u>and the server</u> powerful economic engines for the city and region — Oakland Alameda County Coliseum and <u>the Server</u> at a Oakland International Airport — the last decade has seen significant transformation.and <u>the server</u> <u>decade</u> at a improvement to this ever-evolving gateway to Oakland.

A transit hub for the East Bay, the LightUP Oakland! pilot area presents a rare combination of <u>Standed Standed Stande</u>

Geographic Location

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The pilot area is bounded by Coliseum BART and San Leandro Street to the east, 98th Avenue and a south, Oakland International Airport to the west, and 66th Avenue north, taking in the entirety of the transmission of the 400-acre Oakland Airport Business Park, land use of which is regulated by Port of Oakland and the set match.

Lit San Leandro

Conceived by Dr. J. Patrick Kennedy (a San Leandro resident and CEO & Founder of OSIsoft, one of the San Leandro's largest employers), Lit San Leandro is a public-private partnership designed to attract new business to San Leandro. The 10-mile digital backbone of fiber optics it created revolutionized the city's telecommunications infrastructure in allowing ISPs to deliver high speed broadband, positioning San Leandro to be a major player in the high-tech and cleamtech economies. Having gained access to the city's available conduit to construct its loop; Lit San Leandro also uses BART's right of way (at the San Leandro BART station) as a vehicle to network the city's commercial districts. The LightUP Oakland! pilot area is uniquely positioned near the terminus of the San Leandro loop that became operational in 2012 and roughly abuts Oakland's border at Doolittle Drive (Figures 2, 3 and 4).

Oakland international Airport

Oakland International Airport enjoys status as California's fourth largest airport, with over 10 million departures and arrivals annually. The airport is in the midst of executing a \$200 million Terminal 1 renovation and remodel project, as well as the implementation of a \$400+ million, 5-year capital improvement program. Once complete, the Oakland Airport Connector will more conveniently deliver Bay Area passengers to Oakland International Airport terminals:

Oakland Airport Connector

Under construction and expected to be operational mid- to late-2014, BART's Oakland Airport Connector (OAC) will provide a dedicated connection for Bay Area travelers transiting between the BART system and Oakland International Airport. Already a distinctive landmark in the Airport-Coliseum district and a wholly unique feature within the city and region, the OAC stands as a pivotal resource to be exploited in facilitating fiber optics within the pilot area.

911 Dispatch Center

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The City of Oakland's 911 call center, managed by the Oakland Police Department's <u>states</u> called Communications Section, is located on Edgewater Drive in the pilot area, where it dispatches more than 600,000 incoming calls annually. Serving as the critical public safety answering point for the entire city, the 911 call center responds to all emergency calls for police, fire and medical service requests. The Edgewater Drive call center is also the location from which the city's ShotSpotter gunfire detection system and state-of-the-art digital voice recording equipment are monitored.

Coliseum City

Coliseum City is a major pending project within the pilot area, envisioned as a transformative retail and entertainment district development contiguous to new, state-of-the-art stadium facilities for each of Oakland's three teams. Planned as a vibrant regional destination serving local residents are a state and the broader city and regional population, the development of Coliseum City is being directed by City of Oakland's prime consultant, JRDV Urban International, through the awarding of an Exclusive are a state Negotiating Agreement last year.

Area Master Planning

City of Oakland and JRDV Urban International are also In the midst of leading a master planning effort within the LightUP Oakland! pilot area. While improved telecommunications and implementation of fiber infrastructure will certainly be a component of a forthcoming Specific Plan generated by the City's consultant, that envisions development of a new science and technology park, its execution is a 20-year proposition that may or may not occur.

Companies and Real Estate

The pilot area hosts major manufacturing firms, distributors and a variety of service providers, each standing to benefit from ready access to fiber, including, for example: <u>Service provider and the service provider access</u> of the service provider and the service provider access to fiber, including, for example: <u>Service provider access</u> of the service provider access to fiber, including, for example: <u>Service provider access</u> of the service provider access to fiber, including, for example: <u>Service provider access</u> of the service provider access to fiber, including, for example: <u>Service provider access</u> of the service provider access to fiber, including, for example: <u>Service provider access</u> of the service provider access to fiber, including, for example: <u>Service provider access</u> of the service provider access to fiber, including, for example: <u>Service provider access</u> of the service provider access to fiber, including, for example: <u>Service provider access</u> of the service provider access to fiber, access

- Acumen Building Enterprise
- Best Western Inn
- Coliseum Lexus of Oakland
- Comcast
- Comfort Inn
- Courtyard by Marriott
- Days Inn
- Drelsbach Enterprises
- Everett Graphics
- FedEx

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- Give Something Back
- Hilton Oakland Airport
- Holiday Inn
- Horizon Beverage

- Lighthouse Community Charter School 27 3-
- McGuire and Hesters Associated
- Oakland-Alameda County Coliseum
- Oakland Harley-Davidson
- One Toyota
 Unim departa
- Oracle Arena: A set of yard by Minn be
- Pet Food Express and a received and a second sec
- Rainin Instruments: hosen Category as
- Red Lion at the marks
- Revolution Foods areas
- UPS
- Wal-Mart Contrastigence statement
- Webcor

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Zhone Technologies concerned

Five companies in the pilot area appear as Top 25 Sales Tax Producers in a 2013 Economic Indicator report published by City of Oakland.

Also notable is global developer Goodman Birtcher's recent acquisition of a major parcel on Swanz the Bercher set Way to build a 375,000 sq. ft. logistics center, now under construction. Arena Center is a newer, we are book a but vacant, campus of 150,000 square feet on Oakport Street, one of four Class A buildings in the set of Oako pilot area that house almost 650,000 square feet of tenant space. Class B, C and flex space within the district. While the pilot area sits within what is arguably the district of most strategic set of the street of the area sits within what is arguably the district of most strategic set of the street of the aging infrastructure and other factors that contribute to a high overall vacancy rate (the street set of the street set of the area sits within the city), less than stellar leasing activity, and lowered real estate values, while its an area set of the city and region.

Even so, its proximity to an active fiber loop and status as a critical employment centen and methods are a second regional transportation hub make the Oakland Airport Business Park the logical pilot area and plausible point of origin for potential expansion of a citywide fiber network, Coliseum to City Hall.

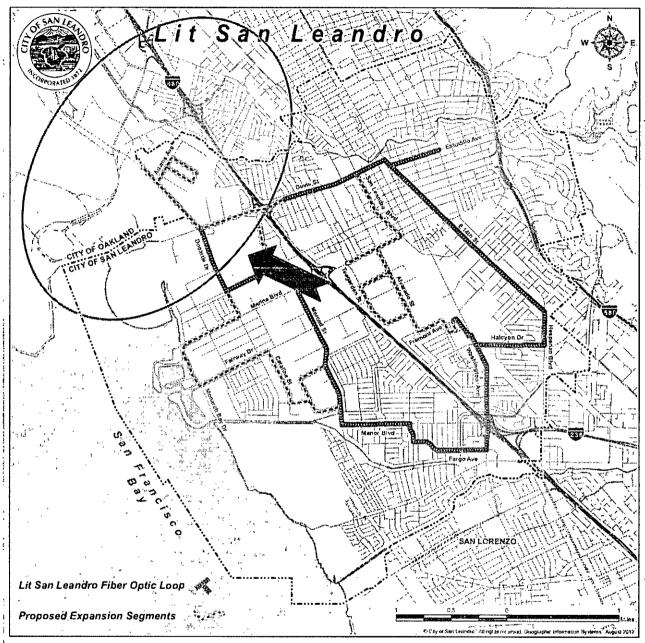
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LightUP oakland! Pilot Area within the Airport-Coliseum District and its Proximity to San Leandro Loop





Lit San Leandro's Proximity to the Oakland Border



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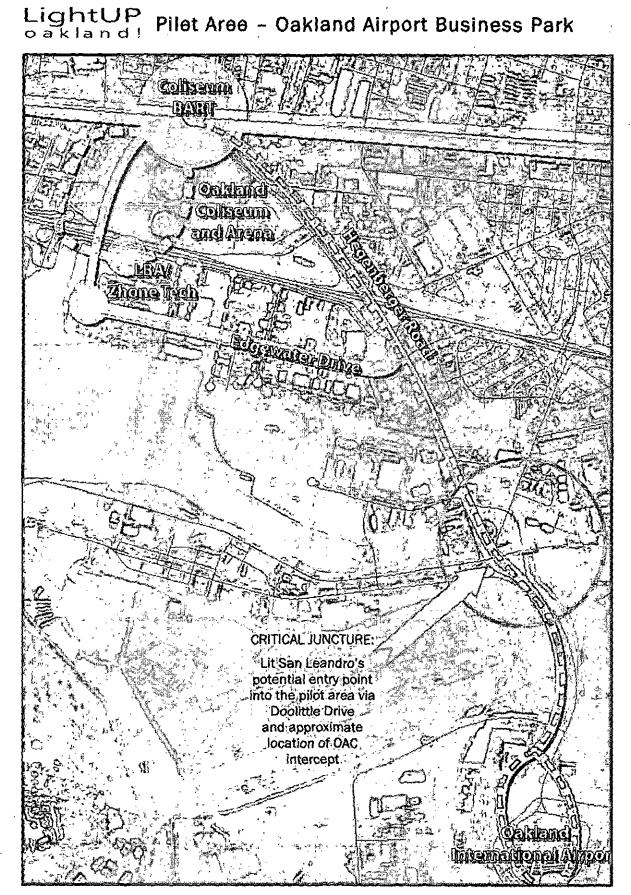
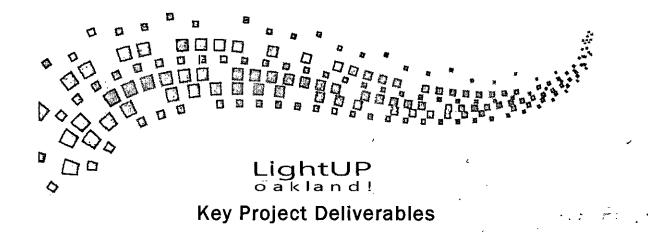


Figure 5



Assessment of Existing Resources LightUP Oakland! will access, examine and analyze City of Oakland resources that help facilitate the project, including conduit maps, street light and traffic schematics, and a variety of documents provided by Public Works Agency and other divisions as needed and requested by LightUP Oakland! Design and Mapping LightUP Oakland!, in cooperation with City of Oakland, Port of Oakland and BART, will map a professional, logical, advisable, responsible and technically-feasible fiber route that maximizes OAC use and draws upon data gleaned from existing City of Oakland resources, the expertise of experienced collaborative members, and best practices utilized as part of similar projects conducted in other cities a state shows a **Business Plan Creation** LightUP Oakland! will provide an overarching and comprehensive project business plan encompassing roles and responsibilities, technical logistics of implementation, financing, capitalization and budgeting, critical path and benchmark mapping, project design, \cdots 🤇 construction specification, and anticipated project marketing Capitalization LightUP Oakland! will capitalize the project through financing and investment strategies and agreements executed amongst its private sector collaborative members; according to its 1. 1. 1 business plan that includes a comprehensive schedule of costs and a plant cost of the plant includes and the plant is a schedule of costs and the plant is a sc **Business Plan Execution** · · · ·

LightUP Oakland! will execute its business plan that includes, but is not limited to; budgeting, analysis, planning, capitalization, mapping, design, scheduling, logistics, project 11.1 management, outreach and marketing, and construction. The main deliverable of the side as a structure and business plan - construction - will involve pulling fiber optic cable (up to 288 strands) business plan - load of the state of the stat through existing City of Oakland, Port of Oakland and BART conduit in Traising City of Cat. And Com-

Fiber Allocation

LightUP Oakland! will convey to City of Oakland, Port of Oakland, and BART respectively, per a 120 negotiated license agreement, ownership and unrestricted exclusive use of 10% of the number of fiber strands installed (cumulatively) or a designated number to each entity is an all strands أترث ترتمرين

	1995 - 1978 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 -					
Outreach to Property and Business Owners						
LightUP Oakland! will conduct outreach to project area property and business owners that involves education of fiber optic benefits, how they impact business retention and the general attraction, why fiber connectivity should be supported, and the opportunity each will be attracted afforded by having access to the network	: ;	•.••	10			
Marketing	1.		-			
LightUP Oakland! will develop and implement an organized campaign surrounding the project and the business district it serves, including promotion of realized benchmarks, and positive region-wide news reports and articles, interviews with stakeholders and business leaders, periodic press conferences and news releases, a public groundbreaking, ribbon control of cutting, and a variety of public relations events	- - - -		د- - د 1			_
Stakeholder Collaborative	-					
LightUP Oakland! will further cultivate a public-private consortium that includes primary stakeholder public agencies, such as Port of Oakland and BART, along with private sector capital investors and other collaborative members who offer specialized technical expertise for the purpose of executing the LightUP Oakland! business plan.			۰ . <u>ء</u>	. ;		
Business Model						
LightUP Oakland! will develop a business model that supports monetization of the fiber network and maximizes its potential as a revenue-generating asset, based on successful models employed by other cities		• • • •		• •	50 B. S. 1942 C.	•
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Project Recommendations

LightUP Oakland! respectfully recommends execution of the following agreements in a star of the start of the following agreements in a start of the start of the

12-Month Non-Exclusive Negotiating Rights Agreement with the second state of the secon

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12-Month Non-Exclusive Negotiating Rights Agreement with LightUP Oakland! for the purpose of negotiating a license <u>production of the states</u> and the states of the states agreement to install fiber optic facilities within the City of Oakland's metric descent of the states of the states existing conduit in the project area

- 2. LightUP Oakland! respectfully recommends it work in a cooperative manner with the stand a second stand City Administrator's Office to identify those individuals within City of Oakland who stand as "village experts" in regards to fiber optic technology, whether it be institutional conserve as a second stand knowledge or current specialized technical expertise. Suggested in the development of the stand stand as project team are key City staff, selected with the assistance of LightUP Oakland!, from a select of select a public Works Agency (and its Traffic Engineering division), Office of Information experies as a second stand stand technology, and the Office of Economic Development & Workforce Development. The select of the second standard second standard second sec
- 3. LightUP Oakland! recommends the Airport Area Business Association, a 44-year-old more on a Arobit Area organization focused on sustaining commerce in the Oakland Airport Business Park, and a log commerce in the Oakland! to the public and be participatory or a second strength of the second stren

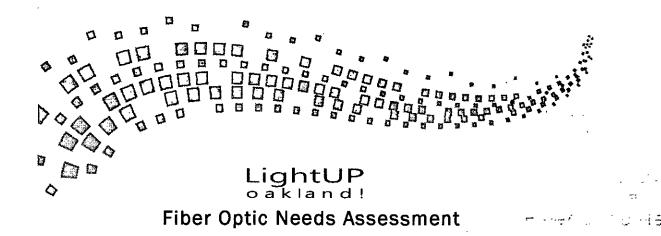


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Fiber optics has become widely used in modern telecommunications infrastructure for good	
reason. Its enormous bandwidth, ability to carry signals over vast distances, and lower measured and the second	
installation and maintenance costs are attractive to the health sciences, advanced and the second second second	
manufacturing, biotechnology, education, public safety, digital arts, and clean and green and a second second	
sectors that now require high speed and large capacity. If these business types are to be $1.000000000000000000000000000000000000$	
attracted and supported, the need exists for fiber's reliability, durability, higher bandwidth,	
and ability to handle the push and pull of massive amounts of data and video now required	
to conduct commerce and communicate effectively in the 21st century. Failure to provide	
the efficient upload and download of large quantities of data and video to support business	
operation and expansion will eventually force modern, technology-dependent companies to	
locate outside of the Oakland Airport Business Park, or outside of Oaklande or the Oaklande or the Oakland Airport Business Park, or outside of Oaklande or the Oakland Airport Business Park, or outside of Oaklande or the Oakland Airport Business Park, or outside of Oaklande or the Oakland Airport Business Park, or outside of Oaklande or the Oakland Airport Business Park, or outside of Oaklande or the Oakland Airport Business Park, or outside of Oaklande or the Oakland Business Park, or outside of Oakland Business	

The need for high speed broadband in the underserved Oakland Airport Business Park is	•••	-	$\{ e_i \in E_i \}$	÷ .
evident to those major companies conducting business there and to local commercial,	: •			•
brokers experiencing difficulties attracting high-tech and other types of business to the	·	• :	.•	
district. Built in the 1980's, the business park lacks modern telecommunications $\mathcal{M}^{(i)}$	• •		ي ، ^د ر ر	
infrastructure now enjoyed by similar commercial areas in neighboring cities, leaving local	יי .	يەر.	1111	,
companies at a distinct disadvantage to remain competitive.				



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able to afford this service and sign multi-year service agreements that put the overall price tag for obtaining true high speed broadband in the hundreds of thousands of dollars.

The need exists for improved connectivity and stability the LightUP Oakland! project will provide the to Oakland Police Department's 911 call center located on Edgewater Drive that responds to 912 and over 600,000 emergency calls annually, maintains the city's ShotSpotter gunfire detections are used as system, monitors live intelligence feed, and utilizes digital mapping at dispatch consoles, and the system are non-structure is needed to ensure the reliability and longevity and of Oakland's emergency response system as a whole, a critical component of which resides in the technology. Fiber infrastructure is a whole, a critical component of which resides in the technology.

The need for fiber infrastructure in LightUP OaklandI's project area to satisfy public safety needs, as well as the requirements of technology-driven companies expecting high speed broadband service as a given when signing a lease, is clear. Deployment of fiber optics in the business park is vital for its continued growth and economic health. Without the unparalleled speed, capacity and reliability provided by fiber, the Oakland Airport Business Park is at risk for being left behind as neighboring commercial zones, one by one, employ broadband strategies that serve to attract 21st century business and investment. Stocked and the

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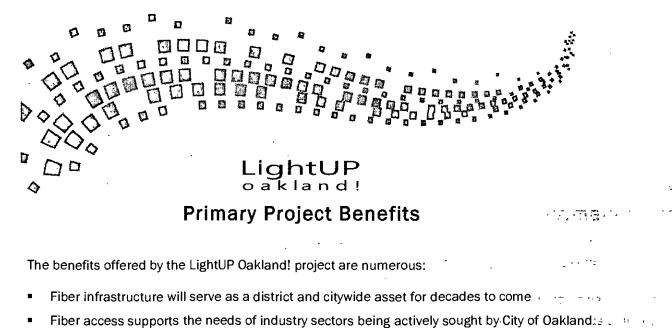
LightUP

Extraordinary Opportunity of Now

An exciting opportunity exists now to bring fiber optic infrastructure to fruition in the Oakland Airport Business Park:

- A clear and immediate demonstrated need to attract and retain business exists now within a start of the second second
- The Oakland Airport Connector, under construction now, offers a convenient, above-ground a service network backbone off of which to feed the business park with broadband service of the service of
- San Leandro's adjacent fiber loop recently became operational and stands at the ready to
 offer regional linkage now
- Area master planning occurring now complements the LightUP Oakland! fiber project
- Oakland's emergency response center on Edgewater Drive stands to benefit now from fibere
 access that improves public safety throughout the city
- Private sector investors who see value in the LightUP Oakland! project are ready to
 Collaborate now with public stakeholder agencies

A fortunate alignment of circumstances causes implementation of LightUP Oaklandl's fiberation of project to be all at once reasonable, practical, recommended, and urgent. This extraordinary confluence of opportunity meeting need must be harnessed and exploited before it passes.



- Fiber access fulfills a component of area master planning anticipated to incorporate high second area speed broadband service for a proposed science and technology park second area second area.
- Fiber access brings heightened visibility to a district needing a cutting edge image to facilitate...
 new business
- Fiber access contributes to property owner, workforce, and City of Oakland prosperity and altowards of the
- Fiber access benefits property owners through increased opportunity to lease up real estate inventory that now stands vacant
- Fiber access resulting in new investment and commercial activity benefits the City of Oakland
 through increased tax revenue
- Execution of license agreements with ISP's leverages and monetizes the fiber network entry of the order of th
- The fiber project maximizes utilization of the OAC as a backbone off which laterals can be runseled for the deployment of broadband service within the business park
- The citizens of Oakland are beneficiary to a more reliable emergency response system via fiber upgrades to the Edgewater Drive 911 call center that responds to emergency calls, maintains
 ShotSpotter, monitors live intelligence feed, and utilizes digital mapping at dispatch consoles, and amongst other technology
- The project offers system redundancy and greater connectivity to Oakland International Airported to the second second
- Expandability of the fiber network lends itself to incorporating Oakland's Police Administration
 Building, Emergency Operations Center, Eastmont substation, and proposed Domain e attack to de the fiber of the opportunity to interconnect the entirety of Oakland's deep the attack to de the emergency response system and facilitating use of video surveillance; license plate readers; a state of the attack to de the emergency response system and facilitating use of video surveillance; license plate readers; a state of the attack to de the emergency response system and facilitating use of video surveillance; license plate readers; a state of the attack and other innovative crime-fighting technologies that employ rapid, real-time communication to de the attack of the attack and the community factors attack and the community factors attack at the attack of the attack o
- A fiber network offers building blocks needed to develop a citywide Wi-Fisprogram 3 and approximation of the second se



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Municipal and private sector-owned fiber loops are making dally headlines across the nation and around the globe, garnering heightened visibility and positive publicity for the cities in which they reside, including Lit San Leandro that sits next door to the Oakland Airport Business Park:

"Digital West of SLO Helps Businesses Grow with Metro Fiber Project" The Tribune, June 5, 2013

"Stockholm Fibre Network Adds Billions to Economy" The Swedish Wire, June 3, 2013

"For Broadband in Northern Illinois, the Future is Now" Northern Public Radio, June 3, 2013

> "Missouri School District Upgrades Fiber Optic Network to 10 Gbps" The Journal, June 3, 2013

"Local Entrepreneurs Pioneered Broadband and Fiber Optic Networks" SavannahNow.com, June 1, 2013

> "Lafayette: Nation's First City to Provide Gigabit Intranet Service" Bayou Buzz, May 29, 2013

"New Fiber Optics for Jacksonville Will Add 'Extreme' Speed to Internet" FlorIda Times Union, May 28, 2013

> "Gov. Patrick Lights First Section of MassBroadband 123" Providence Business News, April 15, 2013

"San Leandro's Old Chrysler Plant Revved Up for Tech" San Francisco Business Times, March 8, 2013

FCC Chairman Commends San Leandro for Fiber Network" Mercury News, February 27, 2013

 * "In San Leandro, a Drive to Get Wired"
 In San Leandro, a Drive to Get Wired"

 The Wall Street Journal, March 4, 2012
 The Wall Street Journal, Cases 4, 2014

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A large marketing and public relations opportunity exists as a benefit of the LightUP Oakland! project, one that highlights the business park, and by extension the city of Oakland, as being:

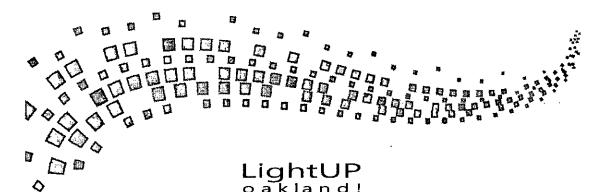
- locally and regionally connected
- good for business in offering owners and lessees technology enhancements at affordable rates is encoded.
- poised to meet the demands of 21st century industry via true high speed broadband offerings and test.
- innovative in taking steps to realize maximum and continuing benefit from the OAC and the transformer
- a conduit for improved public safety throughout the city

The Oakland Airport Business Park and its property owners stand to benefit from an organized a status marketing and media campaign promoting LightUP Oakland!, the realization of its benchmarks, the end of the and the business district it serves. Positive news reports, articles, interviews, press or the end of the end of the conferences, press releases, a public groundbreaking, and public relations events will garner to be action ongoing publicity long after glass is laid in the ground and broadband service is deployed. The LightUP Oakland! project presents an exceptional opportunity for the Airport-Coliseum district of the and the city of Oakland to shine.

The LightUP Oakland! project will benefit the city of Oakland by serving as a potential conduit for example of for regional linkage to the forthcoming joint Port of Oakland/City of Oakland Domain the forthcoming joint Port of Oakland/City of Oakland Domain the forthcoming joint Port of Oakland/City of Oakland Domain the forthcoming joint Port of Oakland/City of Oakland Domain the forthcoming joint Port of Oakland/City of Oakland Domain the forthcoming joint Port of Oakland/City of Oakland Domain the forthcoming joint Port of Oakland/City of Oakland Domain the forthcoming joint Port of Oakland/City of Oakland Domain the forthcoming joint Port of Oakland/City of Oakland Domain the forthcoming joint Port of Oakland point utility; security and it of the forthcoming joint Port of Oakland point utility; security and it of the forthcom of the proposes to better network and monitor utility; security and it of the proposes to better network and monitor utility; security and it of the propose of the propos

The LightUP Oakland! project is one component of a larger, longer-term vision to broaden as a second statement of a larger, longer-term vision to broaden as a second statement of a larger, longer-term vision to broaden as a second statement of a larger term vision to broaden as a second statement of the stateme

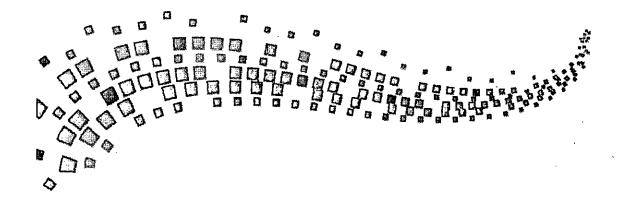
LightUP oakland!



Collaborative Executive and Advisory Teamers

A Public-Private Partnership





Appendices

Exhibit A

CITY OF OAKLAND

CITY HALL . 1 FRANK H. OGAWA PLAZA . OAKLAND CALIFORNIA 9461

LAURENCE: E: REID Vice Mayor Councilmember District #7 Ireid @oaklandnet.com

(510) 238-7007 FAX: (510) 238-6910 TDD: (510) 839-6451

June 5, 2013

Dear Oakland Business Community Members and Stakeholders:

The deployment of fiber optics in Oakland is critical for the continued growth and economic vitality of our city. Without the unparalleled speed, capacity and reliability provided by flber, Oakland risks being left behind as neighboring cities, one by one, employ broadband strategies that serve to attract high-tech business.

The demand for more bandwidth and speed in today's digital world is real – advanced manufacturing, the healthcare industry, biotechnology and media services all rely upon the capacity and speed only fiber can provide to streamline operations and remain competitive. Time is money – and could be the difference between choosing Oakland or going elsewhere.

Also used in crime-fighting strategies such as video surveillance with license plate readers and other innovative technologies, high speed broadband can facilitate rapid, real-time communication amongst law enforcement, public safety agencies and the community. Fiber infrastructure will ensure the reliability and longevity of Oakland's emergency response system.

The LightUP Oakland! project is a collaborative, public-private driven effort that includes support from BART and Port of Oakland to bring high speed broadband infrastructure to Oakland. The LightUP Oakland! project presents the opportunity to reposition our major commercial and industrial zones for the 21st century economy, beginning with the strategically important yet underserved Airport-Colliseum area as pilot, using the Oakland Airport Connector as the conduit for feeding the district with broadband service.

The LightUP Oakland! project is in keeping with East Bay Broadband Consortium goals of supporting technologyled development, regional collaboration, and job creation. Broadband infrastructure can provide the foundation upon which the city can further economic development, improve public safety, increase the capacity to attract high-tech business, help to overcome the digital divide, and improve the health of our major commercial corridors. The entire Bay Area will be the ultimate beneficiary of improved infrastructure that begins with the LightUP Oakland! pilot project in East Oakland.

Building fiber infrastructure in Oakland is good for the city and good for the region. LightUP Oakland! has my endorsement to pursue a course of action that brings high-speed broadband infrastructure in Oakland to finition.

28-0

Sincerely: Larry/E. Reid

Vice Mayor Councilmember, District 7

Exhibit B

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The Airport Area Business Association is a regional association of business and industry 2012-13 June 5, 2013 1024 00000 BOARD OF DIRECTORS Ms. Deanna Santana **City Administrator** ANN COOKE President City of Oakland ULTIMATE SPORTS GUIDE 1 Frank Ogawa Plaza, 3rd Floor RANDALL WHITNEY Vica President Oakland, CA 94612 SAFE STORAGE MANAGEMENT CO. RON RISI Secretary RECOLOGY EAST BAY Dear Ms. Santana: ANA CHRETIEN Treasured ABC SECURITY SERVICE, INC. It is my sincere pleasure to submit this letter on behalf of the AABA membership and board of directors in support of LightUP Oaklandl's efforts to implement a fiber pilot in MARK BRYANT the Hegenberger Corridor. PORT OF OAKLAND TOM BLICKLEY HOLIDAY INN & SUITES OAKLAND AIRPORT There is no doubt that the local business community will benefit from having access to affordable high speed broadband, given that telecommunications services are severely ALTON JELKS JELKS GROUP DYNAMICS lacking and unreliable within the business park – creating a situation that makes it m. - 212-2 A.J. MUSANTE difficult for commercial brokers to attract new companies here. Also, the speed and a strategy of a CITY OF OAKLAND, RETIRED capacity provided only by fiber is needed if the district is to actively recruit technology-MIKE TALLENT driven companies that already rely on broadband to conduct business. THE ART SIGN COMPANY · 7. . . KYLE TAYLOR SHRED WORKS AABA recognizes the exciting marketing opportunities a fiber pilot presents for the second se district. Not only will the Airport-Coliseum area be part of a region-wide effort to deploy - ---MICHAEL YOELL MICHAEL GLENN INVESTIGATIONS broadband service, but the district will also serve as the launching point for making fiber a gate of available to our major business corridors across the city. The marketing opportunities to uncess or a provided by the fiber pilot will be a shot in the arm for a submarket that is currently. EXECUTIVE DIRECTOR impacted by low confidence and high vacancy rates. We look forward to helping LightUP as a set of the set of t DEBRA HAUSER Oakland! promote the corridor as being Oakland's launch point of enhanced technology http://adoc.au http://adoc and innovation. Mail: P.O. Box 14123. The core value of the fiber pilot remains, however, the high speed broadband it will offer a program. Oakland, CA 94614 major end users within the business park, along with increased reliability and system, Office, by appointment: redundancy it can provide to both Oakland International Airport and the 911 call centeral to each of 333 Hegenberger Road, Suite 328 Oakland, CA 94621 located on Edgewater Drive in the pllot area. has added the start for one back . = : 510.545.7773 tel 510.261.4112 fax AABA and the hundreds of businesses we represent wholeheartedly support LightUPa is of suspass debbie@aaba.org Oaklandl's efforts to implement fiber optic infrastructure in the Hegenberger Corridor. 5 www.aaba.org We look forward to supporting LightUP Oakland! in whatever way possible to bring the support of http://facebook.com/AABAOAK pilot project to fruition. REPARENCE AND CLASS

Bestregards,

Debbie Hauser Executive Director

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Exhibit C

ITY OF OAKLAND FILED AGENDA REPORT OFFICE OF THE CITY CIE Office of the City Administrator TO: ATTN Community and Economic Development Agency FROM: January 24, 2012 DATE: A Follow-up Report and Proposed Action on the Community and Economic and en RE: Development Director's Economic Development Strategy for the City of Oakland

SUMMARY

On September 27, 2011 the Community & Economic Development (CED) Committee of City Council heard a report by staff on an Economic Development Strategy and directed staff to return with recommendations for the creation of a Strategic Plan. Key areas of interest for the Committee were information on the City's current economic development strategies that are working; workforce and small business development strategies; and <u>strategies</u> to brand and promote the City of Oakland as a choice for businesses and talent. Staff proposes to develop ah updated Economic Development Plan and return to Council oy May of 2012, pending identification of resources.

The first phase of the Plan creation will be to confirm Oakland's current status and standing among the existing business community and leadership to define priorities and strategies for going forward, given constraints and need for re-alignment of City resources. The subsequent phase will be to develop the Economic Development Strategic Plan with definable short and long term actions and timelines. This Plan should serve as a coordinating document, relating crossdivisionally as a companion to the adopted General Plan of the City and informing city staff cross-divisionally of the importance of economic development to all divisions of the City.

Staff intends to engage with key partners, such as UC Berkeley, Oakland Chamber of Commerce, Inner City Advisors, the East Bay Economic Development Alliance, and the Oakland Workforce Investment Board as well as others in this process. The creation of a plan will require contracting with an economic development consultant(s) to assist in this effort; in addition to City staff to support this and the ongoing work being done oh a day to day basis within Economic Development Division. This level of support is required to ensure that the Plan will be developed by May 2012, given the urgency to respond to the demise of the Oakland Redevelopment Agency and the need for Economic Development staff to continue to serve clients. This report presents staff recommendations regarding the components of the Oakland Economic Development Strategic Plan and requests input and direction of the CED Committee.

FISCAL IMPACT

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This is an informational report, thus there is no fiscal impact for a selence or over the over the back use

Item: CED Committee January 24, 2012

Deanna J. Santana
CEDA: Economic Development Strategic Plan Framework

Page 4

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- Demographic Characteristics (age, ethnicity, income, educational attainment, housing)
- Market Performance Measures (Retail, Office and Industrial, Hotel, wages, major employers, sectors, real estate)
- Targeted Industry Clusters (venture capital, wages, vendors & suppliers) astrophy and the manual restored as the
- Multiplier effect documentation/ supplier network employment and revenue impact of CAC y BIR 6197 36 • targeted clusters

Expected Deliverable: Economic Overview/present conditions report

Task 2: Review of existing plans and strategies

- General Plan • Zoning Updates Const Coderes Redevelopment Project Area Plans tist states at the second و دورو شر Specific Plans Economic Development Plans (Oakland Partnership, WIB Plan, East Bay EDA) · · · · /
 - Industry Cluster Work (private and public)

Expected Deliverable: Cross divisional and cross disciplinary analysis of existing City policies, procedures and plans that support economic development.

Task 3: Key Stakeholder and Market Leader interviews

- CED Committee Planning Session
- Business and Community Leader interviews
- Targeted Cluster focus groups

Expected Deliverable: Publication (web-based) of focus group feedback with update of material previously gained from industry leaders through the Oakland Partnership leadership committees and the protone rous

Task 4: Development of Key Goals for a 21st Century Economic Development Program: Scorecard on Oakland's Performance by: and the second

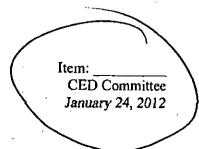
- Niches of Competence
- Infrastructure for Innovation (Targeted Clusters, Small Businesses)
- Human Capital Assets
- City and Regional Promotion
- Smart and Vibrant Community Places
- City Development and Finance

Expected Deliverable: Trends Analysis report

Task 5: Identification of major areas for strategy developihents areas and reason of ranger areas for areas or or

- Confirmation of major areas for which strategies are required to compliant of the gor owned the whether and
 - Prioritization of key strategy areas Provide Ballacia - Editor State State State

Expected Deliverable: Priority Initiatives and Targeted Industries report assertioned Broad and interactives of



Attachment A:

 Complete inventory of youth employment programs and strategically market programs to priority sector businesses 	
Close digital divide	
 Continue working with private partners to provide free/low-cost internet access 	•
 Develop programs and secure funding to increase computer ownership and provide culturally competent 	. .
computer training to vulnerable communities	
Quality of Life and Neighborhood Revitalization	
Upgrade neighborhood commercial areas	
 Expand tourism marketing to include distinctive neighborhood districts 	وريع ورور مودو
 Assess the feasibility of creating free shuttles between neighborhoods 	2 5
 Expand Neighborhood Marketplace Initiative, which provides grants and other technical support to 	
commercial districts that are not yet CBDs	. • .
 ID permanent funding source for streetscape improvement program, promote façade improvement 	
matching grants to select businesses	
• Encourage creativity by continuing to develop City as center for the arts	, -, ,
 Use land use and financial resources to increase affordable housing and workspaces for artists 	
 Award density bonuses for developers who include arts space in their projects the state of the s	in.i.
 Create and support a touring program to raise visibility of SF arts industry 	
• Recognize and enhance value of parks and open spaces	
 Park and Rec should explore the feasibility of creating and managing Park Improvement Districts 	•-
 Develop ongoing relationships with nonprofits to fund improvements in play structures and other park 	
amenities	•••
Infrastructure	
Provide sufficient real estate for strategic priorities	
 Provide a clear and rational land use entitlement process 	
Maximize City's accessibility to local/regional workforce	B
 Complete Transbay Transit Center, fund efforts to improve the reliability and efficiency of transit system 	
 With MTA, develop bicycle and pedestrian projects of major regional value of group for the starting of the starti	
• Work to reduce cost of residential and commercial dev.	
Streamline building and permitting processes	
 Create area plans with program EIRs that reduce need for project-specific EIRs 	
 Create incentives for replacing single story retail bldgs. with multi-story mixed-use projects and for 	
additional secondary units	
 Commit to citywide goals for homeownership, which should increase over time. 	
Technology and Innovation	
Echnology and Innovation Support commercialization of research and technology	- / ¹ -
 Technology and Innovation Support commercialization of research and technology Explore feasibility of creating additional incubator space for early stage biotech companies 	
 Technology and Innovation Support commercialization of research and technology Explore feasibility of creating additional incubator space for early stage biotech companies Explore partnerships with UCSF and other institutions to develop additional research institutes along the second sec	
 Technology and Innovation Support commercialization of research and technology Explore feasibility of creating additional incubator space for early stage biotech companies Explore partnerships with UCSF and other institutions to develop additional research institutes along the likes of QB3 	
 Technology and Innovation Support commercialization of research and technology Explore feasibility of creating additional incubator space for early stage biotech companies Explore partnerships with UCSF and other institutions to develop additional research institutes along the likes of QB3 Improve telecom infrastructure for info-intensive industries 	
 Technology and Innovation Support commercialization of research and technology Explore feasibility of creating additional incubator space for early stage biotech companies Explore partnerships with UCSF and other institutions to develop additional research institutes along the likes of QB3 Improve telecom infrastructure for info-intensive industries Consider making underutilized fiber optic facilities available to businesses at a reasonable cost 	
 Technology and Innovation Support commercialization of research and technology Explore feasibility of creating additional incubator space for early stage biotech companies Explore partnerships with UCSF and other institutions to develop additional research institutes along the likes of QB3 Improve telecom infrastructure for info-intensive industries 	41 - 10 - 1

Exhibit D

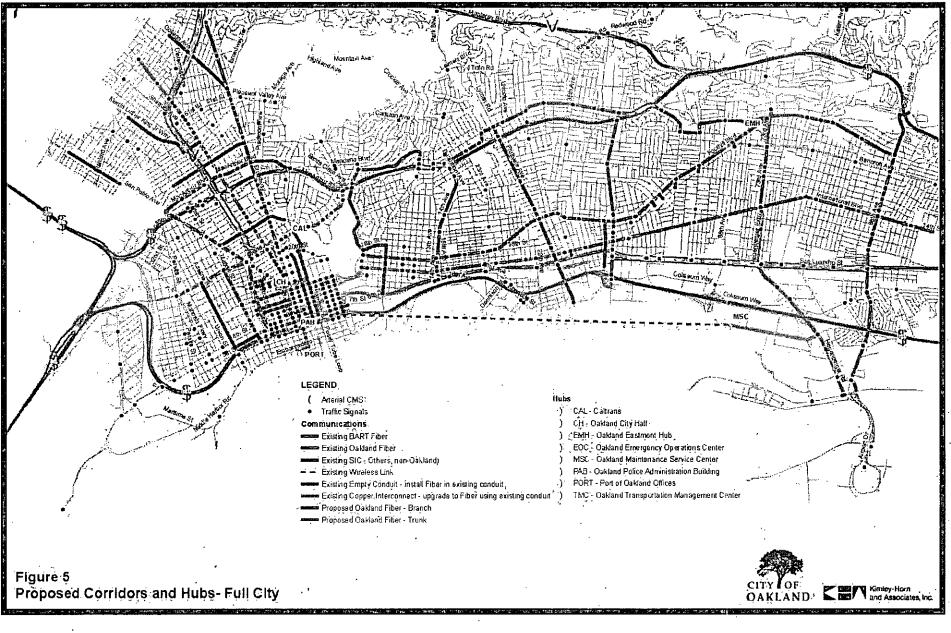
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Kimley-Horn 2013 Mapping of Existing and Proposed Fiber in Oakland





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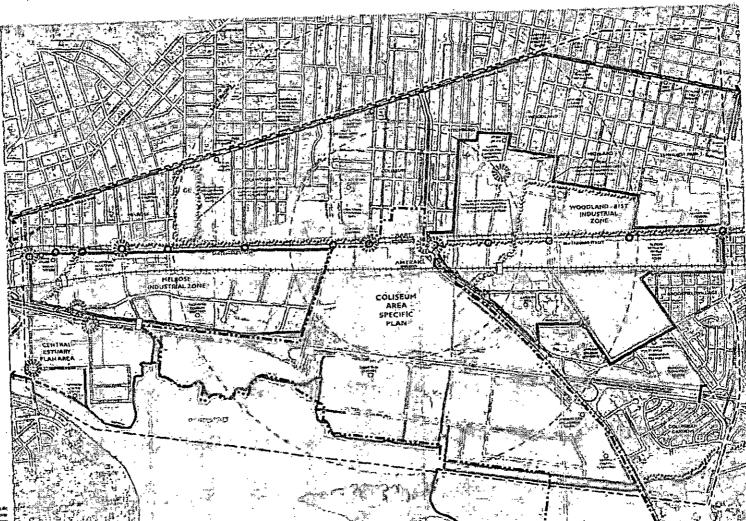
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NOTE To view all relevant plans and projects, refer-

C senscoord Plan and the Education Plan



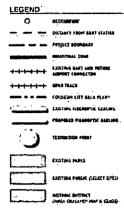


RELEVANT PLANS & PROJECTS

COLISEUM INDUSTRIAL INFRASTRUCTURE MASTER PLAN

DRAFT S

OCTOBER 19, 2012



¹³ The Cultimum Area Specific Harn is part of an original Specific Year part Die Educ (The Cultimum Indians) all Maraticulture Phase Pan dess nos in John programs or elements of propiet vision term I seam groupesed within the Collisium Capitane Maximity I seam groupesed within the Collisium Capitane Maximity



NOTE: To view all relevant plans and projects, refer (1)²¹ size to the Relevant Plane & Projects Plan, the Reycle Sejimb Commissions Plans and the Pederstrian Connections Plane (2011)



FIBEROPTIC PLAN

COLISEUM INDUSTRIAL INFRASTRUCTURE MASTER PLAN

DRAFT

OCTOBER 19, 2012

Exhibit F

Oakland Police Department Bureau of Services



Communications Section 7101 Edgewater Drive. Building #8

Communications Section Annual Report 2012



Oakland Police Communications Section 7101 Edgewater Drive Building #8

I. Section Functions / Responsibilities

The Communications Section answers and evaluates various citizen calls for service; dispatches resources or refers calls to the appropriate agency or organizational unit. The Section is the Public Safety Answering Point (PSAP) for the City of Oakland. Communications receives all emergency calls for police, fire, and medical service requests. It dispatches police resources and forwards other emergency calls to the appropriate agency. The Section receives and evaluates all non-emergency calls for police and City services.

Services Provided

- Answers 9-1-1 calls for service and calls on other emergency and non-emergency lines.
- Transfers fire and medical calls to the Fire Services Agency.
- Dispatches police officers, animal control officers, field civilians and on occasion Oakland housing Authority and Oakland Public schools police.
- Refers non-emergency calls to other Oakland Police Department units, when appropriate.
- Responds to requests for audio CD copies of 9-i-1 and other incidents from the court, a strategy attorneys, media and other persons.

- Answers the internal Affairs Division "24-Hour" Complaint Hotline after hours documenting misconduct allegations or service complaints, notifying the Watch Commander and dispatching a supervisor if appropriate.
- Maintains and logs all the Use of Force incidents "24-Hour" in the City. Documenting information and forwarding for reporting compliance.
- Monitors the Shot Spotter equipment and creates calls for service and dispatch if appropriate.
- Conducts mandatory basic dispatch training for new hired dispatchers and in-service training for entire staff.
- Supports tactical and other emergency operations via the Tactical Operations Support feam.
- Provides service channel requests for field officers and City personnel when needed. Callbacks, warrants checks and confirmation, Phone notifications and call documentations and follow up services.
- Attends and participates in Community meeting to provide training, awareness and educate the community on the use of 911 services.

II. Staffing

Staffing history: It is critical to the timely delivery of emergency services to maintain Section staffing.

• On 16 Feb 1999, the City Council recognized the importance of maintaining staffing and passed Resolution 74790 C.M.S. The Resolution found that "the 9-1-1 emergency response line is one of the most vital services provided" and that "there is a critical need to begin the tesdng and hiring without delay". The funding for the hiring was provided through an "increase in General Fund revenues resulting from a utility user's tax settlement". However, in the last six years there have been only three job tests for Dispatchers.

• At the beginning of fiscal year 2003-04, the Communications Section Police Communications Dispatcher (PCD) staffing was reduced from 92 to 73 positions in order to save City funds.

• Starting July 2004, the civilian supervisory (PCS) staffing was reduced from 5 to 4 positions.

• In 2005, one PCD position was cut bringing the Sections authorized full time employee staffing to 72.

In late 2008 staffing was reduced by two PCD positions from 72 to 70 to save City funds.



Communications Commander Carlos A. Gonzalez

IX. Major Projects for 2013

- Implement the 9-1-1 Wireless Project In coordination with State Telecommunications, California Highway Patrol, (Golden Gate) AT&T. 9-1-1 and City Information Technology Section begin process to implement the acceptance of wireless (cell phone) calls by the 9-1-1 Center
- Develop and install an internet monitoring system at the Communications Section for live intelligence feed. The installation of three 70" monitors and four 50" monitors to monitor all high risk or tactical operations that require monitoring.
- o Establish and maintain a service and maintenance plan for radio consoles and handheld radios. To improve the radio system for daily use for front line officers and public safety personnel.

Carlos A. Gonzalez Lieutenant of Police Communications Section

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Exhibit G

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Bridging the Digital Divide

The EBBC was formed to close the gaps in broadband infrastructure and access and advance the region as a center of innovation for advanced communications technologies.

About the East Bay Broadband Consortium

The East Bay Broadband Consortium (EBBC) is an East Bay regional initiatives and interaction of the BBC is a set organized to improve broadband deployment, access, and adoption in Alameda, Contra and deployment, access, acc Costa and Solano counties through a collaborative regional approach a second and solar or accurate a consecond construction

Broadband – high speed Internet – is a critical 21st century infrastructure that is a key of the second enabling technology for:

- Economic competitiveness
- Public health and safety
- Sustainable Communities
- The Smart Grid
 - A 14 1 1 1 Access to information and services delivered through broadband applications of the second access to and technologies

Basic digital literacy skills are virtually essential to every aspect of the 21st century economy. Yet infrastructure and access gaps are present in the East Bayaresulting in a reasonable interaction of the persistent "Digital Divide."

EBBC was formed to close these gaps and advance the region as a center of innovation for advanced communications technologies, leveraging the region's deep knowledge of the second s assets. The EBBC Action Plan will identify and leverage opportunities aimed at the three way does not be the increasing: 1 - 5 - 11

- 1. The region's broadband infrastructure investments (public and privately financed) the astronomy of a
- 2. Affordable access to broadband technologies.
- 3. Wide adoption of broadband to acquire the benefits of these technologies. a start start and start and

The EBBC vision is to make the three-county East Bay the nation's leading broadband Country and the Country East enabled region in the nation. and the second second

The East Bay Broadband Consortium

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EBBC was organized by three East Bay economic development organizations - the EastEnet Boy economic Bay Economic Development Alliance (EDA), the Contra Costa Economic Partnership, 1946 accesses to a second and the Solano Economic Development Corporation (EDC), in partnership with the subsection states and the solar section of the solar sec California Emerging Technology Fund and support from the East Bay Community equation Fund and support Foundation and the Lesher Foundation. In January 2012, EBBC was awarded a three Foundation to Jentiary year grant from the California Public Utilities Commission to implement an Action Plana Public Utilities Commission to implement an Action Plana Public Utilities Commission to implement and Action Plana Public Utilitities Commission to implement an

The EBBC's three primary roles in achieving the intended goals of the Action Plan are tool to subleving intended convene, build consensus and organize the enabling network. The East Bay Community, conversion and enabling Foundation, East Bay EDA, Contra Costa Economic Partnership, and Solano EDC serves and history and solar deconomic as the Consortium Steering Committee, with the Partnership serving as the fiscal agent here the service of the Consortium Members will provide advice and recommendations as well as collaborate in as which the start star implementing policies and projects. There will be a Technical Advisory Group to provide (2005, The Polyhert of technical expertise, and additional Work Groups may be formed during the project the Harmonic State of the planning and implementation process. No. 13 Anno 11 Mini Anna (2001).884

Exhibit H

LICENSE AGREEMENT

THIS LICENSE AGRÉEMENT (this "License") is entered into effective as of October 17, 2011 ("Effective Date") by and between the City of San Leandro, a municipal corporation ("City") and San Leandro Dark Fiber, a limited liability company ("SL Dark Fiber"). The City and and SL Dark Fiber are sometimes hereinafter referred to individually as "Party" and collectively as the "Parties."

RECITALS

A. The City is the owner of the real property (the "Property") containing City conduit that houses City-owned fiber optic wiring and related facilities, as more particularly described by the minimum diagrams and maps in <u>Exhibit A</u>, attached hereto and incorporated herein by reference.

B. The City has the authority to regulate the terms and conditions for the use of the public right-of-way or service easements within the City's jurisdiction.

C. SL Dark Fiber desires to install and operate fiber optic cables and related facilities (the "Project") in the existing conduit or other City infrastructure located on the Property and within the City's right-of-way, that will be used to support the provision of telecommunications services . To existing and future customers in the City.

D. On June 6, 2011, the Parties entered into an Exclusive Negotiating Rights Agreement allowing City Staff to pursue negotiations and grant SL Dark Fiber with exclusive negotiating are rights regarding SL Dark Fiber's proposed development of the Project.

E. Prior to execution of this License, SL Dark Fiber has demonstrated that it has sufficient and the financial resources to fund the Project.

F. In order to carry out and complete the Project, SL Dark Fiber must have access to the Property and the public right-of-way in exchange for the grant of dark fiber strands to the City.

G. To this end, the purpose of this License is to grant limited permission to SL Dark Fiber to enter onto and use the Property for the duration of the Project, solely for the purposes of the Project, strictly on the basis stated herein and subject to the terms, conditions and covenants stated herein.

In view of the foregoing recitals and the covenants below, all of which constitute good and the view valuable consideration, with the intention to be legally bound the Parties agree as follows: Interview

ARTICLE I DEFINITIONS

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1.1.	"Abandonment" is defined in Section 2.6(c).	•	• '	² St. Margare and ²⁷ exactly a state of the second state of
1.2.	"Applicable Laws" is defined in Section 5.1.		12	"Annicable Lawshits Hiller of C.
1.3	"City Property" is defined in Section 3.4			- Declerit States

177047 Lit San Leandro Fiber Optic License

1.4.	"City Strands" is defined in Section 2.4(b).		
1.5.	"Claims" is defined in <u>Section 10.1</u> .	•	
1.6.	"Contractors" is defined in Section 3.5.	-	the caracters is second.
1.7.	"Construction Permits" is defined in Section 5.2.	·	and the second sec
			-
1.8.	"Effective Date" is defined in the preamble of this Le	ease.	
1. 9 .	Reserved.	-	
1.10.	"Hazardous Materials" is defined in Section 11.3(b).	• .	- 11170 Y - X - Y - 10
LH.	"Hazardous Materials Claims" is defined in <u>Section 1</u>	<u>[].](c)</u> .	
1.12.	"Hazardous Materials Laws" is defined in Section 11	<u>.3(c)</u> .	11 (14) 11 (14)
1.13.	"Indemnitees" is defined in <u>Section 10.1</u> .		The state of the second
<u>]</u> 1.14.	"Initial Term" is defined in <u>Section 2.3</u> .		
1.15.	"License Fee" is defined in Section 2.2.	: •	1 - Alder and Article Providence
1.16.	"Permitted Activity" is defined in <u>Section 2.1</u> .	÷.	en ander
1.17.	"Permitted Work" is defined in Section 3.1.	,	emana in Sala a sa s
1.1 8 .	"Property" is defined in <u>Recital A</u> .	<i>t</i> .	engebenen vielden im
1.1 9 .	"Project" is defined in <u>Recital C</u> .		
1.20.	"Remedial Work" is defined in <u>Section 11.3(a</u>].		· · · · · · · · · · · · · · · · · · · ·
1.21.	"Required Insurance" is defined in <u>Section 9.1</u> .	• .	Theorem as and the second
1:22.	"Scope of Work" is defined in Section 3.1.	·7.	Theope of Well on Jun fragments
1.23.	"Reserved.	•	анананан калан калан Калан калан кала
1.24.	"SL Dark Fiber Studies" is defined in Section 2.9.		TOU Dark Titler for Her is the

ARTICLE II

GRANT OF LICENSE; LICENSE FEES; TERM; CONVEYANCE OE FIBER TO CITY; E DUE DILIGENCE

2.1. <u>Grant of License: No Leasehold of Property Rights Created</u>. The City hereby <u>Solution</u> grants to SL Dark Fiber a non-exclusive, non-revocable License to enter onto; have access and the solution use the Property, for the sole purpose of installing and operating a fiber optic cable of not more to the solution.

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than a two hundred eighty-eight (288) strand capacity (unless otherwise mutually agreed upon by the Parties in writing) and related facilities in the existing conduit or other City infrastructure located on the Property or within the City's right-of-way in order to support the provision of <u>the uncertained</u> to telecommunications services in the City. This License is not intended to nor shall it be<u>ued to a factor</u> interpreted to create or vest in SL Dark Fiber any leasehold, easement or any other property SL Corf. For <u>the state</u> rights or interests in the Property or any part thereof <u>the state state state state</u> state state state state state state.

2.2. License Fee. On or before the first day of Years 1 through 10 of the Initial Term of this License, SL Dark Fiber shall pay to the City a fee (the "License Fee") in the amount of the one dollar (Si.00) per year for the use of the Property. Such fee is not a revenue sharing for the version of a revenue sharing for the version of the revenue sharing for the version of the revenue sharing for the version of the version of the revenue sharing for the version of the v

(a) <u>Interest</u>. Any amount due from SL Dark Fiber to the City which is not the second second paid when due shall bear interest at the lesser of ten percent (10%) per annum or the maximum the second second

(b) License Fee Review and Increase. Commencing in Year 11 of this the Added A

Market Rate. Market rate shall be determined by mutual agreement of the · • • • • • (c) Parties based on ten recently negotiated commercial conduit licensing agreements. If the Parties are a set are unable to agree, then they shall submit to formal mediation with a jointly agreed upon ~**•** mediator. If mediation is unsuccessful, than the parties shall submit to binding arbitration under the rules of the American Arbitration Association and the decision of the arbitrator(s) shall be a second 0.1enforceable in any court having jurisdiction thereof Arbitration shall occur only in Alameda ; 👘 👘 County, CA. In the event any dispute is arbitrated, the prevailing Party (as determined by the arbitrator(s)) shall be entitled to recover that Party's reasonable attorney's fees incurred (as the second s . . 1 determined by the arbitrator(s)).

2.3. Initial Term. This License shall commence on the date first signed by the Parties memory in the second and shall have an Initial Term of twenty (20) years.

(a) <u>Renewal Right; License Fee During Renewal Term</u>. SL Dark Fiber shall <u>graded to a standard standard</u> have the right to renew the lease for four (4) additional five (5) year terms, immediately <u>beauting additional five</u> (5) year terms, immediately <u>beauting additional five</u> (5) year terms, immediately <u>beauting additional five</u> (6) year terms, immediately <u>beauting additional five</u> (7) year following the Initial Term ("Renewal Terms"). The License Fee payable during each of the <u>standard standard</u> (6) year terms and the terms shall be the market rate for conduit as determined on the first (1st) year of that <u>standard standard</u> (6) year terms difference in the standard s

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Renewal Term, and shall adjust for infiation each subsequent year of that Renewal Term. All other terms and conditions of this License shall apply during any Renewal Term. In order to exercise the Renewal Right for a Renewal Term, SL Dark Fiber shall send written notification to the City as early as fifteen (15) years prior to the commencement of, and no later than one *Defeated are to the commencement* of the then-effective term (Initial data was not to the commencement).

2.4. Third Party Access to, and City Ownership of the Fiber Contained in the Project.

(a) The City hereby agrees that SL Dark Fiber may enter into agreements with the state of affiliates or third parties to provide telecommunications services using the portion of the Project services SL Dark Fiber owns.

(b) In addition to any fiber optic cable and related facilities provided to the 20 40 City by SL Dark Fiber under this License and upon Project completion, SL Dark Fiber agrees to the convey to the City the ownership and exclusive use of thirty (30) strands of the dark fiber ("City the Strands") installed for the Project in any area of conduit where there is sufficient capacity for SL Dark Fiber to install a 288-strand fiber cable. If space constraints limit SL Dark Fiber to install a fewer than 288 strands of fiber, then the City shall have ownership and exclusive use of ten (10) a double active percent of the number of fiber strands installed. The Parties agree that there are no restrictions. The city is use of the City Strands.

2.5. City Approval of Sale or Transfer; City Right of First Refusal. The state of the total states of the states o

(a) If at any time during the Initial or Renewal Terms of this License, SL and the Advance of the Project, or enough of a portion of the Project to result in a change of control, SL Dark Fiber must notify the City. The City shalls a second the Project to result in a change of control, SL Dark Fiber must notify the City. The City shalls are the Advance of the Project to result in a change of control, SL Dark Fiber must notify the City. The City shalls are the Advance of the Project to result in a change of control, SL Dark Fiber must notify the City. The City shalls are the Advance of the Project to result in a change of control, SL Dark Fiber must notify the City of the City shalls are the Advance of the Project to result in a change of control, SL Dark Fiber must notify the City of the City shalls are the Advance of the Project to result in a change of control, SL Dark Fiber must notify the City of the City shalls are the Advance of the Project to result in a change of control, SL Dark Fiber must notify the City of the City shalls are the Advance of the Project to result in a change of control, SL Dark Fiber must notify the City of the City of the City and Right of First Refusal for one hundred and eight of First Refusal.

(b) If the City elects to exercise its Option and Right of First Refusal to the state of the state of purchase SL Dark Fiber's fiber optic cable and associated facilities; it acknowledges and agrees we are a state of that it will assume and continue to provide facilities to support any unexpired customer(s) or approved on the lease of the project

(c) Agreement(s) for telecommunications services provided on SL Dark 76(5) of 0.1 to one of Fiber's facilities through any affiliate or agreements with third parties using SL Dark Fiber's Blate or a meanward of facilities to provide telecommunications services using facilities in the Project (provided such that the state of the

(d) If the City fails to exercise its Option and Right of First Refusal, then SL 2010 Constants Dark Fiber may proceed to sell, assign or otherwise dispose of the Project upon the City's Discussion of Dark Fiber may proceed to sell, assign or otherwise dispose of the Project upon the City's Discussion of Dark Fiber may proceed to sell, assign or otherwise dispose of the Project upon the City's Discussion of Dark Fiber may proceed to sell, assign or otherwise dispose of the Project upon the City's Discussion of Dark Fiber may proceed to sell, assign or otherwise dispose of the Project upon the City's Discussion of Dark Fiber may proceed to sell, assign or otherwise dispose of the Project upon the City's Discussion of Dark Fiber may proceed to sell, assign or otherwise dispose of the Project upon the City's Discussion of Dark Fiber may proceed to sell, assign or otherwise dispose of the Project upon the City's Discussion of Dark Fiber may proceed to sell, assign or otherwise dispose of the Project upon the City's Discussion of Dark Fiber may proceed to sell, assign or otherwise dispose of the Project upon the City's Discussion of Dark Fiber may proceed to sell, assign or otherwise dispose of the Project upon the City's Discussion of Dark Fiber may proceed to sell.

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written consent, which shall not be unreasonably withheld. The City agrees and acknowledges that the purchasing entity shall have the right to use the portions of the Project that the City does not own to continue providing service to support any unexpired customer agreement for telecommunications services provided by SL Dark Fiber or any affiliate or third party with <u>services agreement</u> whom SL Dark Fiber has contracted to provide telecommunications services, provided such a straight agreement satisfies the terms of this License and any extensions of the substraint agreement of the terms of the License and any extensions.

2.6. Termination, Abandonment or Expiration of License or Project: miscauou, Augustaneers of Security

Parties.

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(a) This License may be terminated at any time by mutual agreement of the starting between the starting of the

Either party shall have the right to terminate this License upon the other (b) · Party's material breach of this License in which the breaching Party fails to commence a cure of such breach within ten (10) calendar days of written notice of default from the non-breaching methods within ten party. SL Dark Fiber shall have the right to terminate this License, effective upon ten (10) days -. written notice to the City, if the results of its investigation into the feasibility of the Project or the Property inspection described in Sections 2.8 and 2.9 below are unsatisfactory or if SL Dark and the section of Fiber is unable to obtain other necessary approvals, certifications, rights or interests. Neither Party shall have the right to seek an award of damages as a result of the termination of this taken ward of damages as a result of the termination of this taken ward of damages as a result of the termination of this taken ward of damages as a result of the termination of this taken ward of the termination of te License pursuant to this Section 2.6(a). If SL Dark Fiber terminates this License prior to any edited of the 1 portion of the Project becoming operational (i.e., the Project is capable of supporting the second s telecommunications services), then ownership of any fiber optic cable or associated facilities and the method of the second s already installed will transfer to the City.

After the first five (5) years of the Initial Term, the City shall have the first many second (c) right to terminate this License in the event that SL Dark Fiber abandons the Project for at least determined and one hundred twenty (120) days. For purposes of this Agreement, "abandons" or "abandonment" means the intent to absolutely surrender or relinquish the Project. Periods of disuse due to force in a serie that majeure events (defined above), or other events causing the Project to be unusable or in which the move of the disrepair, shall not be interpreted or construed as abandonment. Force majeure is defined as:anyre or men as inability of a Party to perform because it is directly prevented or delayed by reason of strikes; 36a et al. 66 d. 66 d. lockouts, labor disputes, supply shortages, utility outages, civil disorders, actions of a supply short outs out in a governmental authorities, actions of civil or military authority, national emergency, insurrection, it is also enabled riots, war, acts of God, fire, floods, epidemics, freight embargoes, power outages or other causes anthemics, here, m beyond the reasonable control of the party. The City shall attempt to contact SL Dark Fiber at the party. The City shall attempt to contact SL Dark Fiber at the party. the address contained herein for notices at least once per month during the 120 day period of the state state to asserted abandonment to notify SL Dark Fiber that the City believes the Project has been in SL Dark Fiber that abandoned. 54 (121) MME

(d) Both Partics acknowledge and agree that if telecommunications services a construction are being provided to customers, any termination of this License (whether by mutual consent or in the second second

regulatory requirements and that they will comply with such regulatory requirements. In the event of abandonment, the City will not be bound to any agreements between SL Dark Fiber and and third parties or affiliates. .

Ownership of the Project Upon Termination or Abandonment. Upon (e) termination or expiration of this License, or abandonment of the Project ownership of the Project -GEL BE A SERVICE shall automatically transfer to the City.

Effect of Termination on License. Upon termination as provided herein, **(f)** or upon the expiration of the Initial Term and any extensions thereof, this License shall forthwith be void, and there shall be no further liability or obligation on the part of either of the Parties or their respective officers, employees, agents or other representatives; provided however, that certain provisions of this License shall survive such termination, as specified herein. Is we are the

Access to Unused Conduit Space. After the first five (5) years of the (g) Initial Term the City may permit others access to unused conduit space and such access will not constitute a reduction in capacity of conduit specified for use by SL Dark Fiber:

Nonexclusive License. SL Dark Fiber understands that this License does not the the 2.7. provide SL Dark Fiber exclusive use of the Property and that the City shall have the right to ϕ permit other providers of communications or other entities to install equipment or devices in or on the Property. However, in granting others a similar license for access to and use of the access to access the access the access to access the access to access the access to access the access the access to access the access to access the access to access the access to access the access the access to access the access the access the access the access to access the access t Property, or for the City's own use, the City agrees that it will not make or allow a subsequent change to the Property that materially affects SL Dark Fiber's ability to use the Property for the Project, including reducing the capacity of conduit specified for use by SL Dark Fiber, or that materially interferes with or degrades the services provided by SL Dark Fiber. In which provide the

Inspection of Propeny: Right of Entry Agreement. At its sole discretion, SL Dark 2.8. Fiber must inspect, examine, survey, and prepare any studies, surveys, plans, specifications and reports ("SL Dark Fiber Studies") that SL Dark Fiber deems necessary or desirable to determine the viability of the Project. Such studies may include, without limitation, marketing, we wanted a studies of the st feasibility, seismic and environmental studies, financial feasibility analyses and design studies. SL Dark Fiber's inspection, examination, survey and SL Dark Fiber Studies shall be at SL Dark Fiber's sole expense. SL Dark Fiber shall be responsible for obtaining the City's advance and the state of th written permission for access to the Property as may be necessary to prepare the SL Dark Fiber Studies. SL Dark Fiber shall provide the City with a summary of the results of SL Dark Fiber Studies for the limited purpose of notifying the City that SL Dark Fiber has determined that the Property is suitable for the Project. After any necessary inspection, examination, survey or destination review SL Dark Fiber shall repair, restore and return the Property to its condition immediately, and preceding SL Dark Fiber's entry therein at SL Dark Fiber's sole expense, unless otherwise my there is a second sec directed by the City. The provisions of this Section 2.8 shall survive the expiration or earlier store and a section 2.8 shall survive the expiration of earlier store and a section 2.8 shall survive the expiration of the section 2.8 shall survive the section 2.8 shall survive the expiration of the section 2.8 shall survive the s . Je s Marite Gity (Burger termination of this License.

AS-IS Conveyance. The City hereby grants this License to SL Dark Fiber for the 2.9. Property in its "as-is" condition existing on the Effective Date, and SL Dark Fiber acknowledges that, except as otherwise expressly set forth in this License, the City makes no representations or well warranties to SL Dark Fiber with regard to the condition of the Property or the fitness or and the second

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suitability thereof for SL Dark Fiber's purposes, including but not limited to, matters pertaining to topography, utilities, soil, subsoil, presence or absence of fill, presence or absence of Hazardous Materials (as defined in Section 11.3(b)), drainage, flood zone designation, · · environmental laws, rules, or regulations. The City shall allow SL Dark Fiber to have access to the Property at no charge for inspection and verification of the suitability of the Property for the. Project. SL Dark Fiber shall rely solely on its own independent investigation and judgment as to: 19 all matters relating to the Property and the suitability of the Property for SL Dark Fiber's use: SL Dark Fiber represents that it has, prior to the execution of this License, made investigations of the Property, including without limitation such inquiries of governmental agencies, soils testing, tests and inspections as SL Dark Fiber has deemed necessary to determine the condition of the Property and that SL Dark Fiber, by execution hereof, accepts the Property in its current "as-is". condition and state. Notwithstanding this provision, the City agrees that it will negotiate with SL Dark Fiber in good faith to accommodate SL Dark Fiber's capacity needs, including replacing; relocating or sharing existing City fiber optic cable or related facilities with SL Dark Fiber. Any costs arising from such accommodation shall be mutually agreed to in writing by the City and SL Dark Fiber.

2.10. Financial Feasibility. Prior to the execution of this License, SL Dark Fiber must . provide the City with confirmation that it has sufficient financial resources and commits to fund the Project.

2.11. Annual Reporting. Together with any applicable License Fee, SL Dark Fiber 3. shall send to the City a confidential written annual report detailing information regarding the number of subscribers, capacity used, capacity available, and revenue received from the Project. Such report is designated a SL Dark Fiber trade secret exempt from disclosure under the State and the second California Public Records Act.

ARTICLE III

SCOPE OF WORK; PERFORMANCE OF WORK; DEVELOPMENT SCHEDULE

3.1. Scope of Work. Pursuant to this License, the City authorizes SL Dark Fiber to install the Project in the existing conduit of the Property (hereinafter "Permitted Work") as described in the "Scope of Work," attached as Exhibit B and incorporated herein by this - n-reference. The performance of the Scope of Work shall be at SL Dark Fiber's own risk, subject to inspection with or without notice at any and all times by the City; final approval by the City and the City and subject to the City's review of SL Dark Fiber's final plans for the Project. Any second subject to the City's review of SL Dark Fiber's final plans for the Project. improvements made to the Property as a result of the Scope of Work shall be for the benefit of the City, and all costs shall be home by SL Dark Fiber.

Development Schedule. SL Dark Fiber shall make all effons to comply with the 3.2. Development Schedule, attached as <u>Exhibit C</u> and incorporated herein by this reference, which includes a schedule describing the anticipated dates by which SL Dark Fiber shall obtain or me entitlements, commence construction, and complete the Project of The City shall assist SL Dark Fiber in obtaining any necessary permits or entitlements from the City (including but not limited to encroachment permits and environmental review). The City acknowledges and agrees that the schedule set forth in Exhibit C is a best estimate by SL Dark Fiber and that any failure or C is a inability to meet the deadlines set forth in Exhibit C shall not constitute a material breach or set of the

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grounds for termination of this License, unless SL Dark Fiber abandons the Project for one hundred twenty (120) days.

Workmanlike Standard. The Permitted Work shall be performed in a good and 3.3. workmanlike manner consistent with the standard of care and level of skill presently maintained ... 1463 mm dist by the practice of professionals in this locale; in compliance with all federal, state and local laws as the area in compliance with all federal, state and local laws as the area in compliance with all federal, state and local laws as the area in compliance with all federal, state and local laws as the area in compliance with all federal, state and local laws as the area in compliance with all federal, state and local laws as the area in compliance with all federal, state and local laws as the area in compliance with all federal state and local laws as the area in compliance with all federal state and local laws as the area in compliance with all federal state and local laws as the area in complex state and local laws area in the area in complex state and local state and local laws area in the area ordinances, rules and regulations, in a manner so as not to disturb the occupancy, business or source of the second states and the s quiet enjoyment of any other tenants or licensees of the Property; and in a manner so as to avoid harm to person(s) or the Property.

Damage to City Property During Construction and Installation of the Project. 3.4. Precautions must be taken by SL Dark Fiber to avoid interference with or damage to the City's real and personal property. SL Dark Fiber's equipment must not damage wire lines at, over or 2010 and 20 near the Property, as well as any other utilities or structures located thereon. SL Dark Fiber shall as a structure shall be a structur be liable for any damage to the Property, or any other property of the City or the City right-of-. way (all of the foregoing, collectively, "City Property") that occurs as a result of this License and the use of the Property, unless caused by the gross negligence or willful misconduct of the City or its employees, agents or contractors. Any waste generated in the process of completing the Permitted Work will be the responsibility of SL Dark Fiber, at SL Dark Fiber's sole cost and and the responsibility of SL Dark Fiber. expense.

Subcontractors. SL Dark Fiber shall be responsible for all Contractors and all Subdamentations and sub-3.5. subcontractors engaged to complete the Permitted Work ("Contractors"), including, without the subsequences when limitation, responsibility for the payment of any compensation or other amounts payable to the compensation of any compensation of the payment of any compensation of the payment of the p Contractors, and shall be responsible for their conduct and the conduct of their employees, agents and the conduct of the conduct and volunteers. SL Dark Fiber shall direct the Permitted Work rendered or performed by Contractors using SL Dark Fiber's skill and attention, shall require discipline and good order______ among its employees and subcontractors, and shall not knowingly employ or engage, on the job, any person unfit or unskilled for the task assigned to him or her. All Contractors and the second second second subcontractors shall be properly licensed and insured to complete work within the public rightof-way. . .

3.6. Materials and Supplies. SL Dark Fiber shall, at SL Dark Fiber's own cost and the state of the st expense, furnish (unless herein otherwise specifically provided) all superintendence, labor, tools, consequentiating of equipment, materials, and supplies and all other things requisite and necessary to perform the requirement of the per-Permitted Work under this License. a and Mercelling and Mercelle

Supervision by SL Dark Fiber. SL Dark Fiber shall be responsible for the av SL Dark Fiber. He Dark 3.7. direction of the Permined Work, be responsible for all methods, sequences and procedures used a specific for all a in connection with the Permitted Work, and be responsible for coordinating all portions of the Mork and de costnors Permitted Work. All persons entering the work zone pursuant to this License shall wear safety to a group of the state of the glasses with side shields, hard hats and steel-toed safety shoes, and shall abide by CAL-OSHA(s) and steel-toed safety shoes, and shall abide by CAL-OSHA(s) and steel-toed safety shoes, and shall abide by CAL-OSHA(s) and steel-toed safety shoes, and shall abide by CAL-OSHA(s) and steel-toed safety shoes, and shall abide by CAL-OSHA(s) and steel-toed safety shoes, and shall abide by CAL-OSHA(s) and sh rules and regulations. and the first of the

Independent Contractor. SL Dark Fiber and the agents and employees of SL Dark Contractor. SL Dark Hore 3.8. Fiber are not employees of the City. SL Dark Fiber is acting as an independent contractor and the Court State Back and th nothing herein contained shall be construed inconsistent with that status, and the shall be soluted at the observed

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ARTICLE IV

ECONOMIC BENEFITS; CONFORMANCE WITH GENERAL PLAN

4.1. <u>Economic Benefits of Project</u>. <u>Exhibit D</u>, attached hereto and incorporated herein <u>Constant of Mathematical States</u> by reference, confirms that the Project is consistent with the City's Economic Development Planets of the states of a states of the states of th

4.2. Addition of Other Businesses to Project. Exhibit E of this License identifies third the parties that SL Dark Fiber may contract with to provide telecommunications services using the facilities that are included in the Project, and describes how SL Dark Fiber proposes to allow the businesses or other entities access to the Project. Such list shall be updated from time to times a second to the second telecommunications is provided as an other entities access to the Project. Such list shall be updated from time to times a second telecommunication of the city's request. The disclosure of such affiliates or third parties is provided as an other entities access to the construct of the proval from the City. The disclosure of such affiliates or third parties is provided as an other entities access to the construct of the proval from the City. The disclosure of such affiliates or third parties is provided as an other entities access to the construct of the proval from the City.

ARTICLE V

COMPLIANCE WITH LAW; PERMITS AND APPROVALS; LIENS AND ENCUMBRANCES

5.1. <u>Compliance With Law</u>. In completing the Permitted Work, SL Dark Fiber shalls a second s

5.2. <u>Permits</u>. SL Dark Fiber shall obtain all necessary permits and authorizations required by Applicable Laws. Prior to commencing the Permitted Work, SL Dark Fiber shall? apply for and obtain, or cause to be applied for and obtained, from the City all necessary separates and the second authorizations by the City, apart from this License, required by the City's Municipal Code and because and the second any other City rules and regulations, including encroachment permits, building permits and any state of the second s other City permits (collectively "Construction Permits") from the City. The City shall assist the second and the SL Dark Fiber in obtaining all such permits. SL Dark Fiber shall comply with all generally and n'., 1, - . . applicable City requirements for the issuance of Construction Permits, such as the payment of such a content of the such as the payment of such as such as standard fees, the submission of plans, installation plans, and traffic control plans. If SL Dark . 1 SL Dark Fiber of such deficiency and give SL Dark Fiber a reasonable period to cure such and a state of the such deficiency. If SL Dark Fiber does not cure such deficiency within size (CO) Fiber commences the Permitted Work without meeting such requirements, the City shall notify ' may, at its option, immediately remove any or all non-conforming equipment. Any removals of the state of the such equipment pursuant to this Section shall be at the risk of SL Dark Fiber and any such his decourse all be at the st removed equipment shall be stored only for sixty (60) days by the City and disposed of thereafter ante and accepted and in a manner to be determined solely by the City. SL Dark Fiber shall reimburse the City for allly of the City. SL Dark costs of removal and storage incurred, within thirty (30) days of receipt of an invoice: detailing meet means (30) the same.

5.3. Liens and Encumbrances. SL Dark Fiber shall at all times keep the Property free of the Statement Fiber and clear of all liens and encumbrances (including mechanic's liens) affecting title to the construction of the Property or arising from any act or omission of SL Dark Fiber or those claiming under SL Dark to explore the Fiber. The provisions of this Section 5.3 shall survive the expiration or earlier termination of this of Schole survive License. SL Dark Fiber shall pay as due all undisputed claims for work done, and for services of the exploration of the subscription of the survive the expiration of the services of the exploration of the services of the survive the expiration of the services of the exploration of the exploration of the exploration of the exploration o

rendered or material furnished to the City Facilities as part of the Project, at the City's request. If SL Dark Fiber fails to pay any undisputed claims or to discharge any undisputed liens, the City may do so and collect all costs of discharge, including its reasonable attomeys' fees. Payment or discharge by the City shall not constitute a waiver of any right or remedy the City may have on the state of the account of SL Dark Fiber's default. SL Dark Fiber may withhold payment of any claim include of the second connection with a good faith dispute over the obligation to pay, so long as the City's property page of the solution of the so interests are not jeopardized. If a lien is filed as a result of nonpayment, SL Dark Fiber shall a set and a set at the within ten (10) business days after knowledge of filing of the lien, provide the City with an its executed copy of a discharge of the lien, or deposit with the City cash or a sufficient corporate surety bond or other security satisfactory to the City in an amount sufficient to discharge the lien plus any costs, attomey fees or other charges that could accrue as a result of any foreclosure sale and the state of the s or sale under the lien. This License shall be subject and subordinate to any liens and the subject and the subject and subordinate to any liens and the subject and subject and subordinate to any liens and the subject and subject and subordinate to any liens and the subject and subject and subordinate to any liens and the subject and subj encumbrances as are now on or as the City may hereafter impose on City Property, and SL Dark and SL Dark and the second Fiber shall upon request of the City, execute and deliver agreements of subordination consistent with this Section.

ARTICLE VI REPRESENTATIONS

SL Dark Fiber represents and warrants to the City as follows:

6.1. · Facilities and Experience. SL Dark Fiber is able to cause the performance of the Permitted Work and has the knowledge, experience and competence to do so. Contract Sacher Strategie Strategie

Solvent. SL Dark Fiber is financially solvent, able to pay its debts as they mature 6.2. and is possessed of sufficient working capital to cause the performance of the Scope of Work and the methods and ومحاجئ جرح والمعي وأحجا المناحد والمناح والم meet their obligations under this License.

6.3. Authority. SL Dark Fiber is authorized to do business in California; the County of the second second of Alameda and the City, and is properly qualified, certified and licensed to cause the performance of the Permitted Work by all necessary governmental and quasi-governmental means that as a second authorities having jurisdiction over SL Dark Fiber.

6.4. Execution. SL Dark Fiber's execution of this License and performance of it is the first second and within its duly authorized powers, and neither SL Dark Fiber, nor its respective employees, approximation of the agents or subcontractors are subject to any restrictive obligations imposed by any third party blass and even of the even which would impair SL Dark Fiber's ability to cause the performance of the Permitted Work, or than the second which would prevent SL Dark Fiber from complying fully with the requirements of this Licehser. From contact,

ARTICLE VII COSTS

7.1. Project Costs. SL Dark Fiber has the sole responsibility for all Project costs, the characteristic sector of the sole of the s including without limitation all design, development, and construction costs and the cost of all and the c improvements, if any. SL Dark Fiber shall submit design and construction drawings and plans in the second states conformance with the Development Schedule attached as Exhibit C. Except as otherwise open at second contracted at a contracted of the second expressly provided herein, SL Dark Fiber shall pay all of its own costs and expenses incurred in concerning of the second s connection with this License and the activities contemplated hereby. SL Dark Fiber shall be distributed with the second statement of the second statem

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responsible for any environmental studies required by the California Environmental Quality Act ("CEQA"), including an Environmental Impact Report should one become necessary, that is required for the approval of this License or other agreements pertaining to the Project.

7.2. <u>City Responsible for its Own Expenses</u>. The City will be responsible for its costs to the end of the city of the costs of the cost of the

ARTICLE VIII MAINTENANCE; REPAIRS

Obligation to Repair, Maintain and Secure the Projects SL Dark Fiber shall have. All gasta and Dark sole responsibility for the installation, operation, maintenance, security, replacement and repair and repair and the second secon of the Project and, the City shall have sole responsibility for the routine inspection, maintenance, : : repair, and security of the Property, including all conduit, vaults and other City infrastructure: Repair obligations in the event of damage caused by a third party is set forth in section 8.7. en calinda below. In the event of damage to City Property, including but not limited to City conduit, caused and the most set with the set by SL Dark Fiber or its Contractor related to SL Dark Fiber's work to install or to repair the in the state of the Project, including but not limited to theft or damage to City Infrastructure, SL Dark Fiber shall - 10 G be responsible for repair and restoration of the City's Property and conduit. Both Parties agree and a strength of the City's Property and conduit. and acknowledge that time is of the essence for repair of the Property used for the Project that is a subset for some in use to provide telecommunications services. SL Dark Fiber shall be responsible for that the multiple of the second replacement or repair of its fiber optic cable and related facilities. 8.2 ··· Secure and Safe of 1 1 1 1 Condition and Good Repair. SL Dark Fiber shall keep the Project and the City Property free of debris and anything of a dangerous, noxious or offensive nature or which would create a hazard. An elona an all All or undue vibration, heat, noise or interference. SL Dark Fiber shall, at its own expense, maintain a forease. State as the Project in (i) a safe condition, in good repair; (ii) in a manner reasonably satisfactory to the state of the second City so as not to conflict with the use of or other leasing of the Property by the City; and (iii) in the transformer of story conformity with such requirements and specifications as the City may require at the time of the second state for the second state in the second state is the second state in the second state is the second st installation and thereafter in compliance with all federal and state applicable laws and the second state of the second state regulations of general applicability, including but not limited to the National Electrical Safety of the output of the output of the second Code. SL Dark Fiber shall not interfere with the City or other tenant's use of the City. Property, office was the Dise of related facilities or other equipment on the City Property. SL Dark Fiber shall secure the Project 2 and tab City 200, 209 at all times to prevent access and theft of the Project. The City shall secure the Property, and the back the Back of the Project. including any City infrastructure or conduit, to prevent access, damage or theft of the Project and the data there are a second statement of the secon July, Figer scale and set of the sheet afforts. SL Dark Fiber shall cooperate with such efforts.

8.3 City's Rights with Regard to Maintenance. SL Dark Fiber recognizes the City Regard to Maintenance must have the right to take any reasonable action that it deems necessary, in its sole discretion, to use the user action of electrical power thereon to the openet state of the property and provision of electrical power thereon to the openet state of the property and provision of electrical power thereon to the openet state of the property and provision of electrical power thereon to the openet state of the property and provision of electrical power thereon to the openet state of the property and safety of its citizens, including users of the Property. The City by of the openet state of the acknowledges and agrees that, to the extent feasible, any such action shallont damage, interference entert feasible, any with or degrade the telecommunications services or facilities provided by SL Dark Fiber, its contact services structure affiliates or designated third parties. Other than emergency repairs, the City shall have no duty of the structure service service to the make repairs to the Property used by the Project until SL Dark Fiber has given written notice of the table of the data service to the fiber of the fiber of the data service to the fiber of the data service to the fiber of the data service to the

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1871 - 533 No Congreso - 700 to the City of the repairs to be made or the condition to be corrected. The City shall have no liability for failure to make any repair required of it if the repair is completed within a reasonable time following the notice from SL Dark Fiber. The City agrees that it will take all reasonable that the state of the steps to prevent damage such as cable cuts to the Project by ensuring that all such property is table to the firm areasonable to the Project by ensuring that all such property is table to the firm areasonable to the Project by ensuring that all such property is table to the firm areasonable to the Project by ensuring that all such property is table to the firm areasonable to the firm areasonable to the project by ensuring that all such property is table to the firm areasonable to the first table table table to the first table table

8.4 Mutual Cooperation. The City agrees to cooperate with SL Dark Fiber, in a constrained with a reasonable and non-discriminatory manner, in obtaining, at SL Dark Fiber's expense (including constrained with a reimbursement of the City's reasonable attorney and administrative fees), any City or federal constrained with a licenses and permits required for or substantially required by SL Dark Fiber's use of the City or federal constrained with a fiber installation of its fiber cable, and fiber cable, and fiber installation shall test to verify that SL Dark Fiber's fiber optic facilities do not cause the fiber with the fiber of the City of some constrained with the fiber of the City of some constrained with the fiber of the City of the cable, and fiber cable, and fiber cable, and fiber cable, and fiber optic facilities do not cause the fiber of the City of some constrained with the fiber of the cable of the City of some constrained with the fiber of the City of some constrained with the fiber of the City of the cable of the City of t

Relocation at City's Request. SL Dark Fiber understands and acknowledges that 8.5 the City may occasionally require SL Dark Fiber to relocate or remove the Project, at SL Dark 21 (2019) From the Fiber's sole cost and expense, whenever the City reasonably determines that the relocation or surgeration determines that the relocation or surgeration determines that the relocation of surgerational determines that the relocation of surgeration determines that the relocation of surgeration determines that the relocation of surgeration determines the relocation determines the relocation determines the relocation determines the relocation determines the reloc removal is needed to address an emergency situation that puts at risk the public health or welfare againage resources If the City desires for SL Dark Fiber to relocate facilities for any of the following non-emergency in relocate facilities f purposes: (a) to facilitate the construction, completion, repair, relocation, or maintenance of a construction, and the City facility or project; (b) to prevent interference with the proper operation of City-owned light and evel of the second poles, traffic signal poles, or other City facilities or services, the City shall give SL Dark Fiber of The International Statement of the Sta thirty (30) days notice and shall afford SL Dark Fiber a reasonably equivalent alternate location for the same License Fee. The City and SL Dark Fiber shall mutually agree in writing who shall and SU Bark Fiber shall mutually agree in writing who shall and SU Bark Fiber shall mutually agree in writing who shall and SU Bark Fiber shall mutually agree in writing who shall and SU Bark Fiber shall mutually agree in writing who shall and SU Bark Fiber shall mutually agree in writing who shall agree shall be shall b bear the costs for such non-emergency moves. If, after agreement on payment of costs is reached, SL Dark Fiber fails to relocate or remove any of its facilities as requested by the City, a sufficiency of the within a reasonable period that enables SL Dark Fiber to avoid disruption of service to its an employed but when the customers, the City shall be entitled to relocate or remove the same at the sole cost and expense a to relocate or reof SL Dark Fiber, with notice to SL Dark Fiber. In such event the City shall not be responsible in Dark 7 bar in a for damage, but shall use reasonable care to preserve such removed equipment or facility until a surge as a surge surge of the surge surge of the surge su retrieved by SL Dark Fiber. المرجم المعالي أرار

8.6 Alterations: Improvements. SL Dark Fiber shall not make or allow to be made or metals. Such as any alterations, additions or improvements to any of the Property or any part thereof without firstometats to any of the City provides such consent, all alterations, where there is a different of obtaining the written consent of the City. If the City provides such consent, all alterations, where there is a different of the City and the sole expense of SL Dark-Fiber. SL: Dark Fiber at the sole expense of SL Dark-Fiber. SL: Dark Fiber at the sole expense of SL Dark-Fiber. SL: Dark Fiber at the sole expense of SL Dark-Fiber. SL: Dark Fiber at the sole expense of sl: Dark-Fiber. SL: Dark Fiber at the sole expense of sl: Dark-Fiber. SL: Dark Fiber at the sole expense of sl: Dark-Fiber. SL: Dark Fiber at the sole expense of sl: Dark-Fiber. SL: Dark Fiber at the sole expense of sl: Dark-Fiber. SL: Dark Fiber at the sole expense of sl: Dark-Fiber. SL: Dark Fiber at the sole expense of sl: Dark-Fiber. SL: Dark Fiber at the sole expense of sl: Dark-Fiber. SL: Dark Fiber at the sole expense of sl: Dark-Fiber. SL: Dark Fiber at the sole expense of sl: Dark-Fiber. SL: Dark Fiber at the sole expense of sl: Dark-Fiber. SL: Dark Fiber at the sole expense of sl: Dark-Fiber. SL: Dark Fiber at the sole expense of sl: Dark-Fiber. SL: Dark Fiber at the sole expense of sl: Dark-Fiber. SL: Dark Fiber at the sole expense of sl: Dark-Fiber. SL: Dark Fiber at the sole expense of sl: Dark-Fiber. SL: Dark Fiber at the sole expense of sl: Dark-Fiber. SL: Dark Fiber at the sole expense of sl: Dark-Fiber. SL: Dark-Fiber at the sole expense of sl: Dark-Fiber. SL: Dark-Fiber at the sole expense of sl: Dark-Fiber. SL: Dark-Fiber at the sl: Dark-

reasonable judgment of the City, place an undue burden on or risk of damage or injury to the Property, the City facilities thereon, or persons working on or affected by the City facilities; and (iv) any change in their location on the Property is approved in writing. SL Dark Fiber shall submit to the City a detailed proposal for any replacement to its equipment in the Property and <u>approved in writing</u> any supplemental materials, as may be requested. No equipment upgrade or replacement within a submit of the Property may be undertaken without written approval of the City, prior to the installations wat occurrent approval.

Pepairs, Damages and Notification. Any damage done to Property by SL Dark . . Fiber, its agents or contractors, during construction, installation, repairs, maintenance, replacement, relocation and/or during operations shall be repaired or replaced immediately at SL Dark Fiber's sole cost and expense and to the City's sole satisfaction. Except in case of the second s emergency, SL Dark Fiber shall notify the City in advance in writing and obtain approval of SL-Dark Fiber's proposed construction, maintenance or repair activities to be performed on the state of the stat Property in order to coordinate those activities with the City's operations. The City's approval a 1. 4 of any construction, maintenance, and repair activines under this subparagraph shall not be the second unreasonably withheld. In cases of emergency, any construction, maintenance, and repair work performed without written notification to the City shall be limited to the work necessary to eliminate the emergency or otherwise protect the public health and safety, and SL Dark Fiber shall notify the City as soon as possible of the emergency and any work performed to eliminate it or protect the public health and safety. Any damage to the Property, including conduit or other .) City infrastructure by third parties unaffiliated with either Party shall be promptly repaired by City. Both Parties agree and acknowledge that time is of the essence for repair of the Property used for the Project that is in use to provide telecommunications services. If the Project is a communication and the damaged, SL Dark Fiber will make all necessary repairs. The City shall take all reasonable and more some second necessary actions to recover the damages caused by the third party to the Property or the Project, and the second se including but not limited to any legal action. If both the Property and the Project are damaged, SL Dark Fiber and City agree to split the costs incurred by City to recover all damages from the second states responsible third party in proportion to the cost of damage. For example, if the cost to repair the Property is three times the cost to repair the Project, then the City shall pay for three quarters of the total cost and SL Dark Fiber shall pay for one quarter. SL Dark Fiber shall have the right at the state of the state o its own expense to have counsel participate in any such legal action.

ARTICLE IX INSURANCE

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9.1. <u>Types of Insurance Required</u>. Prior to commencing any activities under the <u>stability of Prior 2</u> Scope of Work, SL Dark Fiber shall procure, or cause to be procured; and keep in full force and <u>the stability of the stability</u> effect during the life of this License, at SL Dark Fiber's sole cost and expense, all of the License at SL Dark Fiber's following types of insurance:

Type of Insurance Policy	Limits and the second	
Commercial general liability policy, combined single limit		 112 3.0 F/2 1
Contractual liability coverage	and the first state of the state	
Comprehensive automobile liability coverage	\$2,000,000	 <u>.</u>
Worker's compensation	Statutory	

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For purposes of this License, the foregoing insurance shall be referred to herein as "Required Insurance."

9.2. Qualifications of Insurers and Deductibles. All of the Required Insurance shall be <u>supported and</u> issued by an admitted insurer or insurers as defined by the California Insurance Code with a <u>supported and</u> Bests' rating of no less than A:VII. The deductibles under each of the policies issued for the <u>supported address</u> Required Insurance shall be reasonable in amount and in no event shall exceed the sum of Tento and the transmission of Thousand Dollars (\$10,000.00) under each such policy.

9.3. Additional Insured; Form of Endorsement. All policies for Required Insurance <u>Formation</u> will be required to name the City and its respective directors, officers, employees, agents and <u>Formation</u> events representatives as additional insureds by way of an endorsement. Prior to the Effective Date, SL <u>Formation</u> evidencing the City with certificates of insurance in a form acceptable to the City with certificates of an endorsements evidencing such <u>Formation</u> evidencing the Required Insurance coverage and duly executed endorsements evidencing such <u>Formation</u> evidencing such <u>Form</u>

9.4. <u>Cancellation Provisions</u>. All of the Required Insurance shall provide (by way of endorsement or otherwise) that no cancellation, expiration, reduction or modification in such Required Insurance can occur or be implemented without first notifying the City with at least the state of the thirty (30) days prior written notice.

9.5. <u>Primary insurance Endorsement</u>. All Required Insurance shall contain an <u>secondary insurance Endorsement</u> endorsement providing that such insurance is primary and that any insurance maintained by the secondary insurance is noncontributory with the Required Insurance. All Required Insurance shall also contain an endorsement providing or negligence of the City is that any loss shall be payable notwithstanding or negligence of the City is that are that might otherwise result in the forfeiture of the Required Insurance. <u>Waiver of Subrogation</u>. All Required Insurance shall also contain an endorsement providing for a waiver of subrogation and the second seco

9.6. <u>Worker's Compensation</u>. This policy or policies shall cover the entire liability of Contractor to employees as determined by California law. The policy shall contain a waiver of subrogation against the City.

9.7. <u>Comprehensive General Liability</u>. General Liability Insurance must be Two: <u>Comprehensive General Liability</u>. General Liability Insurance must be Two: <u>Comprehensive General Liability</u>. Million Dollars (\$2,000,000.00) combined single limit per event and annual aggregate for bodily <u>denoted on the second second</u>

9.8. <u>Certificates of Insurance</u>. Prior to the commencement of the Services, SL Darktyce, Prior to the

ARTICLE X INDEMNITY

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10.1. <u>Indemnity</u>. To the fullest extend allowed by law, SL Dark Fiber shall defend, with the extended extended of counsel reasonably acceptable to the City, indemnify and hold harmless the City, its agents, where Charles and endowed officers and employees (the "Indemnitees") from and against any and all present and future definities and endowed in the city.

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liabilities, losses, damages, fines, deficiencies, penalties, claims, demands, suits, actions, causes of action, legal or administrative proceedings, judgments, costs and expenses (including without limitation reasonable attorneys' fees and court costs) (all of the foregoing, collectively "Claims") which directly or indirectly, in whole or in part, are caused by; arise in connection matrix, at the statement with, result from, or are alleged to be caused by this License or SL Dark Fiber's (or its agents, and cause of the second employees, consultants, contractors or subcontractors) failure to comply with all applicable state, or and werear or an and federal laws and regulations relating to the construction of the Projects including without a strengt with a superlimitation, all applicable federal and state labor laws and standards, or in any other manner arising from or relating to the design, development, construction, or the operation or maintenance .. . of the Project, whether such Claim shall be discovered before or after termination of this and the back to the second before or after termination of this and the second before or after termination of this and the second before or after termination of License. SL Dark Fiber shall not be required to indemnify the City for any Claim caused in the state of the s whole or in part by the gross negligence or willful misconduct of the City (including its take to be a set of the later employees, agents and consultants). At its sole discretion, SL Dark Fiber may participate at its in the second and the second at t own expense in the defense of any claim, action or proceeding, but such participation shall not relieve SL Dark Fiber of any obligation imposed by this License. SL Dark Fiber shall notify the team of the second states and the se City promptly of any Claims and cooperate fully in its defense. It is further agreed that the City and the City · . does not and shall not waive any rights against SL Dark Fiber which it may have by reason of . . . this Section because of the acceptance by the City of SL Dark Fiber's deposit with City of any of سم د شو رو the insurance policies described in this License. The provisions of this Section 10.1 shall survive in the the expiration or earlier termination of this License. . : :

10.2. <u>Release of Claims</u>. SL Dark Fiber hereby waives, releases, and discharges <u>Stables and Stables and Stables</u> forever the Indemnitees from all present and future Claims arising out of or in any way <u>stables</u> is the stable connected with entry upon or use of City Property by Licensee or Licensee's agents, employees, stables are stable contractors or subcontractors, including without limitation all Claims arising in connection with <u>stables</u> any injury to persons or damage to or theft of vehicles, equipment, materials, or any other <u>stables</u> released any injury to persons or damage to or theft of vehicles, equipment, materials, or any other <u>stables</u> released at the misconduct of any of the Indemnitees. The provisions of this <u>Section</u> shall survive the expiration at New York and the stables are stables and the extent caused solely by the gross negligence or willful stables at the stables are stables at the stables.

ARTICLE XI ENVIRONMENTAL MATTERS

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11.1. The City covenants that to the best of its knowledge, there are no Hazardous of strategies between strategies and according to the property. Based on this covenant, SL Dark Fiber hereby the strategies of the covenants and agrees that throughout the Initial Term:

(a) The Project, and the use and operation thereof, shall be in compliance with all the task and experiments. Hazardous Materials Laws, and SL Dark Fiber shall not cause or permit the Property or any US of Dark Line shall not portion thereof to be in violation of any Hazardous Materials Laws, as defined below: of start of start of the task of the task

(b) SL Dark Fiber shall not permit the Property or any portion thereof to be a site for any peak of the Annethe use, generation, treatment, manufacture, storage, disposal or transportation of Hazardous (Laugh and Storage, du Materials, as defined below, nor shall SL Dark Fiber permit the presence or release of Hazardous: Exclude the Property with the exception of materials customarily (or the Anne) when Materials in, on, under, about or from the Property with the exception of materials customarily (or the Anne) when used in construction, operation, use or maintenance of facilities, provided such materials are the approximate of the used, stored and disposed of in compliance with Hazardous Materials Laws, and the property of the anti-state.

Upon receiving knowledge of the same, SL Dark Fiber shall immediately advise (c) the City in writing of (i) any and all enforcement, clean-up, removal or other governmental or regulatory actions instituted, completed or threatened against SL Dark Fiber or the Property pursuant to any applicable Hazardous Materials Laws; (ii) any and all complaints, claims, and the second seco citations, demands, inquiries, reports, or notices made or threatened by any third party against SL. Dark Fiber relating to damage, contribution, cost recovery, compensation, loss or injury resulting contribution, cost recovery, compensation, loss or injury resulting contribution. from any Hazardous Materials; (iii) the presence or release of any Hazardous Materials in, on, a moment of the under, about or from the Property; or (iv) SL Dark Fiber's discovery of any occurrence or condition on any real property adjoining or in the vicinity of the Property classified as "Border Zone Property" under the provisions of California Health and Safety Code, Sections 25220 et seq., or any regulation adopted in connection therewith, that may in any way affect the Property and the second pursuant to any Hazardous Materials Laws or cause it or any part thereof to be designated as a structure of the Border Zone Property. The matters set forth in the foregoing clauses (i) through (iv) are: ... hereinafter referred to as "Hazardous Materials Claims." The City shall have the right at its own expense to join and participate in, as a party if it so elects, any legal proceedings or actions and the second initiated in connection with any Hazardous Materials Claim. 1 1 1 2 .

(d) If the presence of any Hazardous Material on the Property results in any second additional examples of the property in violation of Hazardous Materials Laws, except to the extent of the extent of the property in violation of Hazardous Materials Laws, except to the extent of the

11.2. <u>Release of Claims</u>. SL Dark Fiber hereby waives, releases and discharges forever is the line of the indemnitees from all present and future Claims SL Dark Fiber may have arising directly or the treatment of the presence of Hazardous Materials on, under, in or about the Property; provided however, this release excludes and shall not apply to (i) any Hazardous is the area of the property after the Effective Date, or (ii) any Hazardous Materials that are shown as a state of the Effective Date, or (ii) any Hazardous Materials that are shown as a state of the Effective Date, or (ii) any Hazardous Materials that are shown as a state of the effective Date of the Effective D

SL Dark Fiber is aware of and familiar with the provisions of Section 1542 of the state of the s

A GENERAL RELEASE DOES NOT EXTEND TO CLAIMS WHICH THE CLEASE OF PERSON OF CREDITOR DOES NOT KNOW OR SUSPECT TO EXIST IN HIS FAVOR AT THE CLEASE OF TIME OF EXECUTING THE RELEASE, WHICH IF KNOWN BY HIM MUST HAVE CLASSES OF MATERIALLY AFFECTED HIS SETTLEMENT WITH THE DEBTOR LODGED TO DEST CLASSES OF PERSON OF THE PERSON OF TH

As such relates to this Section 11.2, SL Dark Fiber hereby waives and relinquishes all rights and Section 1542 of the California Civil Code, Broad and 1542 of the California Civil Code, Broad

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SL Dark Fiber Initials

11.3. Environmental Indemnity, Subject to Sections 11.1 and 11.2 above, SL Dark. Fiber shall indemnify, defend (with counsel reasonably acceptable to the City) and hold Indemnitees harmless from and against all Claims arising during the Term of this. License and the second resulting, arising, or based directly or indirectly in whole or in part, upon (i) the presence, reserve release, use, generation, discharge, transport, storage or disposal of any Hazardous Materials on, under, in or about, or the transportation of any such Hazardous Materials to or from, the Property during the Term of this License, (ii) the failure of SL Dark Fiber, SL Dark Fiber's employees, agents, contractors, subcontractors, licensees, permittees, or any person acting on behalf of any. of the foregoing to comply with Hazardous Materials Laws, or (iii) the breach by SL Dark Fiber and en of any of its covenants contained in this Article 11. The foregoing indemnity shall further applyto any residual contamination in, on, under or about the Property or affecting any natural resources, and to any contamination of any property or natural resources arising in connection with the generation, use, handling, treatment, storage, transport or disposal of any such Hazardous Materials, and irrespective of whether any of such activities were or will be undertaken in accordance with Hazardous Materials Laws and shall include, without limitation, Claims arising in connection with any investigation of site conditions or any clean-up, remedial, removal or restoration work ordered by a court or required by any federal, state, or local governmental city or political subdivision. It is further agreed that the City does not and shall not waive any rights against SL Dark Fiber which it may have by reason of this Section because of the acceptance by the City of SL Dark Fiber's deposit with the City of any of the insurance policies described in this License. This Section 11.3 shall survive the expiration or earlier and a termination of this License.

(a) <u>Remedial Work</u>. For purposes of this License, "Remedial Work" rtieans all investigation, testing, analysis, monitoring, restoration, abatement, detoxification, containment, handling, treatment, removal, storage, decontamination, clean-up, transport, disposal or other ameliorative work or response action required by (i) any Hazardous Materials to Laws, (ii) any order or request of any federal, state or local governmental city, or (iii) any for the formation clean-up, removal, remedial or other governmental or regulatory actions or agreements or orders. For threatened, instituted, or completed pursuant to any Hazardous Materials Laws or 'any actions, appeared proceedings or claims by such entities or third parties relating to or arising out of the breach of its any Hazardous Materials Laws or the presence or release of any Hazardous Material in, on, and the under or from the Property.

(b) <u>Hazardous Materials</u>. As used herein, "Hazardous Materials" means any treated substance, material, or waste which is or becomes regulated by any local, state or federal a construction authority, city or governmental body, including any material or substance which is: (i) defined as a material a "hazardous waste," "extremely hazardous waste," or "restricted hazardous waste" under the and Sections 25115, 25117 or 25122.7, or listed pursuant to Section 25140 of the California Health and Safety Code, Division 20, Chapter 6.5 (Hazardous Waste Control Law); (ii) defined as a "hazardous substance" under Section 25316 of the California Health and Safety Code, Division 12 20, Chapter 6.8 (Carpenter-Presley-Tanner Hazardous Substance Account Act); (iii) defined as a feature "hazardous material," "hazardous substance," or "hazardous waste" under Section 25501 of the sector

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Califomia Health and Safety Code, Division 20, Chapter 6.95 (Hazardous Materials Release Response Plans and Inventory); (iv) defined as a "hazardous substance" under Section 25281 of the Califomia Health and Safety Code, Division 20, Chapter 6.7 (Underground Storage of Hazardous Substances); (v) petroleum; (vi) friable asbestos; (vii) polychlorinated biphenyls; zone the life total of (viii) listed under Article 9 or defined as "hazardous" or "extremely hazardous" pursuant to the total of total of Article 11 of Title 22 of the Califomia Administrative Code, Division 4; Chapter 20; (ix) there are demonstrated designated as "hazardous substances" pursuant to Section 311 of the Clean Water Act (33/U.S.C.s. total of each of §1317); (x) defined as a "hazardous waste" pursuant to Section 1004 of the Resource of the california at the section Conservation and Recovery Act, 42 U.S.C. §6901, et seq. (42 U.S.C. §6903); or (xi) defined as "hazardous substances" pursuant to Section 101 of the Comprehensive Environmental Response, some that a substance compensation, and Liability Act, 42 U.S.C. §9601, et seq., as the foregoing statutes and regulations now exist or may hereafter be amended.

(c) <u>Hazardous Materials Laws</u>. As used herein "Hazardous Materials Laws" means all federal, state and local laws, ordinances, regulations, orders and directives pertaining to Hazardous Materials, including without limitation, the laws, statutes and regulations cited in the preceding <u>Section 11.3(b)</u>, as any of the foregoing may be amended from time to time.

ARTICLE XII MISCELLANEOUS

12.1. <u>Notices</u>. Except as otherwise specified in this License, all notices to be sent that the sent state of the pursuant to this License shall be made in writing, and sent to the Parties at their respective sent the sent state of the addresses specified below or to such other address as a Party may designate by written notices to be sent state of the delivered to the other parties in accordance with this Section. All such notices shall be sent by:

(i) personal delivery, in which case notice is effective upon delivery; make a state of the method

(ii) certified or registered mail, return receipt requested, in which case notice shall be deemed delivered on receipt if delivery is confirmed by a return receipt deviced on receipt if delivery is confirmed by a return receipt deviced on receipt if delivery is confirmed by a return receipt deviced on receipt device

(iii) nationally recognized overnight courier, with charges prepaid or charged to the sender's account, in which case notice is effective on delivery if delivery is confirmed by <u>sentences</u> the delivery service; or <u>sentences</u>

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(iv) facsimile transmission, in which case notice shall be deemed delivered to the action to be the upon transmittal, provided that (a) a duplicate copy of the notice is promptly delivered by first-beam of the action of the operation of the notice given by facsimile shall be considered to the action of the next business day if it is received after 5:00 p.m:recipient's time or process any others of a non-business day.

City of San Leandro		1428324 - 3
City Hall		a Cartana F
835 E. 14 th Street		13 2
San Leandro, CA 94577		162.00
Telephone: 510.577.3354		1 Aspender 1
	City Hall 835 E. 14 th Street San Leandro, CA 94577	City Hall 835 E. 14 th Street San Leandro, CA 94577

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Facsimile: 510.577.3340 • Attn: City Manager

SL Dark Fiber:

SL Dark Fiber 303 W. Joaquin STE 100 San Leandro, CA 94577 Telephone: (510) 877-4383 Facsimile: (510) 405-2001 Attn: Crystal Calvan

12.2. Modification. No waiver, modification or amendment of this License shall be a modification of the second statement of th effective or enforceable unless made in writing, signed by SL Dark Fiber and the City and specifying with particularity the nature and extent of such waiver, modification or amendment. Any waiver by the City or SL Dark Fiber shall not affect or impair any right arising from any subsequent default.

12.3. Dispute Resolution Procedure. The City and SL Dark Fiber shall endeavor to resolve all disputes through business-like negotiations, without resort to litigation. Accordingly, if a dispute arises, the Parties shall meet and engage in reasonable good faith negotiations to resolve the matter. If the Parties are unable to negotiate a mutually acceptable resolution within ten (10) calendar days they shall be free to pursue any legal remedies which may be available. Except as to those matters that the Parties mutually agree to be resolved by such alternate dispute resolution mechanisms as the Parties may deem appropriate, all claims, disputes and other and the claims and the claims are matters in question which arise out of or relate to this License shall be decided by a court of the court competent jurisdiction.

12.4. Governing Law and Forum. This License shall be governed by the laws of the State of California, and any action to enforce or interpret'its provisions must be brought in courts الدار المستعلقة والالدار والدار with jurisdiction in Alameda County, California.

12.5. <u>Relationship of Parties</u>. The Parties agree that nothing in this License shall be a set of the set of t deemed or interpreted to create between them the relationship of lessor and lessee, of buyer and seller, or of partners or joint venturers. CARLES OF THE PERSON PERSON OF

12.6. Attorneys' Fees. In the event any suit, action or proceeding arising from or based upon this License, the Permitted Work or the Scope of Work shall be instituted by SL Dark Fiber or the City, the prevailing party in any such action, suit or proceeding shall be entitled to recover as s its reasonable attomeys' fees, costs and disbursements, including the cost of reasonable investigation, preparation and professional or expert consultation incurred by reason of such suit, the action or proceedings. This attorney fee provision shall not apply to any suit, action or as automatic procession of a statement of the statem proceeding brought by a third party. L M BR SLODILACOY BROKE MAY.

12.7. Severability. If any term or provision of this License or the application thereof whether shall, to any extent, be held to be invalid or unenforceable, such term or provision shall be a set to share the ineffective to the extent of such invalidity or unenforceability without invalidating or rendering or two unenforceable the remaining terms and provisions of this License or the application of such-such terms and provisions to circumstances other than those as to which it is held invalid or a supervise

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unenforceable unless an essential purpose of this License would be defeated by loss of the invalid or unenforceable provision.

12.8. Entire License; Amendments In Writing; Counterparts. This License contains the interpreted where a entire understanding of the Parties with respect to the subject matter hereof and supersedes all the subject matter hereof all

12.9. Successors and Assigns; No Third-Party Beneficiaries. This License shall be the event of the binding upon and inure to the benefit of the Parties and their respective successors and assigns; a second state provided however, that neither Party shall transfer or assign (either directly or indirectly; as the event of voluntarily or involuntarily, by operation of law or otherwise) any of such Party's rights, by the event of the respective successors and assigns; a second state of the reunder by operation of law or otherwise without the prior written consent of the other Party, and any such transfer or assignment without such prior written consent shall be void. Subject to the immediately preceding sentence, this License is not intended to benefit, and shall not run to the benefit of or be enforceable by, any other person or entity other than the Parties and their the association of a subject to the benefit of or be enforceable by, any other person or entity other than the Parties and their the association of the successors and assigns. This provision shall not preclude SL Dark Fiber from sufficient to the successor and assigns. This provision shall not preclude SL Dark Fiber from sufficient to the period be associated as the period be associated as the period be associated as the sufficient to the period by the provision shall not preclude SL Dark Fiber from sufficient to the period be associated as the period by the p

12.10. <u>Captions</u>. The captions of the sections and articles of this License are for the approximation of the contract of the

SIGNATURES ON FOLLOWING PAGE.

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IN WITNESS WHEREOF, the Parties have executed this License as of the date first written --- above.

City of San Leandro

- Mar By: ional

Name: Lianne Marshall Interim City Manager

APPROVED AS TO FORM:

By: **City** Attomey

ATTEST:

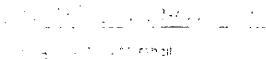
By: City Clerk

SL Dark Fiber a limited liability company By:

Name: J. Patrick Kennedy

Its: [Managing Member]

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and the reary - store recording

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EXHIBIT A PROPERTY

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EXFIBIT B SCOPE OF WORK

<u>Scope of Work</u>. Pursuant to this License, the City authorizes SL Dark Fiber to install the Project device the end of the Property (hereinafter "Permitted Work") as described in the them are interested or the "Scope of Work," attached as <u>Exhibit C</u> and incorporated herein by this reference. Thes as <u>the reference of the scope and recer</u> performance of the Scope of Work shall be at SL Dark Fiber's own cost and risk, subject to final statement of the Property as a result of the Scope of Work shall be for a statement of the Property as a result of the Scope of Work shall be for a statement of the benefit of the City, and all costs shall be bome by SL Dark Fiber. The statement of the Statement of the Scope of Work shall be bome by SL Dark Fiber.

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Splice Loops added to appropriate vaults	
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EXHIBIT C

DEVELOPMENT SCHEDULE

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EXHIBIT D ECONOMIC BENEFITS OF PROJECT

Confirm Project is Consistent with Economic Development Plan and General Plan and Second

The first sentence in the San Leandro General Plan is "San Leandro enters the new millennium" with a deep appreciation of its past, a clear understanding of its present, and this shared vision of its future."

The General Plan further points out that:

Almost a third of the City's land is used for industrial and commercial purposes, including about 1,800 acres of industrial land and 900 acres of commercial land. Industry and commerce provide thousands of jobs, millions of dollars in annual sales and property tax revenues, and many critical services to San Leandro residents. The City is committed to keeping its economy healthy, maintaining a competitive edge within the region, and staying attractive to established and emerging businesses.

This project recognizes that San Leandro has historically been a City that has supported, via the infrastructure such as power, water, rail, highways and sewer, the industrial market. To compete, grow and attract this next generation of business, San Leandro must again act as it did when it built its own, modem sewer facilities. The modem equivalent is a fiber optic. Information which highway. Such infrastructure is not only consistent with the General Plan; it is the extension of the long standing traditions of attracting jobs to the area and goal of SB 375. In the last few decades, the character of the industries that live in the SF Bay Area has changed from the traditional manufacturing facilities to, as Alvin Tofier called it, the Information Age. It is the access, at sufficient speed, to telecommunications, data centers, and other information enabling: the the Department of Commerce Foreign Trade Zones and the recognition of the world wide nature of investment through tools from the INS like the EB-5/Regional Genter visa for jobs program, and state programs like the Enterprise Zone.

The next generation manufacturing will undergo rapid change as new technologies are evolved as like the 3D Printing that allows the manufacture of physical items directly from the computer drawings so that an appliance manufacture no long has to inventory all the formed and machined raparts that comprise the appliance. Other manufactures will make high tech devices or software – manufactures as strength of the US. These new companies and startups are essential to our economy because – manufacture plants that are dependent upon low cost: labor or natural resources that do startup not include the price of the environmental damage.

Economic Development efforts in San Leandro are guided by an Economic Development as a state of the Strategy and Work Program; a document first adopted by the City Council in 1997, and designed of to create a positive environment for investment in the local economy. In that document it was noted that the challenge was to attract the investment needed to recycle existing commercial and the even industrial properties that are no longer functional. It was recognized that it would be important to the establish a process for the continual upgrade of the area so that the City does not stagnate; these

correspond to the EDAC vision elements of A Sustainable Community and A Diversified Economy.

The "Lit San Leandro" project is a game changer. It is truly an infrastructure project – it is not being put in for a particular job or upgrade, it is being installed for the use of next generation and a manufacturers and commercial (e.g. hospitals) operations. Fibers carry extremely large amounts and the second sec

http://www.gizmodo.com.au/2011/05/record-breaking-laser-beam-transfers-26-terabits-persecond/

This is hard to quantify but this data transfer speed would transfer the entire Library of Congress across the fiber in 10 seconds. In the case of Internet usage, good Internet today is 1 Mbit and the T-1 – the staple of the telecom industry – is 1.4 Mbit. A typical building for both telecom and Internet usage might have a single T-1 or if really data intensive with 100's of workers it might use a T-3 (essentially 3 T-1 lines). At the speeds above, a single fiber the diameter of a human could accommodate nearly 2,000,000 T-1 lines. In the fiber industry you need a fiber to send and one to receive and generally you have two pair of fibers that are sent different routes so to "light" a complex it takes 4 fibers. The speed is then a function of the electronic/laser interface at the building and fast equipment today supports 120 channels of 100 GB

Although many might say that this is more than the world will need, it is instructive to look at these server telecommunications needs over the last decade. In my company we have grown from a single T-and the telecommunications needs over the last decade. In my company we have grown from a single T-and telecommunications needs over the last decade. In my company we have grown from a single T-and telecommunications needs over the last decade. In my company we have grown from a single T-and telecommunications needs over the last decade. In my company we have grown from a single T-and telecommunications needs over the last decade. In my company we have grown from a single T-and telecommunications needs over the last decade. In my company we have grown from a single T-and telecommunications needs over the last decade. In my company we have grown from a single T-and telecommunications needs over the last decade. In my company we have grown from a single T-and telecommunications needs over the last decade. In my company we have grown from a single T-and telecommunications needs over the last decade. In my company we have grown from a single T-and telecommunications needs over the last decade. In my company we have grown from a single T-and telecommunications in the unit of 32 T-1 lines and we project orders of magnitude increase in the requirements to accommodate "The Cloud." in the US many areas are out or close to out of the unit of the u

The bottom line is that to create a business that depends upon fiber optic-requires and more the second states and the creates and the creates

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26

- 1. A Loop Structure (for redundancy)
- 2. Dark Fiber (Dedicated) for High Security Communication? Const Fiber (Tenter) and the jenset of the sector and the
- 3. Availability
- 4. Fiber (commonly called "All Glass") connection to data centers, services providers, a set in the and other facilities for distributed companie that different address the approximation of the app

.

5. All of these (1-4) at a reasonable cost.

The Lit San Leandro Project has all of this. It completes an 11 mile loop around San Leandro and an entry is and connects into the Route Diverse gateway to the rest of the world via BART as the second state of the second state

The Economic Benefit to San-Leandro would be via property taxes and, if applicable, sales taxes the work to the sale for the manufacturing jobs and supporting commercial operations to support the new employees. A single sale are not

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Lease rates today in San Leandro are as low as \$0.40/sq ft/month (Reynolds and Brown) whereas a lit Class A office building would lease for about \$3.00/sq ft/month (David Irmer). This would have the effect of creating a like increase in value of structures and it would help achieve a higher % leased. The most important feature is that it creates a unique feature for next generation of the tracter to the the manufacturers that cannot be matched in other Bay Area Cities. The closest is Santa Clara (which has itsr own fiber loop) but because of the proximity to land and workers, is not very the because of the proximity to land and workers, is not very the because of the proximity to land and workers, is not very the because of the proximity to land and workers, is not very the because of the proximity to land and workers, is not very the because of the proximity to land and workers, is not very the because of the proximity to land and workers, is not very the because of the proximity to land and workers, is not very the because of the proximity to land and workers, is not very the because of the proximity to land and workers, is not very the because of the proximity of and and workers, is not very the because of the proximity to land and workers, is not very the because of the proximity to land and workers, is not very the because of the proximity to land and workers, is not very the because of the proximity to land and workers, is not very the because of the proximity and developers to remove the older generation of manufacturer and build high tech buildings and plants. This is critical because most of the existing structures are not suitable for the high the provide the

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EXHIBIT E

POTENTIAL THIRD PARTIES CONTRACTS

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Exhibit F of this License identifies third parties that SL Dark Fiber may contract with to provide the contract matching telecommunications services using facilities that are included in the Project. Such list shall be a subsequence of such affiliates or third, that Dignet actions for the parties is provided as a courtesy only, and shall not be construed as a request for approval from may, and that not be construed as a request for approval from may, and that not be construed as a request for approval from may, and the construed as a request for approval from may, and the construed as a request for approval from may, and the construed as a request for approval from may, and the construed as a request of the construct of the con

Phase 3 Communications

Lit San Leandro

Place & Connumations

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Exhibit I

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City of Oakland Wireless Broadband Feasibility Study

7 August 2009

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Tellus Venture Assóciates

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1. Executive Summary

1.1. Findings

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•	A point-to-point wireless broadband system serving specific community and a service of the second system serving specific community and a second system serving specific community second se		1.5
	institutional needs is financially and technically sustainable for the City of Oakland.	•	
•	The cost of building and operating such a system can be met through identifiable		
	cost savings, efficiency gains and budgetary choices based on the economic value of	¥ 1	• -
	benefits.		
•	Public Internet access by way of community anchor institutions is financially and		
	technically feasible, and universally supported by a diverse range of Oakland 2. A stress of the second stress of	:	12
	residents, organizations, agencies and businesses if it is implemented in a fiscally sound manner.	× .	. .
			. ·
•	Enabling entrepreneurial opportunities for local businesses on a pay-as-you-go,		
	public-private partnership basis is likewise backed by Oakland stakeholders and we prove		÷
	supported by the financial and technical analysis conducted for this study.		۰.
•	Providing wireless Internet service to residences or individual consumers is not		1.
	financially sustainable or technically feasible for the City of Oakland, and is a summer of the city of Oakland, and is a summer of the city of the ci		
	opposed by nearly all stakeholders, who cite the widespread technical and financial as a second		:
	failure of such systems in other cities.		

1.2. Community Priorities

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A comprehensive stakeholder assessment process gathered extensive comment from the state of the members of the public, local businesses and non-profits, City staff and other government agencies. This research included district-based focus groups, a town hall meeting, which is workshops, meetings, written staff surveys, and inbound and outbound telephone and email a contract does not determined.

The top strategic goals identified by Oakland residents and other stakeholders are: doubled by the contract date

	Stakeholder Assessment Strateglc Goals	380
Prlority	Strategic Goal	general and
1	Sound financial planning	Section for the second
2	Free school access	1. - 1 . 1. 1 ¹ - 1
3	Free public access at libraries, community centers, parks, etc.	·
4	Affordable access for the public .	to the standard of the
5	System facilitates improved productivity	An electric de
6	Public project awareness	خرب بالمت

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Oakland residents, City staff and representatives from local businesses, non-profits, government agencies believe that a wireless broadband system must, to the extent financially and technically possible, meet five design criteria:

	Stakeholder Assessment Design Criteria	!
Priority	Strategic Goal	·
1	Flexible and interoperable	
2	Reliable network	•
3	High level of security	
4 [·]	Full city coverage	
5	Mobile and real time data access	

In the context of the stakeholder discussions, "full city coverage" means that any proposed the stakeholder discussions, "full city coverage" means that any proposed the stakeholder discussions, "full city coverage" means that any proposed the stakeholder discussions, "full city coverage" means that any proposed the stakeholder discussions, "full city coverage" means that any proposed the stakeholder discussions, "full city coverage" means that any proposed the stakeholder discussions, "full city coverage" means that any proposed the stakeholder discussions, "full city coverage" means that any proposed the stakeholder discussion within the limits of technology and finances. For example, if wireless broadband service is the stakeholder discussion of technology and finances to all libraries to the extent practical.

On the other hand, stakeholders strongly believed the City should not spend money on the two in the state of the blanket wireless coverage based on inappropriate technology or unsustainable economics down to the blanket Failed municipal wireless networks in other cities were frequently and emphatically offered to the state of the state of the blanket wireless of what the City of Oakland should not do.

1.3. Current Opportunity

. S. States Type The hy

The American Recovery and Investment Act of 2009 (ARRA) includes \$7.2 billion in the second s

Consistent with the BTOP grant criteria released by NTIA on 1 July 2009, this feasibility a stress study presents a conceptual point-to-point system that will: <u>state a state a conceptual point-to-point system that will</u>

- Provide broadband access to community anchor institutions such as schools; <u>Careers and the angle</u> libraries and organizations and agencies serving vulnerable populations, as well as <u>the transferred services</u> and <u>institutions</u> and <u>agencies serving</u> vulnerable populations, as well as <u>the transferred services</u> and <u>institutions</u> and <u>agencies serving</u> vulnerable populations, as well as <u>the transferred services</u> and <u>institutions</u> and <u>agencies serving</u> vulnerable populations, as well as <u>the transferred services</u> and <u>institutions</u> and <u>agencies serving</u> vulnerable populations, as well as <u>the transferred services</u> and <u>institutions</u> and <u>agencies serving</u> vulnerable populations, as well as <u>the transferred services</u> and <u>institutions</u> and <u>agencies serving</u> vulnerable populations, as well as <u>the transferred services</u> and <u>institutions</u> and <u>agencies serving</u> vulnerable populations, as well as <u>the transferred services</u> and <u>institutions</u> and <u>agencies serving</u> vulnerable populations, as well as <u>the transferred services</u> and <u>institutions</u> and <u>agencies serving</u> vulnerable populations, as well as <u>the transferred services</u> and <u>institutions</u> and <u>agencies services</u> and agencies and age
- Provide improved access to broadband service to consumer's living in:underserved is to best device areas of Oakland through community anchor institutions and proven middle-mile.gn code or anticaucher solutions.
- Improve access to, and use of broadband service by public safety agencies that a model of the direct direction serve Oakland.
- Stimulate the demand for broadband, economic growth and job creation for all as the second community.

The reference architecture developed during this study is not intended as a final design, however it is a financial and technical proof-of-concept that will support a BTOP grant application by the City, and provide an objective basis for the system and performance are the an appeared requirements in subsequent requests for proposals (RFP).

1.4. System Design

n

This study uses a modular implementation approach, and develops a reference architecture in the second state of that employs a variety of spectrum, technology and applications to meet the diversity of the state of

	Reference Architecture		1. S. C. S.
Segment	Primary Users	······	
Backbone	Central infrastructure for all users		, • <i>.</i> •
Public Safety	Police, fire, health, public works		The House
Government	All City departments, City staff in field		··· .
BayRICS	Police and fire	·· .	· · · · ·
Public	Community anchor institutions	÷ ,	
Business	Underserved commercial properties	1 · · · · · ·	• •

In this conceptual design, the backbone segment provides the underlying broadband <u>Consection</u> and <u>Induck of the section</u> infrastructure necessary for supporting all users of the system. Once it is built, the system <u>Social grades</u> are can be extended to serve any or all user groups, depending on policy priorities and funding altreed access availability.

The prospective budget for the system includes equipment costs for conhecting to. For the system or definitions are community anchor institutions and other public facilities. Funds for more than 600 such a state of the connections are included in the budget and are supported by the financial analysis of the definition of the context and account

1.5. Financial Analysis

Funding for construction and operation of the core system will come from five primary sources:

- Offsetting current expenditures by replacing some existing leased lines with faster of the and more survivable wireless links.
- Broadband Technology Opportunity Program grants.
- Federal and state public safety grants.
- Use of existing City facilities such as towers and telecommunications sites.
- Providing service to underserved commercial properties for a fee on a public-private partnership basis.

The system has the potential for reducing City expenditures, enhancing revenues and improving public services through increased efficiency. This productivity gain primarily comes from allowing staff to work from the field without having to return to their offices to access information technology resources.

The business case analysis also shows that the market value of the new services provided is greater than the cost of building and operating the system, even when discounted rates are available to government and nonprofit organizations. The cost offsets and other value determined are created by the system pay its full costs over time, including capital financing costs.

1.6. Next Steps

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ual Frue Steps

To meet BTOP grant application requirements and deadlines, five steps should be taken in the second the next four weeks:

- Develop an implementation plan that meets BTOP schedule requirements and the three schedule ARRA criteria for "shovel-ready" projects.
- Determine the source for the 20% matching funds required by BTOP, including the making any necessary applications to **S**tate agencies.
- Prepare and submit grant applications covering as those BTOP, categories for which applies the City of Oakland qualifies.
- Release an RFP to support the BTOP grant application as soon as possible. Compare the BTOP grant application as soon as possible.

The NTIA schedule and qualification criteria will be difficult to meet. However, because of the desired it, the ideal time to move forward with a wireless broadband system in the City of Oakland a web is now.

2. Findings and Recommendations

2.1. Introduction

The goal of the Wireless Broadband Feasibility Study is to determine if a wireless structure of the broadband system can be deployed, either comprehensively or modularly; in the City of the structure of the broadband to achieve key objectives:

Enhance economic development.	and the set of the set
Improve public safety.	
Increase the effectiveness of public, private, and nonpu	rofit organizations through a second
improved access to state of the art broadband wireless	technology. I have so of me and the second
• Help overcome the digital divide.	the second second second second
• Improve quality of life for all Oaklanders.	$\sum_{i=1}^{n} \sum_{j=1}^{n} \sum_{i=1}^{n} \sum_{j=1}^{n} \sum_{i$
Tellus Venture Associates was engaged in September 2007 to evaluation of this question through a process that included sta participation, and technical and financial analysis.	0
2.2. Needs and Requirements	a an
The study began with an extensive assessment, consultation at included goal setting and technical meetings, and an assessme of Information Technology (DIT) staff. Workshops for staff.fr	ent process with Department
for representatives from local non-profits, businesses and othe	

for representatives from local non-profits, businesses and other government agencies followed. Finally, a town hall meeting and a series of citywide, council district-based focus groups were held to gather comments from as broad a cross section of the public as a possible.

The information collected was analyzed, and priorities, needs and design criteria were set of the developed. The top strategic goals identified during the research were: here a summation of the strategic goals identified during the research were: here a summation of the strategic goals identified during the research were: here a summation of the strategic goals identified during the research were: here a summation of the strategic goals identified during the research were strategic goals descent during the research were strategic goals during the strategic goals during the research were strategic goals during the strategic goals during the research were strategic goals during the strateg

1.	Sound financial planning.	we set that was a start of	
2.	Free school access.		
3.	Free public access at libraries, community centers, parks,	, etcue indiatio necessi de tabuardes 👘 🦂	tax is
4.	Affordable access for the public.	Alter during 1993 a portan and	
5.	System facilitates improved productivity.	Building Scherkler, Statistics	··· 、
6.	Public project awareness.	formed interpolitical accurate	

From these strategic goals and after deeper discussions on heeded capabilities, a set of top

broadband system deployed for the City of Oakland should, to the extent financially possible, meet five criteria:

1. Flexible & interoperable.		الربينان فراجه
2. Reliable network.	•	
3. High level of security.		
4. Full city coverage.		· ··· · · · · ·
5. Mobile & real time data access.		· · · · · · · · · · · · ·

Operational requirements identified by all potential users and beneficiaries of the system of the were then evaluated against these design criteria and against the available technological construction options. Finally, seven prioritized operational requirements were established:

1.	Extensible network backbone	
2.	Point to point networking	· · · .
3.	Citywide data access	
4.	Video: incidents and events	· · · · · · ·
5.	Video: surveillance and monitoring	the state of the second state of the
6.	Video: routine operations	5 cp. 7 5 5 5 5
7.	Mobile communications	· · · · · · · · · · · · · · · · · · ·

To ensure that any system deployed can address these requirements and priorities within the second straints, a modular approach was used, so individual segments could be what the second deployed separately, in any order, over a fiexible time frame.

2.3. Reference Architecture

با مرؤحين جعدي وري" الارز

An initial reference architecture for a citywide wireless broadband system was developed to be a state of set of the meet these operational requirements, and the financial cost and benefits of each alternative operation was given to finding immediate offsets of existing of the meet the costs, such as leased data lines, and the potential for grant funding. The meet data has a state operation of the potential for grant funding. The meet data has a state operation of the potential for grant funding.

Several iterations of this design/financial analysis cycle were performed, resulting in a beaution of the seven conceptual system design that meets these operational requirements to the greatest extent constrained on the possible given the limits of current technology, regulations and funding. The timits of current technology regulations and funding.

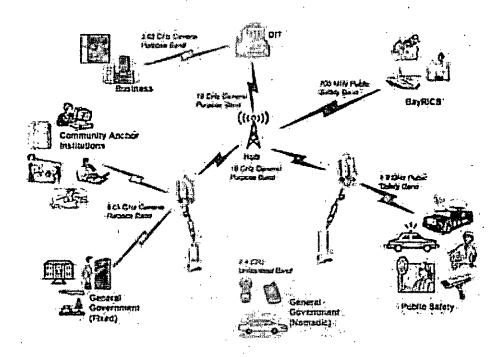
Public safety agencies require robust and redundant systems able to survive and perform the restant of a start of under emergency conditions, and the federal government has set aside both valuable and the start of the start of spectrum and grant funding for this purpose. General purpose grant funding, such as the start of the st

successfully funding the project. Consequently, the reference architecture focuses on maximizing these resources.

Scenarios and alternatives for extending broadband capabilities to other City departments <u>secondary contraction</u> build on this core system. Other point-to-point links would serve other governments. The second se

The reference architecture provides an extensible backbone that minimizes the cost of the state extension and adding these capabilities, and demonstrates that wireless broadband technology is: State extension and the cost of the state extension adding these capabilities in the City of Oakland.

Figure 2.1 – Oakland Wireless Broadband System Conceptual View Constant Statements Conceptual View



The backbone of the system is a wireless broadband system operating on licensed to an accorders broadband frequencies in the 18 GHz band. The backbone is built around six hubs; centeriligion the distribution operates is main DIT facility at Frank Ogawa Plaza, and then extending first to fire stations and police operate at and ment operations of the relations. These links will present address to obtain the operate at speeds up to 600 Mbps. There are no regulatory restrictions on the type of the relation are accorded applications or users that may be supported.

Two types of connectivity are provided at each backbone location, or "node". First, high speed city network access is provided directly to the location itself. Second, wireless access points operating on the unlicensed 2.4 GHz band are installed at each node, providing <u>second second second</u> convenient information technology network access at or near the backbone location for city <u>second</u> second s

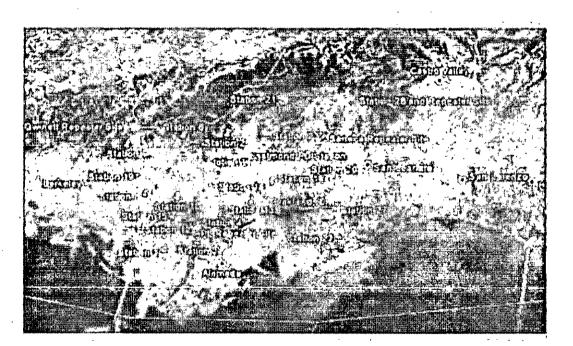


Figure 2.2 – Core System

Nomadic applications are midway between fixed uses, such as permanent cameras or links <u>services</u> first a between buildings, and truly mobile applications such as video from moving vehicles or <u>buildings</u> productions handheld devices that people use while walking around. Examples of nomadic applications <u>services</u> and the service and the service of a first service and the service and the

2.4. Alternatives and Scenarios

Beyond the reference architecture, and building upon it, additional system segments provide some level of wireless broadband service to every comer of the community. These <u>additional service</u> segments include:

- Fixed links for general government purposes on the 3.65 GHz semi-licensed band.
- 802.11 standard hotspots on the unlicensed 2.4 GHz band for general government nomadic purposes.
- A 700 MHz system for mobile public safety applications that is being developed and the set of the separately by a coalition of Bay Area cities, initiated by Oakland Mayor Romanne and the set of the Dellums.
- Public Internet access offered at community anchor institutions such as community
- Business grade Internet service to unserved and underserved commercial buildings.

Each of these alternatives and scenarios can be implemented independently. In some cases and the second costs are offset by replacing existing leased lines or by improvements in efficiency and the second costs are productivity. In other cases, costs are offset by users or through programs such as the second costs are offset by users or through programs such as the second costs are offset.

N.S. Arrighter Dear

2.5. Business Case Evaluation

Financial analysis of the reference architecture's core system and the alternatives and the second scenarios is based on:

- The annual out of pocket cost of operations versus cost offsets and other funding
- The ability of the system to repay construction costs over time and the system of th
- The long term capital value of the system

The core system pays for itself on an operating basis, based on the hard cost savings <u>set an operation</u> provided by replacing a few, redundant leased circuits. The system also pays for its full cost and the lease over time, even if no public safety grant funding is available. Enough cost savings are <u>set grant content</u> of generated to support the ongoing operations of the 700 MHz public safety mobile system as <u>strengtons</u> well.

Various cost savings and efficiency gains, potentially including improved tax revenue there explains, provide the conjunction of the conjunction o

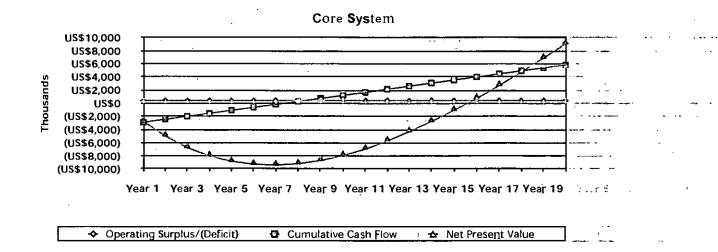


Figure 2.3 – Oakland Wireless Broadband Core System Financial Analysis

There is no immediate funding source for public Internet access via community anchor institutions, however the financial analysis clearly shows that the value of these services to the services to the services to the services to the service of building and operating the necessary facilities. These services to the service segments of the community, and are intended to meet the ARRA grant funding criteria.

2.6. Conclusion

This study demonstrates that a citywide broadband system based on wireless technology is the comboth technically and financially feasible. This system can extend and enhance cohnecdvity the to the City's existing information technology network, providing tiew capabilities and enhanced enhanced efficiencies to City departments and employees. It can also provide sustainable in the Internet access to unserved and underserved communities in Oakland.

The ARRA program offers a unique window of opportunity to:fund and operate this system, or so and significantly enhance the quality of life and public services available to Oakland be quality residents. This study offers a solid basis for policy makers to evaluate the alternatives and other second decide how to move forward. Once those decisions are made, this study provides the tools the second needed to implement those decisions and support the quest for grant funding, including as some shovel-ready request for proposal document.

3. Needs Assessment

3.1. Overview

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Extensive primary research was conducted to facilitate the establishment of a sound vision demonstrate the for the deployment (or not) of an achievable and sustainable wireless broadband network in the city of Oakland. Under the direction of the City of Oakland's Department of the city of Oakland. Under the direction of the City of Oakland's Department of the city of Oakland. Under the direction of the city of Oakland's Department of the city of Oakland.

- Enhance economic development.
- Improve public safety.
- Increase the effectiveness of public, private, and nonprofit organizations through improved access to state of the art wireless broadband technology.
- Help overcome the digital divide.
- Improve the quality of life for all Oaklanders.

A total of 15 assessment sessions were conducted to obtain comments from and ascertain as the needs and priorities of

Members of the public
City of Oakland staff.
Businesses
Nonprofit organization
Educational institutions
Other government agencies

In December 2007, a meeting was held with communications and information technology personnel from key City departments. Then, in July 2008, a series of workshops were	ала 200 — Н • • •
conducted, three for city staff, and one each for the business community, nonprofit out most organizations, and educational institutions and other local government agencies) approach institutions	a en
Seven public focus groups were held in September 2008, orie in each council district, along is the	2
with a citywide town hall meeting at Oakland City Hall. Throughout this process, a summer	
additional public comment was gathered in person and by phone and email: contract was got a set	• • • •
Many concerns, issues and ideas were put forth during the course of this research. However	ang
this study is limited to the assessment of how the City of Oakland's needs might be met by a compared of the study of the	њ .
wireless broadband technology, and a comprehensive examination of all related concerns is	ي، د د د
outside its scope. Key concerns that are noted and treated as potential limiting factors for a second	
wireless broadband deployment include:	

- 1. Web-based communications and service delivery by government agencies.
- 2. Interoperability between City departments, and with outside agencies.
- 3. General information technology and telecommunications infrastructure and policy.
- 4. Provision of computer hardware, software, training and technical support to under-analysis served communities and individuals.

3.2. Analytical Framework

The results of this research are broken down into two categories: strategic goals and design and the two criteria. Strategic goals encompass top level concerns voiced by study participants, and are a broad concepts that might be applied to any major project. These goals can help guide policy makers and managers as implementation progresses, and inform the recommendations made by this study.

Design criteria, on the other hand, are specific attributes that study participants believe a second wireless broadband system should meet. Any wireless broadband system that might result from this study should meet these criteria to the greatest extent possible.

3.3. Strategic Goals

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Although each public session and community workshop was made up of different assessment in the second participants drawn from broad cross sections of Oakland's very diverse community, the dense second provides a groups were remarkably consistent in identifying and prioritizing strategic goals. Figure 3.16 (192.18) provides a breakdown of these goals.

The top three goals identified during the focus groups, town hall meeting, and workshops to the second for nonprofit organizations and local government agencies were free school access, free to the second public access at community anchor institutions, and affordable access for the public, y addition of the school access for the public, y addition of the school access for the public, watches to the school access for the public access at community and the school access for the public access for the pub

The endorsement of these goals, however, was not unconditional. Nearly all the participants we have supported assessed these goals within the context of what were perceived to be greater needs of the context of THE WEEK Oakland community and with an explicit awareness of the fiscal constraints facing the City and the urchess Participants made a distinction between "free" and "affordable" service, and a consistent between between a e" and overwhelmingly chose not to endorse the provision of free Internet access to businesses and endorse the A BIOD : residences. Providing public access, free or otherwise, at public facilities, such as libraries and community centers, or high traffic areas, such as bus shelters, the convention center or uch s the downtown area, was generally seen as a much higher priority than providing residential Internet service of any kind. - HEARD PRESS PROCESS AND A SHEER

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The city staff and business community workshops were similarly consistent, although the focus was on different goals and priorities. The top concerns were insuring that any system facilitates improved productivity and the public is aware and in support of any wireless and the public sequences are broadband project. Both these goals received further endorsement from various public, sequences are nonprofit and local agency groups.

		Figure	3.1 – Strat	tegic Goals					,
		Free access at public facilities	Affordable access	System facilitates improved productivity	Public project awareness	local	Facilitates community outreach	•	· · · ·
City Workshops						;+		-	
Police, Fire, Admin				х	Χ.				
Pub Wks, CEDA, Finance				х	X				
Library, Museum, Parks				X .	х		X		
Community Workshops		r					•		
Businesses				х		х			
Non-profits	х	Х	Х		Χ-		х		
Agencies & Education	х	Х	х			,			
Focus G roups					· · · · · ·	3			
Focus group 1	х		Х		- X		<		;
Focus group 2	х	х	х		X、	Х	:		
Focus group 3	х	Χ.	х	х	1				
Focus group 4	х	х					7	•	
Focus group 5	х	х	Х	х	· X		۰.	1	
Focus group 6	х	X			· . · ·	Х		•	
Focus group 7	х	X	Х		-				
Town Hall Meeting	х	Х	х	х	• <u>.</u> • .	: X	2		•

Two other goals – using local vendors to build and operate a system and facilitating [12] and [12] community outreach – were mentioned in a handful of groups, but overall received output the state of here are significantly lower support.

Although the groups did not specifically identify financial goals, such as lowering City specific budget requirements, a consistently high-level of a specific budget requirement, a constraint and managerial aspects of any broadband initiative requirements and the specific budget requirements. For this reason, can express of a specific budget requirement additional goal of sound financial planning and fiscal responsibility is included as a top mean event managerial approximate requirement.

Consequently, the six strategic goals identified by this research for a wireless broadband initiative by the City of Oakland are:

1.	-Sound financial planning.	ំ ស្រុក ខេត្ត () () ស្រុងជារដ្ឋារ 🕈
2.	Free school access.	
3.	Free public access at libraries, community centers, p	arks, etc.,
4.	Affordable access for the public.	et et al de la
5.	System facilitates improved productivity.	
6.	Public project awareness.	the second state and the second second

These goals are further addressed in the final study recommendations. But is another the associate out of the state of the

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3.4. Design Criteria

The fourteen groups discussed six design criteria that were seen as relevant to any wireless broadband network that the City might procure.

Figure 3.2 – Design Criteria								≥ – Ha	4
	Flexible & inter- operable	Reliable network	High level of security	Full City coverage	Mobile & real time data access	Revenue stream for City		je se strukture Strukture	
City Workshops					415 - 12	13			
Police, Fire, Admin	Х	х	. X	X ."	- X	••			
Pub Wks, CEDA, Finance	х	х	х	X		, a nexize			
Library, Museum, Parks			х	7	X	5 X -			
Community Workshops					;				
Businesses	х				e* 2	х			
Non-profits				h +	~,"···				
Agencies & Education	x		х	X .	• -	·- · ·			
Focus Groups				4 8	81420 J. 1. 2				
Focus group 1	х			÷	M AL		,		
Focus group 2	х				a norae e				
Focus group 3	х	х			s a tur B			2	
Focus group 4		х		X Contra	s grou i A				
Focus group 5	х				n 1. 1. 19. 19		•		
Focus group 6	х	х	х	\overline{a}_{i} .	מ גיווריי		:		
Focus group 7	X				e prese	X	Ň		
Town Hall Meeting		х	х	?	- alt he-			·.	

City of Oakland Wireless Broadband Feasibility Study

The top concern, identified by city staff, businesses, local agencies and six out of seven focus groups, was that any system be fiexible and interoperable. In other words, that it can be used by all city departments (although every department wouldn't necessarily need access to all the features and capabilities), that it serve as a means of communications with any a other public agencies, and that the public can use and benefit directly from it, as, one appropriate. System reliability (including disaster survivability for emergency systems) and security were also perceived as being necessary by most participants.

Complete coverage of the City and mobile access to real-time data was not seen as a necessary technical requirement by most groups, however both were particular priorities of City staff Both requirements will have to be met if City of Oakland departments are assumed to be regular users of any citywide wireless broadband system. Additionally, there was a general concern expressed during most focus groups, the town hall meeting and some workshops that all areas of the City be served equally, if not fully.

There was some discussion of whether a wireless broadband system should be a source of revenue for the City, however only three groups identified it as a requirement. Instead, as noted above, when the focus of discussion turned to financial and managerial issues, the emphasis was on cost savings and greater efficiency rather than revenue generation.

Consequently, the research identified five attributes which can be described as necessary and the same shall be the for a citywide wireless broadband system:

- 1. Flexible & interoperable.
- 2. Reliable network.
- 3. High level of security.
- 4. Full city coverage.
- 5. Mobile & real time data access.

It should be noted that "full city coverage" refers to providing a given service or facility equally and evenly throughout Oakland, within the limits of technology and finances: For Decer example, if wireless broadband service is provided to City libraries, it should be provided to the all libraries to the extent practical. It does not mean blanketing the City with wirelessment of the Internet access, in fact that approach was generally opposed by nearly all stakeholders. And and

These design criteria are taken into account in the assessment of functional system: makes the matrix requirements and the design of the reference architecture below. In addition, the business case analysis looks at the costs involved in meeting these criteria to the fullest extent practical. The Mail

7 August 2009

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4. Operational Requirements

Strategic priorities and operational needs must drive the overall design, deployment and management of any citywide wireless broadband system in the City of Oakland; but the problem of the system via the problem of the system will individually decide whether the system of the system of the line meets their particular needs and whether or not they want to pay for it. Those needs are add whether the system of the system

Figure 4.1 – 0	- Operational Requirements by User Group						<u> </u>	2 (M	្រា ហទំព
Operational Requirement	Public Safety	Emergency Sorvices	Public Works	Finance & Admin	Other Agcncies Parks & Recreation Human Services CEDA	Business	Public Non-Profits		
Citywide data access	х	х	х	х	. X - X - 1 X	2			
Mobile communication	х	х	х		·: : · · · .				
Video: routine operations	х	х	х	х	ter the president	11 A S			
Video: incidents & events	х	х	х		- * . Xs & X	en gang			
Video: surveillance & monitoring	х		х		· . X	X =	5.3		
Point to point networking					X *** ::: X *** X	oric rX	х		
Extensible network backbone					X • = X ± • X	- X	хх		

Seven operational requirements were identified. The applications that drove these maximum set of the requirements are described below, followed by a technical summary. At a top level, though; no single type of user needs a network that meets all of these criteria. There is overlap between these requirements. Meeting one, for example providing citywide data access; the set of the set of the might support another, such as transmitting live video from emergencies or planned events; the set of the set of

Three of these requirements concern video transmission. Video was singled out because it that the interview of the matter interview of the matter interview of the substance of

- Planned transmissions to support routine operations at specific locations missions to a present operation operation.
- Unplanned transmissions from as wide a range of City locations as possible, where is the masses of the ame
- Surveillance and monitoring.

Other operational requirements are the ability to access data throughout the City, either through the City's IT infrastructure or the Internet, mobile communications, point to point networking and an extensible network backbone.

4.1. Citywide Data Access

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Provided that any system deployed meets the basic security and other design criteria of the various City departments, there was a nearly universal belief expressed throughout the research process that citywide data access would boost the efficiency, productivity and the security and the value of the public accessibility of City operations and services. In particular, representatives from the security accession police, fire, public works and emergency services departments indicated that wireless the technology in the field would allow them to better communicate and access vital the security accession information where they need it most.

On a general basis, two-way data communication from the field can provide City departments with increased awareness of ongoing incidents and improve communications the state of the belween and amongst supervisors and field personnel, as well as the emergency operations should be the state of the state o

Emergency and routine communications priorities for the police department include high the and the police was a data rates, scalability, reliability and no dead spots. In addition, the fire department needs to addition the solution access above and below ground, for example in basements and tunnels any different department in layer to include

Another potential application for citywide data access is improving communication to and the state was from neighborhood service coordinators, and citizens groups such as neighborhood watch in the state was or CORE (Citizens of Oakland Respond to Emergencies).

City departments have a variety of needs. For example, simply having a nearby hotspote is defined as the comparative available would allow a human services caseworker to access current client information is service access concerns before making a site visit. Building inspectors stated that they spent considerable time in the concerns of the field checking building sites and performing code compliance inspections but then had and performing code compliance inspections but then had and performing code submission, approval and confirmation was identified as a potential benefit by both City to act on the state does not as the field matrix of the constraint of the constraint of the constraint of the state of the constraint of t

Having remote access to information could allow the finance department to increase tax revenue by conducting more, and more thorough, field audits. Police officers would like better access to resources such as Department of Justice databases.

The City's human services department has a multipurpose senior services program (MSSP). Having access to a citywide wireless network could be helpful to the registered nurses. Have the could be used for the field to check on clients. Currently, they are using commercial department and constructor wireless service to access the Internet, but not City IT resources. Such a network could also be used for remote health monitoring, and to deliver other services to the elderly, on a routine basis and in emergencies.

Another possible use of a citywide data network is to create the Internet equivalent of a tradhional bookmobile. Computers and supporting technology can be brought directly into neighborhoods on a periodic basis (along with the necessary training and technical support) and connected to the Internet from wherever is most advantageous. Similarly mobile facilities could be used to deliver health care to under served communities, either at central locations or in homes.

The Oakland Unified School District and the Port of Oakland are two government agencies as a second structure that could be primary users of the system. The jurisdictions of both agencies are essentially and therefor might be well served by a citywide network. Both the distribution agencies also have their own wireless broadband programs, and could be good partners in the distribution any City project. Other government agencies that have a presence in Oakland could also another agencies that have a presence in Oakland could be agencies that have a presence in Oakland could also another agencies that have a presence in Oakland could be agencies that have a presence in Oakland could be agencies that have a presence in Oakland could be agencies that have agencies that have a pre

4.2. Mobile Communication

the state of a state of a

Mobile communication is a specific kind of citywide data access need that is necessarily with the back of the met wirelessly. Mobile users need to be able to communicate to and from moving vehicles, and with a content including boats and aircraft. In addition to adequate radio frequency signal strength, the content and the back of a propriate a tent of the back of

The City of Oakland already has an extensive radio communications system designed to tak the extensive radio r support public safety, public works and other City departments, particularly for voice to some the other City departments, particularly for voice to some the other City departments and other cases, City workers use commercially available facilities, for a set inverse to some example data service provided by cellular telephone carriers.

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Location-based services for vehicles and other assets is one mobile data application that was discussed by workshop participants which the City does not currently have. It was also identified as a need by business representatives.

Other mobile services might be, in effect, extensions of existing networks. For example, Litten in se real-time information about transit bus locations and status could be gathered wirelessly, and the substances of and delivered to members of the public through their mobile phones. and the autoban approximation of the autobanes

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Achieving truly mobile communications is not an easy, or inexpensive, challenge. Options for creating a mobile data infrastructure, and the associated costs, are explored below.

4.3. Video Transmission

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Three types of video transmission needs were identified:

- 1. Live, high quality video from incident sites and organized events. Live video from the scene, for example, of a major fire would allow field personnel who were staging or were not yet involved to gain situational awareness and to better prepare states and the states of the before deploying. Fire department representatives, in particular, identified visual information as being particularly valuable for deployment to and management of incidents, as well as for coordination with police and public works personnel. Command staff and communication center personnel would also gain increased: and the second staff and communication center personnel would also gain increased: awareness and be better equipped to make decisions, manage assets and the second state between the second s communicate with field personnel. A technically similar application would be to: transmit live coverage of a soccer match from a park via the City's KTOP cable. access station. _ -· 01.
- 2. Video to support routine operations. Video could be used to reduce the time and the second se expense associated with transporting personnel to handle course-of-business and the second second second second operations at varying locations. Examples would be the use of video lineups at the Eastmont police substation or performing sewer inspections. Another would be to. a partier ser offer video-based training, either live from a central location to remote sites; such as the end of the start fire stations, or on an on-demand basis. In the long run, wired connections are a fire stationary of the stationary of t in the state of the faster, more reliable and cheaper for fixed, point to point communications than and wireless. However, wireless facilities could be used to test applications, rapidly or how facilities could be deploy or extend connectivity to new or seldom used locations, and support action to new or operations until an economic case exists to install hardwired connections at an evolution of a second secon
- 3. Surveillance and monitoring. The same economic and technical tradeoffs apply to where the same and these sorts of applications. Where a need is more or less permanent; such as the structure of the second se watching high-traffic areas or a frequently flooded underpass, fixed, wireline and the state of the gradient facilities would generally be preferred. However, those facilities are not available or prepared of

economically feasible at every location, or might be too expensive to acquire if the need had not yet been proven. Wireless technology can be used to reach problematic locations, test the effectiveness of video monitoring in a specific location, and quickly adjust coverage as needs change or as private sector participants join the system. For ad hoc surveillance, for example from an area experiencing a sudden increase in crime or of traffic congestion caused by a freeway closure, wireless technology would almost always be the means of choice.

4.4. Point to Point Networking

Wireless technology is well suited to providing quick connectivity to, say, a someone who is using a laptop computer on a city street to connect to an access point. However, depending on location and the availability of wired connections, wireless technology could also connect a fixed location to the City's IT infrastructure or the Internet. In this sort of application, both ends of the connection would be wired (for example, a desktop computer connecting to a central server) but part of the intermediate transmission chain would be wireless.

City workers at some locations, such as park offices, lack wired connectivity to the City's information technology infrastructure. A wireless system could be used to quickly extend network access to such locations, or to test the effectiveness of a particular application at a particular location. The economic and technical case for extending hard wired facilities can be properly evaluated.

In many respects, the requirement for point to point networking is the same as the transmission requirement for video support of ongoing operations. The major difference is in the capacity and quality of service requirements involved. Live video requires continuous access to a large amount of bandwidth, with little tolerance for network congestion or capacity sharing, and little ability to make momentary use of empty bandwidth. Standard data networking, on the other hand, is more amenable to sharing facilities, can make good use of bandwidth that varies in capacity, and usually requires less capacity.

Point to point capability could also be used to extend Internet service to community groups and public facilities, where it can be made available to anyone at little or ho cost. This approach has advantages over attempting to deliver wireless Internet service directly into any other the homes.

First, the laws of physics make it very difficult, and very expensive, to achieve reliable twoway wireless data transmission from inside a building to an outside access point using the transmission consumer grade equipment or untrained personnel. Mobile phone compahies have spent years and billions of dollars trying to solve this problem and have yet to deploy sufficient assets to comprehensively do so. Municipalities that have attempted it have either failed or, at best, have achieved partial success at significant cost.

Second, raw bandwidth can be combined with properly configured and maintained equipment, neighborhood-specific training and ongoing technical support. Where cities have been able to provide some level of residential wireless Internet service to communities in need, usage of this service has been lower than anticipated. In some cases, usage has been unacceptably low because people lack the basic technological prerequisites to make use of it.

Point to point networking can also be used to enhance other programs, for example health care and education, that can make onsite use of Internet resources. These programs (or the facilities themselves) might be operated by non-profits or other government agencies who in turn might be able to help offset costs.

4.5. Extensible Network Backbone

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Wireless network services, such as citywide data access, mobile communication, video transmission and point to point networking, would be supported by a shared network backbone that would connect these facilities back to the City's IT infrastructure and, possibly, the Internet. This backbone would likely include both wireless and wired

This backbone can be designed so that it can be expanded and extended to support additional services as desired. For example, the City could sell access to its network backbone to building owners that needed to upgrade Internet connectivity; or to groups – public and private sector alike – that wanted to install public wireless hotspots.

A few research participants thought that it would be a good idea for the City to provide the second second second utility-like Internet service to the general public, either on a subsidized basis to targeted second seco

For these reasons, this study will not recommend the adoption of the municipal wireless of the second at Internet utility model by the City of Oakland. Nevertheless, an extensible network of the second support such an endeavor, should circumstances changed autoent of the second sec

Other government agencies that have a significant presence in Oakland, such as BART or the County of Alameda, but that have operations that extend well beyond Oakland's borders, could use this backbone to supplement and extend their existing network architecture where they have a specific need. Likewise, the City of Oakland may be able to <u>exact theory</u> <u>shows</u> share wireless or other broadband facilities owned by other agencies: For example, BART <u>shows</u> <u>appendix</u> <u>decovered</u> by has a broadband system with wireless capabilhies throughout its right of way, and offers <u>shows</u> <u>appendix</u> <u>decovered</u> some level of access to City departments.

5. Network Design Priorities

5.1. Methodology

The network design attributes needed to support these operational requirements are mark one operational requirements are mark one operational assessed according to five criteria that measure resource intensity. \Rightarrow bandwidth; quality:of that the uncess service (QoS), ubiquity, simultaneous users of a given network segment, and mobility – and eous users are rated as low, medium and high. At this stage in the analysis, resource intensity also $\frac{1}{2}$ and $\frac{1}{2}$ are rated as low, medium and high. At this stage in the analysis, resource intensity also $\frac{1}{2}$ are rated as rough proxy for cost: higher resource intensity generally equates to higher cost. The provides a rough proxy for cost: higher resource intensity generally equates to higher cost.

	Low	Medium	High	
Bandwidth	2 Mbps or less per session	2 to 20 Mbps N	lore than 20 Mbp	S 1. U N U U-13 3 - 1 07
Quality of Service	Variable & bursty (web browsing, database queries)	Fault tolerant (file Unit transfer)	nterrupted stream	ling to the state for the state state for
Ubiquity	Specific points	Designated areas dov	Citywide	ട്ടെക്കുന്നു പരിച്ചു.
Simultaneous Users	One	Few - Lature	s bs. Many	?
Mobility	Fixed	Portable 154, 17	Mobile	2 LC

When resource intensity is plotted against the relative number of user groups identified as a data state state likely beneficiaries of a given operational requirement, a rough picture emerges that helps added and state to clarify design priorities. In this analysis, the simultaneous users criterion is given doubles take the weight because being able to support many users at once, across a wide range of the constant state applications and departments, is a critical requirement for a cost-effective network.

Figure 5.2 – Prio	ritization of Categorie s	
Category	Priority	
High demand, low cost	High	Control over Local
Low demand, low cost	Medium	1 A garage with respect
High demand, high cost	Medium	مردد رافس جبره رخبار ا
Low demand, high cost	Low	i dan mining kuga kuna

Using these categories, operational requirements can then be assigned a rough; provisional **bulk** of the priority. This prioritization has a very limited purpose. It is used to guide, the initial of the association of the reference architecture and business model, and provide a starting point of the reference architecture and business model, and provide a starting point of the technical feasibility and constraints of; and the economic case for an exercise deploying a network that can support these operational requirements. This prioritization is operational starting point of the second sta

1

also relative: it compares the demand for and the cost of any given requirement against the other requirements. It is an intermediate step used in determining the total cost and the ability or willingness of potential users to defray those costs, which is the central focus of the business case analysis below.

Operational requirements that have a high demand and low cost relative to other requirements are assigned a high priority. The applications supported by these requirements should provide the biggest bang for the buck. Requirements that have costs conimensurate with demand – low demand/low cost, high demand/high cost – are assigned a medium priority. Lowest priority are requirements that have a relatively low demand and high cost.

5.2. Prioritization

<u>1. í dvritir ver</u>

This provisional analysis first assesses the resource intensity of the seven operational requirements identified by the research conducted in the City of Oakland.

Figure 5.3 – Operational Requirements by Resource Intensity Advardation Constants

	Simultaneou					
	Bandwidth	QoS	Ubiquity susers Mobil	ity Parament		
Citywide data access	Low	Low	High : + High : Mediu	im '		
Mobile communication	Low	Low	High High High	ı .		
Video: routine operations	Medium	High	Low Medium Low			
Video: incidents & events	High	High	High Low- Mediu	im		
Video: surveillance & monitoring	Medium	Medium	Low a same Medium in Maturi Low	i Alasta		
Point to point networking	Medium	Medium	Low class Low set	1		
Extensible network backbone	Medium	Medium	Mediumulate net Low blue nulle Low	1 149		

Figure 5.4 then shows how these operational requirements sort into the four prioritization server is a categories described above.

By this analysis, an extensible network backbone and point to point networking are the ended operational requirements with the highest priority, in that order. Although an extensible bane backbone is somewhat more costly than point to point networking, the potential demand is the significantly greater. Citywide data access has the third highest priority, despite its yields data access has the third highest priority, despite its yields data access has the third highest priority, despite its yields data access has the third highest priority despite its yields data access has the third highest priority despite its yields data access has the third highest priority despite its yields data access that access has the third highest priority despite its yields data access that access has the third highest priority despite its yields data access that access has the third highest priority despite its yields data access that access has the third highest priority despite its yields data access that access has the third highest priority despite its yields data access the data access has the third highest priority despite its yields data access that access has the third highest priority despite its yields data access that access data access has the third highest priority despite its yields data access that access has the third highest priority despite its yields data access that access data access has the third highest priority despite its yields data access that access data access the data access data acces

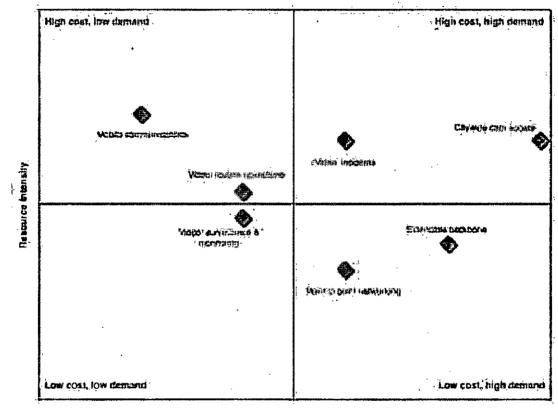


Figure 5.4 – Relative Demand versus Resource Intensity

Relative Demand

Video from incidents and events is fourth on the list, showing a cost generally in line with some statements is fourth on the list, showing a cost generally in line with some statements is fourth on the list.

Figure	Figure 5.5 – Provisional Operational Requirement Priority		
Priority	Operational Requirement	Red ity	an a
1	Extensible network backbone	ι,	
2	Point to point networking	:	:
3	Citywide data access	2	
4	Video: incidents & events	L	ere ere als <u>A</u>
5	Video: surveillance & monitoring	;	ince
6	Video: routine operations	· · .	inter anter
7	Mobile communication		

City of Oakland Wireless Broadband Feasibility Study

Next, in order of priority, are video for surveillance and monitoring, and video to support routine operations. Both have midlevel demand and cost, with surveillance and monitoring showing a marginally better balance between the two factors. Last priority is mobile communications, which has the lowest relative demand and highest relative resource as the average of the second provide and average of the second provide at a provide attact the sets.

It is important to note that all of these operational requirements were identified as being an the second we both desirable and beneficial by the research process. The fact that one requiremenf is low the second we have on the list does not necessarily mean that it shouldn't be supported by the reference-result, which is the second we have a se

Nor are these seven requirements mutually exclusive. Implementing one can create basic and the seven requirements mutually exclusive. - .cimb o infrastructure that lowers the cost of another, or can attract additional users, which in tum • . - 12 H could raise demand. One example given above is video to support routine operations, which might be added to a point to point network facility for a low marginal cost. Another • · example is mobile communications, which might be supported by a citywide data access network to a degree that is sufficient for certain applications. Finally, creating a wireless the second 1. I broadband network with an extensible network backbone will ensure that operational requirements that are not supported in an initial deployment can be accommodated in later (see a 1.1.1.11 phases. $a_{1} \in \mathbb{Q}$

The next step in the process is to create a reference architecture and a business model that one of the company support these operational requirements, while meeting the strategic goals and design criteria to be considered identified by this study.

6. Reference Architecture

6.1. System Overview

Public safety and other departments in the City of Oakland have requirements for fixed and use the second s

This system can also serve other government agencies, private businesses, community and the based organizations and non-profits, and the community at large of a new constraint of the second s

Priority	Operational Requirement	Comment to an a second stand to a second stand s	- · . · .
1	Extensible network backbone	Phase one design can be expanded for additional bandwidth, and infrastructure can support phase 2 scenario for citywide Internet access.	
2	Point to point networking	Design supports bidirectional point to point links up to 15 Mbps, throughout the city.	· · · · · · · · · · · · · · · · · · ·
3	Citywide data access	Basic design covers entire city limits, and budget allows for supplementation in difficult areas. User terminal options range from USB-enabled data modems to vehicle or building-mounted subscriber units)	ی به می اور ۱۹۹۹ اور اور اور ۱۹۹۹ اور اور اور اور ۱۹۹۹ اور اور اور
4.	Video: incidents & events	Ad hoc, high bandwidth coverage (up to 15 Mbps) is available throughout the city. Field units are available to support needs.	т. По се страна страна По се страна с
5	Video: surveillance & monitoring	Scalable bandwidth (up to 15 Mbps in theory) is available to the throughout the city.	and the second sec
6	Video: routine operations	Point to point bandwidth (upito 15 Mbps) is available throughout the city.	· · · · · · · · · · · · · · · · · · ·
7	Mobile communications	Network not optimized for mobile use, but can support up to a point. Network is designed to be upgradable when mobile protocols are finalized.	n Francisco de Constante de Const Antes de Constante d Antes de Constante d

A reference system plan using a hub/spoke/cloud architecture has been designed using has a state of the second state of the se

- Antenna towers, space and power at existing public safety radio repeater sites which are meridian experimental owned and operated by the City of Oakland and provide city wide coverage at radio or the order of the second second frequencies.
- Point-to-point (PTP) FCC licensed 18 GHz radio links from these existing repeater sites.
- Point to muhipoint (PMP) FCC licensed 4.9 GHz radios installed at city(fire department entropy of a stations and police department sub-stations to support fixed and transportable broadband is the stations of population of the stations are supported by the stations of the stations are supported by the stations of the stations are supported by the stations are sup
- Point-to-point (PTP) 4.9 GHz subscriber units (SU) that can be fixed or nomadic to fully. The second support video camera links, voice over Internet protocol (VoIP) links and high speeds some of the second support video camera links. Note over Internet protocol (VoIP) links and high speeds some of the second support video camera links.

• A second phase scenario which allows the system to be expanded to include provision of Internet service to the community, either directly or indirectly via City facilities such as community centers.

This design provides wireless Ethernet connectivity throughout the city limits of Oakland, the reactive decision. The traffic generated, from units in the field and from police or fire stations, is aggregated and the state of the state of the field and from police or fire stations, is aggregated and the state of the field and from police or fire stations, is aggregated and the state of the field and from police or fire stations, is aggregated and the state of the field and from police or fire stations, is aggregated and the state of the field and from police or fire stations, is aggregated and the state of the field and from police or fire stations, is aggregated and the state of the fire fire state of the field and from police or fire stations, is aggregated and the state of the fire fire state of the fire fire fire state of the fire state of th

- · Use existing data links, either upgraded for the purpose or used as ising data while a more upgraduated or the purpose or used as ising data.
- Install high capacity wireless PTP links.
- Multi-Point Label Switching (MPLS) IP Virtual Private Network (VPN) links from the statistic s

For the purposes of this study we have used the second option, the high capacity wireless optimized optimized by PTP links, to connect five hubs into the central aggregation point (and sixth hub) at the City as a second optimized by Hall complex. This option is the middle-case alternadve, providing cost-effective first control of the central impact on the City's existing IT infrastructure.

In some of the scenarios, some or all of the hubs are connected to the public Internet by at the discribute of DS3 grade (45 Mbps) MPLS lines. These lines can be used to route traffic directly onto the as the other of public Internet and to connect the hubs to the City Hall complex. Redenet the association of the as

6.2. System Plan Description

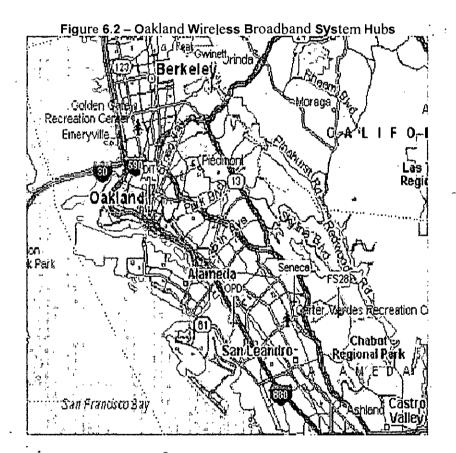
This reference architecture for a citywide wireless broadband system has been designed to the the second stars take advantage of existing City of Oakland facilities. The system relies on a star networky calibrated theorem architecture consisting of the six hub sites, twenty-six spokes and thirty-two wireless local. This second second stars are network (WLAN) clouds to service subscriber radios in the field, and provide the second se

In the some scenarios, additional "spoke" links are added to the hub sites. These additional to spoke to declarate a spokes could terminate, for example, at community centers, schools, businesses or too to declarate added to monprofit organizations. From these sites; Internet access could be further extended into the spokes would connect directly to the public (Internet and to spokes would menor to could be physically separate from the City's IT infrastructure, sharing only logistical to the spoke to added to the facilities such as towers and power supplies, and management and maintenance resources: the spoke to the spoke to the public traffic securely and logically separated from City traffic. Cool the second work of the face to the spoke to be spoke to be fully integrated into the initial system, with the total of the face to the spoke to be spoke to be fully integrated into the initial system, with the total of the face to the spoke to the spoke to the spoke to the spoke to the face the second to the spoke to the spoke to the spoke to the second to the spoke to the

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6.3. System Hubs

Four existing radio repeater sites (which include a fire station) that currently support 800 MHz public safety radio services to the City's police and fire departments, a police <u>services of the City's department</u> of Information Technology and Devices of the department of Information Technology and Devices of the equipped with PTP 18 GHz radios installed on repeater site towers linking to a <u>services of the station</u> corresponding 18 GHz radio installed at twenty-five fire stations (the City's twenty-sixthes of the service of the station is a hub location) and one police substation. Each of the hub sites would then be a cost connected back to the central aggregation point at the City Hall complex via additional 18 to context of GHz PTP radio links.



For some scenarios, radios used for public Internet access (or the entire system, if desirable) would be interfaced to DS3 leased lines provided by a local telecommunication carrier. A data provided to the second of the lines would utilize Mulfi-Point Label Switching (MPLS) technology to provide such that the second of the public Internet access and to create an Internet Protocol (IP) Virtual Private Network and the second block of the second of the second block of the second block

Site	Address	Latitude	Longitude	AMSL	Tower	Hub	RF Path	Ch.	
	Oakland, California	Latitude	Longitude		Height (ft)	~		BW	
Station 1	1605 Martin Luther Way	27°48'27 55"N	122916/20 30/54		TBD	APL	0.45	15	
Station 2	100 Jack London Squa				TBD	. APL .::	0.49	15	
Station 3	1445 14th Street		122°17'34.29"W		TBD	APL	1.27	15	
					TBD		1.57	- 15 - 15 -	
Station 4	1235 E. 14th Street		122°14'51.25"W						
Station 5	934 34th Street		122°16'35.40"W		TBD	APL	· 1.29	15	
Station 6	6080 Colton Blvd.		122°12'28.35'W		TBD	Gwinett	2.30	15	
Station 7	1006 Amito Dr.		122°14'3.41'W	912	TBD	Gwinett		15	. •
Station 8	463 %1st Street		122°15'41.21"W		TBD	Gwinett	· 2.76	15	
Station 10	172 Santa Clara Ave		122°15'8.52'W	115	TBD`	Gwinett	3.49	.⇒15 .	
Station 12	822 Alice Street		122°167.62'W	23	TBD ⁷	APL	=0.27	15 :	
Station 13	1225 Derby Ave.		122°13'40.63'W		TBD	Seneca	1. 4.12	15	1 . * * *
Station 15	455 27th St		122°15'59.43'W		TBD	APL	· 1.00	15	• •
Station 16	3600 13th Ave.	37°48'10.36"N	122°13'49.29"W		TBD	APL	2.26	15	•
Station 17	3344 High Street		122°11'50.37' W		TBD	Seneca	2.97	15	· · · · · ·
Station 18	1700 50th Ave.	37°46'19.30''N	122°12'23.53'W		TBD	Seneca	2.82	. 15 .	
Station 19	5766 Miles Ave.	37°50'44.47"N	122°15'0.19"W	236	TBD	Gwinett	1.89	15	• •
Station 20	1401.98th Ave.	37°44'39.88''N	122°10'13.56"W	34	TBD ·	Seneca	· 1.04	15	··· ·
Station 21	13150 Skyline Blvd.	37°47'21.28"N	122° 8'59.07'W	1140	· TBD`	FS-28	3.00 ^r	15	••••
Station 22	751 Air Cargo Way	37"43'13.50"N	122°13'12.11'W	5	TBD	Seneca	4.18	15	
Station 23	7100 Foothill Blvd.	37"46'10.18"N	122°10'24.01"W	104	TBD	Seneca	1.20	15	
Station 24	5900 Shepard Canyon	37"49'31.66"N	122°11'57.71'W	781	TBD:	Gwinett	. 2.89	15	• •
Station 25	2795 Buters Drive	37"48'33.36"N	122°11'27.25'W	836	TBD	Gwinett	t 4.07 ⊶	15 -	.,
Station 26	2611 98th Ave.	37°45'4.54"N	122° 9'20.66"W	185	TBD:	FS-28	i.∺1,76	15	N 4 [] 3 *
Station 27	8501 Pardee Drive		122°12'6.97"W	9	TBD	FS-28	4.51	15 -	
Station 28	4615 Grass Valley	37"45'3.52"N	122° 7'22.86'W	485	TBD	Hub	. 0 -	15 .	33 <u>.</u>
Station 29	1061 66th Ave.		122°11'51.91"W		TBD	FS-28 ·	4.06	15	
Eastmont PD	2651 73rd Ave.	37°46'4.33"N			TBD	OPD	2.33	15	······
APL	1100 Broadway	37°48'8.09"N	122°16'20.63"W		· 450	Hub	· 0 ·	15	- , -
Gwinett	7185 Marlborough Terra				. 45	/ Hub		15	-
Seneca	9000 Seneca		122° 9'27.88''W		60	Hub	.0	15	
OPD	7101 Edgewater Dr.		122°12'18.91'W		250	Hub ·	0	15	
DIT	150 Frank Ogawa Plaza				TBD	∴Hub∵	0	·' 15) Ťa
RF Hub	Address	Latitude			Tower Hgt				·
APL			Longitude		- 450				
	1100 Broadway		122°16'20.63"W		450	,	<u>·: · 8</u> 7.	113	
Gwinett	7185 Marlborough Terra					yes		105	·
Seneca	9000 Seneca		122° 9'27.88"W		60	yes	·· 6	90	
FS-28	4615 Grass Valley				<u>12</u>	yes_	3.5 *4 .;	60	
OPD	7101 Edgewater Dr.		122°12'18.91"W		250	yes.	<u>~ 1</u>	" <u>15</u> -	· · · <u>Qua</u> rie
DIT	150 Frank Ogawa Plaza 1. Tower height in feet. Fire				· TBD	yes	<⇔5 / i	75	<u>ia 15 51</u>
Notes:	2. RF Path lengths in miles		average ou [07:	, -18U		بدر	·	r	• • •
	3. Channel bandwidth in M						•. `	:	
	4. PTP Backhaul channel f	- Martin Contractor and Contractor	0 GHz (licensed)	Bandw	vidth per link		ርሳት ነ የ	1 1 1	n at
	5. PMP WiMAX radio frequ	ency at 4.9 GH	z.(licensed).				and Y to at		4.9
• • • • • • • • • • • • • • • • • • •	6. WiMAX radio can be sec						<u>.</u>	<u> </u>	ວວ້ ⁷
	7. All Radios have SMNP a	na vendor supp	iled IVIAC TOP net	VOLK WE	anagement.	li siriti	• • • • • • • • • • • • • • • • • • •	· · ·	1.11

Figure 6.3 – System Plan

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If implemented, the wireline Layer 3 MPLS VPN (L3VPN) facility in some scenarios provides enhanced border gateway protocol (BGP) signaling, MPLS traffic isolation and router support for VRF's (virtual routing/forwarding) to create an IP based VPN. A Layer 3 MPLS VPN also provides Quality of Service (QoS) facilities which rely on resource reservation control mechanisms rather than achieved service quality methods.

Quality of service is the ability to provide different priority to different applications, users, or data flows, or to guarantee a certain level of performance to a data flow. For example, a required bit rate, delay, jitter, packet dropping probability and/or bit error rate may be guaranteed. Quality of service guarantees are important if the system capacity is determined in sufficient, especially for real-time streaming multimedia applications such as VoIP and the system capacity is a limited resource. In the absence of network congestion, QoS a mechanisms are not required.

6.4. System Spokes

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Each of the PTP radio hops supports data channels up to 108 Mbps in bandwidth operating the second s

12 41 SASY STALLUS

WLAN Base Stations

The hubs, fire stations and the police substation would be equipped with 50 to 75 foot.

These locations will function as a WLAN base station. Each antenna tower will be a more than a more state of the equipped with three (3) PMP radios using 802.16 (WiMAX) standards that operate in the more than the end of the end of

Additionally, 802.11 standard outdoor access points operating in the unlicensed 2.4 GHz address and a standard band would be installed at each spoke and hub location, to provide additional connectivity states are addressed by the City workers wishing to access the City's information technology network: In some and the each spoke are to be used to provide fixed links to nearby City facilities. where the each spoke are to be used to provide fixed links to nearby City facilities. where the each spoke are to be used on the type of traffic or applications that can be used on these access points.

However, the available frequencies in the 4.9 GHz band are designated for public safety use, which "must be related to the protection of life, health or property." This definition is fairly broad, and does not necessarily limit usage to police, fire and emergency services a service of a service of a agencies. It would include, for example, supporting most public works field operations, or service of a service of the enhancing security at City facilities, through such things as surveillance equipment or through increased onsite availability of trained personnel. It would not include supplying the termination public Internet access or providing television coverage of sporting events.

On the other hand, there is no significant usage restriction on the 18 GHz spoke links, or oh a linear the basis the 3.65 GHz cloud radios designated for the second phase scenario. This reference the provides sufficient fiexibility to deploy additional 18 GHz spokes (or remote to solve the second phase scenario) architecture provides sufficient fiexibility to deploy additional 18 GHz spokes (or remote to solve the second phase scenario) architecture provides sufficient fiexibility to deploy additional 18 GHz spokes (or remote to solve the second phase scenario) architecture provides sufficient fiexibility to deploy additional 18 GHz spokes (or remote to solve the second units for applications such as public video coverage) or 3.65 GHz point-to-point links on an architecture to solve the second phase scenario. This reference to solve the second second unacceptable for use at the second second to solve the second s

Each of the radios will be tower mounted and interfaced to 120° sector antennas to create the second to 120° sector antennas to create the second to 120° sector antennas to create the second to 120° radio coverage of the local area. Coverage at 4.9 GHz is in the 3 to 5 mile range. To the second to 120° overlapping "clouds" in some parts of the city center will create very intense coverage and to 120° sector and to 120° sector antennas to create the second to 120° overlapping "clouds" in some parts of the city center will create very intense coverage and to 120° sector and the sector and

There are several options for connecting City users or equipment to the cloud; including: concerning to work of

- Fixed 802.16 protocol user terminals, such as might be connected tota surveillance structures and a structure of a connected tota surveillance structure of the structure of t
- Portable 802.16 protocol user terminals that could be installed, for example, on a truck of a matching of the used for remote video production.
- Hybrid 802.16/802.11 terminals that could be installed on a vehicle, such as a fire engine, where each the term to or at an office or worksite.
- USB-compatible 802.16 modems which could be connected directly/to laptop computers: as which could be connected directly/to laptop connected directl

This public safety cloud coverage would be available outdoors: Ndt every type of public safety wound be as introduced as a state of the safety user terminal will be able to directly access the cloud from every point in the City; sole the able to be given to matching terminals to user needs invorder to provide can be matching terminals to user needs invorder to provide can be matching the appropriate range of coverage.

Indoor coverage will depend on building location, type, size and construction. Cost effective solutions are available for extending fixed access from the cloud to the interior of structures, however the use of portable equipment, such as USB modems, will be restricted.

For the second phase scenario, similar radios operating preferably in the 3.65 GHz bandy. Statistics and (assuming successful frequency coordination with existing users) or at alternative frequencies could be used to extend Internet access to community anchor institutions. The extend of the 1.422.11

6.5. System Coverage

The geographic coverage of the 4.9 GHz reference architecture was modeled by RCC the state of the second se Consultants, Inc. using their proprietary Comsite tool. A complete set of maps can be found in Appendix B.

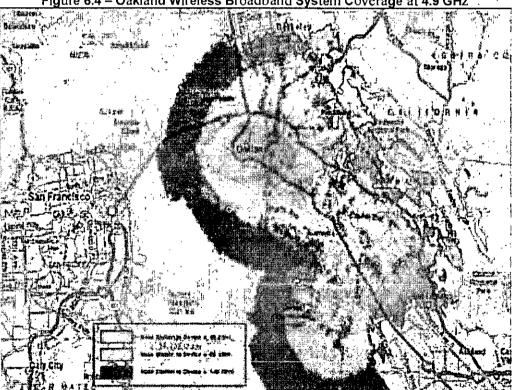
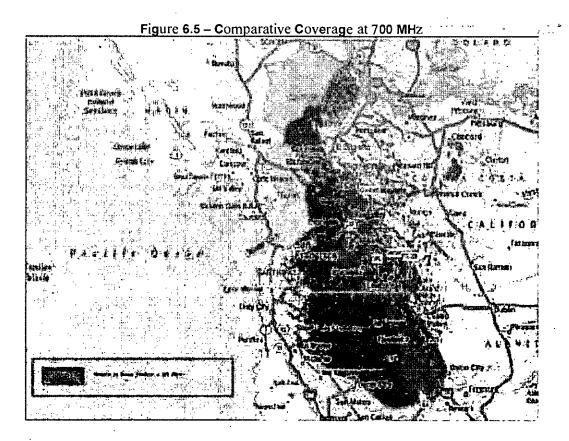


Figure 6.4 - Oakland Wireless Broadband System Coverage at 4.9 GHz

These maps show the expected reach of the 4.9 GHz base stations to users in the field. The task is the last state parameters used assume maximum allowable effective radiated power, tower height of 75 tar. common feet (except for three hubs which were modeled using 25 foot towers) and QAM minimum data and an analysis of the modulation. General assumptions were made for all locations: No effort was made to shape some second or optimize coverage for specific sites. or optimize some some specific class

Three different contours were mapped: -85 dBm, -95 dBm and -100 dBm, which roughly correspond to connection speeds of 24 Mbps, 6 Mbps and 1 Mbps respectively. Nearly all of Oakland west of the SR13/1-580 line is covered by the 6 Mbps contour, and the 1/Mbps device is an expected a contour covers most of what remains in that area. Site-specific engineering can mitigate the expected at the small white areas and further extend the 6 Mbps contour. Given the generalized parameters device at the reference architecture, the modeling shows that full coverage is feasible at 4.9 GHz device at the sector of the SR13/1-580 line.

Coverage east of the SR13/1-580 line, in the Oakland hills area, is more problematic. It is 2014 for the difficult to fully cover that sort of terrain and vegetation using the 4.9 GHz band. There are the structure of two options: build an extensive 4.9 GHz repeater network or look at other frequencies. As 4.9 for the structure of the structure

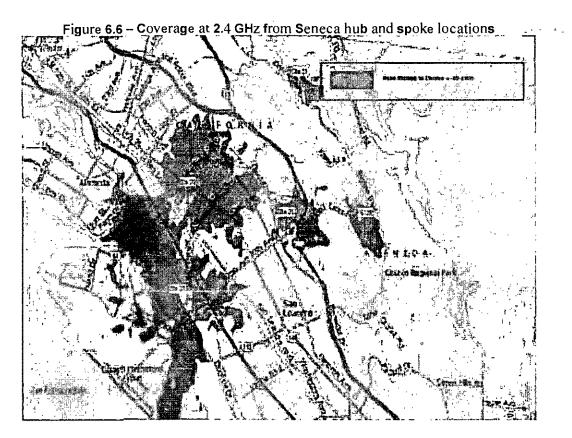


For comparison purposes, coverage of a mobile network operating at 700 MHz was a solvage of the coverage of transmittensites. The six hubble of the submetting of the variable of the six hubble of the submetting of the variable of the six hubble of the submetting of the variable of the six hubble of

frequency-specific network design and use of advantageous locations in neighboring jurisdictions should provide as close to 100% coverage as is physically possible.

Although the 4.9 GHz reference architecture can provide very useful service in the Oakland and a state of hills, further optimizing coverage there will quickly reach the point of diminishing returns. This system will provide excellent service throughout the balance of the City, and because licensing requirements are well established and equipment is widely available, it can truly be regarded as "shovel-ready." Once the core system is constructed and actual coverage is evaluated, a decision can be made whether to attempt to enhance 4.9 GHz coverage in the hills, or to rely on a 700 MHz solution.

Finally, the coverage of 802.11-standard access points at 2.4 GHz was mapped. The result shows that placing access points at hub and spoke locations will provide ample laptop-



The maps show the -85 dBm contour line, which is the practical limit for reliable fixed and the decision of connecdvity using specialized, higher powered bridges (which cost about \$200). City 200 and the decision of facilities which lie within that limit have an excellent chance of establishing all Mbps or the decision of better connection to the system. It should be noted, however, that the 2.4 GHz spectrum is a submatrix of the decision of

City of Oakland Wireless Broadband Feasibility Study

unlicensed and subject to interference and competidon from other users. These maps should be used as guides for field tesdng fixed 2.4 GHz links, rather than as firm predictions of results.

6.6. System Flexibility, Interoperability and Security (1998) and Heroid (1998) and

A system which supports Ethernet traffic throughout is more fiexible, interoperable and the secure than one which relies on Internet protocol alone. Extending Ethernet connecdvity all the way to the end points of the system allows data to be transmitted seamlessly between this wireless broadband system and the City of Oakland's existing information technology and network, in the process extending existing network protocols and security measures.

Broadband networks are commonly described in terms of "layers". Layer 1 is the physical equipment used to construct the network. In a wireline network, this layer might consist of fiber optic cables or copper wire, along with the other devices, such as routers and switches, which connect and manage the traffic. In a wireless network, radio waves or, sometimes, beams of light replace copper and fiber optic connections.

Layer 2 is called the data link layer. This layer is where the "ones and zeros" of digital communication are formed and transmitted. Ethernet, which is specified in the reference architecture, is a robust and commonly used Layer 2 protocol.

The next step up is the network layer, or Layer 3, which chops up the stream of ones and k to see zeros into manageable packets and routes those packets from the beginning, through what and the might be a maze of connections, to the final destination. Internet protocol (IP) is the most see a familiar Layer 3 standard.

In effect Layer 3 rides on top of Layer 2, and Layer 2 rides on top of Layer 1. There are several more layers to consider when designing a complete system which might include a computers, applications and data structures. But the first three layers are collectively accompany referred to as the media layers and form the fundamental structure of a broadband network.

Each layer has its own security considerations and methodology. At Layer I, security is a physical issue. For an outdoor wireline network, Layer I security is provided by locking up the equipment and either burying a line or stringing it high and out of reach: Because lines can⁴ the cross great distances, Layer I security is problematic. For a wireless network, the problems are multiplied because radio transmissions can be intercepted. The radios can be physically security is considered up, but the actual transmissions are easily accessible to anyone. The radios is a security is problematic.

The soludon, for wireline and wireless networks alike, is to build encryption and other and the second security technology into Layers 2 and 3. All traffic going through the radios specified in the second

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reference architecture can be encrypted using 256-bit Advanced Encryption Standard (AES) security, which meets the latest Federal Information Processing Standard 197 for data security.

However, because the reference architecture allows for a seamless extension of the City's 2 and 3000 existing IT network, additional security levels and methods can be used as needed. For the theorem example, a secure "tunnel" – a virtual private network – can be formed inside the encrypted of the data stream going from a police car to a relay point on a fire station and then on to a central stream hub. The data flowing through that tunnel can be further encrypted, providing several layers are to firsecurity that will continue uninterrupted as the information from the wireless system to three sectors the City's existing IT network and finally to a secure database at Police Department to exclude i headquarters.

Likewise, outside agencies or public users can access the system using common Layer 2 and 3 protocols that are already implemented on their own networks or individual equipment. At its basic level, this reference architecture is interoperable with the standard standard transmission protocols used for nearly every purpose. Any given department, agency difference or other authorized user can access the system and run their existing data communications through it.

Interoperability between different users would be determined by those users on a case by/ent as case basis. There are factors which limit interoperability between different users and data his black networks, however this network design should not provide additional obstacles or limits. In the second that sense, it is neutral ground.

Another interoperability consideration is forward compatibility with other potential to the base of the wireless broadband systems. One such system is the region-wide proposal to establish a to be stated at the system for public safety purposes. This network would be system to the work would be system to the work and the system defined in this reference architecture and would the system to the system defined in this reference architecture and would the system to the system accessed by the equipment described in this report, using a common, widely used Layer 2.2000 for the system to the system to integrate data traffic if desired. Layer 11d of the system to the system to cause radio frequency interference and making sure that physical assets, such as tower or back are the system sites, can support the larger antennas and/or power requirements that a 700.MHz:system strand court of the larger antennas and/or power requirements that a 700.MHz:system strand court of the larger antennas and/or power requirements that a 700.MHz:system strand court of the larger antennas and/or power requirements that a 700.MHz:system strand court of the larger antennas and/or power requirements that a 700.MHz:system strand court of the larger antennas and/or power requirements that a 700.MHz:system strand court of the larger antennas and/or power requirements that a 700.MHz:system strand court of the larger antennas and/or power requirements that a 700.MHz:system strand court of the cause court of the larger antennas and/or power requirements that a 700.MHz:system strand court of the cause court of the cau

This architecture allows public Internet traffic to be transported on the same system as the internet in the public safety or other sensitive and confidential data, and for one agency's data to be the sensitive and confidential data, and for one agency's data to be the sensitive according to the sensitive and confidential data, and for one agency's data to be the sensitive according to the sensitive and confidential data, and for one agency's data to be the sensitive according to the sensitive accordin

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comes from thorough, end to end network design and rigorous application of security principles. The reference architecture adopted by this study allows each City department, outside agency or other user to adopt and implement the most appropriate data networking and security methods for its individual needs.

6.7. Expandability, Mobile Access and Citywide Coverage grandburge the bills agreed the lifewide

"Citywide" coverage, in the context of this report, does not mean ubiquitous, cloud-type of the second availability for all users, at all times, within the boundaries of the City of Oakland. Even the second 4.9 GHz "cloud" intended for public safety users will have spotty coverage in parts of the state of the second second

Other segments of the reference architecture are intended either as limited reach hotspots; <u>second</u> <u>the architecture</u> are intended either as limited reach hotspots; <u>second</u> <u>the architecture</u> <u>the arc</u>

However, to insure that these point to point links are available throughout the City, this mean fraction is the second reference architecture can be expanded to include additional fixed lines of communication, the second for example by placing additional PTP "spoke" radios at locations which require highling are Point and the spoke bandwidth connecdvity such as a computer educadon lab at a community center result, such as a computer educadon lab at a community center result.

Each hub location can support up to 10 spoke sites, and if necessary addidonal back haul up to the spoke sites, in capacity out of each hub can be acquired. To carry this example to the extreme limit, more happened to any the hub radios could be installed at each hub location, and additional hub locations could be it have been long and established, without having to do a fundamental redesign of the network or replacing any additional methods significant components.

It is likewise possible to increase the number of public safety "cloud" radios; and to extende the second comparises the system into moving vehicles and hard to reach canyons. If additional spoke locations, and that is trace is a such as libraries, are added to the system, those sites could also be used to add more a to are second to second capacity to the cloud. This reference architecture is designed to be scalable. Hub locations ended with the areas a will be able to support additional spokes, which could be either integrated into the existing is applied with the areas a will be able to support additional spokes, which could be either integrated into the existing is applied with the could system or kept physically separate, depending on security considerations and other is separate, adjoint and operational needs. Backhaul capacity from the hubs to City Hall could be increased by capacity to an explore the adding addidonal wireless links, or even by installing land lines if the demand for capacity or comparison of security and to be sufficiently.

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Although it is possible for users to connect to the system while moving, it would not always be with the highest degree of reliability. In particular, as a user moved from the area covered by one cloud radio to another, there is a chance the connection would be dropped, and there would be a momentary interruption in connectivity while the link was being and there would be a momentary interruption in connectivity while the link was being and there would be a momentary interruption in connectivity while the link was being and there would be a momentary interruption in connectivity while the link was being and there would be a momentary interruption in connectivity while the link was being and there would be a momentary interruption in connectivity while the link was being and there would be a momentary interruption in connectivity while the link was being and there would be a momentary interruption in connectivity while the link was being and there would be a momentary interruption in connectivity while the link was being and there would be a momentary interruption in connectivity while the link was being and there would be a momentary interruption in connectivity while the link was being and there would be a momentary interruption in connectivity while the link was being and there would be a momentary interruption in connectivity while the link was being and there would be a momentary interruption in connectivity while the link was being and there would be a momentary interruption in connectivity while the link was being and there would be a momentary interruption in connectivity while the link was being and there would be a momentary interruption in connectivity while the link was being and there would be a momentary interruption in connectivity while the link was being and there would be a momentary interruption in connectivity while the link was being and there would be a momentary interruption in connectivity while the link was being and there would be a momentary interruption in connectivity when it becomes

6.8. Reliability

All equipment and other system infrastructure and design features selected for this association and the second sec

In addition, in the event of an emergency, equipment intended for routine portable of an energy of a sequence applications, such as event video transmission, could be repurposed to fill the sudden gaps, where the electron of Subscriber terminals mounted on public safety apparatus could also be used for emergency:

6.9. Case Studies

a Pillin indias

The technology presented in this reference architecture has been deployed by cides and the contract of the other public agencies, and its effectiveness has been field proven. The Federal contract is the the tracket of the contract of the

Galveston County, Texas is using 4.9 GHz point to point links, deployed using a hubble as well and spoke topology very similar to the reference architecture developed for this architecture sources are point. The system links the county's central 911 dispatch center with seven locafes the plane y's water or emergency communicadons facilities. If has already fulfilled its role as back upcauous more seven as a capacity to the primary landline network, supporting all operadons for a week in 2008 into a covary seven when the wired network went down completely.

The U.S. Coast Guard is using a point to point 4.9 GHz broadband network as their association of the other primary path for its coastal surveillance system based at the Port of Miamir This parameters are subjected as the particular network is optimized for high reliability over long distances (up to 13 source the other surveillance system based at the off 0 Mbps and meets allocate the other surveillance and interval as the surveillance system based at the port off Miamir This parameters are surveillance system based at the Port off Miamir This parameters are surveillance surveillance system based at the port off Miamir This parameters are surveillance surveillance system based at the Port off Miamir This parameters are surveillance surveillance system based at the Port off Miamir This parameters are surveillance surveillance system based at the Port off Miamir This parameters are surveillance surveilla

The Phoenix police department deployed a 4.9 GHz network in 2006, primarily for surveillance purposes. The objective, which they met, was to create a system that allowed cameras to be installed and moved quickly, to respond to day to day changes and the structure of the central location, and relayed wirelessly to police cars as needed.

The Cities of Lewiston and Auburn, and the Auburn schools in Maine are using 4:9 and the Auburn and the Auburn schools in Maine are using 4:9 and the Auburn GHz point to point links over distances as far as 10 miles to serve an extensive the automatic and the network of surveillance cameras, and to provide connectivity to government IT schools and the automatic and the networks. The network has been operating since 2006. Some links are primary of the school and the automatic and the connections, others are used to provide redundancy to critical locations.

In 2005, Beaverton, Oregon installed a hybrid 4.9 GHz WiMAX and WiFi network and the very similar to this reference architecture. The usage case is very similar as well. Police cars have been fitted with nomadic radios, and officers access the public safety. network from the field. In addition, the system supports point to point links for the term to the surveillance purposes.

The general government alternative described above relies on the semi-licensed 3(65 GHz) and the semi-licensed 3(65 GHz) and the band, rather than the 4.9 GHz public safety spectrum. The same kind of equipment used for the 100 k set of the 4.9 GHz public safety networks is available for the 3.65 GHz band; as well as unlicensed a described and the transformer of the former of the 5 GHz range.

System roll outs are just beginning in the 3.65 GHz band, but early adopters, such as eginere graded by a cost of business Internet service providers Rapid Link and VoiceNetworks, have successfully built as a set of the market of the second of the second second

In the U.S., Clearwire is providing Internet service by way of 2.5 GHz facilities insproveding the establishest of the Baltimore and Portland, Oregon, and plans a nationwide rollout: In California, the City of the advantage of the Santa Barbara uses unlicensed 5 GHz spectrum for public safety communications consol 5. Discupation at form

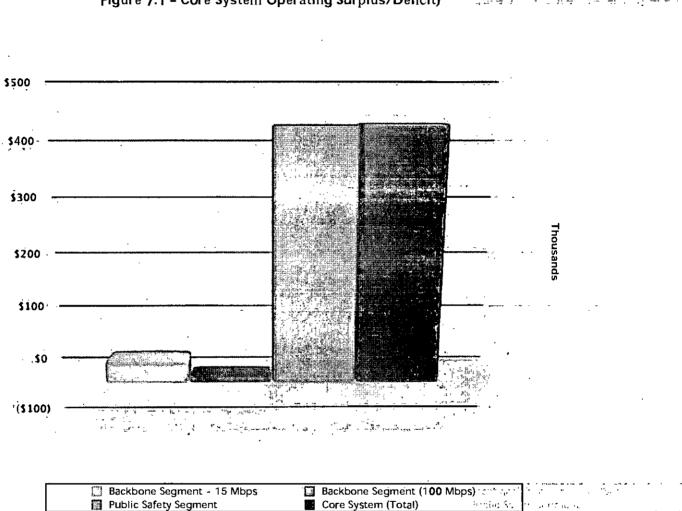
Likewise, WiFi (802.11) based networks and hotspots are very common, and arelused for acceleration of a both public Internet access and secure municipal networking. The City of Milpitas was one constrained at the appropriate of the first cides to adopt WiFi for city networking purposes in 2004; Tucson, Arizona uses of the table of the WiFi to transmit video from ambulances to hospital emergency rooms: southy of community and the transmit video from ambulances to hospital emergency rooms: southy of community accession of the second seco

One of the most dramatic examples of WiFi suitability for public safety applications occurred in 2007, when emergency responders used a partially completed municipal WiFi network to support rescue operations following a bridge collapse in Minneapolis. Cellular phone and data facilities near the incident were overwhelmed by the public, but responders.

The 18 GHz system used for backbone connectivity in the reference architecture is an engineered, point to point wireless network. Rather than rely on wide area coverage to reach nomadic or randomly located fixed locations, this system would be designed location: by location and link by link. These sorts of engineered wireless networks have been in the engineered by operation for decades by many organizations, including the City of Oakland. It is the end of t

City of Oakland Wireless Broadband Feasibility Study

7. Business Case and Financial Analysis



7.1. Modeling Framework



The business model analysis is broken into five segments: The business model analysis is broken as a set as sea

- Core system, which includes:
 - a. Common backbone infrastructure with a minimum link bandwidth of 15% where the second of Mbps,
 - b. Expanded common backbone, with a minimum link bandwidth of 100 and the state of the Mbps,

- c. Public safety facilities
- General City of Oakland IT support alternatives, which include:
 - a. Fixed wireless broadband links
 - b. City IT network access by field workers (also referred to as nomadic or one access portion worker portable applications).
- Mobile video scenario
 Business and entrepreneurship opportunities scenario
- "Drinking fountain" model public access scenario

The core system is described by the reference architecture and evaluated by the primary sectors, where areas a business model. In addition, alternatives and scenarios have been developed and analyzed. The evaluate these segments support the requirements identified in Chapter 4 above. To express the requirements identified in Chapter 4 above. To express the requirements and the evaluate these system elements...

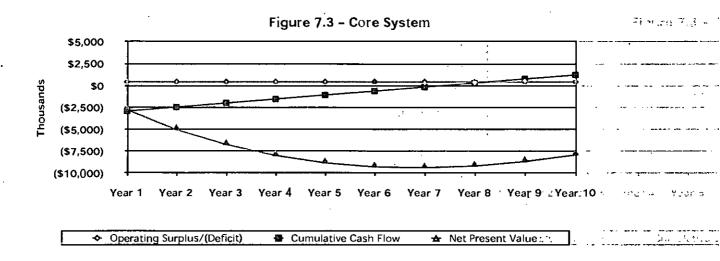
- Specific cost offsets, value propositions, revenue enhancements and operating efficiencies have been identified as sources of and justification for funding each segment of the project.
- Cost estimates have been developed for construction and operation:
 Destination of the second seco
- Each segment is evaluated on the basis of surplus/deficit, cumulative cost and net subscription of the present value calculations.

Figure 7.2 – Business Model Ass	umptions and the second s
Expenses	
Site installation costs are averaged, with an expectation that some exis	fing facilities will be availables and a second
Cost estimates do not include additional IT infrastructure beyond bound	laries of wireless broadband facilities and the second second stream approved
Project management, design, furnishing & commissioning is estimated	at 25% of total base capital expenditure a second state of second as end of
DOIT wireless network security cost is estimated at 10% of total base of	apital expenditure
DOIT acceptance, testing & documentation cost is estimated at 12.5%	of hardware related capital expenditure
	£
Base operating costs are annual rates per node and per site	 Development of the second statement of the second statement
DOIT overhead is estimated at 15% of base operating cost	 A state of the second seco
Annual software upgrades and licensing are estimated at 20% of software	are capex in the second s
Annual hardware replacement is estimated at 5% of hardware capex	 The second parameters of a second provide second sec
Internet bandwidth costs are included only in public service provisioning	, giscenarios and an electronic contraction of the unit service pro-
Public service provisioning scenarios include a 5% franchise & facilities	fee payable to the City receiver the second se
Funding	
Commercial carrier cost offsets & new facility market values are based	on actual City landline circuit costs man, a correct a provide mession of
	i the 2007-2009 City budget≟ cased on F 55 in our control of lorma stalarness
	nue/costiratio ແລະ ຄື ສະ ເຮັດຮ່ອງຮ່ອຍຮົມຢາຍເປັນເຮັດແກ່ນ ແຮງແຜ່ພາຍ ໃຫ້ທ່ານສາຍ
Modeling	Markellin a
All cost and revenue figures are expressed in constant 2009 dollars	೧೯೯೯ ರೋಕನ್ ಕರ್ಷಕ್ರಿ ಕಾರ್ಣಕ್ರಮ ಭಾಗಾಡದಾಗಿದ್ದರೆ ರೇಜಿ
No intra-system charge backs are included	in the second

A number of assumptions have been made in creating this business model. These the state of the state of assumptions are based on nominal City of Oakland cost estimates and management (states) as of cost databased of the states of the states).

accounting practices where applicable, on research conducted specifically for this study and on standard industry experience and practice.

The public safety segment is assumed to be the base case deployment option and as such some soft to be the oake provides the capital cost justification for the overall backbone infrastructurer. The backbone is the overall is segment is self-supporting on an operating basis, but does not pay off its full capital cost source of a backbone without factoring in the additional public safety benefits.



This backbone infrastructure will also support all other segments and sub-segments. The second support all of general government IT alternative is broken into two sub-segments: fixed and nomadic class to concluse the two (also referred to as portable).

A mobile video solution for public safety applications is presented as an alternative to the second state and the scenario, using a 700 MHz broadband system proposal (BayRICS) developed by a Bayes of the state proposal (Area-wide public safety consortium, of which the City of Oakland ista member...) such as the state proposal which the City of Oakland ista member...

Two other potential options for high speed mobile video are the prospective deployments of the second mobile video at 2.5 GHz mobile WiMAX service by Clearwire and various LTE systems by inclumbents the second second mobile telecom carriers. Any RFP requirements developed as a part of the Oakland way the second endowed Wireless Inifiative will, to the extent possible, allow commercial carriers to respond as they wat possible inflow deem appropriate.

Business and entrepreneurship opportunifies and drinking fountain model public access are communication also presented as alternative scenarios within the business model. The core backbone of the constitution between system, developed to support governmental uses, is integral to these two segments. The constitution of the second constitution o

business model will also outline the cost of additional equipment and operating costs to support these two segments.

7.2. Methodology

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The complete business model, including detailed breakouts and alternate scenarios, can be diag tatalace found in Appendix C. The information in this chapter is summary only, and most figures the discussion have been rounded for the purpose of clarity.

All cost and funding figures are expressed in constant dollars. In other words, inflation is the end in ormal on the figured into the model. A piece of equipment or a service that sells for a dollar today is the endpointed of a summer to sell for a dollar ten years from now. The constant dollar method is a clearer and substantiation is simpler analytical method for comparing cost and funding projections over times: where the endpointed of the self.

For example, a quick glance at a graph of constant dollar surplus/deflcit projections over the surplus of the years tells whether the trend is up, down or flat. If an inflation adjustment was included the slope of such a graph would have to be calculated and the inflation of the work of adjustment backed out before meaningful year to year comparisons could be made down on the work of the

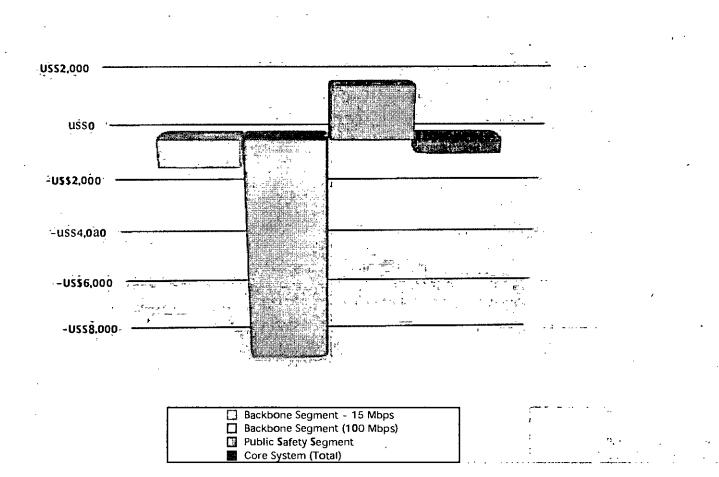
Although inflation adjustments are useful for budgeting purposes, adding a constant the second decoder these inflation figure unnecessarily complicates trend analysis and other long term comparisons. A trades trend are the constant dollar method allows for rapid and meaningful analysis of the value of the dollar dollar dollar dollar method allows for rapid and meaningful analysis of the value of the dollar dolla

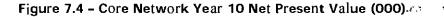
A three step process is used for bottom line analysis of any given segment or scenario: the any given segment or scenar

- 1. Annual operating surplus or deficit. Without considering the construction cost, which is the deduced treated as a capital expense, the annual cost to operate a given segment is subtracted of the densel cost of a from the associated funding source. This step shows whether funding is sufficient to the second of this section support ongoing operations from year to year.
- 2. Cumulative cash flow. The capital costs incurred in each year are subtracted from the contracted proses and contracted form the contract proses and contracted formation of the contract of the capital expenditures are eventually covered by the funding sources: spenditures are contracted proved for the contracted process of the capital expenditures are eventually covered by the funding sources: spenditures are contracted proved for the capital expenditures are eventually covered by the funding sources: spenditures are event.
- 3. Net present value. Finally, the net present value technique is used to factor in the time bedue between whether value of money. A dollar received today is worth more than a dollar promised today and bod today is worth received in ten years, because the dollar received today could be earning interest during the dollar received today could be earning interest during the dollar received today is worth that time. By assuming that the City would have to pay interest on any money it is that the City would have to pay interest on any money it is that the City would have to pay interest on any money it is that the City would have to pay interest on any money it is that the city would have to pay interest on any money it is that the city would have to pay interest on any money it is that the city would have to pay interest on any money it is that the city would have to pay interest on any money it is that the city would have to pay interest on any money it is that the city would have to pay interest on any money it is that the city would have to pay interest on any money it is that the city would have to pay interest on any money it is that the city would have to pay interest on any money it is that the city would have to pay interest on any money it is that the city would have to pay interest on any money it is that the city would have to pay interest on any money it is that the city would have to pay interest on any money it is that the city would have to pay interest on any money it is that the city would have to pay interest on any money it is that the city would have to pay interest on any money it is that the city would have to pay would have to pay it is that the city would have to pay it is that the city would have to pay would have to pay it is that the city would have to pay would have to pay it is that the city would have to pay would have to pay it is that the city would have to pay would have to

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These three metrics show to what extent the cost of building and operating the system is offset by the cost savings, new value creation, efficiencies and increased revenue it generates.





This information can be applied in two different ways. First, it can be looked at as a project of two states of forma business plan for construction and operation of the system by the City itself. Second; the second states of the system by the City itself. Second; the second states of the system by the City itself. Second; the second states of the system by the City itself. Second; the second states of the system by the City itself. Second; the second states of the system by the City itself. Second; the second states of the system by the City itself. Second; the second states of the system by the City itself. Second; the second states of the system by the City itself. Second; the second states of the system by the city itself. Second; the second states of the system by the city itself. Second; the second states of the system states of th

7.3. Cost Estimates

Capital Expense

Construction cost estimates are based on suggested retail prices from a variety of digital senses and the radio, tower and network equipment manufacturers. Installation and licensing estimates are based on standard costs. Furnishing and commissioning is estimated at five percent of machine hardware cost, engineering and design is estimated at 10% of hardware cost, and project management is estimated at ten percent of hardware and installation cost.

Figure 7.5 – Capital Expense						
Core Segments	Nodes	Lfcensing	Towers	Network	Installation	Total 👘 🗉
Backbone (15 Mbps Base)	US\$613,267	US\$74,400	US\$77,438	US\$208,713	US\$35,700	US\$1,198,697.
Backbone (100 Mbps Increment)	USS367,685	US\$0	US\$0	U\$\$90,713	· US\$24,600	US\$482,998 -
4.9 GHz Public Safety Segment	US\$1,175,988	US\$235,200	US\$0	- US\$0	· US\$0	US\$1,693,428
Sub Total	US\$2,156,940	US\$309,600	US\$77,438	US\$299,426	US\$60,300	US\$3,375,123
Scenarios & Alternatives				. -	··	
General Government Fixed	US\$682,294	US\$190,800	US\$245,588	US\$245,588	· US\$66,600	US\$1,966,369
General Government Nomadic	US\$627,273	US\$0	US\$0	US\$0	· USS0	US\$751,113.3
BayRICS 700 MHz Scenario	US\$885,000	US\$14,400	US\$0	USS13,275	· US\$3,600	US\$934,275
Business and Entrepreneurship	US\$83,084	US\$0	US\$0	. – US\$0	.: US\$0	US\$129,164
Drinking Fountain Model	US\$927,130	US\$0	US\$44,250	US\$44,250	· US\$12,000	US\$1,977,310
Sub Total	US\$3,204,781	US\$205,200	US\$289,838	US\$303,113	US\$82,200	US\$5,758,231
Total	US\$5,361,721	US\$514,800	US\$367,276	USS602,539	US\$142,500	US\$9,133,354

Department of Information Technology expenses are estimated at 10% of base capital expenditure for network security and 12.5% for testing, acceptance and documentation. Costs do not include information technology or network facilities beyond the boundaries of a second e ventra de como o das e the reference wireless broadband system architecture.

The capital cost of each segment is calculated individually and in isolation, for the purpose of analyfical clarity. Adding in a charge back for the cost of constructing the backbone segment, for example, would result in money being shifted back and forth through the investigation model. The bottom line result would remain the same, but the model would be more that the same complicated and harder to understand. However, as with inflation adjustments, such charge states of backs would be appropriate in a budgetary document. The basis works are presented as been more than one of the

Operating Expense

In the model, most annual operating costs vary according to the number of nodes and sites and A node is a radio, which is the essential active data transmission hardware. Switches: States set as a state of the state routers and network interfaces associated with a given radio are considered to be integral to so the node. A site is a physical location which contains one or more nodes as a sub-standard standard s

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As an example, take the backbone infrastructure proposed for a typical fire station. A single tower would be installed, which would support one 18 GHz radio link back to a central hub and a WiFi radio for local network access. The station would count as a single site with two access to resolute nodes. Adding the proposed public safety capability would involve installing three 4.9!GHz to access the static radios at the fire station. In that case, there would be a total of five nodes at the location, but access the state of the state of the state of the state of the state.

Figure 7.6 – Operating E		
Core Segments	Annual	- • •
Backbone (15 Mbps Base)	US\$85,145	- 103 G -
Backbone (100 Mbps Increment)	US\$29,175	in the state of the second second
4.9 GHz Public Safety Segment	US\$178,065	– ≩ – Auto Sufety Sol, – 1
Sub Total	US\$292,385	• •, •
Scenarios & Alternatives		
General Government Fixed	US\$222,9 67	, t
General Government Nomadic	USS84,529	
BayRICS 700 MHz Scenario	US\$55,032	. : *
Business and Entrepreneurship	USS94,209	· · · · · · · · · · · · · · · · · · ·
Drinking Fountain Model	US\$788,059	an the Transford Ch
Sub Total	USS1,244,796	• :
Total	US\$1,537,181	

Ongoing equipment replacement and software upgrades and licensing are calculated as a set and software upgrade percentage of original purchase price, 5% and 20% respectively.

For services provided to the private sector, including non-profits, a 5% franchise and a contract sector. And taking facilities fee is included to account for the value of City resources such as antennal as the sector sector mounting locations, rack space and indirect IT support.

Finally, a 15% overhead charge is applied to all operating costs (except the franchise and ease of the hard experimentation of the operation of the second exception of the operation of the second exception of the second ex

Except for this general overhead charge, only direct system expenses are included in the all traded overlap carect model. For example, where providing Internet access is integral to a segmenty such as the bytch g become access Business and Entrepreneurship Opportunifies scenario, the cost of outside bandwidth is g by g by the start of entrepreneurship opportunities scenario, the cost of outside bandwidth is g by g by the start of entrepreneurship opportunities scenario, the cost of outside bandwidth is g by g by the start of entrepreneurship opportunities access is integral to a segment segment is primarily intended for internal City IT network use; the as g is the start of ended potential cost of functional Internet usage is not considered. Sealest of the start of the s

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7.4. Grant Funding Considerations

The American Recovery and Reinvestment Act of 2009 (ARRA), commonly referred to as the stimulus package, has a total of \$4.7 billion allocated for the Broadband Technologies and the entropy of Opportunities Program (BTOP) administered by the National Telecommunications and the standard or of by st Information Administration (NTIA).

Figure 7.7 – National Telecommunications and Information Administration			ere Aliza Aliza
Broadband deployment	· · · ·	US\$3,900	
Expand public computer center capacity	- 1	 US\$200 = 0. 	
Innovative programs to encourage sustainable adoption of broadband service $\sim + \cdot$	· ·	. US\$250 ··· - 3	en la couch e
State-level broadband mapping		. , US\$350	
Total		US\$4,700	

NTIA has released specific grant request specifications, and evaluation and scoring.

- Provide access to broadband service to consumers living in unserved areas and the services of the constant of the service of the service
- Provide improved access to broadband service to consumers residing in underserved states areas, which can include urban neighborhoods.
- Provide broadband education, awareness, training, access, equipment and support to the trade state community anchor institutions, which include:
 - a. Schools, libraries, medical and healthcare providers, community colleges and the second back of the and other organizations that facilitate greater broadband use by these second and the second action organizations.
 - b. Organizations that provide outreach, access, equipment and support services a sub-construction to facilitate greater use of broadband service by low-income; unemployed, where the troade of ages and otherwise vulnerable populations.
- Job-producing strategic facilities located within state-designated economic zones: the test stocated
- Improve access to, and use of, broadband service by public safety agencieste. and a multiple dealed we
- Stimulate the demand for broadband, economic growth and new jobs. We domain the transference of the content of the state of the state
- No less than one grant in each state.
- Increase the affordability and take up of service, and the greatest broadband speedy and the up of the possible to the greatest population of users in the area.
- Enhance service for health care delivery, education or children to the greatest at health or addivery. It population of users in the area.

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In general terms, NTIA funding is available for cities such as Oakland. However, to qualify for grants to build infrastructure, cities have to meet stringent qualification criteria. At this time, Oakland does not appear to qualify for first round infrastructure funding, but criteria might change in later rounds.

There is a requirement for matching funds, usually 20%, from a non-federal source. The requirements follow typical Federal telecommunications grant guidelines, which can allow in-kind services to be counted towards matching funds. This business model identifies and puts a value on potential in-kind services which could fill the gap.

Another potential source of grant funding is the U.S. Department of Homeland Security (DHS). Most DHS grants focus on public safety and security needs. Consequently, the business model divides the proposed system into public safety and non-public safety segments to facilitate DHS grant applications.

Although the business model is intended to support grant funding efforts, it does not include any grant funds in the analysis. Each segment is evaluated on the basis of its direct benefits to the City of Oakland. Insofar as grant funding is available to offset capital and operating costs, the financial case for building the system is only improved.

7.5. Core System Analysis

Backbone Segment

The backbone segment is analyzed in two steps: first, a base facility with a minimum link bandwidth of 15 Mbps is evaluated. Then, the cost of an incremental upgrade to 100 Mbps is considered. The working assumption is that the higher bandwidth option is preferred, however a two-part analysis provides flexibility for future budgetary evaluations.

One-time construction costs for the 15 Mbps base total \$1.2 million, which includes the cost of radios, towers, licenses, network connectivity equipment, installation, design and project management. Segment facilities include:

- High speed (100 Mbps) links between the Department of Information Technology (DIT) and all five hub locations (Edgewater 911 center, Fire Station 28, and the APL, Gwinett and Seneca sites), plus Fire Station 1/EOC and the Eastmont police substation.
- Multiple T1 grade (15 Mbps) links between DIT and the remaining fire stations.
- Secure network access via WiFi (802.11n at 2.4 GHz) at the above locations.
- Network Operations Center (NOC), including test equipment, at DIT.

City of Oakland Wireless Broadband Feasibility Study

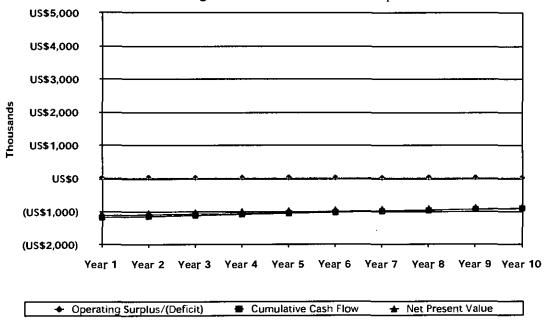


Figure 7.8 - Backbone - 15 Mbps Base

Annual operating expense for the base 15 Mbps segment is estimated to be \$85,000 per year, with maintenance, replacements and upgrades accounting for \$50,000 of that cost.

Upgrading the backbone to a minimum link bandwidth of 100 Mbps adds \$483,000 to the capital cost for a total of \$1.7 million. Annual operating cost increases by \$29,000. Additional facilities include:

- 108 Mbps bi-directional, upgradable radios used for all 18 GHz nodes.
- All links between hubs and DIT are upgraded to 622 Mbps bi-directional via software upgrades and additional radios.
- The links to Fire Station 1/EOC and the Eastmont police substation are upgraded to 311 Mbps bi-directional via software upgrades.

City of Oakland Wireless Broadband Feasibility Study

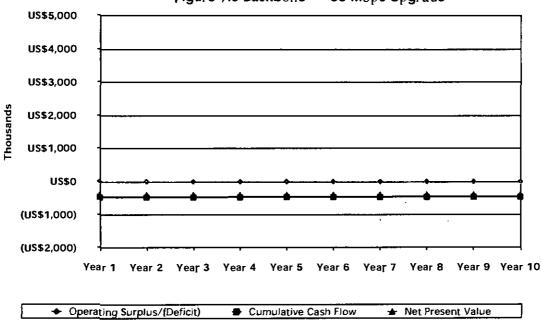


Figure 7.9 Backbone - 100 Mbps Upgrade

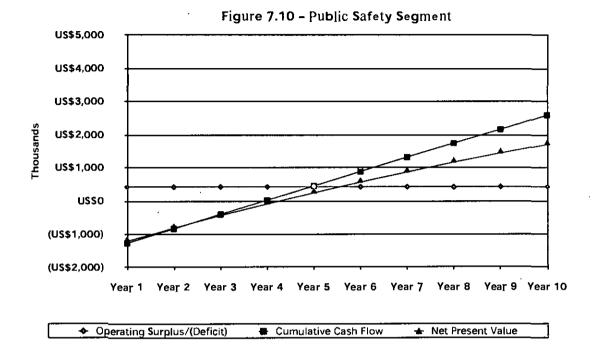
Several high speed data links used by public safety agencies have been identified as replaceable by this segment. Annual out of pocket costs for these links are approximately \$116,000.

The backbone segment would provide better than T-1 grade circuits to all fire stations, replace two T-1 circuits serving the Police Department, and replace three DS-3 circuits serving the EOC, the Eastmont substation and the Edgewater 911 center. These three circuits represent a fraction of the total landline bandwidth leased by the City to serve these locations, and would enhance overall survivability and reliability by providing independent alternate pathways.

Public Safety Segment (Fixed and Nomadic)

The public safety segment of the reference architecture provides high speed broadband connectivity, sufficient for video applications, to fixed locations and vehicles. However, the technology is not designed to work while vehicles are moving. In other words, it is intended for fixed and nomadic (or portable) applications, and not for mobile use.

The capital cost to build this segment is estimated at approximately \$1.7 million. Operating costs are pegged at \$178,000 annually, with maintenance and equipment replacement accounting for about half of that figure.



The bandwidth provided by this segment can be used by public safety personnel to access either the City's IT infrastructure or the Internet from the field. Some manufacturers claim to offer USB-enabled devices that can be plugged into personal computers and used in the same way as a cellular data card. However, these devices have not been field proven at this time, and should be assumed to have a limited range and/or high power consumption requirements.

An alternative is to mount more robust devices into vehicles. For the purposes of evaluation, the business model assumes 100 of these vehicle mounted devices would be bought, however the infrastructure and the operating cost offsets can support many times that figure, if non-reimbursable funding sources can be found for additional vehicle mounted units. These units can be used to provide connectivity to laptops and handheld devices through WiFi or other technology.

Cost offsets for the public safety segment include the cost of providing commercial cellular data service to laptop and handheld computers that have been acquired or are already in the purchasing pipeline. The Police Department has identified 842 such nomadic devices, the Fire Department 50 and the Public Works Agency 120. The estimated annual cost for providing commercial data service to these units is \$607,000.

A comprehensive, integrated wireless broadband infrastructure will provide Oakland's public safety agencies with more options and greater capabilities than simple Internet

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City of Oakland Wireless Broadband Feasibility Study

access through commercial carriers. However, the Police and Fire Departments have already committed to widespread deployment of laptop and handheld computers and, to some extent, commercial data services. Both agencies already make use of extensive fixed data lines from commercial carriers as well. Additionally, quantifying the efficiency and performance measures used by these two agencies is difficult to do in ways that are directly relevant to their true mission. Taking all these factors together, it would be speculative to try to value the gains in efficiency and performance measures that the Police and Fire Departments could realize through a wireless broadband system.

Similar considerations apply to the Public Works Agency, particularly where public safety issues are concerned. However, routine operations are more quantifiable and more easily enhanced by information technology. The public works agency has purchased an advanced management information system for that purpose, and it is reasonable to assume that integration of that system into the City's IT infrastructure and extending it to workers in the field will result in efficiency gains. Consequently, efficiency and performance measure gains for public works activities are included with other departments under the general government nomadic segment below.

General Government Alternatives: Fixed and Nomadic Segments

Deploying fixed wireless broadband capacity that can be used for non-public safety purposes will allow replacement of landline circuits that are currently costing the City \$89,000 per year. As with the public safety segment, this figure only includes a fraction of the circuits being leased by the City.

More than sixty locations operated by the Parks and Recreation and Human Services Departments do not currently have this sort of high speed service, and the market value of extending the City's information technology infrastructure to these locations is estimated to be \$87,000 annually. Because there is no regulatory restriction on the use of these segments, these new wireless links can also support public Internet access and other programs at recreation centers, swimming pools, rental facilities, Head Start/Early Head Start locations, shelters and senior centers.

Community gardens and open spaces have not been included in this calculation. To the extent such locations are included in this segment, the business case for deployment will be improved.

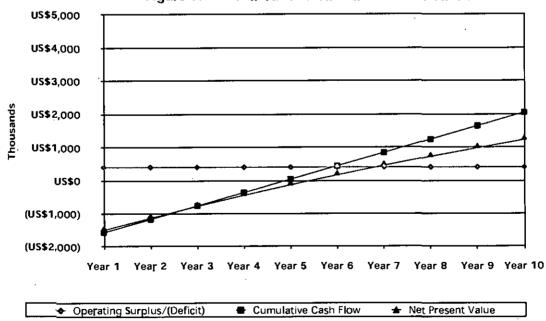
The Public Works Agency manages more than 300 separate locations for the City. This study identifies approximately half of these locations as being suitable for high speed wireless data links. The other half could also benefit from wireless connectivity. We have based the value of connecting these locations on the cost of providing a minimal data link

for security purposes. To the extent these facilities could make use of greater bandwidth, the business case for the system is only enhanced. The estimated market value of these security links is \$143,000 per year.

Adding remote monitoring capability should result in fewer routine trips and improved emergency response to these 157 sites. We estimate the value of the annual efficiency gain at \$84,000, which is approximately equal to the average cost of one full time equivalent (FTE) for the Public Works Agency's facilities and management program.

Allowing non-public safety workers to access the system from the field is also an identified need with quantifiable benefits to virtually every department. Besides the Public Works Agency, major beneficiaries include the Finance and Management Agency, the Human Services Department and the Community and Economic Development Agency (CEDA). Parking enforcement personnel, tax auditors, tax officers, case workers and field inspectors can all make use of the system on a daily basis. The market value of providing remote data access to these workers is estimated to be \$53,000 annually.

Allowing these workers to access their departments' IT resources and file reports from the field will result in greater operating efficiencies, estimated to be an average of one hour saved per day by eliminating repetitive trips and speeding up access to information.



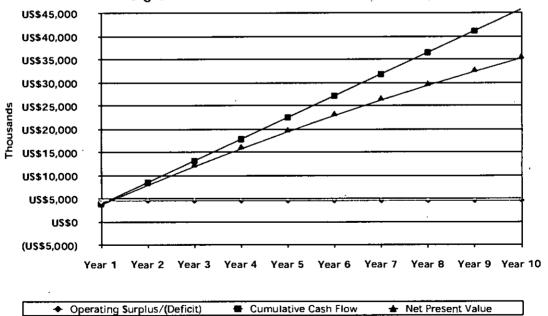


Performance improvement measures adopted by the Finance and Management Agency directly relate to enhanced tax revenue flowing to the City. Using the City Auditor's performance standard ofia 4 to 1 dollar return on direct, specific auditing activities (as opposed to overall agency activities), the resulting annual revenue enhancement is estimated to be \$2.5 million.

For Public Works, CEDA and Human Services field workers, the estimated yearly gain in FTE value is \$2.2 million annually. Likewise, extending fixed wireless link capability to non-public safety locafions will improve operating efficiencies. For example, supervisors will be able to securely access and report personnel data from their primary work locations. The value of these gains in efficiency and performance measures is estimated to be \$221,000 annually.

In total, \$624,000 in recurring funding offsets have been identified for fixed general government applications, such as providing broadband access to recreation centers, and \$4.7 million for nomadic applications.

To support the fixed applications, an additional 18 GHz link has been budgeted to serve the main library, 33 additional access points would be installed at existing backbone sites, and 120 non-public safety locations would receive lower cost subscriber devices. The construction cost for this segment is estimated at \$2 million.





To support nomadic user by providing widespread access by way of common WiFi devices, 86 WiFi access points would be added to the 32 budgeted for the backbone segment. Together, these 118 access points would not provide ubiquitous coverage, but would ensure that city employees are never very far – walking distance or a short drive at most – from access to the City's IT infrastructure or the Internet. The capital cost of extending this kind of nomadic connectivity is \$751,000.

Annual operating cost is \$223,000 for the fixed general government segment and \$85,000 for the nomadic segment.

7.6. Additional Scenarios

BayRICS 700 MHz Mobile Segment

One option for providing mobile, or near-mobile, broadband coverage throughout the City – of the sort contemplated for public safety video applications – is to blanket the city limits with outdoor WiFi coverage. This level of coverage would not be sufficient to provide Internet connectivity to homes or businesses, but it would effectively cover streets and open spaces.

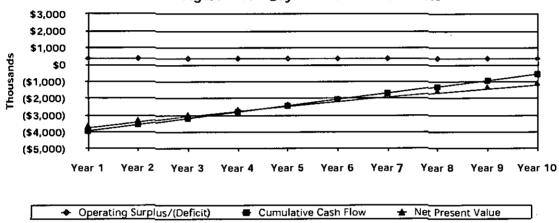
The construction cost would be approximately \$10 million, with an annual operafing expense of nearly \$i million. The surplus generated by the public safety segment above does not come close to covering this additional expense.

Although it is likely that such a system would support most mobile video applications, it is not at all certain. The technology employed is not specifically designed to support mobile applications, and the spectrum used can be problematic. The high cost and unknown reliability of a WiFi-based mobile video system eliminate this option from further consideration. Its only advantage is that it could be deployed immediately.

A cheaper and more reliable option is the 700 MHz BayRICS (Bay Area Region-wide Voice and Data Interoperable Communications System) system proposed by Oakland Mayor Ron Dellums, San Francisco Mayor Gavin Newsom and San Jose Mayor Chuck Reed on 11 September 2007. City of Oakland staff have been participating in the consortium, and have ensured that it will take into account the unique characteristics and needs of Oakland.

No additional funding sources have been identified to support this segment, however in the core business model, the core system shows a significant operating surplus and pays back the entire capital cost within eight years.

At this point, the details of the BayRICS system have not been fully defined. For comparison purposes, we assumed that six BayRICS sites would be built in Oakland and used the cost estimates generated by the Major Cities Chiefs' Workshop. The operating surplus is more than sufficient to meet the added operating expense of this conceptual segment, and the additional capital expense delays full positive cash flow by only four years. This analysis assume a worst case funding situation: no grant money would be available and the entire cost would have to be self-funded by the City of Oakland.





Business and Entrepreneurship Opportunities

Some commercial properties in Oakland are unable to obtain affordable high-speed broadband service from existing carriers. This lack restricts business and employment growth in Oakland, particularly in areas where it is needed most. The reference architecture developed for this study, in particular the core system, can be used to enable delivery of T-1 grade or better service to problematic locations.

It might not be appropriate for the City to directly compete with incumbent telecoms carriers. However, it is appropriate for the City to enable opportunities for new and/or small businesses, particularly in areas or locations where services are lacking. The City can help the business community overcome challenges by making facilities and technical resources available on a wholesale basis to qualified small businesses and business groups.

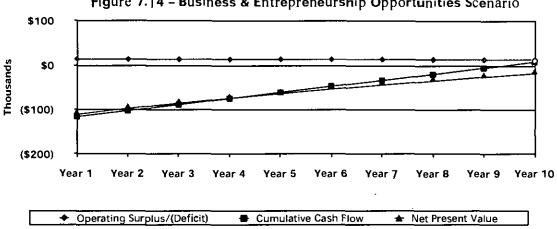


Figure 7.14 – Business & Entrepreneurship Opportunities Scenario

This scenario assumes that independent, commercial DS-3 grade Internet bandwidth, selected portions of the backbone system and standardized customer premise equipment (CPE) will be combined to create a facility that can support multiple T-1 grade circuits and lower bandwidth hotspots. Building this infrastructure would require a capital investment of \$129,000, with annual operating expenses of \$94,000.

Revenue would be derived from selling this capacity to local resellers or associations at the monthly wholesale rate of \$300 per T-I equivalent and \$200 per hotspot. Providing standardized CPE and core maintenance service would generate additional revenue.

A pro forma estimate puts annual wholesale revenue to the City at \$108,000, allowing for pay-as-you-go funding of the program.

Drinking Fountain Model Public Access

The backbone infrastructure and technical resources created through the Oakland Wireless Initiative can also be used to extend Internet access into the community, providing free or low cost access at community anchor institutions. This access also provides an enabling element for educational, economic development, employment, social, health and other programs. This increased service to the community would be in addition to any Internet access or related programs provided at city-owned community anchor institutions such as recreational centers, senior centers, libraries and the Oakland Museum.

One of the top priorities identified by Oakland residents during the stakeholder analysis process was ensuring that schools had sufficient Internet access. During the workshop process, it was determined that the Oakland Unified School District and other educational institutions already have access to adequate bandwidth through existing programs.

However, those programs place restrictions on the usage of that bandwidth. Offering alternative Internet resources to these institutions could expand their policy and programmatic options.

Community organizations and neighborhood institutions also support programs that could be enhanced by access to high speed Internet bandwidth. For example, the Oakland Housing Authority operates 267 sites where common area Internet access might be offered to residents. In total, the business model assumes that 627 such sites could be supported, including providing each site the necessary equipment to connect to the system.

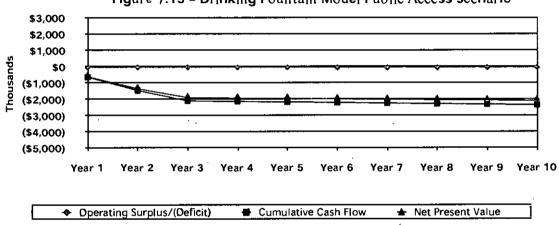


Figure 7.15 - Drinking Fountain Model Public Access Scenario

Assuming a discounted T-1 equivalent rate of \$100 per month, the yearly value of providing high speed bandwidth to these community anchor institutions is estimated to be \$752,000, against a capital cost of \$2 million and an annual operating budget of \$788,000. Although the value proposition justifies the operating expense, accounting for the capital cost is more problematic.

No specific funding source has been identified for this program. However it would be a viable candidate for ARRA funding as well as other broadband funding initiatives currently in the pipeline. The job creation, digital inclusion, educational and public safety benefits are significant, and are directly in line with the BTOP goals and priorities set by Congress.

It is also possible to find funding sources on a case-by-case basis for individual sites. Because this program relies on unrestricted segments of the overall system, it can be built out as needs are prioritized and funds become available.

8. Appendix A: Summary of Research

8.1. Scope

While the scope of this feasibility study is restricted to the assessment of wireless broadband technology, applications and economics, and the needs that might be served directly by such technology, the scope of the assessment sessions was necessarily much broader.

Participants were not expected to immediately make distinctions between needs that might be met by the deployment of wireless broadband facilities, and needs that were either general in nature or for which wireless technology is not an appropriate solution. Conversations with and among participants were far ranging, and covered a wide variety of topics, concems and needs. Volume 2 of this report contains detailed minutes of these sessions, along with other public comments, and could be very useful for a number of purposes unrelated to this study.

Topics discussed that are either outside the scope of this study or are too general to be comprehensively addressed by it include:

- Web-based communications and service delivery by government agencies, including the City of Oakland, to the public. From an information technology perspective, general purpose content and applications are a key service government agencies provide to the public, a fact which was emphasized throughout the research process. Examples included the City of Oakland web site, an online permit process and a number of educational opportunities and applications. Although increased demand for online resources would tend to support a case for wireless broadband deployment, the same could be said of wired access. It is important to ensure that any public wireless Internet access deployed is able to support online services, but this study does not encompass determining the type, extent and need for such services.
- 2. Interoperability between City departments, and between City departments and outside agencies. As detailed below, to the greatest extent possible, any wireless broadband system deployed by the City of Oakland should be usable by all appropriate parties, and should facilitate rather than hinder cooperation. However, full interoperability is also a function of policy, management and other factors, which extend into areas that this study is not intended to address. Interoperability also depends on existing technology, which this study assesses in the specific context of wireless broadband feasibility, rather than in terms of general interoperability.

- 3. General information technology and telecommunications infrastructure and policy. Any wireless broadband system that might be deployed is necessarily an extension of the City's existing information technology network, and must support and adapt to the policies, standards and network architecture already in place. Where appropriate, this report will make recommendations concerning changes in this infrastructure insofar as it concerns integrating wireless resources, but it does not address general information technology strategy or implementation.
- 4. Provision of computer hardware, saftware, training and technical support to under served communities and individuals. As noted below, in order for under served communifies and individuals. As noted below, in order for under served communifies and individuals to make use of broadband access of any sort, they must also have access to computer resources, including training. This consideration is a limiting factor for some aspects of a wireless broadband system, and must be assessed during any implementation process. Wireless technology, and the policy adopted to deploy it, can also create opportunities to increase the availability of these resources. However, a full assessment of this need and the means to fill it are outside the scope of this study.

8.2. Methodology

Examples of the agenda, discussion guides and other material used in this research can be found in Volume 2 of this study. The primary research program consisted of a series of targeted workshops and public focus groups, as well as a town hall meeting.

The six workshops were structured as semiformal meetings in a business setting. Three workshops were for city personnel, with participants invited from all city departments. One workshop was held for the local business community, one for local non-profits, and one for educational organizations and other government agencies. Department of information technology personnel were present at all workshops, and contributed information and observations as appropriate. However, since DIT is the department that is responsible for this study, they were not primary participants.

The workshops opened with introductions, and then moved to a presentation of background information about the study and on wireless broadband initiatives elsewhere. Participants then discussed their particular needs and concems. This information was gathered on fip charts, which were then used to facilitate a brainstorming session. The workshops closed with participants prioritizing needs and solutions.

One focus group was held in each of the seven Oakland City Council districts, and participants were recmited from people who live and work in the respective district. An effort was made to recruit people from all demographic categories in each district, and although every focus group did not include participants from all possible demographic categories, taken as a whole the groups did encompass nearly every segment of the greater Oakland community. Focus group participants were assured of anonymity.

Each group was led through the same discussion guide, with the goal of sparking a wide ranging discussion of needs that could then be channeled into topics specific to wireless broadband. To set the stage, participants introduced themselves and were given a brief presentation of various examples of municipal broadband deployments. They were then asked open ended questions about their perceptions of needs and existing City services, which led to interactive discussion of relevant topics. Each session closed with a summary of the points raised in the discussion and a brief prioritization exercise.

The town hall meeting was designed as an open and unstructured public discussion, with no screening or targeted recruitment of participants. It began with a presentation about various municipal wireless broadband projects and an overview of the study process. Members of the audience then asked questions and presented their own views about what they thought were the important needs and service priorities for the City of Oakland, and their opinions and suggestions concerning wireless broadband specifically. All public comment was taken as presented, with no effort made to channel the discussion or produce a group consensus or identify common conclusions.

8.3. Technical Kickoff Meeting

On 7 December 2007, City of Oakland personnel responsible for networking and telecommunications met with prime study contractor Stephen Blum and technical lead Stuart Browne to discuss information needs, and to be briefed on the planned course of the study. Blum and Browne presented background information on the technology and economics of municipal wireless broadband and discussed technical information needs.

All participants agreed to help collect the technical data and later did so, using a guide and questionnaire prepared by Browne.

8.4. Workshops

Workshop 1: Police and Fire Departments, Mayor's Office, Administrator's Office, KTOP

This workshop focused on public safety and emergency services. **P**articipants brainstormed and discussed potential applications that could increase response time, improve service efficiency and increase interoperability between agencies in times of emergency. A representative from the Human Services Department attended, and provided ideas on how wireless technology could be used to serve the elderly. Police department representatives discussed a current effort to provide all police officers with laptop computers, and the need to provide those computers with data access in the field. Fire department representatives stated that they are not currently accessing data from the field and that personnel, for example fire inspectors, are recording information on paper in the field and returning to their offices to manually enter it into computers.

Police and fire representatives believed that better visual information from the scene of incidents would lead to improved coordination between their departments, and would enhance their ability to respond to those incidents.

Network independence and cost savings were two key potential benefits identified. Using commercial networks for public safety can be problematic, primarily due to security concems. There was a belief that costs could possibly be reduced if a Citywide network was in place. Increases in efficiency and productivity also could be possible. Participants identified an opportunity to make field workers more efficient by providing remote access to records, and to file reports and record other information without having to return to the station. The result could be better service and faster response, as well as an increase in the amount of time field workers could spend in the field.

Security and privacy were key concerns. Participants agreed that, in general, any wireless technology used must be secure and able to support Federal standards, including encryption and segmentation for law enforcement communications. Privacy standards, for medical records for example, must also be met.

Coverage must be adequate to support intended users and should represent an upgrade in capability, according to participants. They observed that police and fire personnel already have to contend with radio dead spots because of hilly terrain, and ideally any wireless network deployed would help alleviate that problem. Another challenge is the need to communicate with aircraft and boats.

Another concern of participants was system survivability during a disaster, such as an earthquake, and ensuring that the system is adaptable to meet the rapidly shifting needs and circumstances that major emergencies present. Participants believed that any system must have a high degree of reliability, with adequate emergency power, backup equipment and spare capacity to function at all times, during emergencies as well as routine operations.

Workshop 2: Public Works, Facilities Management, Risk Management, Human Services, Community Economic Development Agency (CEDA)

In this workshop, the focus was cost savings, productivity, and driving new revenue opportunities for the City. Some of the same issues mentioned in Workshop 1, such as gaining efficiency in work management systems, were also raised. Location-based tracking was identified as a way to manage City assets. Ideas for emergency and disaster management applications were also offered.

Participants discussed ways wireless technology might improve efficiency and productivity, echoing comments in the earlier workshop about the benefits of being able to access information and file reports from the field. Potential cost savings were identified as well. For example, the public works department is acquiring 150 new laptop computers. Purchasing commercial wireless data service would cost approximately \$50 per month for each computer, for a total budget of \$90,000. An independent City wireless network might be able to provide comparable service for less money.

Specific applications that could enhance productivity were discussed, such as remote reporting and two-way access to the City's geographical information system (CIS). City tree crews would like to be able to access right of way and property line information while in the field. The traffic division is currently looking at wireless technology as a way of managing radar feedback signs. Currently, they are transferring data by swapping out physical media on individual units. Managing and monitoring traffic signals was also mentioned as a potential application.

Other uses for wireless technology mentioned included filling in dead spots in current City radio and commercial carrier data network coverage, providing remote access to desktop computers and enabling telecommuting. One observation made about telecommuting was that in addition to being a potential productivity enhancer, it is also useful in preparing for emergencies. According to one of the participants, the federal department of homeland security requires some employees to work from home one day per week, to ensure they can do their jobs if they are unable to report to their primary offices during an emergency.

Wireless technology was also mentioned as a potential economic development tool, which could boost the value of some properties by enabling state-of-art broadband facilities. In other cases, it could provide a back-up service for businesses that rely on wired connections or as an extension of wired networks for businesses with significant numbers of field workers within the city limits. Another potential economic development opportunity identified by participants was providing wireless public Internet access in high traffic areas, which could be of particular benefit to mobile workers and the travel industry. Participants also thought that wireless technology could aid in increasing the trust of the general public and promoting transparency. The rationale was that when field workers were interacting with the public, for example during an inspection, wireless data access would allow them to show processes and results in real time, rather than having to wait days, or longer, to provide feedback. Another need identified was the lack of affordable Internet access in some neighborhoods, and wireless technology was discussed as one element of a potential solution.

Workshop 3: Finance Department, Office of Emergency Services, Oakland Museum, Parks and Recreation Department

The discussion in this workshop centered on ways that wireless technology could plug holes in current networking capabilities, extend information technology resources into the field and enhance existing City services.

Participants came from a diverse group of departments, with a variety of institutional needs. Both the finance and parks and recreation department representatives saw value in being able to access their exisfing information technology assets directly from the field. For example, being able to access information remotely would allow the finance department to conduct more and better field audits, potentially leading to increased tax revenue flowing to the City.

Adding geographic information to existing databases, and accessing that information automatically through location-based services, was seen as a way to enhance tax code compliance, as well as compliance with other City requirements. Location-based services were identified as a way of improving City operations and services, such as emergency response management.

Some parks and recreation offices do not yet have wired access to the City's information technology infrastructure, and wireless technology was mentioned as a potential means of providing connectivity. Currently, supervisors have to go to a central office to file routine reports, such as personnel-related records. This situation was seen by the group as being inefficient and a specific application where wireless technology could improve productivity. As with previous groups, participants believed that being able to access and file information from the field would increase productivity by reducing the need to travel back and forth to an office.

Security was a central concern. Participants noted that the two examples above involve confidential information that has to be carefully controlled, both while it is being transmitted and on any devices that are used in the field. The City's current IT infrastmeture

already has extensive safeguards, such as virtual private networks (VPNs) built into it. Any wireless extensions to the existing network would have to support those safeguards.

The representative from the office of emergency services echoed comments made by police and fire department personnel during the first workshop. Wireless facilities could improve communication with emergency responders on a routine basis as well as during major incidents, and provide a back-up to existing systems.

Finally, improving communications with and service delivery to the public was seen as a significant potential benefit of wireless technology. For example, it could enhance interactive tours of the Oakland museum, provide better public access to the museum's collection, and aid in volunteer recruitment and management.

Workshop 4: Oakland Businesses

Participants discussed gaps in services and facilities, both public and private, and ways wireless technology might plug those gaps. Much of the discussion focused on the economic case for extending networking resources and capabilities, including ways that the City might pay for the facilities needed, and on opportunities for private businesses and individuals to participate in such a project.

Business representatives generally believed that adding wireless connectivity to the City's. IT facilities could increase the productivity of field workers, potentially reduce crime by improving surveillance, and improve service delivery to business, such as expediting building inspections permit processes.

A couple of specific business opportunities were idenfified and discussed. First, downtown Oakland has a number of "Class B" buildings that lack commercial-grade Internet access. A wireless network could be a way to bring connectivity to those buildings, and the use of wireless technology internally could be a way of quickly distributing access throughout a property. Second, adding wireless hotspots in key locations, such as bus shelters, the downtown area and Jack London Square, could help increase tourism and convention business.

Several suggestions for financing wireless facilities were offered. One idea was to allow business owners to buy in to a video surveillance network, making it possible for them to add supplemental coverage of their own locations, and to assist with monitoring and reporting. Another was to maximize advertising and sponsorship opportunities.

One suggestion made was to integrate public transit information and dial-a-ride service with mobile phone networks, offering both a way to deliver information to the public and a means of billing. Transportation-related applications were seen as potentially fundable through grants.

Participants generally believed that any wireless system deployed should be financially sustainable, and the costs of the system should fall primarily on those who benefit from it. They also emphasized that the value of any system should be determined before decisions are made, and that costs be in line with the value added.

A City wireless system could also encourage other wireless-related businesses to develop, according to participants. For example, access to wireless facilities might make it possible to offer new voice communication or Internet access services, or extend the reach of current, commercially available services to new places and new customers. Businesses might also be able to use a citywide system to track employees and assets.

Workshop 5: Oakland Non-profits

Participants were concerned about providing access to Internet resources and services to those who don't yet have it, particularly youth and the economically disadvantaged. They generally believed these individuals would be left behind, academically and technologically, if efforts were not made to educate them with the basics of technology. The discussion focused on the benefits of Internet access, regardless of whether it was provided wirelessly or otherwise.

One of the key points of the discussion was that the inability to access Internet resources and services is due to several factors, including access to the necessary hardware and software, basic technology skills, computer-specific skills and professional technical support, as well as an inability to obtain Internet access service, either because it is not available or it is not affordable.

Two ways of overcoming Internet access issues were discussed. One was to deliver alternate Internet service into homes for free or at a reduced rate. Another was to provide it to community groups and at public facilities, making it easier to combine it with hardware, software, training, technical support and other necessary resources, and to create programs that serve the specific needs of different parts of the community. A variation on this idea, which favors the use of wireless technology, is to create mobile centers, similar to bookmobiles, that take these programs directly into neighborhoods.

One of the participants was from Kaiser Foundation Health Plan, Inc. He described a mobile medical clinic that Kaiser is currently testing in Hawaii. Its immediate purpose is to provide health care to under served communities, but ultimately it could be a platform for providing care directly to people in their homes. Other Oakland area hospitals are also

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expanding online services, and City infrastructure, wireless or otherwise, could help link these efforts.

Internet access, wireless or otherwise, was seen as a means to help achieve goals, rather than as a goal itself Those goals included improving educational levels, teaching skills, encouraging the pursuit of higher education, improving delivery of health care, increasing access to social services, and community building. Participants generally had a sense of urgency about reaching these goals, and saw needs as being immediate and pressing.

Workshop participants generally favored business models, network architectures and technology that was non-exclusive and available to all. Creating competition for incumbent Internet service providers was seen a beneficial. Job training opportunities were also identified, for example training local residents to become network technicians.

Workshop 6: Education and other Government Agencies

Participants in this workshop were primarily management level information technology and telecommunications staff from local government agencies. As a result, the discussion focused on common technical challenges, and interagency cooperation and the means to foster it. There was considerable willingness amongst all participants to discuss sharing resources and cooperating where possible.

Several of these agencies, for example the Oakland Unified School District (OUSD), BART, the Metropolitan Transportation Commission and the Port of Oakland, have existing broadband networks within the Oakland city limits, including wireless facilities. In addition, BART is extending public wireless access, through mobile phone carriers and other means, throughout its system. OUSD and the Port operate more or less completely within the city limits, and face some of the same networking challenges as the City. In some cases, participants said, the City could share existing facilities. In other cases, agency representatives said they would be interested in making use of City resources.

One example of project congruency is the Port's current program to install public wireless Internet access in high traffic areas that it controls, such as the airport and Jack London Square. Another example is OUSD's program to create a wireless overlay of its existing information technology network within all its buildings. This network is not intended to provide public Internet access, however one suggestion made was for the City and OUSD to cooperate in providing public access in common areas, such as auditoriums, after school hours, if legal and security concerns could be addressed.

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OUSD and Peralta Community College District representatives expressed other security concerns. Rogue wireless access points – personal wireless routers that are attached to a secure network – are an issue, and in some instances have shut down networks.

Emergency planning is another area of potential interagency cooperation. For example, some OUSD schools are designated as emergency evacuation shelters. If activated, those sites would have communication needs that are radically different from normal day to day operations, and could benefit from wireless broadband facilities that could be quickly adapted to satisfy those needs.

Ongoing technical coordination, from the planning process on through to deployment and operations, was seen by participants as essential to any partnership. Security was one area of particular concem. Individually, agencies have to meet security requirements that are unique to their jurisdiction. Consequently, any common broadband facilities have to be able to meet all the security requirements of all the partners.

One suggestion that was generally endorsed by all participants was that interagency planning and coordination should extend beyond the workshop, as a group or one-on-one as appropriate. One existing group that was mentioned as an example, and potentially as a forum, is the recently formed Bay Area transportation CIO roundtable.

Participants also believed that policy-level coordination is an important element in creating any ongoing cooperative effort. The governing authorities of each agency have concerns and priorities that might or might not be consistent with City policies and, according to participants, advance coordination would be necessary to ensure a smooth process.

8.5. Focus Groups

Focus Group 1 - District 6

The majority of the participants either lived or worked in East Oakland. This focus group had the highest youth participation of all the focus groups, with young people comprising more than half of the participants. Council member Desley Brooks, who represents this district, made opening remarks to the participants.

Top priorities

- Overcome economic and educational hurdles to hardware and access, ensuring that everyone who wanted access could afford it, and who needed hardware could get it.
- Equip all schools.
- Secure post-disaster resources.

(Prioritization of topics was done by participants themselves as part of the concluding process of each focus group.)

Focus Group 2 - District 5

This focus group was the smallest. The participants either live or work in this predominantly Latino area of Oakland. Perhaps because of its smaller size, this group engaged in a very lively discussion. Participants ranged in age from high school students to senior citizens.

Top priorities

- Access for all, "not just free access, but having the tools the hardware and the software to even endeavor taking advantage of the access".
- Service providers ought to be a part of Oakland.
- Make sure any public services are multilingual.

Focus Group 3 - District 4

This session was very interactive. The focus group took place in the Dimond library, one of the few libraries that offer free wireless access to the Internet. While the focus group was taking place, members of the public parked outside the closed library, just to make use of this access. This group seemed well versed on innovative technologies. Council member Jean Quan and members of her staff participated in this focus group.

Top priorities

- Easy and inexpensive access for all, the more people on the network, the more valuable it becomes.
- Bandwidth and strong infrastructure to support use
- Public access should start in public areas.

Focus Group 4 - District 1

Senior citizens were well represented at this focus group and it was held at a senior center. The group seemed very engaged with the city, in terms of volunteerism and other roles, and very educated about the status of Oakland politics. Overall this group focused more on city issues than on issues relating to their personal needs.

Top priorities

- Better real time communication in emergencies.
- Public safety and emergency response.
- Education.
- Technology and software.
- Accessibility across Oakland.

Focus Group 5 - District 2

This focus group had the most culturally diverse group of participants, who spoke a remarkable variety of languages. Language issues might have led some to engage in discussion less than others, but even so a broad range of issues, some unique to the district, were put forth.

Top priorities

- Leadership necessary to effectively implement.
- "Public face" on this initiative.
- Public utility-type service.
- Training.
- Access.

Focus Group 6 - District 3

This focus group was one of the most balanced in terms of male/female ratio and above/ below 40 age range. The majority of participants in this focus group lived or worked in West Oakland.

Top priorities

- Infrastructure.
- Public access.
- Content, in terms of what is accessible over the system.

Focus Group 7 - District 7

The participants of this focus group lived or worked in East Oakland. Just under half of the participants were young people. Perhaps as a result, the discussion was free flowing and covered topics and ideas that had not yet been considered.

Top priorities

- More WiFi at community centers, schools, libraries, etc.
- If the city wants to create more revenue, focus on WiFi on buses so people will use them more.
- Have WiFi available as a public service.

8.6. Town Hall Meeting

The Town Hall meeting was well attended. Participants focused on the City's plans and what should be considered during the assessment process. A good portion were technologyoriented and seemed to have a good understanding of what would be involved in designing and deploying wireless broadband solutions for the City of Oakland. Top priorities

- Access for unserved areas is important, but needs to be combined with other necessary resources such as equipment, training and support.
- Some solutions are easier to implement than other, and can be deployed quickly, such as offering free WiFi access at all City libraries.
- Costs have to carefully considered.
- Wireless broadband facilities created for City staff should address genuine needs.
- Wireless technology can help provide public as well as infrastructure support in emergencies.

8.7. Samples of Public Comment

As noted above, detail notes and other documentation from all the sessions, as well as other public comment received during the study, is contained in Volume 2 of this study. Typical comments include

"The Diamond Library has WiFi, but the Eastmont Branch doesn't. All the libraries need it."

"Residents could use Internet to report incidents to the City, or the police department. With wireless reporting police could see whether there are clusters of incidents happening repeatedly in an area, and send a cruiser to that area."

"Need to know what benefits the taxpayers are getting from the wireless service as well as what benefits the vendor is getting."

"Will development of this infrastructure produce the kinds of jobs we need in Oakland?"

"Security is important for privacy."

"Let's not spend all this money to hire brand new people to recreate stuff that already exists. See what already exists... and leverage existing resources."

Train teenagers to be technicians to support access and hardware. "The point is to train people in the community, not bringing folks from outside."

"Wireless access is only good if you have the equipment. Consider lending programs such as Berkeley's tools program for home improvements, for video cameras, digital cameras, computer equipment." "Provide WiFi access in bus shelters as well as on buses. "[While riding the bus] people spend a lot of time sitting around doing nothing; it would be much more enjoyable and productive for people with WiFi access. In Japan they provide all the messaging in different languages."

"It's fairly common throughout the country that most libraries have WiFi, so we are a little bit behind the times now. The main library does not have it. We get asked for it easily five times per week. In terms of the digital divide, patrons who come in to use equipment at the library don't have computers or printers at home, so providing WiFi in some neighborhoods might not actually provide access."

"I have a concern that commercial implementation of WiMAX or a 4G system by a major corporation could easily render something that we put up ourselves obsolete."

"Must be careful not to underestimate the cost associated with broad-scale wireless access. This makes me think pragmatically about the drinking fountain model, where you focus first on services that can piggyback on existing wired connections at schools, recreation centers, and public buildings as a nexus for people to come together that might otherwise have difficulty accessing the Internet."

"I love technology – wireless everywhere would be wonderful. However, given other cities' problems with wireless, Oakland's current resource problems, and frankly track record – please don't do it."

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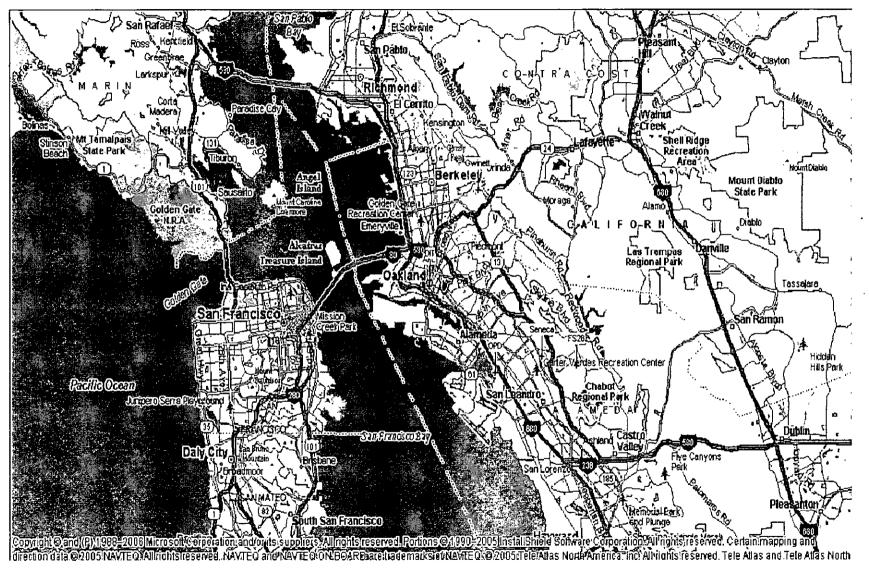
9. Appendix B: Frequency Mapping

Oakland Reference Architecture

Coverage Maps 4.9 GHz 2.4 GHz 700 MHz

Tellus Venture Associates

RF Hub Locations



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Oakland Reference Architecture

Coverage Maps

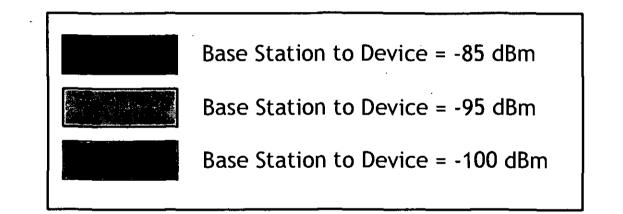
4.9 GHz 2.4 GHz

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4.9 GHz and 2.4 GHz Assumptions

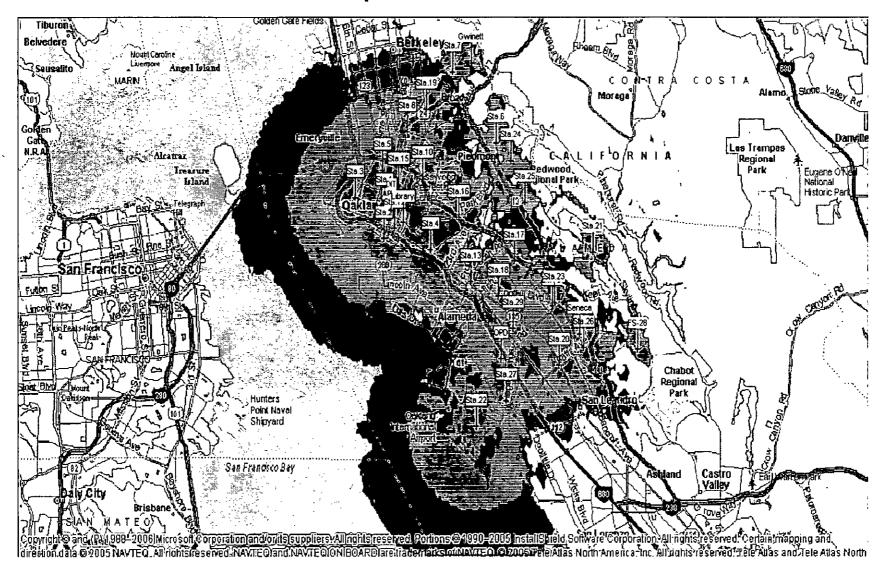
- Maps are for informational purposes only.
- Do not assume a particular system design, other than frequency band.
- Maps do not account for subscriber density or multi channel access points.
- Maps are based on Talk Out- Base Station to Subscriber
- All maps are based upon a reliability of approximately 95% Area Reliability.
- 2.4 GHz Maps are based on an ERP of 36 dBm Maximum allowable per FCC.
- 4.9 GHz Maps are based on an ERP of 29 dBm Maximum allowable per FCC.
- Gwinnett, Seneca, and FS 28 location on tower adjusted to 25 ft.

Map Legend - 4.9 GHz and 2.4 GHz



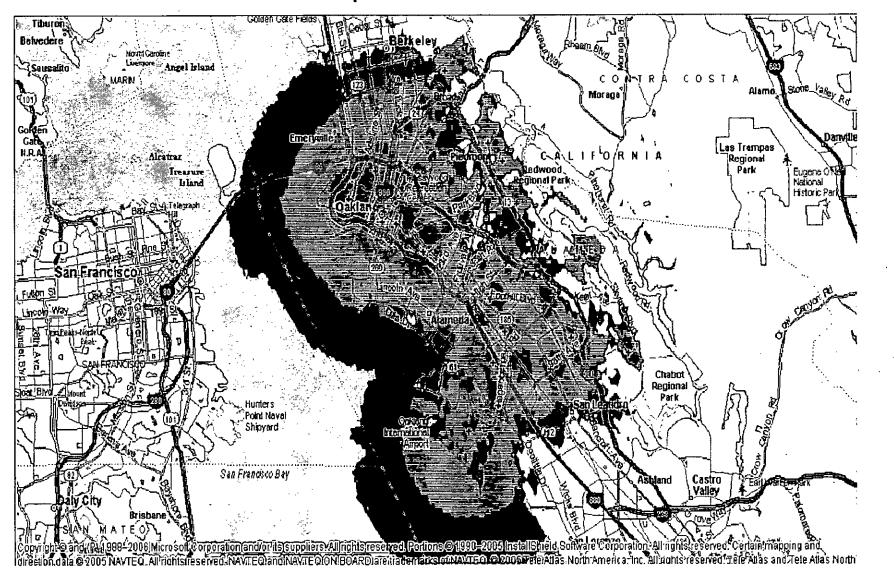
Tellus Venture Associates

Composite - 4.9 GHz



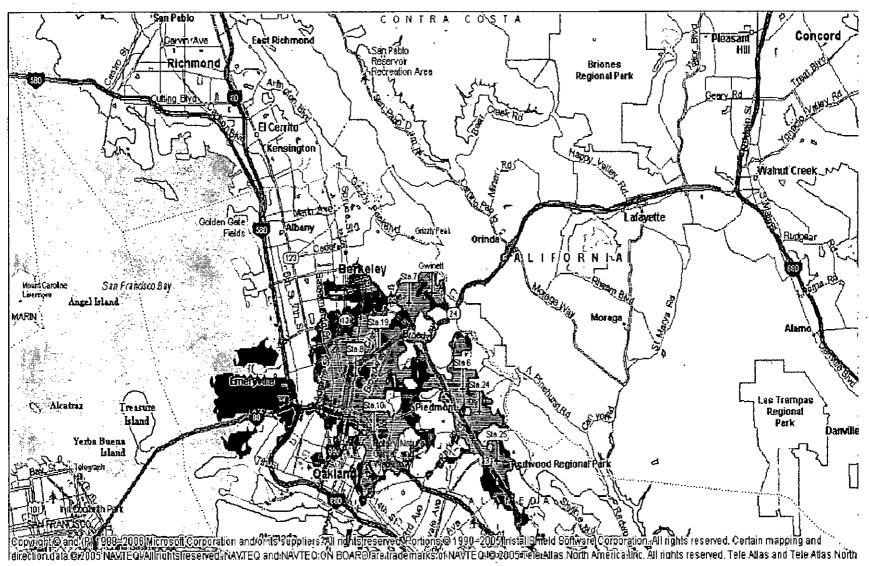
Tellus Venture Associates

Composite - 4.9 GHz



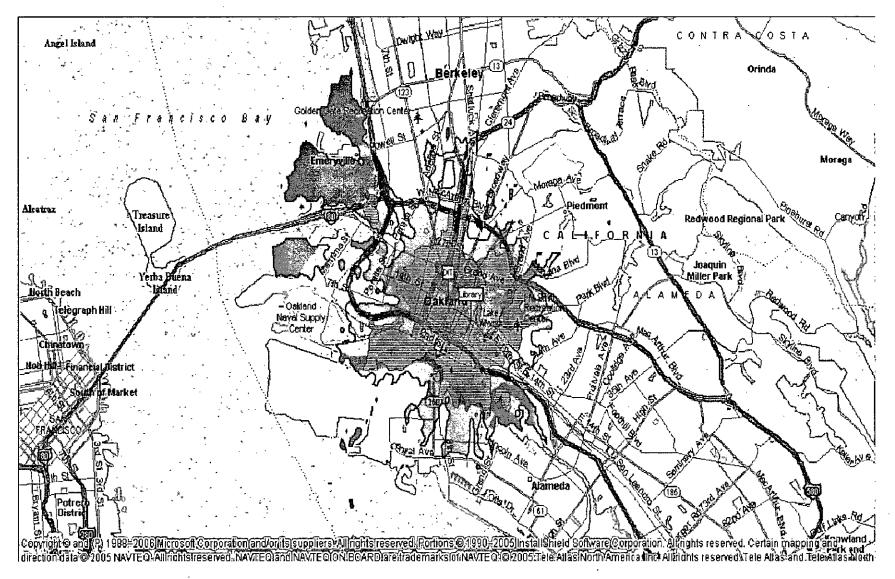
Tellus Venture Associates

Gwinnett - 4.9 GHz



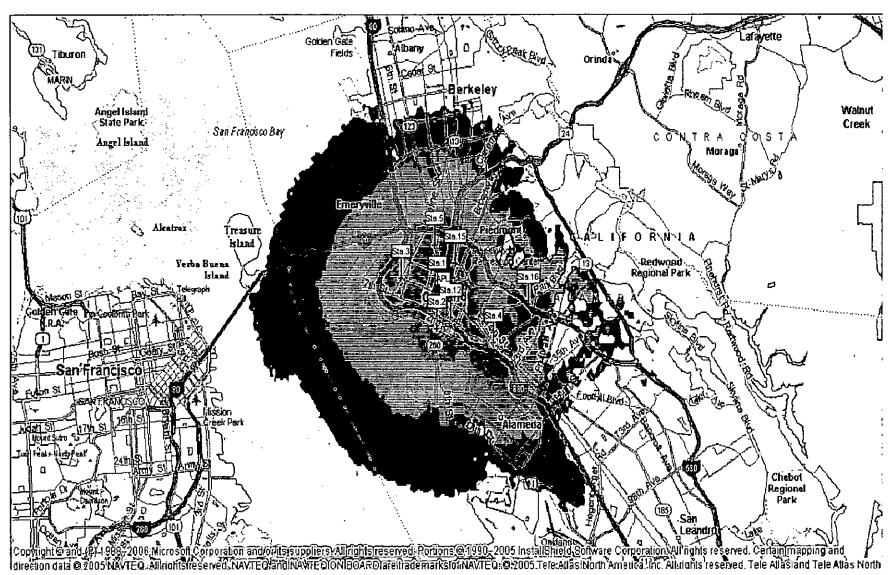
Tellus Venture Associates

DIT- 4.9 GHz

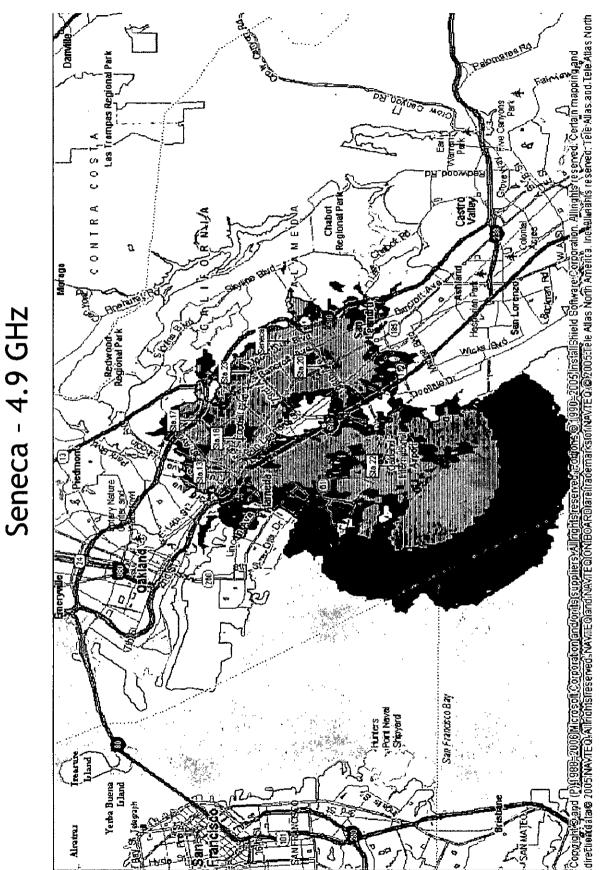


Tellus Venture Associates

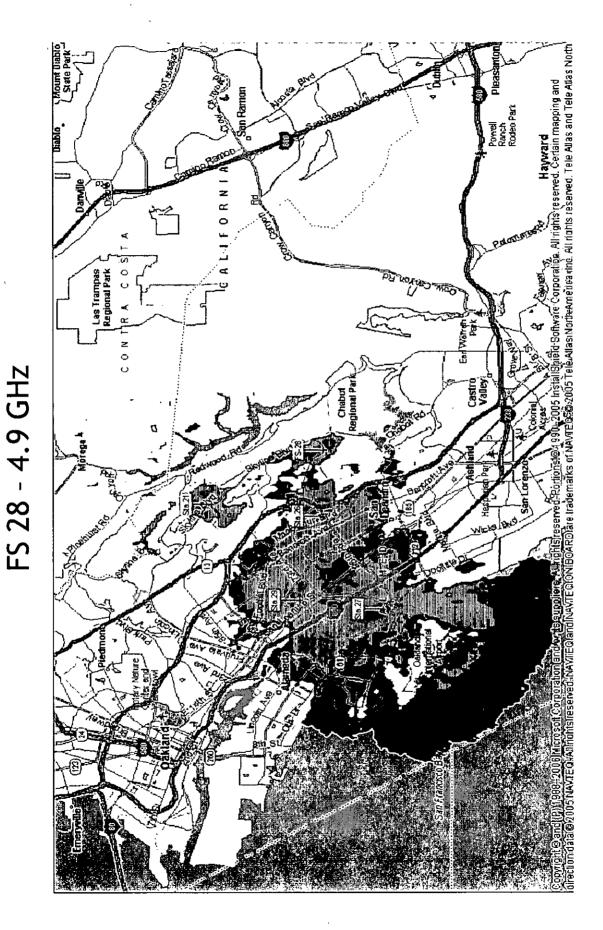
APL - 4.9 GHz



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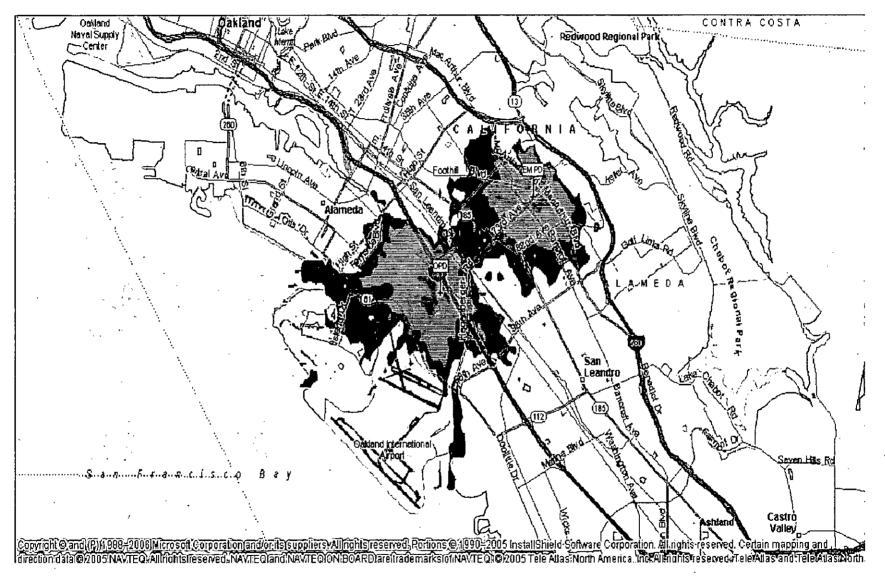
Tellus Venture Associates



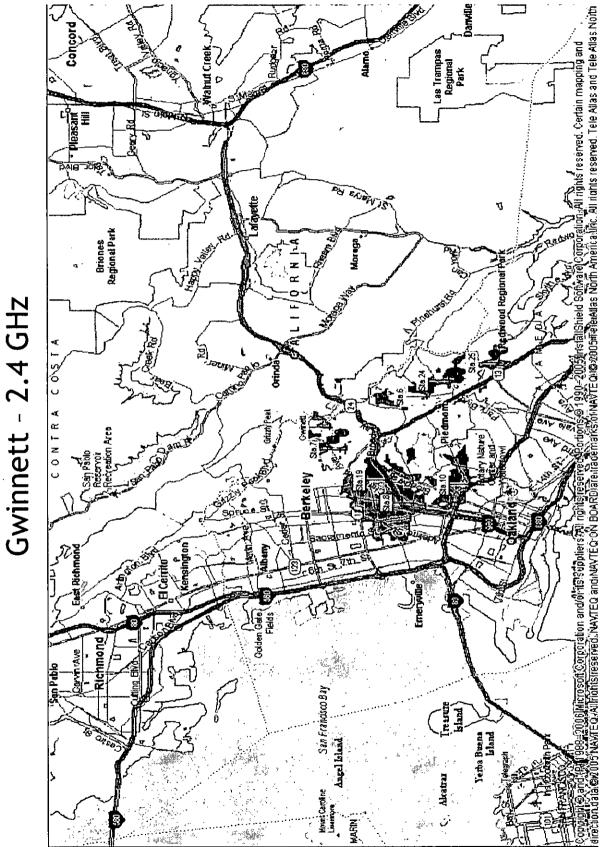
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OPD - 4.9 GHz



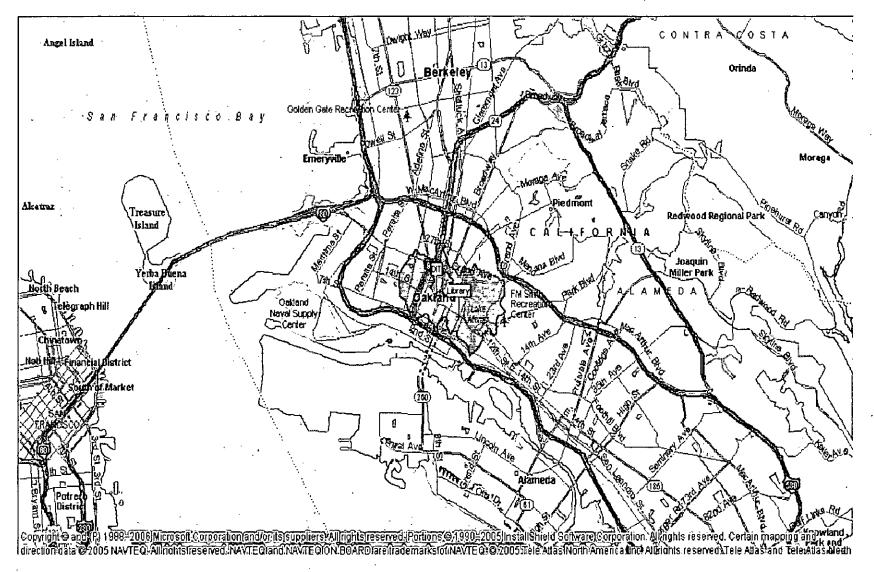
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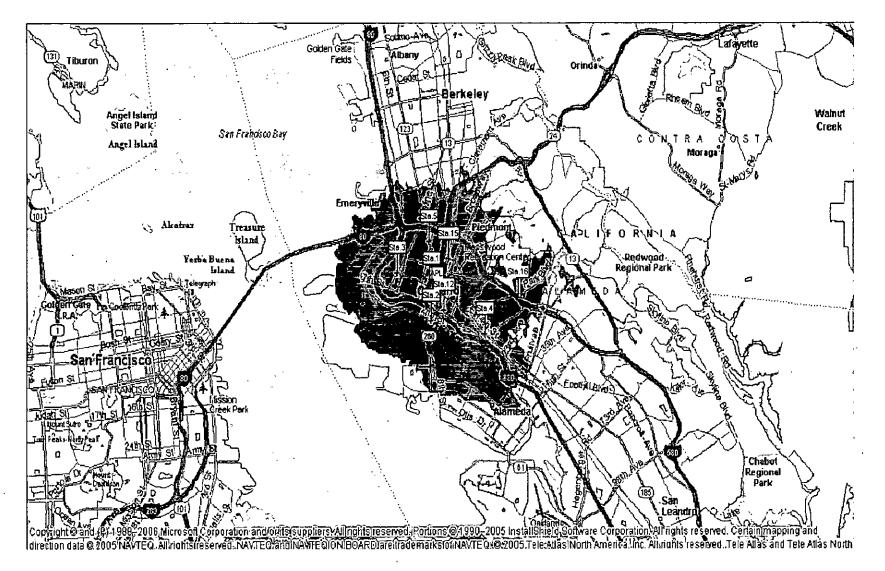
Tellus Venture Associates

DIT - 2.4 GHz



Tellus Venture Associates

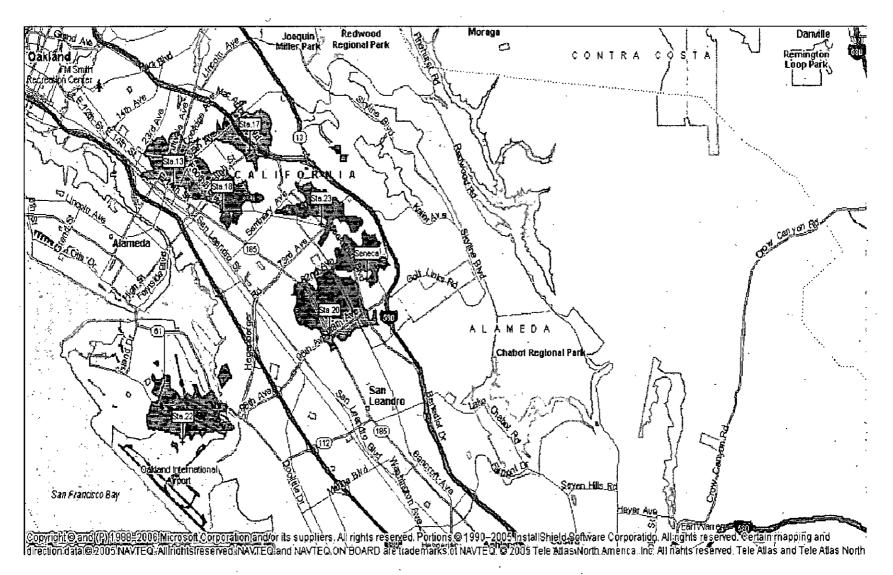
APL - 2.4 GHz



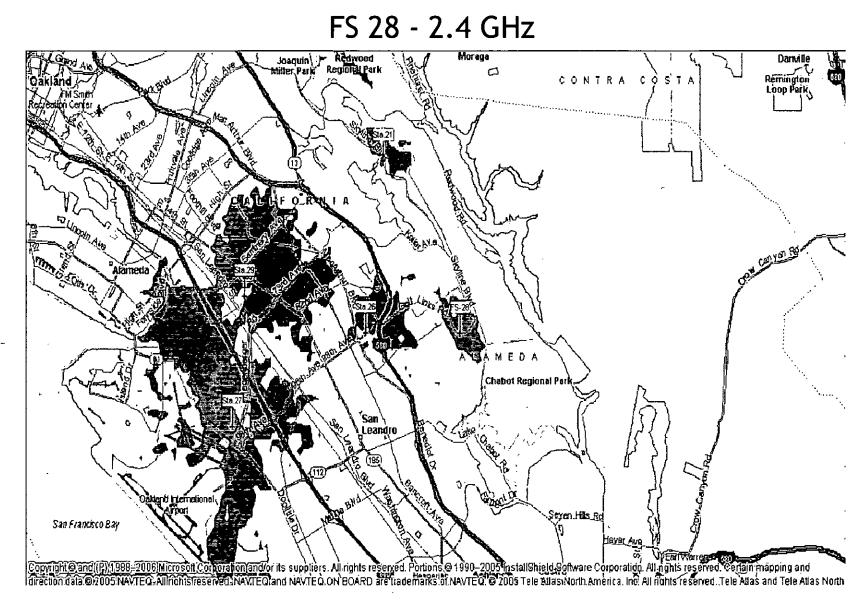
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Seneca - 2.4 GHz

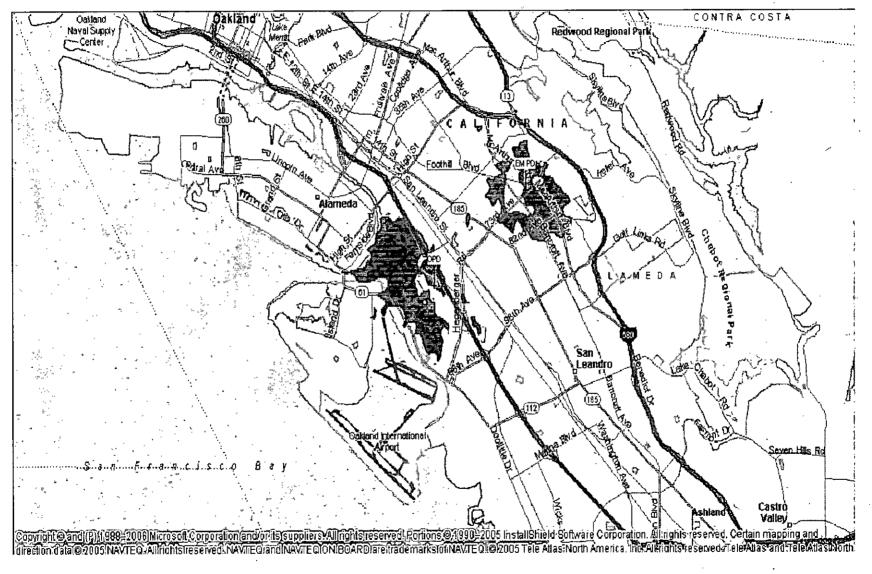


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OPD - 2.4 GHz



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Oakland Reference Architecture

Coverage Maps

700 MHz

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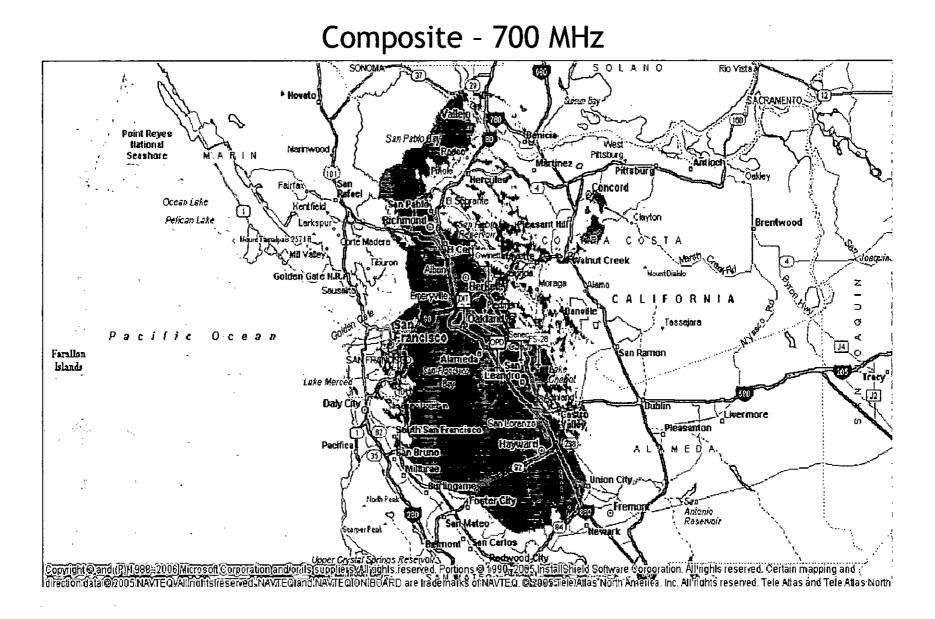
700 MHz Assumptions

- Maps are for informational purposes only.
- Do not assume a particular system design, other than frequency band.
- Maps do not account for subscriber density or multi channel access points.
- Maps are based on Talk Back Subscriber Unit to Base Station.
- All maps are based upon a reliability of approximately 95% Area Reliability.

Map Legend – 700 MHz

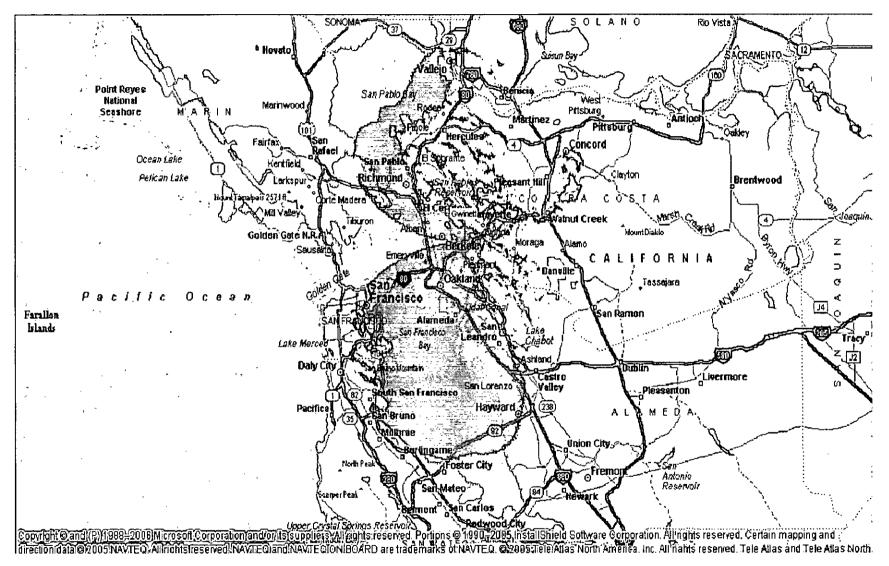
Mobile Device to Base Station = -95 dBm

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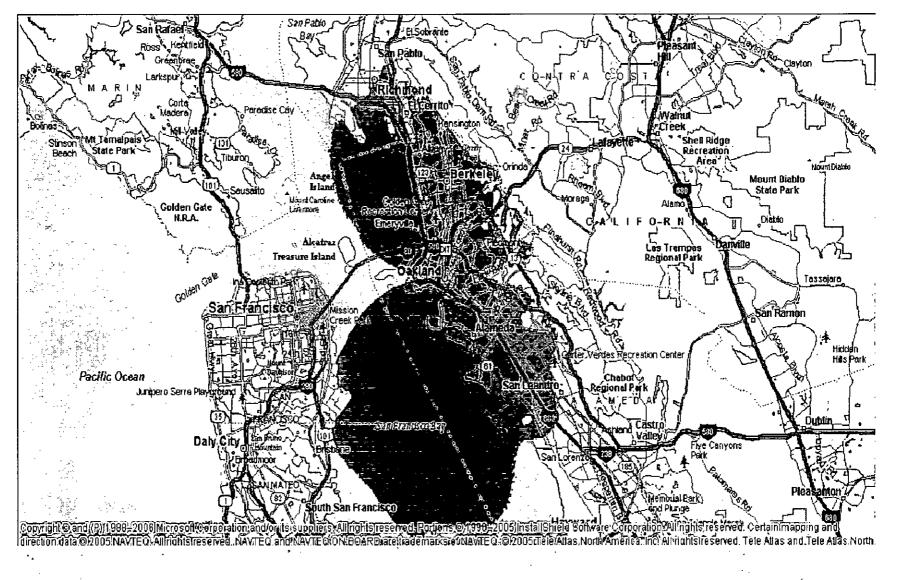
Gwinnett - 700 MHz



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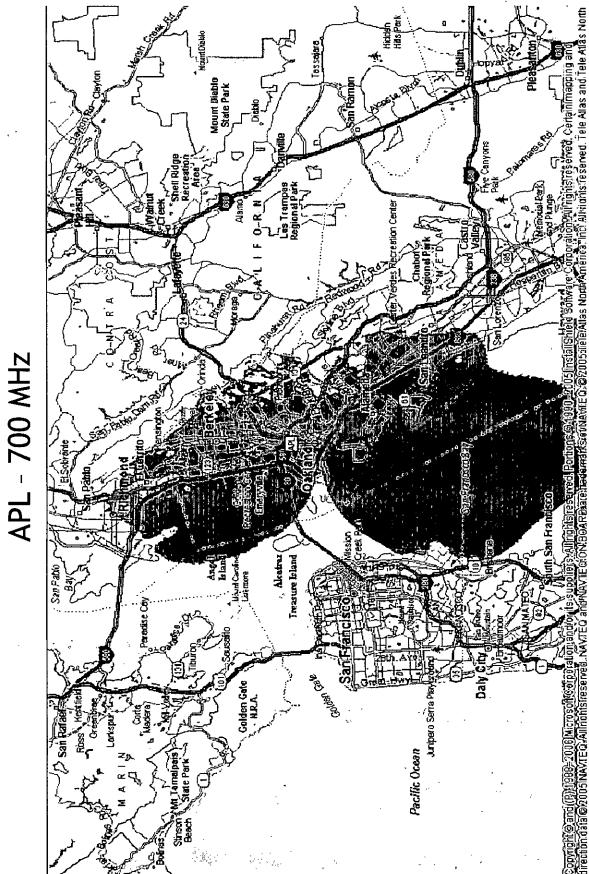
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DIT - 700 MHz



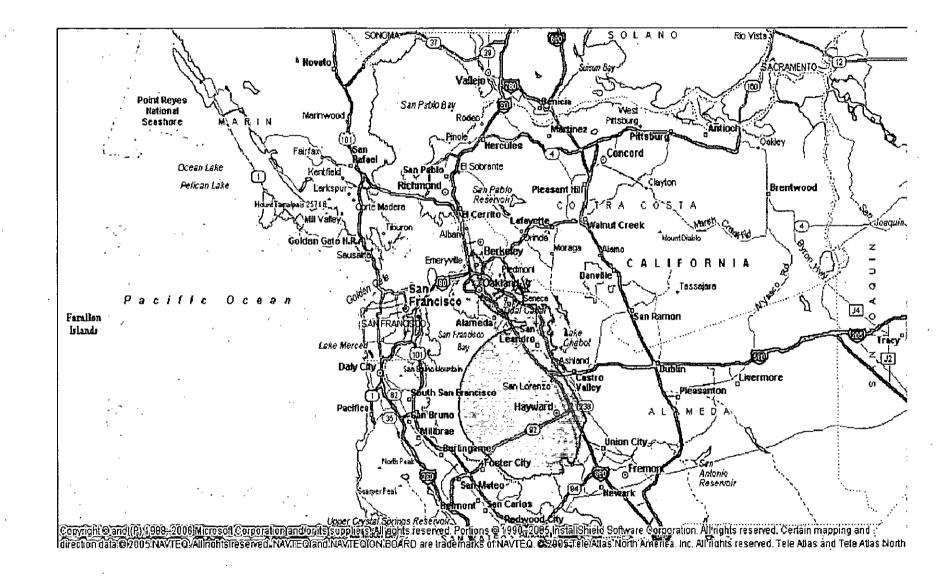
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Seneca - 700 MHz



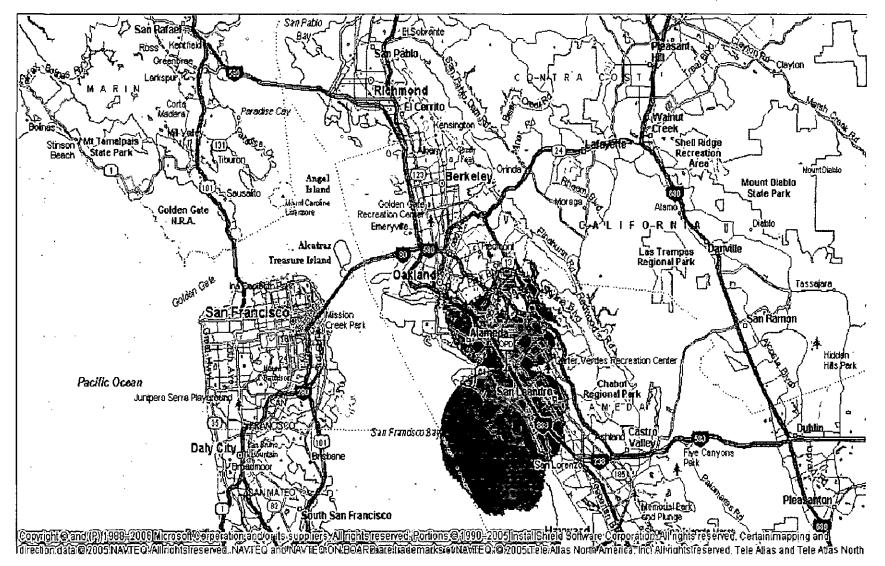
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FS 28 - 700 MHz



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OPD - 700 MHz



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10. Appendix C: Spreadsheets

	Year 1	Year 2	Year S	Year 4	Year S	Year 6	Year 7	Year S	Year 9	Year 10	Year 15	Year 20
Business Model Summary												
Operating Results												
Funding Source Backbone Segment (15 Mbps Base) Public Safety Fixed/Nomadic Segment Total	\$115,728 \$607,200 \$722,928	\$115,728 \$607,200 \$722,928	\$115,728 \$607,200 \$722,928	\$115,728 \$607,200 \$722,928	\$115,728 \$607,200 \$722,928	\$115,728 \$607,200 \$722,928	\$115,728 \$607,200 \$722,928	\$115,728 \$607,200 \$722,928	\$115,728 \$607,200 \$722,928	\$115,728 \$607,200 \$722,928	\$115,728 \$607,200 \$722,928	\$115,728 \$607,200 \$722,928
Operating Expense Backbone Segment (15 Mbps Base) Backbone Segment (100 Mbps Increment) Public Safety Fixed/Nomadic Segment Total	\$85,145 \$29,175 \$178,065 \$292,385	\$85,145 \$29,175 \$178,065 \$292,385	\$85,145 \$29,175 \$178,065 \$292,385	\$85,145 \$29,175 \$178,065 \$292,385	\$85,145 \$29,175 \$178,065 \$292,385	\$85,145 \$29,175 \$178,065 \$292,385	\$85,145 \$29,175 \$178,065 \$292,385	\$85,145 \$29,175 \$178,065 \$292,385	\$85,145 \$29,175 \$178,065 \$292,385	\$85,145 \$29,175 \$178,065 \$292,385	\$85,145 \$29,175 \$178,065 \$292,385	\$85,145 \$29,175 \$178,065 \$292,385
Operating Surplus/(Dericit) Backbone Segment (15 Mbps Base) Backbone Segment (100 Mbps Increment) Public Safety Fixed/Nomadic Segment Total	\$30,583 (\$29,175) \$429,135 \$430,543	\$30,583 (\$29,175) \$429,135 \$430,543	\$30,583 (\$29,175) \$429,135 \$430,543	\$30,583 (\$29,175) \$429,135 \$430,543	\$30,583 (\$29,175) \$429,135 \$430,543	\$30,583 (\$29,175) \$429,135 \$430,543	\$30,583 (529,175) \$429,135 \$430,543	\$30,583 (\$29,175) \$429,135 \$430,543	\$30,583 (529,175) \$429,135 \$430,543	\$30,583 (\$29,175) \$429,135 \$430,543	\$30,583 (\$29,175) \$429,135 \$430,543	\$30,583 (\$39,175) \$429,135 \$430,543
Capital Expense												
Backbone Segment (15 Mbps Base) Backbone Segment (100 Mbps Increment) Public Safety Fixed/Nomadic Segment Total	\$1,198,697 \$482,998 \$1,693,428 \$3,375,122	\$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0	\$0 \$0 \$0 \$0	\$0 \$0 50 \$0	\$0 \$0 \$0 \$0	\$0 \$0 <u>\$0</u> \$0	3 \$0 \$0 \$0 \$0 \$0	\$0 \$0 - \$0
Cash Flow Analysis												
Cumulative Backbone Segment (15 Mbps Base) Backbone Segment (100 Mbps Increment) Public Safety Fixed/Nomadic Segment Total	(\$1,168,113) (\$481,590) (\$1,264,293) (\$2,913,996)	(51,137,530) (\$480,182) (\$835,159) (\$2,452,871)	(\$1,106,947) (\$478,774) (\$406,024) (\$1,991,745)	(\$1,076,364) (\$477,366) \$23,111 (\$1,530,519)	(\$1,045,781) (\$475,958) \$452,245 (\$1,069,494)	(\$1,015,197) (\$474,551) \$881,380 (\$608,368)	(\$984,614) (\$473,143) \$1,310,515 (\$147,242)	(\$954,031) (\$471,735) <u>\$1,739,650</u> \$313,884	(\$923,448) (\$470,327) \$2,168,784 \$775,009	(\$892,865) (\$468,919) \$2,597,919 \$1,236,135	(\$739,949) (\$461,880) \$4,743,592 \$3,541,764	(\$587,033) (\$454,841) \$6,889,266 \$5,847,392
Net Present Value	(\$ 2,775.235)	(\$5,000,061)	(\$ 6,720,605)	(\$7,979,849)	(\$8,817,825)	(59,271,799)	(59,376,441)	(\$9,163.992)	(\$8,664,414)	(\$7,905,535)	(\$1,062,547)	\$9,100,705

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	Year 1	Year 2	Year 3	Year 4	Year 5	Year 5	Year 7	Year 8	Year 9	Year 10	Year 15	Year 20
Capital Equipment Replacement												
Accumulated Equipment												
Backbone Segment (15 Mbps Base)	\$557,274	\$557,274	\$557,274	\$557,274	\$557,274	\$557,274	\$557,274	\$557,274	\$557,274	\$557 274	\$557 274	\$557,274
Backbone Segment (100 Mbps Increment)	\$310,778	\$310,778	\$310,778	\$310,778	\$310,778	\$310,778	\$310,778	\$310,778	\$310,778	\$310,778	\$310,778	\$310,778
Public Safety Fixed/Nomadic Segment	\$797,280	\$797,280	\$797,280	\$797,280	\$797,280	\$797,280	\$797,280	\$797,280	\$797,280	\$797,260	\$797,280	\$797,280
Total	\$1,665,332	\$1,665,332	\$1,665,332	\$1,665,332	\$1,665,332	\$1,665,332	\$1,665,332	\$1,665,332	\$1,665,332	\$1,665,332	\$1,665,332	\$1,665,332
Accumulated replacement needs	\$166,533	\$333,066	\$499,600	\$666,133	\$832,666	\$999,199	\$1,165,732	\$1,332,266	\$1,498,799	\$1,665,332	\$2,497,998	\$3,330,664
Net Present Value	(\$2,775,235)	(\$5,000,061)	(\$6,720,605)	(\$7,979,849)	(\$8,817,825)	(\$9,271,799)	(\$9,376,441)	(\$9,163,992)	(\$8,664,414)	(\$7,905,535)	(\$1,062,547)	\$9,100,705
Nominal surplus/(deficit)	(\$2,941,768)	(\$5,333,127)	(\$7,220,205)	(\$8,645,982)	(\$9,650,491)	(\$10,270,998)	(\$10,542,174)	(\$10.496,258)	(\$10,163,213)	(\$9,570,867)	(\$3,560,545)	\$5,770,041

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	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 5	Year 5	Year 10	Year 15	Year 20
Cash Flow Analysis Detail												
Backbone Segment (15 Mbps Base)										· · ·		
Funding Source	\$115,728	\$115,728	\$115,728	\$115,728	\$115,728	\$115,728	\$115,728	\$115,728	\$115,728	\$115,728	\$115,728	\$115,728
Operating Expense Operating Surplus/(Deficit)	\$85,145 \$30,583	\$85,145 \$30,583	585,145 \$30,583	\$85,145 \$30,583								
Operating Supposition(Denot)	\$30,363	430,303	430,303	430,303	430,303	430,565	400,000	400,000	400,000	400,000	400,000	\$30,303
Capital Expense	\$1,198,697	\$0	- \$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total	(\$1,168,113)	\$30,583	\$30,583	\$30,583	530,583	\$30,583	\$30,583	\$30,583	\$30,583	\$30,583	\$30,583	\$30,583
Cumulative Cash Flow	(\$1,168,113)	(51,137,530)	(51 106,947)	(\$1,076,364)	(\$1,045,781)	(\$1,015,197)	(\$984,614)	(\$954,031)	(\$923,448)	(\$892,865)	(\$739,949)	(\$587,033)
Net Present Value	(\$1,112,489)	(51,084,749)	(51,058,330)	(\$1,033,169)	(\$1,009,207)	(\$986,385)	(\$964,650)	(\$943,950)	(\$924,236)	(\$905,461)	(\$824,173)	(\$760,482)
Backbone Segment (100 Mbps Incremen	t)											
Base Surplus/(Deficit)	\$30,583	\$30,583	\$30,583	\$30,583	\$30,583	\$30,583	\$30,583	\$30,583	\$30,583	\$30,583	\$30,583	\$30,583
Operating Expense	\$29,175	\$29,175	\$29,175	\$29,175	\$29,175	\$29,175	\$29,175	\$29,175	\$29,175	\$29,175	\$29,175	\$29,175
Operating Surplus/(Deficit)	\$1,408	\$1,408	\$1,408	\$1,408	\$1,408	\$1,408	\$1,408	\$1,408	\$1,408	\$1,408	\$1,408	\$1,408
Capital Expense	\$482,998	\$0	\$0	\$0	\$0	\$0	\$ 0	5 0	\$0	\$0	\$0	- \$0
Total	(\$481,590)	\$1,408	\$1,408	51,408	\$1,408	\$1,408	\$1,408	51,408	\$1,408	\$1,408	\$1,408	\$1,408
Cumulative Cash Flow	(\$481,590)	(\$480,182)	(\$478,774)	(\$477,366)	(\$475,958)	(5474,551)	(5473,143)	(\$471,735)	(\$470,327)	(\$468,919)	(\$461,880)	(\$454,841)
Net Present Value	(5458,657)	(\$457,380)	(\$456,164)	(\$455,006)	(5453,902)	(5452,852)	(\$451,851)	(\$450,898)	(\$449,991)	(\$449,127)	(\$445,385)	(\$442,453)
Public Safety Fixed/Nomadic Segment												
Funding Source	\$607,200	\$607,200	\$607,200	\$607,200	\$607,200	\$607,200	\$607,200	\$607,200	\$607,200	\$607,200	\$607,200	\$607,200
Operating Expense	\$178,065	\$178,065	\$178,065	\$178,065	\$178,065	\$178,065	\$178,065	\$178,065	\$178,065	\$178,065	\$178,065	\$178,065
Operating Surplus/(Deficit)	\$429,135	\$429,135	\$429,135	\$429,135	\$429,135	\$429,135	\$429,135	\$429,135	\$429,135	\$429,135	\$429,135	\$429,135
Capital Expense	\$1,693,428	\$0	\$0	\$0	\$0	\$0	<u>50</u>	\$0	\$0	~ \$ 0	· \$ 0	\$0_
Total	(\$1,264,293)	\$429,135	\$429,135	\$429,135	\$429,135	\$429,135	\$429,135	\$429,135	\$429,135	\$429,135	\$429,135	\$429,135
Cumulative Cash Flow	(\$1,264,293)	(\$835,159)	(5406,024)	\$23,111	\$452,245	\$881,380	\$1,310,515	\$1,739,650	\$2,168,784	\$2,597,919	\$4,743,592	\$6,889,266
Net Present Value	(\$1,204,089)	(\$814,851)	(5444,148)	(591,098)	\$245,140	\$565,367	\$870,345	\$1,160,800	\$1,437,424	\$1,700,876	\$2,841,483	\$3,735,178

Tellus Venture Associates

	Year 1	Year 2	Year 3	Year 4	Year s	Year 6	Year 7	Year s	Year 9	Year 10	Year 15	Year 20
Operating Results Detail												
Backbone Segment (15 Mbps Base)												
Funding Source												
Commercial carrier cost offsets	\$115,728	\$115,728	\$115.728	\$115,728	\$115,726	\$115,728	8115,728	\$115,728	\$115,728	\$115,728	\$115,728	\$115,728
Total –	\$115,728	\$115,728	\$115,728	\$115,728	\$115,728	\$115,728	\$115,728	\$115,728	\$115,728	\$115,728	\$115,728	\$115,728
Operating Expense			•									
Equipment maintenance	\$11,385	\$11,385	\$11,385	\$11.385	\$11,385	\$11.385	\$11,385	\$11,385	\$11,385	\$11,385	\$11,385	* ** 005
Site support & power	\$3,680	\$3,680	\$3,680	\$3,680	\$3,680	\$3,680	\$3,680	\$3,680	\$3,680	\$11,365 \$3,680	\$3,680	\$11,385
NOC operations	\$11,385	\$11,385	\$11,385	\$11,385	\$11,385	\$11.385	\$11,385	\$11,385	\$11,385	\$11,385	\$11,385	\$3,680
IT support services	\$3,795	\$3,795	\$3,795	\$3,795	\$3,795	\$3,795	\$3,795	\$3,795	\$3,795	\$3,795	\$3,795	\$11,385
Engineering support	\$1.518	\$1,518	\$1,518	\$1,518	\$1,518	\$1,518	\$1,518	\$1,518	\$1,518	\$1,518	\$1,518	\$3,795
Legal & regulatory	\$759	\$759	\$759	\$759	\$759	\$759	\$759	\$759	\$759	\$759	\$759	\$1,518 \$759
General & administrative	\$759	\$759	\$759	\$759	\$759	\$759	\$759	\$759	\$759	\$759	\$759 \$759	\$759 5759
Equipment replacement	\$47,264	\$47,264	\$47,264	\$47.264	\$47.264	\$47,264	\$47.264	\$47.264	\$47,264	\$47.264	\$47,264	\$47,264
Software upgrades 8 licensing	\$4,600	\$4,600	\$4,600	\$4.600	\$4,600	\$4,600	\$4,600	\$4,600	\$4,600	\$4.600	\$4,600	\$4,600
Total	\$85,145	\$85,145	\$85,145	\$85,145	\$85,145	\$85,145	\$85,145	585,145	\$85,145	\$85,145	\$85,145	\$85,145
Operating Surplus/(Deficit)	\$30,583	\$30,583	\$30,583	\$30,583	\$30,583	\$30,583	\$30,583	\$30,583	\$30,583	\$30,583	\$30,583	\$30,583
Backbone Segment (100 Mbps Increm	ont!											
Operating Expense	enų											
Equipment maintenance	\$863	\$863	\$863	\$863	\$863							
Site support & power	\$575	\$575	\$575	\$575	\$575	\$863 \$575	\$863 \$575	\$863	\$863	\$663	\$863	\$863
NOC operations	5863	\$863	\$863	\$863	\$863	\$863	\$575 \$863	\$575 \$863	\$575	\$575	\$575	\$575
IT support services	\$288	\$286	\$288	\$288	\$288	\$288	\$288	\$288	\$663 \$288	\$863	\$863	\$863
Engineering support	\$115	\$115	\$115	\$115	\$115	\$115	\$200 \$115	⇒200 \$115	\$200 \$115	\$288	\$288	5288
Legal & regulatory	\$58	\$58	\$58	\$58	\$58	\$58	\$58	\$115	\$115	\$115 \$58	\$115 \$58	\$115
General & administrative	\$58	\$58	\$58	\$58	\$58	\$58	\$58	\$58	\$58 \$58	۵۵۵ \$58	مەد \$58	\$58 \$58
Equipment replacement	\$26,358	\$26,358	\$26,358	\$26,358	\$26.358	\$26,358	\$26,358	\$26,358	\$26,358	\$26.358	\$38 \$26.358	++-
Software upgrades & licensing	\$0	\$0	\$0	\$0	\$20,000	\$0	\$20,350	\$20,358 \$0	\$20,356 \$0	\$20,350	≥20,338 \$0	\$26,358
Total	\$29,175	\$29,175	\$29,175	\$29,175	\$29,175	\$29,175	\$29,175	\$29,175	\$29,175	\$29,175	\$29,175	\$0
Operating Surplus/(Deficit)	\$1,406	\$1,408	\$1,408	\$1,408	\$1,408	\$1,408	\$1,408	\$1,408	\$1,408	\$1,408	\$1,408	\$1,408

Tellus Venture Associates

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	Year 1	Year 2	Year 3	Year 4	Year 8	Year 6	Year 7	Year 8	Year 9	Year 10	Year 15	Year 20
Public Safety Fixed/Nomadic Segment												
Funding Source												
Commercial carrier cost offsets	\$607,200	\$607,200	\$607,200	\$607,200	\$607,200	\$607,200	\$607,200	\$607,200	\$607,200	\$607,200	\$607,200	\$607,200
Total	5607,200	\$607,200	\$607,200 .	\$607,200	\$607,200	\$607,200	\$607,200	\$607,200	\$607,200	\$607,200	\$607,200	\$607,200
Operating Expense												
Equipment maintenance	\$33,810	\$33,810	\$33,810	\$33,810	\$33,810	\$33,810	\$33,810	\$33,810	\$33,810	\$33,810	\$33,810	\$33,810
Site support & power	\$22,540	\$22,540	\$22,540	\$22,540	\$22,540	\$22,540	\$22,540	\$22,540	\$22,540	\$22,540	\$22,540	\$22,540
NOC operations	\$33,810	\$33,810	\$33,810	\$33,810	533,810	533,810	\$33,810	\$33,810	\$33,810	\$33,810	\$33,810	\$33,810
IT support services	\$11,270	\$11,270	\$11,270	\$11,270	\$11,270	511,270	\$11,270	\$11,270	\$11,270	\$11,270	\$11,270	\$11,270
Engineering support	\$4,508	54,508	\$4,508	\$4,508	\$4,508	\$4,508	\$4,508	\$4,508	\$4,508	\$4,508	\$4,508	\$4,508
Legal & regulatory	\$2,254	\$2,254	\$2,254	\$2,254	\$2,254	\$2,254	\$2,254	\$2,254	\$2,254	\$2,254	\$2,254	\$2,254
General & administrative	\$2,254	\$2,254	\$2,254	\$2,254	\$2,254	\$2,254	\$2,254	\$2,254	\$2,254	\$2,254	\$2,254	\$2,254
Equipment replacement	\$67,619	\$67,619	\$67,619	\$67,619	\$67,619	\$67,619	\$67,619	\$67,619	\$67,619	\$67,619	\$67,619	\$67,619
Total	\$178,065	\$178,065	\$178,065	\$178,065	\$178,065	\$178,065	5178,065	5178,065	\$178,065	\$178,065	\$178,065	\$178,065
Operating Surplus/(Deficit)	\$429,135	\$429,135	\$429,135	\$429,135	\$429,135	\$429,135	\$429,135	\$429,135	\$429,135	\$429,135	\$429,135	\$429,135

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General Government Alternatives	Year 1	Year 2	Year 3	Year 4	Year S	Year 6	Year 7	Year S	Year S	Year 10	Year 1S	Year 20
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Funding Source									****			
General Government Fixed Segment	\$624,019	\$624,019	\$624,019	\$624,019	\$624,019 \$4,746,866	\$624,019 \$4,746,866	\$624,019 \$4,746,866	\$624,019 \$4,746,866	\$624,019 \$4,746,866	\$624,019 \$4,746,866	\$624,019 \$4,746,866	\$624,019 \$4,746,866
General Government Normadic Segment Total	\$4,746,866 \$5,370,885	\$4,746,866 \$5,370,885	\$4,746,866 \$5,370,885	\$4,746,866 \$5,370,885	\$5,370,885	\$5,370,885	55,370,885	\$5,370,885	\$5,370,885	\$5,370,885	\$5,370,885	\$5,370,885
10 tai	\$3,370,883	\$3,370,883	\$0,010,000	\$0,510,005	\$0,070,000	\$0,070,000	55,576,665	\$0,010,000	\$0,010,000	\$0,010,000	\$0,010,000	\$0,010,000
Operating Expense												
General Government Fixed Segment	\$222,967	\$222,967	\$222,967	\$222,967	\$222,967	\$222,967	\$222,967	\$222,967	\$222,957	\$222,967	\$222,967	\$222,967
General Government Nomadic Segment	\$84,529	\$84,529	\$84,529	\$84,529	\$84,529	\$84,529	\$84,529	\$84,529	584,529	\$84,529	\$84,529	\$84,529
Total	\$307,496	\$307,496	\$307,496	\$307,496	\$307,496	\$307,496	\$307,496	\$307,496	\$307,496	\$307,496	\$307,496	\$307,496
Operating Surplus/(Deficit)												
General Government Fixed Segment	\$401.052	\$401,052	\$401,052	\$401,052	\$401,052	\$401,052	5401,052	\$401,052	\$401,052	\$401,052	\$401,052	\$401,052
General Government Nomadic Segment	\$4,662,337	\$4,662,337	\$4,662,337	\$4,662,337	\$4,662,337	\$4,662,337	\$4,662,337	\$4,662,337	\$4,662,337	\$4,662,337	\$4,662,337	\$4,662,337
Total	\$5,063,389	\$5,063,389	\$5,063,389	\$5,063,389	\$5,063,389	\$5,063,389	\$5,063,389	\$5,063,389	55,063,389	\$5,063,389	\$5,063,389	\$5,063,389
Capital Expense												
General Government Fixed Segment	\$1,966,369	\$0	\$0	\$0	S 0	\$0	\$0	\$0	\$0	ຣວ໌	\$0	\$0
General Government Nomadic Segment	5751,113	\$0	\$0	\$0	SO	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total	\$2,717,482	\$0	50	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
					•							
Cash Flow Analysis										** ** ***		
General Government Fixed Segment	(\$1,565,316)	(51,164,264)		(\$362,160)	\$38,893 \$22,560,570	\$439,945 \$27,222,907	\$840,997 \$31,885,244	\$1,242,050	\$1,643,102	\$2,044,154 \$45,872,254	\$4,049,416 \$69,183,938	\$6,054,677 \$92,495,621
General Government Normadic Segment	\$3,911,223 \$2,345,907	\$8,573,560 \$7,409,296	\$13,235,897 \$12,472,685	\$17,898,234 517,536,074	\$22,560,570	\$27,662,852	\$31,865,244 \$32,726,241	\$36,547,581 \$37,789,630	\$41,209,917 \$42,853,019	\$47,916,408	\$73,233,353	\$98,550,208
Total	\$2,345,907	\$7,409,290	\$12,472,005	517,550,074	\$22,388, 4 03	\$27,002,032	3 52,720,241	\$51,103,050	\$42,000,013	947,310,400	<i>\$</i> 73,233,333	\$30,000,200
Net present value	\$2,234,197	\$8,954,647	\$19,729,022	\$34,155,993	\$51,863,264	\$72,505,710	\$95,763,639	\$121,341,148	\$148,964,586	\$178,381,104	\$344,801,636	\$527,920,340
Cash Flow Analysis Detail					•							
General Government Fixed Segment												
Funding Source	\$624,019	5624,019	\$624,019	\$624,019	\$624,019	\$624,019	\$624,019	\$624,019	\$624,019	\$624,019	\$624,019	\$624,019
Operating Expense	\$222,967	\$223,967	\$222,967	\$222,967	\$222,967	\$222,967	\$222,967	\$222,967	\$222,967	5222,967	\$222,967	\$222,967
Operating Surplus/(Deficit)	\$401,052	\$401,052	\$401,052	\$401,052	\$401,052	\$401,052	\$401,052	\$401,052	\$401,052	\$401,052	\$401,052	\$401,052
Capital Expense	\$1,966,369	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total	(\$1,565,316)	\$401,052	5401,052	\$401,052	\$401,052	\$401,052	\$401,052	\$401,052	\$401,052	\$401,052	\$401,052	\$401,052
	,											
Cumulative Cash Flow	(51,565,316)	(\$1.164,364)		(\$362,160)	\$38,893	\$439,945	\$840,997	\$1,242,050	\$1,643,102	\$2,044,154	\$4,049,416	\$6,054,677
Net Present Value	(51,490,778)	(\$1,127,011)	(\$780,567)	(\$450,621)	(\$136,386)	5162,886	\$447,906	\$719,354	\$977,876	\$1,224,087	\$2,290,054	\$3,125,266
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Tellus Venture Associates

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	Year 1	Year 2	Year S	Year 4	Year S	Year 6	Year 7	Year S	Year 9	Year 10	Year 15	Year 20
General Government Nomadic Segment Funding Source	\$4.746.866	\$4,746,866	\$4.746.866	\$4,746,866	54,746,866	\$4,746,866	\$4,746,866	\$4,746,866	54.746.866	\$4,746,866	54,746,866	\$4,746,866
Operating Expense	\$84,529	\$84,529	\$84,529	\$84,529	\$84,529	\$84,529	\$84,529	\$84,529	584,529	584,529	\$84,529	\$84,529
Operating Surplus/(Deficit)	\$4,662,337	\$4,662,337	\$4,662,337	54,662,337	\$4,662,337	\$4,662,337	\$4,662,337	\$4,662,337	\$4,662,337	\$4,662,337	\$4,662,337	\$4,662,337
Capital Expense	\$751,113	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$ 0.	\$0	^ \$ 0
Total	\$3,911,223	54,662,337	\$4,662,337	\$4,662,337	\$4,662,337	\$4,662,337	\$4,662,337	\$4,662,337	\$4,662,337	\$4,662,337	-54,662,337	\$4,662,337
Cumulative Cash Flow	\$3,911,223	\$8,573,560	\$13,235,897	\$17,898,234	\$22,560,570	\$27,222,907	\$31,885,244	\$36,547,581	\$41,209,917	\$45,872,254	\$69,183,938	\$92,495,621
Net Present Value	\$3,724,975	\$7,953,852	\$11,981,353	\$15,817,069	\$19,470,132	\$22,949,240	\$26,262,675	\$29,418,328	\$32,423,712	\$35,285,982	\$47,678,115	\$57,387,675
Operating Results Detail												
General Government Fixed Segment												
Funding Source												
Commercial carrier cost offsets	\$88,981	\$88,981	\$88,981	\$88,981	588,981	\$88,981	\$88 981	\$88,981	\$88,981	588,981	\$88,981	\$88,981
Market value of new facilities	\$230,124	\$230,124	5230,124	\$230,124	\$230,124	S230,124	\$230,124	\$230,124	\$230,124	\$230,124	\$230,124	\$230,124
Performance measure & efficiency gains	\$304,914	\$304,914	5304,914	\$304,914	\$304,914	\$304,914	\$304,914	\$304,914	\$304,914	\$304,914	\$304,914	\$304,914
Total	\$624,019	\$624,019	\$624,019	\$624,019	\$624,019	\$624,019	\$624,019	\$624,019	\$624,019	\$624,019	\$624,019	\$624,019
Operating Expense												
Equipment maintenance	\$51,923	\$51,923	\$51,923	\$51,923	\$51,923	\$51,923	\$51,923	\$51,923	\$51,923	\$51,923	\$51,923	\$51,923
Site support & power	\$34,615	\$34,615	\$34,615	\$34,615	\$34,615	\$34,615	\$34,615	\$34,615	\$34,615	\$34,615	\$34,615	\$34,615
NOC operations	\$51,923	\$51,933	\$51,923	\$51,923	\$51,923	\$51,923	\$51,923	\$51,923	\$51,923	\$51,923	\$51,923	\$51,923
IT support services	\$17,308	\$17,308	\$17,308	\$17,308	\$17,308	\$17,308	\$17,308	\$17,308	\$17,308	\$17,308	\$17,308	\$17,308
Engineering support	\$6,923	\$6,923	\$6,923	\$6,923	\$6,933	\$6,923	\$6,923	\$6,923	\$6,923	\$6,923	\$6,923	\$6,923
Legal & regulatory	\$3,462	\$3,462	\$3,462	\$3,462	\$3,462	\$3,462	\$3,462	\$3,462	\$3,462	\$3,462	\$3,462	\$3,462
General & administrative	\$3,462	\$3,462	\$3,462	\$3,462	\$3,462	\$3,462	\$3,462	\$3,462	\$3,462	\$3,462	\$3,462	\$3,462
Equipment replacement	\$53,353	\$53,353	\$53,353	\$53,353	\$53,353	\$53,353	\$53,353	\$53,353	\$53,353	\$53,353	\$53,353	\$53,353
Total	\$222,967	5222,967	\$222,967	\$222,967	\$222,967	\$222,967	\$222,967	\$222,967	\$222,967	\$222,967	\$222,967	\$222,967
Operating Surplus/(Deficit)	\$401,052	\$401,052	\$401,052	\$401,052	\$401,052	\$401,052	\$401,052	\$401,052	\$401,052	\$401,052	\$401,052	\$401,052

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	Year 1	Year 2	Year 5	Year 4	Year 5	Year 6	Year 7	Year 5	Year 9	Year 10	Year 15	Year 20
General Government Nomadic Segment												
Funding Source												
Market value at new facilities	\$53,400	\$53,400	\$53,400	\$53,400	\$53,400	\$53,400	\$53,400	\$53,400	\$53,400	\$53,400	\$53,400	\$53,400
Tax revenue enhancement	\$2,504,252	\$2,504,252	\$2,504,252	\$2,504,252	\$2,504,252	\$2,504,252	\$2,504,252	\$2,504,252	\$2,504,252	\$2,504,252	\$2,504,252	\$2,504,252
Performance measure & efficiency gains	\$2,189,214	\$2,189,214	\$2,189,214	\$2,189,214	\$2,189,214	\$2,189,214	\$2,189,214	\$2,189,214	\$2,189,214	\$2,189,214	\$2,189,214	\$2,189,214
Total	\$4,746,866	\$4,746,866	\$4,746,866	\$4,746,866	\$4,746,866	\$4,746,866	\$4,746,866	\$4,746,866	\$4,746,866	\$4,746,866	\$4,746,866	\$4,746,866
Operating Expense												
Equipment maintenance	\$14,835	\$14,835	\$14,835	\$14,835	\$14,835	\$14,835	\$14,835	514,835	\$14,835	\$14,835	\$14 835	\$14,835
Site support & power	\$9,890	\$9,890	\$9,890	\$9,890	\$9,890	\$9,890	\$9,890	\$9,890	\$9,890	\$9,890	\$9,890	\$9,890
NOC operations	\$14,835	\$14,835	\$14,835	S14,835	\$14,835	\$14,835	\$14,835	\$14,835	\$14,835	\$14,835	\$14,635	\$14,835
IT support services	\$4,945	\$4,945	\$4,945	\$4,945	\$4,945	\$4,945	\$4,945	\$4,945	\$4,945	\$4,945	\$4,945	\$4,945
Engineering support	51,978	\$1,978	\$1,978	\$1,978	\$1,978	\$1,978	\$1,978	\$1,978	\$1,978	\$1,978	\$1,978	\$1,978
Legal & regulatory	\$989	\$989	\$989	\$969	\$989	\$989	\$989	\$989	\$989	\$989	5989	\$989
General & administrative	\$989	\$989	\$989	\$989	\$989	\$989	\$989	5989	\$989	\$989	\$989	\$989
Equipment reptacement	\$36,068	\$36,068	\$36,068	\$36,068	\$36,068	\$36,068	\$36,068	\$36,068	\$36,068	\$36,068	\$36,068	\$36,068
	\$84,529	\$84,529	\$84,529	\$84,529	\$84,529	\$84,529	\$84,529	\$84,529	\$84,529	\$84,529	\$84,529	\$84,529
Operating Surplus/(Deficit)	\$4,662,337	\$4,662,337	\$4,662,337	\$4,662,337	\$4,662,337	\$4,662,337	\$4,662,337	54,662,337	\$4,662,337	\$4,662,337	\$4,662,337	\$4,662,337

Tellus Venture Associates

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	Year 1	Year 2	Year 3	Year 4	Year S	Year S	Year 7	Year S	Year 9	Year 10	Year 1\$	Year 20
BayRICS 700 MHz Scenarios												
Total network operating surplus/defiicit Operating Expense	\$430,543 \$55,032											
Operating Surplus/(Deficit)	\$375,511	\$375,511	\$375,511	\$375,511	\$375,511	\$375,511	\$375,511	\$375,511	\$375,511	\$375,511	\$375,511	\$375,511
Total network capex	\$3,375,122	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
BayRICS 700 MHz scenario capex	\$934,275	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total capex	\$4,309,397	50	\$0	\$0	\$0	\$0	\$0	50	\$ 0	\$0	\$0	\$0
Total	(\$3,933,886)	\$375,511	\$375,511	\$375,511	\$375,511	\$375,511	\$375,511	\$375,511	\$375,511	\$375,511	\$375,511	\$375,511
Cumulative Cash Flow	(\$3,933,886)	(\$3,558,376)	(\$3,182,865)	(\$2,807,354)	(\$2,431,844)	(\$2,056,333)	(51,660,822)	(\$1,305,311)	(\$929,801)	(\$554,290)	\$1,323,264	53,200,817
Net Present Value	(\$3,746,559)	(\$3,405,959)	(\$3,081,579)	(\$2,772,645)	(\$2,478,423)	(\$2,198,211)	(51,931,343)	(51,677,182)	(51,435,125)	(51,204,594)	(5206,515)	\$575,506

Business & Entrepreneurship Scenario

Business and Entrepreneurship Opportu	nities											
Wholesale service income	\$108,000	\$108,000	\$108,000	5108,000	\$108,000	\$108,000	\$108,000	\$108,000	\$108,000	\$108,000	\$108,000	\$108,000
Operating Expense	\$94,209	\$94,209	\$94,209	594,209	\$94,209	\$94,209	\$94,209	\$94,209	\$94,209	\$94,209	\$94,209	\$94,209
Operating Surplus/(Deficit)	\$13,791	\$13,791	\$13,791	\$13,791	\$13,791	\$13,791	\$13,791	\$13,791	\$13,791	\$13,791	\$13,791	\$13,791
BEO capex	\$129,164	\$0	\$0	\$0	\$0	\$ 0	\$0	\$0	\$0	\$0	\$0	\$0
Total Cumulative Cash Flow Net Present Value	(\$116,373) (5115,373) (\$109,879)	513,791 (5101,582) (\$ 97,371)	\$13,791 (\$87,792) (\$85,458)	\$13,791 (\$74,001) (\$74,112)	\$13,791 (\$60,210) (\$63,307)	\$13,791 (\$46.420) (\$53,016)	\$13,791 (532,629) (543,215)	\$13,791 (\$18,838) (\$33,881)	\$13,791 (\$5,048) (\$24,991)	\$13,791 \$8,743 {\$16,525}	\$13,791 \$77,696 \$20,129	\$13,791 \$146,650 \$48,849

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	Year 1	Year 2	Year S	Year 4	Year S	Year S	Year 7	Year \$	Year 9	Year 10	Year 1\$	Year 20
Public Access Scenarios												
Drinking Fountain Model 1			,									
Discounted Market Value of New Facilities E	\$752,400	\$752,400	\$752,400	\$752,400	\$752,400	\$752,400	5752,400	\$752,400	\$752,400	\$752,400	\$752,400	\$752,400
Operating Expense	\$788,059	\$788,059	\$788,059	\$788,059	\$788,059	\$788,059	5788,059	\$788,059	\$788,059	\$788,059	\$788,059	\$788,059
Operating Surplus/(Deficit)	(\$35,659)	(\$35,669)	(\$35.659)	(\$35,659)	(\$35,659)	(\$35,659)	(\$35,659)	(\$35,659)	(\$35,659)	(\$35,659)	(\$35,659)	(\$35,659)
DFM capex	\$593,193	\$790,924	\$593,193	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total	(\$628,852)	(\$826,583)	(\$628,852)	(\$35,659)	(\$35,659)	(\$35,659)	(\$35,659)	(\$35,659)	(\$35,659)	(\$35,659)	(\$35,659)	(\$35,659)
Cumulative Cash Flow	(\$628,852)	(\$1,455,435)	(\$2,084,287)	(\$2,119,946)	(\$2,155,605)	(\$2,191,264)	(52,226,923)	(52,262,581)	(\$2,298,240)	(\$2,333,899)	(\$2,512,194)	(52,690,488)
Net Present Value	(\$598.907)	(\$1,348,642)	(\$1,891,868)	(\$1,921,205)	(\$1,949,144)	(51,975,753)	(\$2,001,095)	(\$2,025,231)	(\$2,048,217)	(52,070,108)	(\$2,164,887)	(\$2,239,148)
Drinking Fountain Model 2												
Discounted Market Value of New Facilities E	\$752,400	\$752,400	\$752,400	\$752,400	\$752,400	\$752,400	\$752,400	\$752,400	\$752,400	\$752,400	\$752,400	\$752,400
Operating Expense	\$788,059	\$788,059	\$788,059	\$788,059	\$788,059	\$788,059	\$788,059	\$788,059	\$788,059	\$788,059	\$788,059	\$788,059
Operating Surplus/(Deficit)	(535,659)	(\$35,659)	(\$35,659)	(\$35,659)	(\$35,659)	(\$35,659)	(\$35,659)	(\$35,659)	(\$35,659)	(535,659)	(\$35,659)	(\$35,659)
DFM capex	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total Cumulative Cash Flow	(535,659) (535,659)	(\$35,659) (571,318)	(\$35,659) (\$106,977)	(\$35,659) (5142.635)	(\$35,659) (\$178,294)	(\$35,659) (\$213,953)	(\$35,659) (\$249,612)	(\$35,659) (\$ 285,271)	(\$35,659) (\$320,930)	(\$35,659) (\$ 356,589)	(\$35,659) (\$534,883)	(\$35.659) (\$713,177)
Net Present Value	(\$33,961)	(\$66,304)	(\$97,108)	(\$126.445)	(\$154,384)	(5180,993)	(\$206,336)	(\$230,471)	(\$253,457)	(\$275,348)	(\$370,127)	(\$444,388)

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Expense Summary

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Capital Expense Core Segments Backbone Segment (15 Mbps Base) Backbone Segment (100 Mbps Increment) 4.9 GHz Public Safety Fixed/Nomadic Segment	Unit s 66 41 196	Units Cost \$613,267 \$367,685 \$1,175,988	instaliation \$157,680 \$0 5282,240	Licensing \$74,400 \$0 \$235,200	0	Tower Cost \$77,438 \$0 \$0	instaltation \$31,500 \$0 \$0	Network \$208,713 590,713 \$0	Installation \$35,700 \$24,600 \$0	Total 51,198,697 \$462,998 \$1,693,428
Scenarlos & alternatives General Government Fixed Segment General Government Nomadic Segment BayRICS 700 MHz Scenario Business and Entrepreneurship Opportunities Drinking Fountain Model Public Access Totat	301 B6 32 <u>647</u> 1,375	5682,294 \$627,273 \$885,000 583,084 \$927,130 \$5,361,731	5435,600 \$123,640 \$1e,000 \$46,080 \$931,680 \$1,995,120	\$190,800 \$0 \$14,400 \$0 \$514,800	0 20	\$245,588 \$0 \$0 \$0 \$0 \$44,250 \$367,375	\$99,900 \$0 \$0 \$18,000 \$149,400	\$345,\$88 \$0 \$13,275 \$0 \$44,250 \$602,538	\$66,600 \$0 \$3,600 \$0 \$12,000 \$142,500	\$751,113 \$934,275 \$129,164
Operating Expense Core Segments Backbone Segment (15 Mbps Base) Backbone Segment (100 Mbps Increment) 4.9 GHz Public Safety Fixed/Nomadic Segment	Annual \$85 145 \$29,175 \$178,065									
Scenarios & atternatives General Government Fixed Segment General Government Nomadic Segment BayRICS 700 MHz Scenario Business and Entrepreneurship Opportunities Drinking Fountain Model Public Access Totat	\$222,967 \$64,529 \$55,032 \$94,209 \$788,059 \$1,537,161	•								

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DITAPDITGwDITSeeDITFSDITEdDITEdDITStaAPLStaAPLStaAPLStaAPLStaAPLStaAPLStaGwinettStaGwinettStaGwinettStaGwinettStaGwinettStaGwinettStaSenecaStaSenecaStaStenecaSta	winett eneca 5-28 dgewater astmont PD 5-1/EOC atton 2 atton 2 atton 3	Bandwidth 106 106 108 108 108	Units	1 t 1 1	Units Cost \$14,642 \$14,642 \$14,642 \$14,642 \$14,642	Installation \$3,000 \$3,000 \$3,000	Licensing \$2,000 \$2,000 \$2,000	Towers	2 2	\$3,000 \$3,000	installation \$1,500 \$1,500	\$1,500 \$1,500	Installation \$500 \$500	Total \$26,142 \$26,142
DIT.GwDIT.SeeDIT.FSDIT.EdDIT.EdDIT.EdDIT.EdDIT.StaAPLStaAPLStaAPLStaAPLStaAPLStaAPLStaAPLStaGwinettStaGwinettStaGwinettStaGwinettStaGwinettStaSenecaStaSenecaStaSenecaSta	winett eneca 5-28 dgewater astmont PD 5-1/EOC atton 2 atton 2 atton 3	106 108 108 108 108		t 1	\$14,642 \$14,642	\$3,000 \$3,000	\$2,000		2	\$3,000	\$1,500			
DIT: See DIT: FS DIT: Edd DIT: Edd DIT: Edd DIT: Edd DIT: Edd DIT: Edd DIT: Edd DIT: Siz APL Sta APL Sta APL Sta APL Sta APL Sta APL Sta Gwinett Sta Gwinett Sta Gwinett Sta Gwinett Sta Gwinett Sta Gwinett Sta Seneca Sta Seneca Sta	eneca 5-28 Igewater astmont PD 5-1/EOC ation 2 iation 3	108 108 108 7 108		1	\$14,642	\$3,000						\$1,500	\$500	\$26,142
DIT.FS.DIT.EdDIT.EaDIT.FS.DIT.FS.APLStaAPLStaAPLStaAPLStaAPLStaAPLStaGwinettStaGwinettStaGwinettStaGwinettStaGwinettStaGwinettStaGwinettStaSenecaStaSenecaStaSenecaStaSenecaSta	S-28 dgewater astmont PD S-1/EOC ation 2 ation 3	108 108 - 108												
DIT.EdDIT.EaDIT.FSAPLStaAPLStaAPLStaAPLStaAPLStaAPLStaAPLStaGwinettStaGwinettStaGwinettStaGwinettStaGwinettStaGwinettStaGwinettStaSenecaStaSenecaStaSenecaStaSenecaSta	dgewater astmont PD 5-1/EOC ation 2 ation 3	108 - 108		1	¢14 642				2	\$3,000	\$1,500	\$1,500	\$500	\$26,142
DIT.EarDIT.FSDIT.FSAPLStaAPLStaAPLStaAPLStaAPLStaAPLStaGwinettStaGwinettStaGwinettStaGwinettStaGwinettStaGwinettStaGwinettStaGwinettStaSenecaStaSenecaStaSenecaSta	astmont PD 5-1/EOC ation 2 ation 3	- 108				\$3,000	\$2,000		2	\$3,000	\$1,500	\$1,500	\$500	\$26,142
DIT.FSAPLStaAPLStaAPLStaAPLStaAPLStaAPLStaAPLStaAPLStaGwinettStaGwinettStaGwinettStaGwinettStaGwinettStaGwinettStaSenecaStaSenecaStaSenecaStaSenecaSta	S-1/EOC ation 2 ation 3	100		1	\$14,642	\$3,000	\$2,000		1	\$1,500	\$750	\$1,500	\$500	\$23,692
APLStaAPLStaAPLStaAPLStaAPLStaAPLStaAPLStaGwinettStaGwinettStaGwinettStaGwinettStaGwinettStaGwinettStaGwinettStaGwinettStaSenecaStaSenecaStaSenecaStaSenecaSta	ation 2 ation 3			t	\$14,642	\$3,000	\$2,000		1	\$1,500	\$750	\$1,500	\$500	\$23,692
APLStaAPLStaAPLStaAPLStaAPLStaAPLStaGwinettStaGwinettStaGwinettStaGwinettStaGwinettStaGwinettStaGwinettStaSenecaStaSenecaStaSenecaSta	ation 3	108		1	\$14,642	\$3,000	\$2,000		1	\$1,500	\$750	\$1,500	\$500	\$23,692
APLStaAPLStaAPLStaAPLStaAPLStaGwinettStaGwinettStaGwinettStaGwinettStaGwinettStaSenecaStaSenecaStaSenecaSta		15		1	\$6,460	\$3,000	\$2,000		1	\$1,500	\$750	\$1,500	\$500	\$15,710
APL Sta APL Sta APL Sta APL Sta Gwinett Sta Seneca Sta Seneca Sta Seneca Sta		15		1	\$6,460	\$3,000	\$2,000		1	\$1,500	\$750	\$1,500	\$500	\$15,710
APL Sta APL Sta APL Sta Gwinett Sta Seneca Sta Seneca Sta Seneca Sta	ation 4	15		1	\$6,460	\$3,000	\$2,000		1	\$1,500	\$750	\$1,500	\$500	\$15,710
APL Sta APL Sta Gwinett Sta Semeca Sta Seneca Sta Seneca Sta	ation 5	15		1	\$6,460	\$3,000	\$2,000		1	\$1,500	\$750	\$1,500	\$500	\$15,710
APL Sta Gwinett Sta Schnett Sta Seneca Sta Seneca Sta Seneca Sta	ation 12	15		1	\$6,460	\$3,000	\$2,000		1	\$1,500	\$750	\$1,500	\$500	\$15,710
APL Sta Gwinett Sta Schnett Sta Seneca Sta Seneca Sta Seneca Sta	ation 15	15		1	\$6,460	\$3,000	\$2,000		1	\$1,500	\$750	\$1,500	\$500	\$15,710
Gwinett Sta Seneca Sta Seneca Sta Seneca Sta	ation 16	15		1	\$6,460	\$3,000	\$2,000		1	\$1,500	\$750	\$1,500	\$500	\$15,710
OwinettStaOwinettStaOwinettStaOwinettStaOwinettStaOwinettStaSenecaStaSenecaStaSenecaStaSenecaSta	ation 6	15		1	56,460	\$3,000	\$2,000		1	\$1,500	\$750	\$1,500	\$500	\$15,710
Owinett Sta Gwinett Sta Gwinett Sta Gwinett Sta Gwinett Sta Seneca Sta Seneca Sta	ation 7	15		1	\$5,460	\$3,000	\$2,000		1	\$1,500	\$750	\$1,500	\$500	\$15,710
Gwinett Sta Gwinett Sta Gwinett Sta Gwinett Sta Seneca Sta Seneca Sta Seneca Sta	ation 8	15		1	\$6,460	\$3,000	\$2,000		1	\$1,500	\$750	\$1,500	\$500	\$15,710
GwinettStaGwinettStaGwinettStaSenecaStaSenecaStaSenecaSta	ation 10	15		1	\$6,460	\$3,000	\$2,000		1	\$1,500	\$750	\$1,500	\$500	\$15,710
Gwinett Sta Gwinett Sta Seneca Sta Seneca Sta Seneca Sta	ation 19	15		1	\$6,460	\$3,000	\$2,000		1	\$1,500	\$750	\$1,500	\$500	\$15,710
GwinettStaSenecaStaSenecaStaSenecaSta	ation 24	15		i.	S6,460	\$3,000	\$2,000		i.	\$1,500	\$750	\$1,500	\$500	\$15,710
Seneca Sta Seneca Sta Seneca Sta	ation 25	15		i.	\$6,460	\$3,000	\$2,000		1	\$1,500	\$750	\$1,500	\$500	\$15,710
Seneca Sta Seneca Sta	ation 13	15		1	\$6,460	\$3,000	\$2,000		1	\$1,500	\$750	\$1,500	\$500	\$15,710
Seneca Sta	ation 17	15		i	\$6,460	\$3,000	\$2,000		1	\$1,500	\$750	\$1,500	\$500	\$15,710
	ation 18	15		i	\$6,460 \$6,460	\$3,000	\$2,000		i	\$1,500	\$750	\$1,500	\$500	\$15,710
	ation 20	15		÷	\$6,460	\$3,000	\$2,000		i	\$1,500	\$750	\$1,500	\$500	\$15,710
-	ation 22	15		1	\$6,460	\$3,000	\$2,000		1	\$1,500	\$750	\$1,500	\$500	\$15,710
	ation 23	15		1	\$6,460 \$6,460	\$3,000	\$2,000		1	\$1,500	\$750	\$1,500	\$500	\$15,710
		15		ł	56,460 \$6,460	\$3,000	\$2,000		i	\$1,500	\$750	\$1,500	\$500	\$15,710
	ation 21			1					ł				\$500	\$15,710
	ation 26	15			\$6,460	\$3,000	\$2,000		•	\$1,500	\$750	\$1,500 \$1,500	\$500	\$15,710
	ation 27	15		1	\$6,460		\$2,000		1	\$1,500	\$750			
	lation 29	15		1	S6,460	\$3,000	\$2,000		1	\$1,500	\$750	\$1,500	\$500	\$15,710
	4 GHz - access point			32	\$156,240	\$36,400	\$0		0	S0	\$0	S0		\$196,640
	eminals & networking			1								\$55,000	\$2,750	\$57,750
NOC software OS				1								\$10,000	\$10,000	\$20,000
Test equipment Tes	est equipment			1								\$30,000	\$1,500	\$31,500 \$0
Sub-total		1,116		66	\$415,774	\$131,400	\$62,000		35	\$52,500	\$26,250	\$141,500	\$29,750	\$859,174
Furnish					\$20,789					\$2,625		\$7,075		\$30,489
Engineering design					\$41,577					\$5,250		\$14,150		\$60,977
Project management					\$41,577	\$13,140	\$6,200			\$5,250	\$2,625	\$14,150	\$2,975	\$85,917
Acceptance & documentation						410,140	40,200				,	\$17,688		\$76,222
Security					551 972									
Total					551,972 \$41,577	\$13,140	\$6,200			\$6,563 \$5,250	\$2,625	\$14,150	\$2,975	\$65,917

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Backbone Segment (100 Mbps Increment)

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	Bandwidth	Units	U	nits Cost	Installation	Licensing	Towers	Tower Cost	Installation	Network	Installation	Total
Option key upgrade (existing)	311		7	\$7,000	\$0	\$0		\$0	\$0	\$10,500	\$3,500	\$21,000
Hardware upgrade (to 108)	108	1	24	\$106,368	\$0	\$0		\$0	· \$0	\$36,000	\$12,000	\$244,368
New radios (108)	106		5	\$40,910	\$0	\$0	(\$0	\$0	\$7 500	\$2,500	\$\$0,910
Option key upgrade (new)	311		5	\$5,000	\$0	\$0	(\$0	\$0	\$7 500	\$2,500	\$15,000
Other	0		0	\$0	\$0	\$0	() \$ 0	\$0	SO	\$0	\$0
Other	0		0	\$0	\$0	\$0	(), S O	\$0	\$0	· \$0	\$0
Sub-total			1	\$249 378	\$0	\$0	(\$0	\$0	\$61,500	\$20,500	\$331,278
Fumish-				*** ***								
				\$12,464				\$0		\$3,075		\$15,539
Engineering design				\$34,928				\$0		\$ 6,150		\$31,076
Project management				\$24,928	\$0	\$0		\$0	\$0	\$6,150	\$2,050	\$33,126
Acceptance & documentation				\$31,160				\$0		\$7,688		\$38,847
Security				\$34,928	\$0	\$0		\$0	\$0	\$6,150	\$2,050	\$33,128
Total			1	\$367,685	\$0	\$0	(\$0	\$0	\$90,713	\$24,600	\$482,998

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4.9 GHz Public Safety Fi	· ·						_					
Location	Туре	Bandwidth		Units Cost	Installation		Towers		installation			Total
DIT	4.9 GHz - Base station			3 \$17,790		\$3,000	c		\$0	\$0	\$0	\$24,390
APL	4.9 GHz - Base station			3 \$17,790		\$3,000	c		\$0	\$0	\$0	\$24,390
Gwinett	4.9 GHz - Base station			3 \$17,790		\$3,000	c			S 0	\$0	\$24,390
Seneca	4.9 GHz - Base station			3 \$17,790		\$3,000	c			\$0	\$0	\$24,390
FS-28	4.9 GHz - Base station			3 \$17,790		\$3,000	c			S 0	S0	\$24,390
Edgewater	4.9 GHz - Base station			3 \$17,790		\$3,000	c			\$0		\$24,390
Eastmont PD	4.9 GHz - Base station			3 \$17,790		\$3,000	c			\$0	S0	\$24,390
FS-1/EOC	4,9 GHz - Base station			3 \$17,790	\$3,600	\$3,000	c			S 0	S 0	\$24,390
Station 2	4 9 GHz - Base station			3 \$17,790	\$3,600	\$3,000	c			\$0	\$0	\$24,390
Station 3	4.9 GHz - Base station			3 \$17,790	\$3,600	\$3,000	c) \$0	\$0	\$0	\$0	\$24,390
Station 4	4.9 GHz - Base station			3 \$17,790	\$3,600	\$3,000	c) \$0	\$0	S0		\$24,390
Station 5	4.9 GHz - Base station			3 \$17,790	\$3,600	\$3,000	c) \$0	\$0	S0	S0	\$24,390
Station 6	4.9 GHz - Base station			3 \$17,790	\$3,600	\$3,000	c) \$0	\$0	\$0	S0	\$24,390
Station 7	4.9 GHz - Base station			3 \$17,790	\$3,600	\$3,000	c) \$0	\$0	S 0	S 0	\$24,390
Station 8	4.9 GHz - Base station			3 \$17,790	\$3,600	\$3,000	c) \$0	\$0	S 0	S 0	\$24,390
Station 10	4.9 GHz - Base station			3 \$17,790	\$3,600	\$3,000	· C) \$0	S0	\$0	S0	\$24,390
Station 12	4.9 GHz - Base station			3 \$17,790	\$3,600	\$3,000	c	\$0	S0	\$0	S0	\$24,390
Station 13	4.9 GHz - Base station			3 \$17,790	\$3,600	\$3,000	c) \$0	S0	\$0	S0	\$24,390
Station 15	4.9 GHz - Base station			3 \$17,790	\$3,600	\$3,000	c) so	\$0	\$0	S 0	\$24,390
Station 16	4.9 GHz - Base station			3 \$17,790	\$3,600	\$3,000	c) <u>s</u> o	\$0	\$0	\$0	\$24,390
Station 17	4.9 GHz - Base station			3 \$17,790	\$3,600	\$3,000	c) \$0	\$0	\$0	\$0	\$24,390
Station 18	4.9 GHz - Base station			3 \$17,790		\$3,000	c) so	\$0	\$0	\$0	\$24,390
Station 19	4.9 GHz - Base station			3 \$17,790		\$3,000	c	50	50	\$0	\$0	\$24,390
Station 20	4.9 GHz - Base station			3 \$17,790		\$3,000	c) <u>\$</u> 0	\$0	\$0	\$0	\$24,390
Station 21	4.9 GHz - Base station			3 \$17,790		\$3,000	c		\$0	\$0	\$0	\$24,390
Station 22	4.9 GHz - Base station			3 \$17,790		\$3,000	Ċ		\$0	\$0	50	\$24,390
Station 23	4.9 GHz - Base station			3 \$17,790		\$3,000	Ċ			50	\$0	\$24,390
Station 24	4.9 GHz - Base station			3 \$17,790		\$3,000	c			50	50	\$34,390
Station 25	4.9 GHz - Base station			3 \$17,790		\$3,000	Ċ			so		\$24,390
Station 26	4.9 GHz - Base station			3 \$17,790		\$3,000	Ċ			\$0	so	\$24,390
Station 27	4.9 GHz - Base station			3 \$17,790		\$3,000	Ċ			50	50	\$24,390
Station 29	4.9 GHz - Base station			3 \$17,790		\$3,000				50		\$24,390
Vehicla-mounted units	4.9 GHz - Nomadic Sub Un	ite	10			\$100,000	Č			• -	50	\$448,000
Security monitoring sites	4.9 GHz - Outdoor CPE		-	0 \$0		\$0	Ċ			so		\$0
Sub-total			19			\$196,000						\$1,228,480
_				*70 PC4				•0		S 0		#00.064
Furnish				\$39,864				\$0				\$39,664
Engineering design				\$79,728		* · · · · ·		\$0		\$0		\$79,738
Project management				\$79,728		\$19,600		\$0			\$0	\$122,848
Acceptance & documentation				\$99,660				\$0		\$0		\$99,660
Security				\$79,728		\$19,600		\$0				\$122,648
Total			19	6 \$1,175,988	\$282,340	\$235,200	C) \$0	\$0	\$0	\$0	\$1,693,428

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General Government Fix	ted Segment														
Location(\$)	Туре	Bandwidth	Units		Units Cost	Instatlation	Licensing	Towers		Tower Cost	Instatlation	Network	Installation	Total	
DIT-Main Library DS-3	18 GHz - 106 Mbps	108		1	\$14,642	\$3,000	\$2,000		1	\$1,500	\$750	\$1,500	\$500	\$23,892	
Security monitoring sites	4.9 GHz - Outdoor CPE			157	\$177,253	\$168,400	\$157,000		0	\$0	\$0	\$0	\$0	\$522,653	
Base stations	3.65 GHz - Access point			33	\$179,487	\$39,600	• \$0		0	\$0	\$0	\$0	\$0	\$219,087	
Library - T1 replacement	3 65 GHz - Outdoor CPE			16	\$13,264	\$19,200	\$0		16	\$24,000	\$12,000	\$24,000	\$8,000	\$100,464	
Other - T-1 replacement	3.65 GHz - Outdoor CPE			25	\$20,725	\$30,000	\$0		25	\$37,500	\$18,750	\$37,500	\$12,500	\$156,975	
Parks & Rec - T1 replacemen	t 3.65 GHz - Outdoor CPE			6	\$4,974	\$7,200	\$0		6	\$9,000	\$4,500	\$9,000	\$3,000	\$37,674	
Perks & Rec unwired sites	3.65 GHz - Outdoor CPE			32	\$26,528	\$38,400	\$0		32	\$48,000	\$24,000	\$48,000	\$16,000	\$200,928	
Human Services unwired site	s 3.65 GHz - Outdoor CPE			31	\$25,699	\$37,200	\$0		31	\$46,500	\$23,250	\$46,500	\$15,500	\$194,649	
Sub-total		-		301	\$462,572	\$363,000	\$159,000		111	\$166,500	\$63,250	\$166,500	\$55,500	\$1,456,322	
Fumish					\$23,129					\$8,325		\$8,325		\$39,779	
Engineering design					\$46,257					\$16,650		\$16,650		\$79,557	
Project management					\$46,257	\$36,300	\$15,900			\$16,650	\$8,325	\$16,650	\$5,550	\$145,632	
Acceptance & documentation					\$57,822					\$20,813		\$20,613		\$99,447	
Security					\$46,257	\$36,300	\$15,900			\$16,650	\$8,325	\$16,650	\$5,550	\$145,632	
Total				301	\$662,294	\$435,600	\$190,800		111	\$245,588	\$99,900	\$245,568	\$66,600	\$1,966,369	
General Government No	madic Segment														
Location(s)	Туре	Bandwidth	Unita		Unita Cost	Installation	Licensing	Towers		Tower Cost	Installation	Network	Instaltation	Total	
Library network sites	2.4 GHz - access point			17	\$84,065	\$20,400	\$0		0	\$0	\$0	\$0	\$0	\$104,465	
Parks & Rec sites	2.4 GHz - access point			38	\$187,910	\$45,600	\$0		0	\$0	\$0	\$0	\$0	\$233,510	
Human Services sites	2.4 GHz - access point			31	\$153,295	\$37,200	\$0		0	\$0	\$0	\$0	\$0	\$190,495	
Sub 4otal				86	\$425,270	\$103,200	\$0		0	\$o	\$O	\$0	\$0	\$528,470	
Fumish '					\$21,264					\$0		\$0		\$21,264	
Engineering design					\$42,527					\$0		\$0		\$42,527	
Pmject management					\$42,527	\$10,320	\$0			\$0	\$0	\$0	\$0	\$52,847	
Acceptance & documentation					\$53,159					\$0		\$0		\$53,159	
Security					\$42,537	\$10,320	\$0			\$0	\$O	\$0	\$0	\$52,847	
Total				86	\$627,273	\$123,840	\$0		0	\$0	\$0	\$0	\$0	\$751,113	
BayRICS 700 MHz Scena	ario														
Location(s)	Туре	Bandwidth	Unita			Instatiation		Towers			Instatlation		Installation		
Hub locations	700 MHz - base station			6	\$600,000	\$1\$,000	\$12,000		0	\$0	\$0	\$9,000	\$3,000	\$639,000	
	700 MHz - base station			0	\$0	\$0	\$0		0	\$0	\$0	\$0	\$0	\$0	
	700 MHz - base station			0	\$0	\$0	\$0		0	\$0	\$0	\$0	\$0	\$0	
	700 MHz - base station			0	\$0	\$0	\$0		0	\$0	\$0	\$0	\$0	\$0	
Sub-total	-			6	\$600,000	\$15,000	\$12,000		0	\$0	\$0	\$9,000	\$3,000	\$639,000	
Fumish	·				\$30,000					\$0		\$450		\$30,450	
Engineering design					\$60,000					\$0		\$900		\$60,900	
Project management					\$60,000	\$1,500	\$1,200			\$0	\$0	\$900	\$300	\$63,900	
Acceptance & documentation					\$75,000					\$0		\$1,125		\$76,125	
Security	-				\$60,000	\$1,500	\$1,200			\$0	\$0	\$900	\$300	\$63,900	
Total				6	\$885,000	\$18,000	\$14,400		0	\$0	\$0	\$13,275	\$3,600	\$934,275	

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Business and Entrepren Location(s)	eurship Opportunities Type	Bandwidth i	Inita		Units Cost	Instaltation	Licensing	Towers	Tower Cost	installation	Network	Instaltation	Total
Hub facility	3.65 GHz - Access point			2	\$10,876	\$2,400	\$0	c	\$0	\$0	\$0	\$0	\$13,278
1-1 equivalent business circui	t 3.65 GHz - Gutobor CPE	ธ์		25	\$20,725	\$50,000	\$07	ď	\$17	\$ び	S U	\$ 0	\$\$6,726.
Hotspot service	2.4 GHz - access point	5		5	\$24,725	\$6,000	\$0	0	\$0	\$0	\$0	\$0	\$30,725
Sub-total				32	\$56,328	\$38,400	\$0	0	\$0	\$0	\$0	50	\$94,728
Fumish					\$2,816				\$0		\$0		\$2,816
Engineering design					\$5,633				\$0		50		\$5,633
Project management					\$5,633	\$3,840	\$0		\$0	\$0	\$0	\$0	\$9,473
Interret bandwidth								•					\$0
Acceptance & documentation					\$7,041				\$0	•	\$0		\$7,041
Security					\$5,633	\$3,840	50		\$0	\$0	\$0	s0	\$9,473
Total				32	\$83,084	\$46,060	\$0	0	\$0	\$0	\$0	\$0	5129,164
Drinking Fountain Model Location(s)	Public Access Type	Bandwidth U	nite		Unita Cost	Installation		T	Tower Cost	1-stallatio-			
Additional base stations Schools & educational facilitie Community organizations Neighborthood partnerships	3.65 GHz - Access point is 3.65 GHz - Outdoor CPE 3.65 GHz - Outdoor CPE 3.65 GHz - Outdoor CPE 3.65 GHz - Outdoor CPE	5 5 5		20 200 60 60	\$108,780 \$165,800 \$66,320 \$66,320	\$24,000 \$240,000 \$96,000 \$96,000	\$0 \$0 \$0 \$0	Towers 20 0 0	\$30,000 \$0 \$0 \$D	\$15,000 \$0 \$0 \$D	- \$30,000 \$0 \$0 \$0	Installation \$10,000 \$0 \$0 \$0	\$217,760 \$405,800 \$162,320 \$162,320
Schools & educational facilitie Community organizations Neighborhood partnerships Community housing	3.65 GHz - Access point is 3.65 GHz - Outdoor CPE 3.65 GHz - Outdoor CPE	5 5 5 5		20 200 60 60 267	\$108,780 \$165,800 \$66,320 \$66,320 \$221,343	\$24,000 \$240,000 \$96,000 \$96,000 \$320,400	\$0 \$0 \$0 \$0 \$0 \$0	20 0 0 0 0	\$30,000 \$0 \$0 \$D \$0	\$15,000 \$0 \$0 \$0 \$0 \$0	- \$30,000 \$0 \$0 \$0 \$0	\$10,000 \$0 \$0 \$0 \$0 \$0	\$217,760 \$405,800 \$162,320 \$162,320 \$541,743
Schools & educational facilitie Community organizations Neighborthood partnerships	3.65 GHz - Access point is 3.65 GHz - Outdoor CPE 3.65 GHz - Outdoor CPE 3.65 GHz - Outdoor CPE 3.65 GHz - Outdoor CPE	5 5 5 5		20 200 60 60	\$108,780 \$165,800 \$66,320 \$66,320	\$24,000 \$240,000 \$96,000 \$96,000	\$0 \$0 \$0 \$0	20 0 0 0	\$30,000 \$0 \$0 \$D \$0	\$15,000 \$0 \$0 \$D	- \$30,000 \$0 \$0 \$0	\$10,000 \$0 \$0 \$0	\$217,760 \$405,800 \$162,320 \$162,320
Schools & educational facilitie Community organizations Neighborhood partnerships Community housing Sub-total Furnish	3.65 GHz - Access point is 3.65 GHz - Outdoor CPE 3.65 GHz - Outdoor CPE 3.65 GHz - Outdoor CPE 3.65 GHz - Outdoor CPE	5 5 5 5		20 200 60 60 267	\$108,780 \$165,800 \$66,320 \$66,320 \$221,343 \$628,563 \$31,428	\$24,000 \$240,000 \$96,000 \$96,000 \$320,400	\$0 \$0 \$0 \$0 \$0 \$0	20 0 0 0 0	\$30,000 \$0 \$0 \$0 \$30,000 \$1,500	\$15,000 \$0 \$0 \$0 \$0 \$0	- \$30,000 \$0 \$0 \$0 \$0 \$0 \$0 \$1,500	\$10,000 \$0 \$0 \$0 \$0 \$0	\$217,760 \$405,800 \$162,320 \$162,320 \$541,743 \$1,469,963 \$34,426
Schools & educational facilitie Community organizations Neighborhood partnerships Community housing \$ub-total	3.65 GHz - Access point is 3.65 GHz - Outdoor CPE 3.65 GHz - Outdoor CPE 3.65 GHz - Outdoor CPE 3.65 GHz - Outdoor CPE	- 5 5 5 5		20 200 60 60 267	\$108,780 \$165,800 \$66,320 \$221,343 \$628,563 \$31,428 \$62,856 \$62,856	\$24,000 \$240,000 \$96,000 \$96,000 \$320,400	\$0 \$0 \$0 \$0 \$0 \$0	20 0 0 0 0	\$30,000 \$0 \$0 \$0 \$30,000 \$1,500 \$3,000 \$3,000	\$15,000 \$0 \$0 \$0 \$0 \$0	\$30,000 \$0 \$0 \$0 \$0 \$0 \$0 \$30,000	\$10,000 \$0 \$0 \$0 \$0 \$0	\$217,760 \$405,800 \$162,320 \$162,320 \$541,743 \$1,469,963
Schools & educational facilitie Community organizations Neighborhood partnerships Community housing Sub-total Furnish Engineering design Project management Internet bandwidth Acceptance & documentation	3.65 GHz - Access point is 3.65 GHz - Outdoor CPE 3.65 GHz - Outdoor CPE 3.65 GHz - Outdoor CPE 3.65 GHz - Outdoor CPE	- 5 5 5		20 200 60 60 267	\$108,780 \$165,800 \$66,320 \$221,343 \$628,563 \$31,428 \$62,856 \$62,856 \$62,856 \$78,570	\$24,000 \$240,000 \$96,000 \$96,000 \$320,400 \$776,400	\$0 \$0 \$0 \$0 \$0 \$0 \$0	20 0 0 0 0	\$30,000 \$0 \$0 \$0 \$0 \$30,000 \$1,500 \$3,000 \$3,000 \$3,750	\$15,000 \$0 \$0 \$0 \$0 \$15,000 \$15,000	\$30,000 \$0 \$0 \$0 \$30,000 \$1,500 \$3,000 \$3,000 \$3,750	\$10,000 \$0 \$0 \$0 \$10,000 \$1,000	\$217,760 \$405,800 \$162,320 \$162,320 \$541,743 \$1,469,963 \$34,426 \$68,856 \$148,996 \$148,996 \$0 \$86,070
Schools & educational facilitie Community organizations Neighborhood partnerships Community housing Sub-total Furnish Engineering design Project management Internet bandwidth	3.65 GHz - Access point is 3.65 GHz - Outdoor CPE 3.65 GHz - Outdoor CPE 3.65 GHz - Outdoor CPE 3.65 GHz - Outdoor CPE			20 200 60 60 267	\$108,780 \$165,800 \$66,320 \$221,343 \$628,563 \$31,428 \$62,856 \$62,856	\$24,000 \$240,000 \$96,000 \$96,000 \$320,400 \$776,400	\$0 \$0 \$0 \$0 \$0 \$0 \$0	20 0 0 0 0	\$30,000 \$0 \$0 \$0 \$30,000 \$1,500 \$3,000 \$3,000 \$3,750 \$3,000	\$15,000 \$0 \$0 \$0 \$0 \$15 000	\$30,000 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0 \$0	\$10,000 \$0 \$0 \$0 \$10,000	\$217,760 \$405,800 \$162,320 \$162,320 \$541,743 \$1,469,963 \$34,426 \$68,856 \$148,996 \$0

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Capex Data	Basic Unit	Antenna	Power Suppl Mo	ount	Cable	Unit Total	Installation	License
aired Links (2 pointa)		,					moundaon	
8 GHz - 15 Mbps	\$4,780	\$1,500	\$0	\$125	\$55	\$6,460	\$3,000	\$2,000
8 GHz - 108 Mbps	\$12,056	\$1,526	\$880	\$125		\$14,642	\$3,000	\$2,000
)ption key (311 Mbps)	\$1,000	\$0	\$0	\$0	\$0	\$1,000	\$0	\$0
lingle Units (1 point)								
9 GHz - Base station	\$5,190	\$560		\$125	\$55	\$5,930	\$1,200	\$1,000
9 GHz - Outdoor CPE	\$649	\$300		\$125	\$55	\$1,129	\$1,200	\$1,000
9 GHz - Indoor CPE	\$599	\$300		\$125	\$55	\$1,079	\$1,200	\$1,000
9 GHz - Nomadic \$ub Units	\$1,610	\$490		\$125	\$55	\$2,260	\$1,200	\$1,000
65 GHz - Base station	\$5,190	\$560		\$125	\$55	\$5,930	\$1,200	\$0
65 GHz - Access point	\$4,699	\$560		\$125	\$55	\$5,439	\$1,200	\$0
65 GHz - Outdoor CPE	\$649	\$0		\$125	\$55	\$829	\$1,200	\$0
65 GHz - Indoor CPE	\$599	\$0 \$490		\$125 \$125	\$55	\$779 \$2,280	\$1,200	\$0 \$0
65 GHz - Nomadic CPE 65 GHz - USB unit	\$1,610 \$500	3490 \$0		3 125	\$55	\$2,280	\$1,200 \$0	30 50
4 GHz - access point	\$4,595	30 50	S O	\$250	\$100	\$4,945	\$1,200	30 50
4 GHz - mesh access point	34,000	30		42.70	\$100	44,040	9 1,200	30
4/3.65 GHz - access point								
4/4.9 GHz - access point	\$5,595	\$0	\$0	\$250	\$100	\$5,945	\$1,200	\$0
0 MHz - base station	\$100,000	\$0	ŝõ	\$0	\$0	\$100,000	\$2,500	52,000
wers		-	•	• -				
foot Rohn 25 g	\$1,500					\$1,500	\$750	\$0
- -								
etwork sco switch	\$1,500					51,500	\$500	\$0
etwork total	51,500	\$0	\$ 0	\$0	\$0	51,500	\$500	\$0
DC & Maintenance	450.000							
rminals & networking	\$50,000 510,000				\$5,000	555,000 510,000	\$2,750 \$10,000	\$0 \$0
55	210,000					210,000	910,000	20

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Other Capex Data

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· · · · · · · · · · · · · · · · · · ·	5%									
umish & commissioning	10%									
ngineering design	10%									
roject management	12.5%									
cceptance \$ documentation	12.5%									
ecurity	1076									
		Year 2	Year 3	Year 4	Year \$	Year 6	Year 7	Year 8	Year 9	Year 10
Capita) Expanse Annual Rollout	Year 1	1641 2								
Core Segments		0 M	0%	0%	0%	0%	0%	0%	0%	0%
Backbone Segment (15 Mbps Sase)	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Backbone Segment (100 Mbps Increment)	100%	0%		0%	0%	0%	0%	0%	0%	0%
1.9 GHz Public Safety Fixed/Nomadic Segment	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
General Government Fixed Segment	100%	0%	0%		0%	0%	0%	0%	0%	0%
General Government Nomadic Segment	100%	0%	0%	۵%	0%	0.76	0,0			
General Covernment Homadic codiment										
						~ *	0%	0%	0%	0%
Scenarios & atternatives	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
BayRICS 700 MHz Scenario	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Business and Entreprenaurship Opponunitias	30%	40%	30%	0%	0%	0%	0%	0.8	070	
Drinking Fountain Modal Public Access	00,0									
							× •	Year 8	Year 9	Year 10
	Year 1	Year 2	Year 3	Year 4	Year \$	Year 6	Year 7	iear o		
Capital Equipment Cost								\$0	\$0	\$0
Core Sagmants	\$557,274	· \$0	\$0	\$0	\$0	\$0	\$0	\$0 \$0	\$0	\$0
Backbone Segment (15 Mbps Base)	\$310,778	\$0	\$0	\$0	\$0	\$0	\$0		\$0	\$0
Backbone Segment (100 Mbps Increment)	\$797,280	\$0	\$0	\$0	\$0	\$0	\$0	\$0		30 \$0
4 9 GHz Public Safety Fixed/Normadic Segment		\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
General Government Fixed Segment	\$629,072	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
General Government Nomadic Segment	\$425,270	20	20	•••	•-					
Scanarias & alternativaa			*0	\$0	\$0	\$0	\$0	50	\$0	\$0
BayRICS 700 MHz Scenario	\$609,000	\$0	\$0 \$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Business and Entrepr\$neurship Opportunities	\$56,328	\$0		\$0 \$0	50	\$0	\$0	\$0	\$0	\$0
Drinking Fountain Modal Public Access	\$197,569	\$263,425	\$197,569	\$0	50		•-			
DUDRING CONTRACT MODEL CONTRACTOR	~									
	5.0%									
Cost of Capital	· 10									
Anticipated equipment lifetime (years)	. 10									

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Operating Expense

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Backbone Segment (1S	Mbps Base)						
ttem	Unit Type	Annual Rate Unita		Unit Cost	Overhead	Total	Annual +
Equipment maintenance	Maintenance per node		66	\$150	15%	\$11,385	Q%
Site support & power	Site fee		32	\$100	15%	\$3,680	0%
NOC operations	Op support per node		66	5150	15%	\$11,385	0%
IT support services	IT per node		66	\$50	15%	53,795	0%
Engineering support	Engineering per node		66	\$20	15%	51,516	0%
Legal & regulatory	Legal per node		66	510	15%	5759	0%
General & administrative	G&A per node		66	\$10	15%	5759	Q%
Equipment replacement	Percent of hardware capex	5%		\$821,979	15%	\$47,364	0%
Software upgrades & licensi	ng Percent of software capex	20%		\$20,000	15%	54,600	0%
Total						\$65,145	-

tem	Unit Type	Annual Rate Unita		Unit Cost	Overhead	Total	Annual +
Equipment maintenance	Maintenance per node		5	5150	15%	5863	0%
ite support & power	Site fee		5	\$100	15%	5575	0%
IOC operations	Op support per node		5	\$150	15%	5863	0%
T support services	IT per node		5	\$50	15%	\$286	0%
ngineering support	Engineering per node		5	520	15%	5115	0%
egal & regulatory	Legal per node		5	510	15%	\$56	0%
General & administrative	G\$A per node		5	\$10	15%	\$56	Q%
quipment replacement	Percent of hardware capex	5%		\$458,398	15%	\$26,358	0%
oftware upgrades & licensi	ng Percent of software capex	20%		50	15%	\$0	0%

4.9 GHz Public Safety I	Fixed/Nomadic Segment						
ltem	Unit Type	Annual Rate Units		Unit Cost	Overhead	Total	Annual +
Equipment maintenance	Maintenance per node		196	\$150	15%	\$33,810	Q%
Site support & power	Site tee		196	\$100	15%	\$22,540	0%
NOC operations	Op support per node		196	\$150	15%	\$33,810	0%
IT support services	IT per node		196	550	15%	\$11,270	0%
Engineening support	Engineering per node		196	520	15%	\$4,508	0%
Legal \$ regulatory	Legal per node		196	510	15%	\$2,254	0%
General & administrative	GSA per node		196	\$10	15%	\$2,254	0%
Equipment replacement	Percent of hardware capex	5%		\$1,175,988	15%	\$67,619	0%
Total						\$178,065	-

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General Government F	*						
ltern	Unit Type	Annual Rate Unita		Unit Coat	Overhead	Total	Annual +
Equipment maintenance	Maintenance per node		301	\$150	15%	\$51,923	09
Site support & power	Site foe		301	\$100	15%	\$34,615	09
NOC operations	Op support per node		301	\$150	15%	\$51,923	09
IT support services	IT per node		301	\$50	15%	\$17,308	09
Engineering support	Engineering per node		301	\$20	15%	\$6,923	0%
Legal & regulatory	Legal per node		301	510	15%	\$3,462	09
General & administrative	G&A per node		301	\$10	15%	\$3,462	0%
Equipment replacement	Percent of hardware capex	5%		\$927,881	15%	\$53,353	09
Total	-					\$222,967	

ltem	Unit Type	Annual Rate Unita		Unit Cost	Overhead	Total	Annual +
Equipment maintenance	Maintenance per node		86	\$150	15%	\$14,835	09
Site support & power	Site fee		86	\$100	15%	\$9,890	09
NOC operations	Op support per node		86	\$150	15%	\$14,835	09
T support services	IT per node		66	550	15%	\$4,945	09
Engineering support	Engineering per node		86	\$20	15%	\$1,976	09
Legal & regulatory	Legal per node		86	\$10	15%	\$989	09
General & administrative	G&A per node		- 66	510	15%	5989	09
Equipment replacement	Percent of hardware capex	5%		\$627,273	15%	536,066	09
Totai						\$84,529	-

BayRICS 700 MHz Scer	nario .						
ttern	Unit Type	Annual Rate Units		Unit Cost	Overhead	Total	Annual +
Equipment maintenance	Maintenance per node		6	\$150	15%	\$1,035	0% 1
Site support & power	Site fee		6	\$100	15%	5690	0%
NOC operations	Op support per node		8	\$150	15%	51,035	0%
IT support services	IT per node		6	\$50	15%	5345	0%
Engineering support	Engineering per node		6	\$20	15%	5138	0%
Legal & regulatory	Legal per node		6	\$10	15%	\$69	0%
General & administrative	G&A per node		8	\$10	15%	\$69	0%
Equipment replacement	Percent of hardware capex	5%		\$898,275	15%	\$51,651	0%
Total	Standard					\$55,032	- 0%

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Business and Entrepre	neurship Opportunities						
ltem	Unit Type	Armual Rata Units		Unit Cost	Overhead	Total	Annual +
Equipment maintenance	Maintenance per node		32	\$150	15%	\$5,520	0%
Site support & power	Site fee		32	5100	15%	\$3,680	0%
NOC operations	Op support per node		32	\$150	15%	\$5,520	0%
IT suppori services	IT per node		32	550	. 15%	\$1,840	0%
Engineering support	Engineering per node		32	520	15%	\$736	0%
Legal & regulatory	Legal per node		32	\$10	15%	\$366	0%
General & administrative	G&A per node		32	\$10	15%	\$368	0%
Internet bandwidth	DS-3		1	\$60,000	10%	\$66,000	0%
Equipment replacement	Percent of hardware capex	5%		\$83,084	15%	\$4,777	0%
Franchise & facilities fee	Percent of revenue	5%		5108,000	0%	\$5,400	0%
Total	Standard					\$94,209	- 0%

Drinking Fountain Mod	el Public Access						
ltem	Unit Type	Annual Rate Unita		Unit Cost	Overtread	Total	Annual +
Equipment maintenance	Maintenance per node		647	\$150	15%	\$111,606	0%
Site support & power	Site tee		647	\$100	15%	574,405	0%
NOC operations	Op support per node		647	· \$150	15%	5111,606	0%
IT support services	IT per node		647	\$50	15%	537.203	0%
Engineering support	Engineering per node		647	520	15%	514 881	0%
Legal & regulatory	Legal per node		647	510	15%	57,441	0%
General & administrative	G&A per node	1	647	S10	15%	\$7,441	0%
Internet bandwidth	DS-3		5	560,000	10%	\$330,000	0%
Equipment replacement	Percent of hardware capex	5%		5971,380	15%	555,854	0%
Franchise & facilities fee	Percent of revenue	5%		5752,400	0%	537,620	0%
Total	Staridard					\$786,059	0%

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Opex Data					
	Unit Type		Unit Cost	Overthead	Annual +
Equipment maintenance	Maintenance per node		\$150	15%	0%
Site support & power	Site fee		5100	15%	0%
NOC operations	Op support per node		\$150	15%	0%
IT support services	IT per node		550	. 15%	0%
Engineering support	Engineering per node		520	15%	0%
Legal & regulatory	Legal per node		\$10	15%	0%
General & administrative	G&A per node		\$10	15%	0%
Internet bandwidth	DS-3		\$60,000	10%	. 0%
		Annual Rate		Overhead	Annual +
Equipment replacement	Percent of hardware capex	5%		15%	0%
Software upgrades & licensing	Percent of software capex	20%		15%	0%
Franchise & facilities fee	Percent of revenue	5%		0%	0%
Totals	Standard			15%	0%

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Oakland Business Model Funding Worksheet

Annual Funding Sources		_	Notes
Summary	Annual +	Base Annual	
Backbone Segment			
Commercial carrier cost offsets	0%	\$115,728	
Sub-total		\$115,728	
Public Safety Fixed/Nomadic Segment			
Commercial carrier cost offsets	0%		
Sub-total		\$607,200	
General Government Fixed Segment			
Commercial carrier cost offsets	0%		
Market value of new facilities	0%		
Perfonnance measure & efficiency gains	0%		
Sub-total		\$624,019	
General Government Nomadic Segment			
Market value of new facilities	0%	••-,	
Tax revenue enhancement	0%	\$2,504,252	
Performance measure & efficiency gains	0%	\$2,169,214	
Sub-total		\$4,746,866	
Total Annual Funding		\$6,093,813	

Commercial Carrier Cost Offsets

.

Backbone Segment						
-	Units		Monthly	Annual	Total	
Fire Department - T1		26	\$115	\$1,380	\$35,880	DIT
EOC - DS3		1	\$1,424	\$17,088	\$17,088	DIT - EOC to Internet
Police Department - T1		2 .	\$115	\$1,380	\$2,760	DIT
Police Department - DS3		2	\$2,500	\$30,000	\$60,000	Eastmont & Edgewater to DIT
Total		31			\$115,728	Calc
General Govemment Fixed	Segment					
	Units		Monthly	Annual	Total	
Library - T1		16	\$115	\$1,380	\$22,080	DIT .
Library - DS3		1	\$1,424	\$17,088	\$17,088	DIT - Main Library to Internet
Parks & Rec fixed lines		1	\$1,276	\$15,313	\$15,313	DIT

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Oakland Business Model Funding Worksheet

	25 0 43	\$115 \$0	\$1,380 \$0	\$34,500 	DIT Calc
Units	~ Mo	nthiv	Annual	Total	
O nito	842	\$50	\$600	\$505,200	DIT
	50	\$50	\$600	\$30,000	OIT
	120	\$50	\$600	\$72,000	DIT Calc
	Units	0 43 Units [~] Ma 842 50	0\$0 43 Units ^^ Monthly 842 \$50 50 \$50	Units Monthly Annual 842 \$50 \$600 50 \$50 \$600	0 \$00 \$00

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Oakland Business Model Funding Worksheet

Market Value of New Facilities Enabled

General Government Fixed Segme	nt				
Un		Monthly	Annual	Total	
Unwired Parks & Rec facilities	32	\$115	\$1,380	\$44,160	Reference
Unwired Human Senvices facilitie	31	\$115	\$1,380	\$42,780	
Security monitoring	157	\$76	\$912	\$143,184	DIT data, FY07-09 Budget
			\$0	\$0	
Total				\$230,124	Calc
General Government Nomadic					_
Un	its	Monthly	Annual	Total	-
FMA - parking enforcement	6	\$50	\$600	\$3,600	FY07-09 Budget
FMA - tax auditors & officers	20	\$50	\$600	\$12,000	FY07-09 Budget
Human Services - case workers	16	\$50	\$600	\$9,600	FY07-09 Budget
Human Services - outreach	2	\$50	\$600	\$1,200	FY07-09 Budget
CEDA - field inspectors	45	\$50	\$600	\$27,000	Reference
Other	0	\$50	\$600	\$0	
				\$53,400	
Tax Revenue Enhancement					
General Government Normadic					
Field auditors	26				Calc
Per capita program cost	\$192,635				Reference
Efficiency gain	12.5%				Reference
Budgetary value of efficiency gain	\$626,063				Calc
City Auditor revenue/cost ratio	4				Calc
Tax revenue enhancement				\$2,504,252	Calc
Perfonnance Measure & Efficie	ncy Gains				
General Government Fixed Sec Site		Hours/week		FTE Value	
Parks & Rec locations	32	64	1.6	\$140,451	Calc/reference
Human Services locations	31	62	1.6	\$80,694	Calc/reference
Security monitoring locations	157	39	1.0	\$83,768	Calc/reference
Total	-			\$304,914	

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General Government Normadic

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CEDA				
Additional permit inspections	5,625			Calc
Additional code inspections	4 375			Calc
Permit inspector FTE gain	2.8			Calc
Code inspector FTE gain	- 2.7			Calc
Value of FTE gain			\$678,455	Calc
-				
Human Services				
Additional clients served	94			Calc
Case manager FTE gain	1.7			Calc
Value of FTE gain			\$87,853	Calc
				•
PWA				
Per capita personnel cost (overal	\$94,860			Calc
Personnel with laptops	120			Reference
Value of efficiency gain			\$1,422,906	Calc
Total (general government normadic)			\$2,189,214	Calc
Calculations & Data				
Efficiency Gain Estimates				
Remote access - average daily ti	1			Estimate
Average work day (hours)	8	•		Estimate
Efficiency gain	12.5%			Calc
2				
New fixed service - average weel	2			Estimate
Average work week (hours)	40			Estimate
Efficiency gain	5.0%			Calc
New security monitoring - averag	0.25			Estimate
Average work week (hours)	40			Estimate
Efficiency gain	0.6%			Calc
CEDA - Development Permit & Cod	e Enforcement In	spections		
Permit inspections performed	45,000	iopeononio		FY07-09 Budget
Code inspections performed	35,000			FY07-09 Budget
Code mapediona perionneo	00,000			
Inspections/permit inspector	2,000			FY07-09 Budget
Inspections/code inspector	1,600			FY07-09 Budget
https://diaroode.inspector	1,000			

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Permit inspectors Code inspectors Total	23 22 44	
Total budgeted inspectors	45	
Unfilled inspector positions	10	
Personnel budget 08-09 FTE 08-09 Average per position	\$9,968,512 81.5 \$122,313	

Calc Calc Calc FY07-09 Budget OSCS report FY07-09 Budget FY07-09 Budget Calc

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Human Services			
Case managers	10.5		FY07-09 Budget
Nurse case managers	3		FY07-09 Budget
Case management clients	750		FY07-09 Budget
Clients per case manager	56		Calc
· · ·			
Program personnel budget 08-09	\$5,802,710		FY07-09 Budget
FTE 08-09	111.5		FY07-09 Budget
Average per position	\$52,061		Calc
Parks & Recreation - Central A	dministration		
Personnel budget 08-09	\$1,729,307		
FTE 08-09	19.7		
Average per position	\$87,782		•
PWA - Overall			
Personnel budget 08-09	\$65,577,014		FY07-09 Budget
FTE 08-09	691.3		FY07-09 Budget
Field FTE 08-09	400		DIT
Average per position	\$94,860		Calc
			•
PWA - Facilities & Managemen			
Personnel budget 08-09	\$13,110,882		FY07-09 Budget
FTE 08-09	153.6		FY07-09 Budget
Average per position	\$85,368		Calc
Finance & Management Agence	. Einanaial M	incoment Breason	
Personnel budget 08-09	\$16,127,420	magement Program	FY07-09 Budget
FTE 08-09	135.0		FY07-09 Budget
Average per position	\$119.462		Calc
Average per position	\$115,4QZ		Calc
O&M budget 08-09	\$9,878,270		FY07-09 Budget
Average per position	\$73,172		Calc
Total per capita program cost	\$192,635		Calc
Total revenue 08-09	\$512,413,998		FY07-09 Budget
	-		
	Rev source	% City rev	
Business license tax 06-09	\$49,139,920	4.6%	FY07-09 Budget
Transient occupancy tax 08-09	\$13,031,524	1.2%	FY07-09 Budget

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Parking tax 08-09	\$17,695,438	1,7%		FY07-09 Budget
Percent of parking tax from airpo	rt		50%	FY07-09 Budget
Non airport parking rev	\$8,847,719	0.8%		Calc
Field-auditable revenue	\$71,019,163	6.6%		Calc
FAR as percent of program	13.9%			Calc
Rev return/audit cost metric:				
FMA	1			FY07-09 Budget
City Auditor	4			FY07-09 Budget

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PWA Personnel Summa	ry	
Administration	\$3,698,847	
Electrical	\$2,278,790	
Environmental	\$706,116	
Facilities	\$13,110,882	
Fleet	\$6,378,003	
Clean	\$10,769,990	
Grounds	\$8,310,874	
Recycling	\$1,326,975	
Safety	\$319,082	
Sewer	\$7,956,534	
Streets	\$5,351,096	
Transponation	\$2,202,446	
Trees	\$3,165,379	
	\$65,577,014	

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FY07-09 Budget Calc

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Business and Entrepreneurship Opportunities

Wholesale Services					
	Units		Monthly	Annual	Total
T-1 equivalent business circuit		25	\$300	\$3,600	\$90,000
New installation & maintenance	•	1	\$500	\$6,000	\$6,000
Hotspot service		5	\$200	\$2,400	\$12,000
Total					\$108,000

0%

Annual +

Drinking Fountain Model Public Access

Discounted Market Value of N	ew Facilities En	abled			
	Units	Monthly	Annual	Total	
Schools & educational facilities	200	\$100	\$1,200	\$240,000	T-1 equivalent service
Community organizations	80	\$100	\$1,200	\$96,000	
Neighborhood partnerships	80	\$100	\$1,200	\$96,000	
Community housing	267	\$100	\$1,200	\$320,400	
Total	627	-		\$752,400	

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Parks & Recreation

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	Facility	Address	Phone	Lines	Monthly	Cos Termination
Recreation Centers	Allendale Recreation Center	3711 Suter Street	(510) 535-5635			
	Arroyo Viejo Recreation Center	7701 Krause Avenue	(510) 615-5755			
	Brookdale Recreation Center	2535 High Street	(510) 535-5632			
	Bushrod Recreation Center	560 59th Street	(510) 597-5031			
	Carmen Flores	1637 Fruitvale Avenue	(510) 535-5631			
	DeFremery Recreation Center	1651 Adeline Street	(510) 238-7739			
	Dimond Recreation Center	3860 Hanty Road	(510) 482-7831			
	Discovery Center – East	2521 High Street	(510) 535-5657			
	Discovery Center - West	935 Union Street	(510) 832-3314			
	FM Smith Recreation Center	1969 Park Boulevard	(510) 238-7742			
	Franklin Recreation Center	1010 East 15th Street	(510) 238-7741			
	Golden Gate Recreation Center	1075 62nd Street	(510) 597-5032			
	Ira Jinkins Recreation Center	9175 Edes Avenue	(510) 615-5959			
	Lincoln Square Recreation Center	250 101h Street	(510) 238-7738			
	Manzanita Recreation Center	2701 22nd Street	(510) 535-5625			
	Moniclair Recreation Center	6300 Moraga Avenue	(510) 482-7812		1 5	210 150 FOP
	Mosswood Recreation Center	3612 Webster Street	(510) 597-5038		ψ.	
	Poplar Recreation Center	3131 Union Street	(510) 597-5042			
	Rainbow Recreation Center	5800 International Boulevard	(510) 615-5751		1	\$76 Sonitrol
	Redwood Heights Recreation Center	3883 Aliso Avenue	(510) 482-7827			210 150 FOP
	San Antonio	1701East 19th Street	(510) 535-5608			
	Sheffield Village Recreation Cntr	247 Marlow Drive	(510) 638-7190			
	Studio One Arts Center	365 45th Street	(510) 597-5027		2 S	400 150 FOP, Int
	Tassataronga Recreation Center	975 85th Avenue	(510) 615-5764		2 9	400 100 FOF, Inc
	Verdese Carter Recreation Center	9600 Sunnyside Street	(510) 615-5758			
Swimming Pools	Castlemont	8601 MacArthur Boulevard	(510) 879-3642			
Swimming Fools	DeFremery	1269 18th Street	(510) 238-2205			
	Fremont	4550 Foothill Boulevard	(510) 535-5614			
	Lions	3860 Hanty Road	(510) 482-7852		1 S	210 150 FOP
	Live Oak	1055 MacArthur Boulevard	(510) 238-2292		ų. ب	210 130 FOF
	McClymonds	2607 Myrtle Street	(510) 879-8050			
	Temescal	371 45th Street	(510) 597-5013			
Rental Facilities	Joaquin Miller Community Center	3594 Sanborn Drive	(510) 238-3187			
Rental Facilities	Lake Merritt Sailboat House	568 Bellevue Avenue	• •		1 S	170 150 FOP
			(510) 238-3187		1 9	170 150 FOF
	Leona Lodge Marsha J. Corprew Garden Center	4444 Mountain Boutevard 666 Betlevue Avenue	(510) 238-3187 (510) 238-3187			
	Morcom Rose Garden					
		700 Jean Street 2666 Mountain Boulevard	(510) 238-3187			
	Sequoia Lodge	2000 Mountain Boulevard	(510) 238-3187	<u> </u>	7 \$1	276
					7 \$1,	210

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Unwired facilities Wired facilities

Community Gardens

Arroyo Viejo Bushrod Golden Gate Lakeside Kitchen Garden Marston Campbell Ternescal Verdese Carter 79th Ave & Arthur St cul de sac 564 - 59th Street 1068 - 62nd Street 666 Bellevue Ave Btwn 16th & 18th St. and Market & West SL 876 - 47th Street Comer 96th Ave & Bancroft Ave

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Human Services

	Facility	Address	Phone	Lines	Monthly Cos Termination
Head Start/Early Head Start	85th Avenue	8501 International Blvd.	510-544-3389		
	92nd Avenue	9202 International Blvd.	510-568-1057		
	Anoyo Viejo	7701 Krause Äve.	510-615-5944		
	Brookfield	9600 Edes Ave.	510-615-5736		
	City Towers	1050 7th Street	510-238-5230		
	De Colores	1155 35th Avenue	510-533-1271		
	Eastmont Mall	7200 Bancroft Ave. #203	510-562-1790		
	Fannie Wall	647 55th Street	510-597-5044		
	Foothill Square	10700 MacArthur Blvd #10	510-553-9926		
	Frank G. Mar	274 12th Street	510-832-5042		
	Franklin	1010 E. 15th Street	510-238-1304		
	Manzanita	2701 22nd Ave,	510-535-5624		
	San Antonio CDC	2228 E, 15th Street	510-534-6189		
	San Antonio Park	1701 E. 19th Street	510-535-5609		
	Seminary	5818 International Blvd	510-615-5924		
	Sungate	2563 International Blvd.	510-535-5648		
	Tassataronga	975 85th Ave.	510-639-0580		
	Thurgood-Marshall	1117 10th Street	510-836-0543		•
	Virginia	4335 Virginia Ave.	510-261-1484		
	West Grand	1058 West Grand Avenue	510-238-2267		
Senior Centers	Downtown Oakland Senior Center	200 Grand Avenue	510-238-3284		
	East Oakland Senior Center	9255 Edes Avenue	510-615-5731		
	Fruitvale/San Antonio Senior Center	3301 E. 12th Street	510-535-6123		
	Hong Lok Senior Center	275 7th Street	510-763-9017		
	North Oakland Senior Center	5714 Martin Luther King Jr Way	510-597-5085		-
	West Oakland Senior Center	1724 Adeline Street	510-238-7017		
Shelters	Covenant House	2781 Telegraph Ave	510.625.7800		
	East Oakland Community Project	5725 International Blvd.	510.532.3211		
	Health Care for the Homeless	1900 Emitvale Ave., Suite 3E	510,533,4663		
	Henry Robinson Multi-Service Center	559 16th St	510,419,1010		
	Oakland Army Base Temporary Winter Shelter	1145 Midway St.	510.839.8005		
		-			0 0

Unwired facilities Wired facilities

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Other	
	31
Public Safety	43
General	
	300
Total faciilities	157
Unaccounted for locations	

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Oakland Unified School District

Acom Woodland Cdc (510) 879-0861 Acorn Woodland Elementary (510) 879-0190 Adult Ed - Abe/Ase 510-879-4040 510-879-4090 Adult Ed - Awd Adult Ed - Cte 510-879-8620 Adult Ed - Esi 510-879-4020 Adult Ed - Oa 510-879-4090 Adult Ed - Pfca/Cbet 510-879-2944 Adult Education Administrative Office (510) 879-3036 Alice Street Cdc (510) 879-0856 (510) 879-1010 Allendale Elementary Alliance Academy (510) 879-2733 Alternative Learning Community Arroyo Viejo Cdc (510) 879-0802 Ascend Elementary (510) 879-3140 (510) 879-1657 Bella Vista Cdc Bella Vista Elementary (510) 879-1020 Best At Mcclymonds (510) 879-3030 Bret Harte Middle School (510) 879-2060 Bridges Academy At Melrose (510) 879-1410 Brookfield Pre-K (510) 879-0806 Brookfield Village Elementary (510) 879-1030 **Bunche Academy** (510) 879-1730 Burckhalter Elementary (510) 879-1050 Business & Information Technology High Schot (510) 879-3010x443 Carl Munck Elementary (510) 879-1680 Castlemont Community Of Small Schools (510) 879-3010 Centre Infantil Annex Cdc (510) 879-081 Centro Infantil De La Raza Cdc (510) 879-1521 (510) 879-1060 Chabot Elementary Claremont Middle School (510) 879-2010 (510) 879-1080 Cleveland Elementary Cole Middle School (510) 879-1091 Coliseum College Prep Academy (510) 879-2456 College Prep & Architecture Academy (510) 879-1131 Community Day Hs (510) 879-8450 Community United Elementary School (510) 879-1340 Cox Ece Center (510) 879-0807 Crocker Highlands Elementary (510) 879-1110 Dewey Academy (510) 879-3100 East Oakland Pride

1029 81st Ave 1025 81st Ave 2455 Church Street 920 53rd Street 2455 Church Street, Rm. 106 750 International Blvd 920 53rd Street 750 International Blvd 2607 Myrtle Street 250 17th Street 3670 Penniman Ave 1800 98th Ave 9736 Lawlor Street 1895 78th Avenue 3709 E 12th St 2410 10th Avenue 1025 E 28th St 2607 Myrtle St 3700 Coolidge Ave 1325 53rd Ave 401 Jones Avenue 401 Jones Ave 1240 18th St 3994 Burckhalter Ave 8601 Macarthur Blvd 11900 Campus Dr 8601 Macarthur Boulevard 314 East 10th Street 2660 East 16th Street 6686 Chabot Rd 5750 College Ave 745 Cleveland St 1011 Union St 1390 66th Ave 4610 Foothill Blvd 4917 Mountain Blvd 6701 International Blvd 9860 Sunnyside Street 525 Midcrest Rd 1111 2nd Avenue 8000 Birch Street

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(510) 879-3010x498

(510) 879-2100

(510) 879-4040

(510) 879-2021

(510) 879-0811

(510) 879-1150

(510) 879-0207

(510) 879-1551

(510) 879-8490

(510) 879-1040

(510) 879-1580

(510) 879-1160

(510) 879-2795

(510) 879-3020

(510) 879-2030

(510) 879-2825

(510) 879-1170

(510) 879-1180

(510) 879-1190

(510) 879-0814

(510) 879-0813

(510) 879-1220

(510) 879-0825

(510) 879-1260

(510) 879-0815

(510) 879-1270

(510) 879-0840

(510) 879-1700

(510) 879-1360

(510) 879-0816

(510) 879-1660

(510) 879-4293

(510) 879-4286

(510) 879-2150

(510) 879-0817

(510) 879-1280

(510) 879-1420

(510) 549-4900

East Oakland School Of The Arts Edna M Brewer Middle School Edward Shands Adult Education Center Etmhurst Community Prep Emerson Cdc Emerson Elementary Encompass Academy Esperanza Academy Excel At Mcclymonds Explore College Preparatory Middle Far West Franklin Elementary Fred T. Korematsu Discovery Academy Fremont Federation Frick Middle School Fruitvale Cdc Fruitvale Elementary Futures Elementary Garfield Elementary **Glenview Elementary Global Family School** Golden Gate Cdc Golden Gate Pre-K Grass Valley Cdc Grass Valley Elementary Greenleaf Elementary Hamet R Tubman Cdc **Highland Campus** Highland Cdc Hillcrest Elementary Hintil Kuu Ka Cdc Hoover Elementary Horace Mann Elementary Howard Cdc Howard Elementary International Cdc International Comm. Elementary James Madison Middle School Jefferson Cdc Jefferson Elementary Joaquin Miller Elementary Kaiser Elementary

8601 Macarthur Blvd 3748 13th Ave 2455 Church Sreet 1800 98th Ave 4801 Lawton Avenue 4803 Lawton Ave 1025 81st Ave 10315 E St. 2607 Myrtle St 3550 64th Avenue 5263 Broadway Ten ace 915 Foothill Blvd 10315 E St. 4610 Foothill Blvd 2845 64th Ave 3200 Boston Ave. 3200 Boston Ave 6701 International Blvd 1640 22nd Ave 4215 La Cresta Ave 2035 40th Ave. 6232 Herzog Street 6200 San Pablo Avenue 4720 Dunkirk Ave. 4720 Dunkirk Ave 6328 East 17th Street 800 33rd Street 8521 A St 1322 86th Avenue 30 Marguerite Dr 11850 Campus Drive 890 Brockhurst St 5222 Yonacio Ave 8755 Fontaine Street 8755 Fontaine St 2825 International Boulevard 2825 International Blvd 400 Capistrano Dr 1975 40th Avenue 2035 40th Ave 5525 Ascot Dr 25 S Hill Ct

La Escuelita Elementary Lafayette Elementary Lakeview Cdc Lakeview Elementary Laurel Cdc Laurel Elementary Lazear Elementary Leadership Preparatory High School Learning Without Limits Life Academy Lincoln Elementary Lockwood Cdc Lockwood Elementary Lockwood School Preschool M L King Jr Elementary Mandela High School Manzanita Campus Manzanita Cdc Manzanita Community School Manzanita Seed Markham Elementary Marshall Elementary Maxwell Park Elementary Mcclymonds Community Of Small Schools Media College Prep Melrose Leadership Academy Met West MI King Cdc Montclair Elementary Montera Middle School Neighborhood Centers -New Highland Academy Oakland High School **Oakland International High School** Oakland Technical High School Parker Cdc Parker Elementary Peralta Cdc Peralta Creek Middle School Peralta Elementary Piedmont Avenue Cdc Piedmont Avenue Elementary

(510) 879-1210 (510) 879-1290 (510) 879-0857 (510) 879-1300 (510) 879-0820 (510) 879-1310 (510) 879-1320 (510) 879-3010x457 (510) 534-0282 (510) 879-1330 (510) 879-0823 (510) 879-1340 (510) 879-0827 (510) 879-1820 (510) 879-1141 (510) 879-1370 (510) 879-0829 (510) 879-1370 (510) 879-1373 (510) 879-1380 (510) 879-1740 (510) 879-1390 (510) 879-3030 (510) 879-1597 (510) 879-1530 (510) 879-0235 (510) 879-0322 (510) 879-1430 (510) 879-2110 (510) 879-4020 (510) 879-1260 (510) 879-3040 (510) 879-3050 (510) 879-0828 (510) 879-1440 (510) 879-0858 (510) 879-8465 (510) 879-1450 (510) 879-0832

(510) 879-1460

1100 3rd Ave 1700 Market SI 746 Grand Avenue 746 Grand Ave 3825 California Street 3750 Brown Ave 824 29th Ave 8610 Macarthur Blvd 2035 40th Ave 2101 35th Avenue 225 11th St 1125 69th Avenue 6701 International Blvd 6701 E.14th SL 960 10th St 4610 Foothill Blvd 2409 E 27th St 2618 Grand Vista 2409 E 27th St 2409 E. 27th St 7220 Krause Ave 3400 Malcolm Ave 4730 Fleming Ave 2607 Myrtle St 4610 Foothill Blvd 5328 Brann Street 314 E 10th St 960A 10th Street 1757 Mountain Blvd 5555 Ascot Dr 750 International Blvd 8521 A St 1023 Macarthur Blvd 4521 Webster St 4351 Broadway 7901 Ney Avenue 7929 Ney Ave 460 63rd Street 2101 35th Ave 460 63rd Street 86 Echo Avenue 4314 Piedmont Ave

Pleasant Valley Adult School Preparatory Literary Academy Of Cultural Exce Prescott Cdc Reach Academy Redwood Heights Elementary	(510) 8 (510) 8 (510) 8	379-4090 379-1470 379-0835 379-1100 379-1480
Rise Community School	(510) 8	379-2553
Robeson School Ot Visual & Performing Arts	· ·	379-1237
Roosevelt Middle School		379-2120
Roots International Academy	· ·	379-2625
Rudsdate Continuation		379-4237
Sankofa Academy		379-1610
Santa Fe Cdc		379-0637
Santa Fe Elementary		379-1500
Sequoia Cdc	· /	379-0846
Sequoia Elementary		379-1510
Skyline High School		379-3060
Sobrante Park Elementary	· ·	379-1540
Sojoumer Tmth Independent Study		379-2980
Stonehurst Campus		379-1550
Stonehurst Cdc		379-0838
Street Academy		379-3130
Think College Now		379-1490
Thornhill Elementary		379-1570
Tilden Elementary		379-1560
Tilden Pre-K		379-0841
United For Success Academy	· /	379-1494
Urban Promise Academy		379-1640
Washington Cdc		379-0839
Webster Academy	· /	379-1620
Webster Academy Ece	(510) 8	379-0842
West Oakland Middle School		
Westlake Middle School		379-2130
Whitlier Elementary	• •	379-1630
Yes, Youth Empowerment School		379-8877
Yuk Yau Cdc		379-0824
Yuk Yau-Annex	(510) 8	379-0821

920 53rd Street 920 Campbell St 800 Campbell Street 9660 Sunnyside St. 4401 39th Ave 8521 A St 4610 Foothill Blvd 1926 19th Ave 1390 66th Ave 1180 70th Avenue 581 61st St 5380 Adeline Street 915 54th St 3730 Lincoln Avenue 3730 Lincoln Ave 12250 Skyline Blvd 470 El Paseo Dr 9736 Lawlor SL 10315 E St 901 105th Avenue 417 29th St 2825 International Blvd 5880 Thomhill Dr 4551 Steele St 4655 Steele Street 2101 35th Ave 3031 E. 18th Street 6097 Racine Street 8000 Birch St 7980 Plymouth Street 991 14th Street 2629 Harrison St 6328 E 17th St 8251 Fontaine St 291 10th Street 314 East 10th Street

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Other Schools

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California College of Arts & Crafts California State University, Hayward Holy Names University
Mills College
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Patten University
Alameda College
Laney College
Merritt College
Vista College
Samuel Merritt College
San Francisco State University - Extended Learning
Holy Names High School

City Statistics Land area (sq. mi.) Lake area (sq. mil.) Total area	53.8 3.5 57.3	FY07-09 Budget FY07-09 Budget
Miles of Streets	835.8	FY07-09 Budget
Population Number of businesses	411,600 19,720	FY07-09 Budget FY07-09 Budget

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Network Specifications Access points/sq. mi.

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Estimate

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11. Appendix D: Communications

11.1. Communications Outline

- I. Communications Objectives
 - A. Awareness. Build brand public awareness of the Wireless Oakland Initiative (WOI) project in the Oakland Metropolitan Area amongst its diverse population. The goal is to have 60% of the constituent community be aware of the WOI within the first six months.
 - B. Education/Buy-in. Educate the public on the key details of the WOI program and the benefits it will provide the citizens of Oakland both short and long term. The goal w to educate as many people as the budget permits.
 - C. Image/Reputation. Increase Oakland's reputation as a smart, progressive city; one that is on the forefront of technology. Increase favorable image of Oakland as a great place to visit, live and do business.
- II. Key Communications Strategies
 - A. A. Positioning. Position the WOI program as a major initiative (versus other City initiatives) by "branding" the program with its own unique image.
 - B. Elements of a "Branded Initiative"
 - Name
 - Logo (City of Oakland logo)
 - Positioning
 - Vision
 - Personality
 - Brand promise
 - Value proposition
 - Core brand message
 - Theme (e.g., "Building a Digital Future Today")
 - C. Continuity of Messaging. All initiative messaging should be consistent across all communications channels so they reinforce the key elements of the brand.

III. Key Communications Tactics

- A. The communications plan will include both an introductory phase (first 90 days) and an ongoing support phase. The plan will use the most cost-effective communication tools available to reach the various target audiences.
- B. The communications tactics recommended are an integrated mix of traditional media, Web media and the new social media.
- C. The current thinking on the elements that should be involved include:
 - 1. Fact sheet (several languages).
 - 2. Q and A document (both printed ad online).
 - 3. Community meetings.
 - 4. Presentation to community groups and service clubs.
 - 5. Media Relations Kit: Introductory and Ongoing.
 - 6. A micro-site as part of the City's master Web site.
 - 7. Quarterly e-mail newsletter campaign.
 - 8. A social media presence (blog, Twitter, Facebook) to reach the digital generation.
 - 9. Optional: Special Education and Teaching Module, budget permitting.

11.2. Presentation

City of Oakland Wireless Broadband Feasibility Study

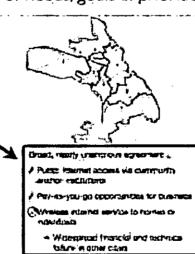
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Comprehensive assessment of needs, goals & priorities

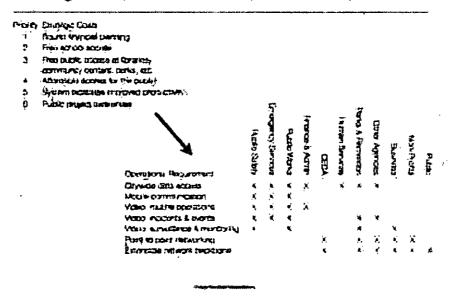
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Study Objective:

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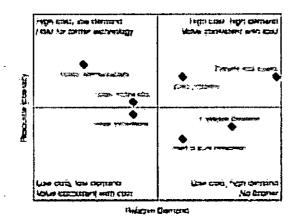


Needs, goals & priorities led to operational requirements

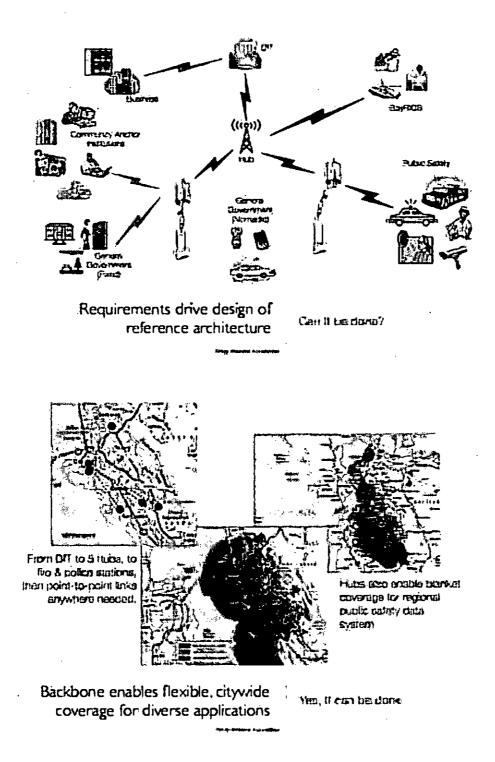


Is desire consistent with cost?

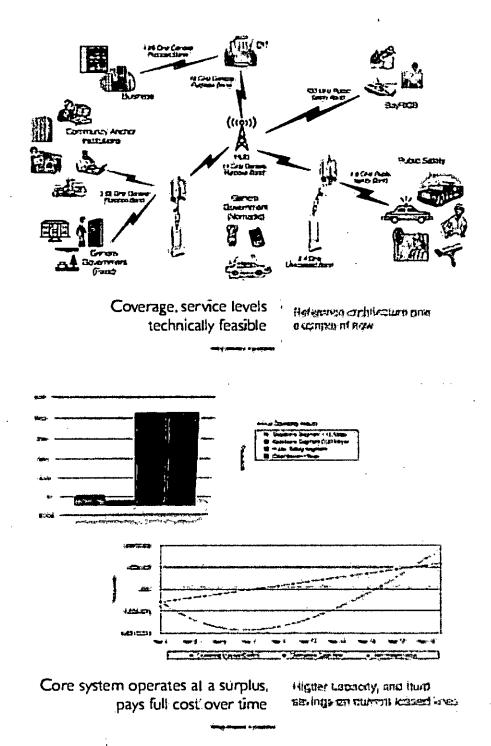
Sotting operational requirement prioritias for the City of Oakland



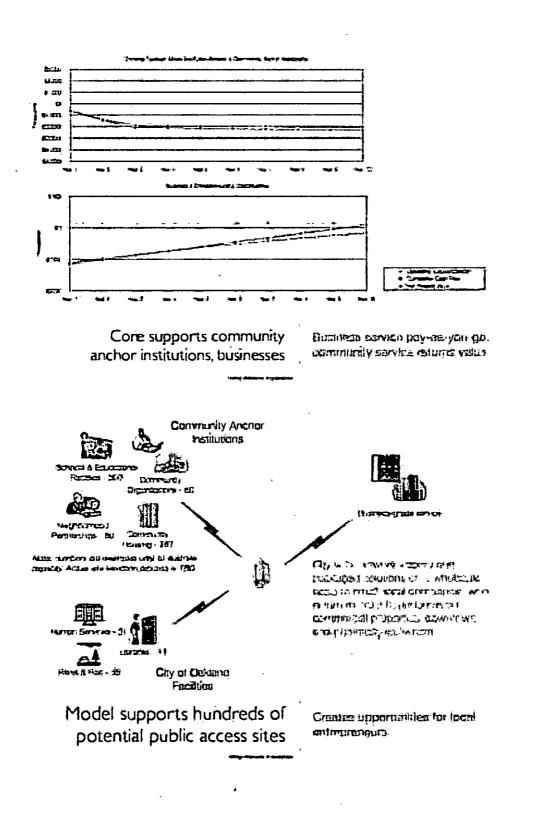
- 1. Extonsible patwork; backbong
- 2. Point to point networking
- 3, Citywido data access
- I. Video: incidents
- 5. ytdso: surveitance
- 8. Video: routine opensions
- 7. Mobile communications



City of Oakland Wireless Broadband Feasibility Study



City of Oakland Wireless Broadband Feasibility Study



Next steps

Slimulus program application deadline sets immediate agenda

- . Determine which broedband grent programs are evaluate to the Oky,
- Divelop un implémentation plan that media acnodule requirements and chierie (or "shovel-ready" pm[acta.
- Identify complementary atimulius program-funded projects and potential partners, per applications guidalines.
- Determine me assinta for the required 20% matching luntia, including making any necessary applications to State of Galifornia epondiea.
- Prepare and submit grant applications covering as many categories as practices dy the 14 August 2009 deadline.
- · Relaces an RFP to suppor the gmm applications as soon as possible.

Creating and implementing fundable business plans for community broadband projects is a speciality of Tellus Venture Associates.

Since 1996, our clients have built, funded, launched and managed wireless, fiber optic and satellite networks that serve consumers and communities around the world. Our experience includes:



- Financial and technical feasibility studies
- · Primary market research to determine demand and community support
- Business case assessment
- · Business model and funding development
- Public/private partnerships
- Reference designs
- RFP development and support

Stephen Blum, the president of Tellus Venture Associates, has led many successful projects and served in several senior executive positions on a consulting basis, including...

- Principal consultant for a successful \$5 million grant application for a regional broadband consortium.
- Chiefoperating officer of a wireless ISP.
- Due diligence lead for an NGO delegation to Angola
- Team leader for an NGO project in the Philippines.
- Principal negotiator for a cable system sale to a top tier MSO.
- · Managing consultant for a public/private WiMAX network deployment.
- Principal consultant for comprehensive feasibility studies for municipal wireless broadband systems.
- Management advisor for satellite broadcasting systems in North and South America, Asia, the Pacific Rim, Africa, the Middle East, and Europe, including most recently Italy, Cambodia and New Zealand.

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