San Leandro Commercial Broadband Strategy

City Council Workshop Draft

9 April 2012

Tellus Venture Associates

Stephen A. Blum
Tellus Venture Associates

www.tellusventure.com

Table of Contents

1. Executive summary

1.1. Introduction

Access to high speed, reliable links to the Internet and internal networks is a basic, 21st Century utility, as vital to economic development as electricity or water.

The essential nature of broadband[1] service has been recognized at many levels in California: in an executive order from the Governor's office, in bills passed by the Legislature, in reports prepared by a statewide task force and various state agencies and in economic development studies prepared for jurisdictions throughout the state.

Studies by the U.S. government and by international organizations uniformly tell the same story about broadband: "it is a key driver of economic growth and national competitiveness, and it can contribute to social and cultural development."[2]

1.2. Commercial access assessment

In 2011, the City of San Leandro's Office of Business Development worked with local businesses, property owners, entrepreneurs and service providers to assess the current state of broadband access for business and industrial users. This research included two business workshops, an online survey, map analysis and one-on-one meetings.

The importance placed on fast, reliable commercial grade broadband service by businesses and developers supports the conclusion that extending fiber optic facilities to these areas will create economic development opportunities and maximize the positive impacts of broadband on commercial real estate values.

As a result, four specific areas within the City were identified as priorities for broadband improvements due to current substandard service levels or future plans for significant development that could benefit from higher quality service:

- Downtown San Leandro
- The Davis/Doolittle/Adams Tract area
- The 880 Industrial Corridor
- The Shoreline

[1] For definitions of technical terms, please see the glossary in Appendix F.

[2] *Building broadband: Strategies and policies for the developing world*, World Bank, January 2010.

In some cases, acceptable commercial broadband access was completely lacking. In other cases, it was unreliable and not of sufficient speed or reliability to support business or industrial users.

1.3. City policy review

City staff provided information regarding policies and practices that impact broadband service development. These policies included conditional use and encroachment permits, wireless tower policy, utility undergrounding, use of City-owned facilities and treatment of high technology businesses. San Leandro's policies were then compared to benchmarks developed by other local governments and at a state level in California.

In general, broadband-related policies and practices in the City of San Leandro meet or exceed benchmarks established elsewhere. On the whole, San Leandro is conducive to high technology businesses and uses, and works to minimize obstacles to broadband development.

In some cases, no formal policy exists but routine practice is consistent with explicit policy benchmarks established elsewhere in California. In others, general practice is broadband-friendly, but not broadband-specific.

1.4. Recommendations

The commercial access assessment and the review of City policy led to seven policy and infrastructure initiative recommendations.

Table 1.1 Summary of Recommendations

	Recommendation	Description	Cost	Funding Options
1.	Formalize and promote existing broadband-friendly practices.	Capitalize on the City of San Leandro's competitive advantages regarding development to attract new business and investment	Staff time	City
2.	Make broadband a standard planning review criterion.	Encourage the growth and universal availability of commercial-grade service by treating broadband similarly to other utilities.	Staff time	City

Table 1.1 Summary of Recommendations

	Recommendation	Description	Cost	Funding Options
3.	Adopt a comprehensive open trench policy.	Reduce costs and traffic disruption and encourage forward-thinking broadband construction through cost sharing and joint planning of street-cut projects.	Staff time	
4.	Pursue opportunities for lateral connections to major fiber routes	Extend the benefits of San Leandro's long haul and local dark fiber networks to under and unserved businesses by assisting construction of links to commercial areas and properties.	Depends on scope, thousands to millions of dollars.	Federal EDA, CASF, cost sharing
5.	Support Lit San Leandro on a non-discriminatory basis	Lit San Leandro's dark fiber network, including fiber strands owned by the City, is a resource few cities can offer and is a competitive advantage in attracting expanding and relocating businesses.	Staff time	
6.	Develop WiFi hotspots in Downtown San Leandro	Encourage foot traffic and attract connected business people and consumers by providing WiFi Internet access as a free amenity.	Staff time, under $50K to start, operating costs likely less than $10K per year.	City, PBID, grants, partners
7.	Support business connections to broadband service.	Add a broadband connection component to the City's existing business incentive programs.	$5K to $25K per business.	City, grants

The City of San Leandro can promote deployment of commercial and industrial grade broadband infrastructure and encourage faster adoption of those services by continuing to pursue the general policies and specific initiatives that it has already successfully implemented. As detailed below, the City already meets or exceeds California benchmarks in several essential categories.

Improved broadband access, including new fiber optic networks similar to Lit San Leandro, has helped cities attract relocating businesses and encouraged upgrades by existing ones. Jobs and businesses have been created in depressed areas as a result of municipal broadband policy and development initiatives.

By itself, better broadband access will not transform San Leandro's economy. But it is a necessary precondition and gaining it will open the door to new and expanding companies with more and better paying jobs.

2. Commercial Broadband Assessment

2.1. Introduction

The purpose of this report is to assess commercial broadband[3] availability in San Leandro and current City of San Leandro policies and initiatives related to broadband, and then make general and specific recommendations for addressing any gaps identified and to guide future development of this utility.

Access to broadband service – fast, reliable, high quality links to the Internet and internal networks – is a basic competitive requirement in the 21st Century economy. Broadband availability is one of the first criteria assessed when businesses consider relocating or expanding. It is considered to be a non-negotiable resource that is necessary for businesses to operate and to keep pace with global competitors. Appendix E contains a list of documents, including municipal case studies, that discuss broadband as an essential utility and consider its vital role in economic development.

As an example, the City of Santa Cruz has seen a significant increase in the number of people and businesses added to its downtown economy since an independently-owned dark fiber link was built to Silicon Valley, which provided competition to and a wider range of choices than the services offered by AT&T and Comcast. Several co-working centers have sprung up to support entrepreneurs, freelancers, telecommuters and others. City government has proactively supported construction of fiber connections, worked to put more municipal operations online and included broadband connectivity as a master plan element.

Taken together, these policies produced a broadband-ready attitude in the business community and amongst local agencies. In some respects, San Leandro's current initiatives and policies are even more advanced. By extending some and focusing others, the City can gain the same kind of benefit, perhaps to an even greater degree.

---

[3] "Broadband" refers generally to any telecommunications service capable of supporting digital data transmission at high speeds. These services can include and/or support Internet, television, telephone, private data networks and various specialized uses. Broadband service can be delivered in a variety of ways, including telephone lines (e.g. DSL), coaxial cable (e.g. cable modem), fiber optic cable (e.g. Lit San Leandro), wireless cellular/mobile service (e.g. cell phones, tablets, wireless modems), WiFi, point-to-point and point-to-multipoint wireless service (e.g. TelePacific, Etheric) and hybrid networks (XO Communications). Although different organizations use different criteria, the California Public Utilities Commission considers 6 Mbps download and 1.5 Mbps upload speed to be a standard for adequate broadband service availability. Unless otherwise stated, this report uses the CPUC definition.

2.2. Summary of research

The assessment of commercial broadband availability, speed and service levels began with:

- Two broadband workshops for local businesses.
- Meetings with individual businesses and property owners.
- An online survey of the San Leandro business community.
- Meetings with Internet service providers.
- Meetings with the San Leandro and San Lorenzo School Districts.
- Follow up contact to obtain additional information.
- Evaluation of state data and initiatives.

2.3. Workshops

The first workshop was a lunch meeting held on July 19, 2011 at the City's Senior Community Center and the second was a morning session on July 26, 2011 at the Davis Street Transfer Station Education Center, which is located in an area previously identified as lacking commercial broadband availability. In total, 23 people from 16 local businesses, non-profits and the public attended, including representatives from AT&T and Comcast.

The comments, ideas and concerns expressed in the two workshops were generally consistent, focusing on specific areas which lacked access to commercial or industrial grade[4] broadband service, ideas for improving broadband service and support for the Lit San Leandro project, albeit with some questions regarding benefits and risks for the City. Concerns expressed included reservations about how broadband would be regulated and where it would installed but, equally, participants were worried about the economic impact on the City if broadband projects weren't pursued.

Participants discussed various issues they were having with broadband availability, and identified specific locations where commercial grade broadband service was not available. Problem areas mentioned included Downtown San Leandro and industrial areas along I-880 and to the west.

---

[4] As used in this report, "commercial grade" service is defined as being similar to residential service in that the provider takes effectively all responsibility for installing, maintaining and supporting the service. Speeds are similar (6 to 100 Mbps), but service levels, reliability, consistency and pricing are higher. "Industrial grade" service refers to service where the customer plays a much greater role in provisioning and supporting the service, including buying different elements from different vendors and managing installation and support. Speeds would be higher – perhaps as high as a Gigabit per second or more – and quality of service levels could be as high as Tier 1. Comcast's Business Class service or AT&T's business DSL service are examples of commercial grade service. A DS-3 or dark fiber strands are examples of industrial grade service.

2.4. Online survey

The City of San Leandro posted an online survey (see Appendix A) regarding commercial broadband availability and satisfaction, and encouraged local businesses to participate. Businesses were informed of the survey via press releases and email notifications by the City and the San Leandro Chamber of Commerce. A total of 44 responses were received, most (40) in July of 2011, with the remainder posted between August 2011 and January 2012.

Table 2.1 Online survey responses

Question	5 point scale response
How satisfied are you with the speed of your current broadband service?	2.8
How satisfied are you with the reliability of your current service?	3.3
How satisfied are you with the value you are currently receiving?	2.7
How satisfied are you with the range of broadband options available at your location?	2.2
How important is broadband availability to your business operations?	4.6

1 = not satisfied at all, 5 = extremely satisfied

Table 2.2 Online survey responses

What improvements would you most like to see in broadband availability for your business?	
Improved Reliability	19%
Improved Speed	38%
Lower Cost	24%
More choices of service providers	19%

Respondents were not generally pleased with the range of broadband options available to them at their business locations, with better speed being the most desired improvement. Availability of broadband was generally seen as “absolutely crucial” to businesses. Although respondents were required to provide their address, most did and this information was used to help identify priority areas. The majority of respondents

who were not pleased with the broadband options available to their businesses were in the downtown areas, with a smaller number reporting problems in the City's industrial areas.

2.5. Service provider follow up and gap identification

In general, the two primary Internet service providers in San Leandro – AT&T and Comcast – have focused their investments on improving television and consumer grade Internet service in residential areas. AT&T's recent service upgrades are focused in residential zones, not commercial or industrial districts, and the information provided by Comcast regarding its high speed broadband services, and confirmed by local businesses, is consistent with this pattern as well.

Specifically, the workshops and online survey produced a consistent picture of broadband service gaps in the commercial and industrial areas of San Leandro (see Appendix A for details). This information was provided to the two major broadband companies serving the City – Comcast and AT&T – for their evaluation and response. Comcast responded with a breakdown of broadband service availability in some of the City's commercial districts and AT&T displayed a map of its Project Lightspeed service nodes. This information was consistent with data collected and mapped by the City.

Project Lightspeed is AT&T's ongoing program to upgrade residential broadband service to speeds and service levels that can support video services similar to those provided by cable television companies. Although it is not designed with businesses in mind, it can support commercial grade service where it's available and, in general, upgrades made for the purposes of the project result in better overall infrastructure.

For the purposes of analysis, the Project Lightspeed nodes were mapped by the City using the assumption that each node had a uniform service radius of 1,500 feet. While this approach is too rough to predict service availability at a particular location – the actual coverage pattern of any given node is subject to many variables – it paints a useful picture of which areas of the City have been targeted for upgrades by AT&T and which have not.

When Comcast was provided with a sample list of problematic addresses, its representatives initially responded quickly with an estimate that approximately a quarter might have had problems in the recent past but should be able to order service now or in the near future. About half were addresses that Comcast would consider deploying service to if the business or property owners were willing to pay some or all of the cost of constructing the necessary facilities – the company's existing budget for these types

of upgrades is relatively small and is spread over the entire region. The remaining quarter or so were unlikely to be served by Comcast in the foreseeable future.

A Comcast representative made it clear that the company is not interested in paying for extensions of service to vacant commercial properties.

Meetings were also held with representatives from the San Leandro and San Lorenzo school districts. School sites located within the City of San Leandro are primarily located in or near residential areas, and do not generally have problems obtaining adequate broadband connectivity. Much of the cost of educational broadband connections is paid for by federal and state grants and connectivity is provided primarily by AT&T under multi-year contracts. Internet bandwidth is provided by the Corporation for Educational Network Initiatives in California (CENIC), a non-profit corporation that provides educational Internet access throughout the state.

Long haul and metropolitan fiber optic cable routes were identified from information previously obtained by the City, released by long haul carriers and provided by local business. These fiber lines are vital for providing connectivity in and out of the City as a whole, but have limited usefulness for delivering broadband service to individual locations.

Finally, information regarding broadband service availability collected by the California Public Utilities Commission (CPUC) was obtained. This data was provided to the CPUC by AT&T, Comcast and competitive carriers.

The information gathered from San Leandro businesses and residents, provided by carriers and collected by the CPUC was combined into a multi-layered map by City GIS staff. The pattern of this data is consistent with the information obtained locally.

A full set of maps is contained in Appendix C. These maps contain additional detail regarding broadband service availability from Comcast and AT&T, availability analysis by CPUC staff, Project Lightspeed and Lit San Leandro information and locations of problem areas.

There are a number of smaller service providers that offer commercial broadband service to businesses in the East Bay Area, including San Leandro. However, these companies do not generally own their own fiber or wire line facilities in the City and depend on either wireless connections or lines leased from AT&T to deliver service to end users.

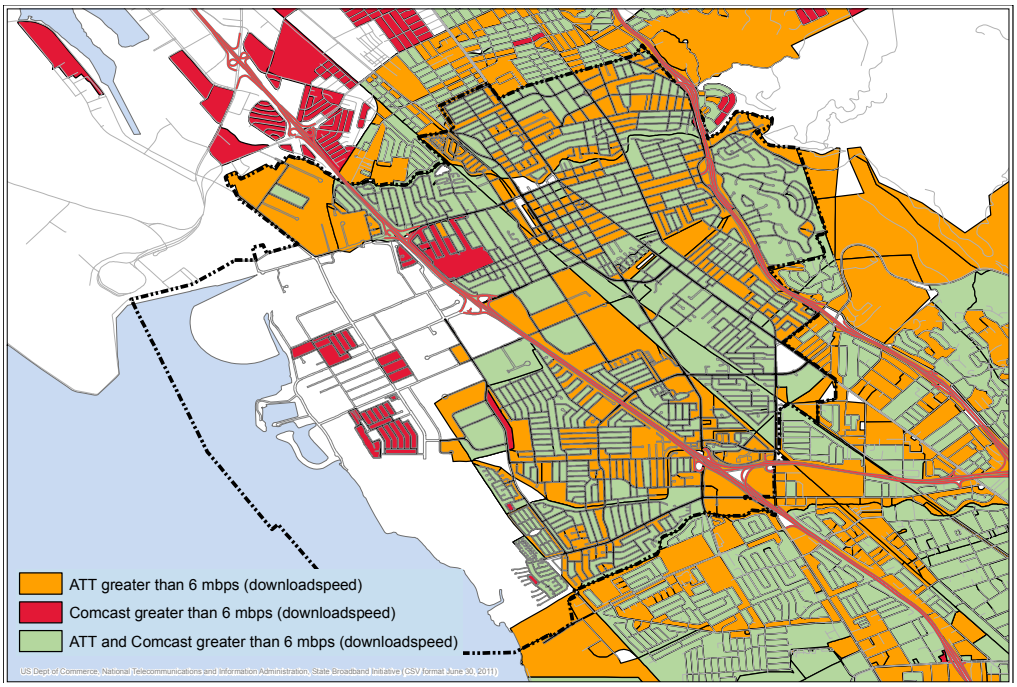


Figure 2.1 Map showing broadband availability data collected by CPUC. A full size map can be found in Appendix C.

CPUC's service availability data indicates that at least some land line-based broadband facilities in the commercial and industrial areas of San Leandro are substandard.

As local businesses and smaller carriers reported and, in some cases, AT&T confirmed, leasable lines capable of supporting high speed, reliable Internet service are not available in several commercial and industrial areas of the City.

Wireless broadband service is theoretically available throughout the City from cellular carriers, from companies (such as TelePacific and Etheric) that offer general service over a wide area from scattered towers and from providers that offer customized, point-to-point connections.

However, wireless broadband facilities operate within cost, coverage, reliability, speed and quality of service (QoS) parameters that are not suitable for all commercial uses or acceptable to all users. For example, a major software company will have bandwidth and QoS requirements that exceed wireless standards. Medical organizations have reliability needs that wireless service providers can rarely, if ever, meet. These types of users will occasionally employ wireless links for back up, mobility or other auxiliary purposes, but will not depend on it for primary service.

Broadband service problems have been identified in key commercial and industrial areas of San Leandro. These gaps can only be filled by upgrading existing land lines or deploying new ones. The importance placed on fast, reliable commercial grade broadband service by businesses and developers supports the conclusion that extending fiber optic facilities to these areas will create economic development opportunities and maximize the positive impacts of broadband on commercial real estate values.

2.6. Specific priority areas

Map-based analysis points to four specific areas in San Leandro where a higher level of commercial broadband availability would enable businesses and property owners to meet the expectations of high technology enterprises. The information used included detailed service reports provided by carriers to the CPUC, data collected in the course of this study and anecdotal reports.

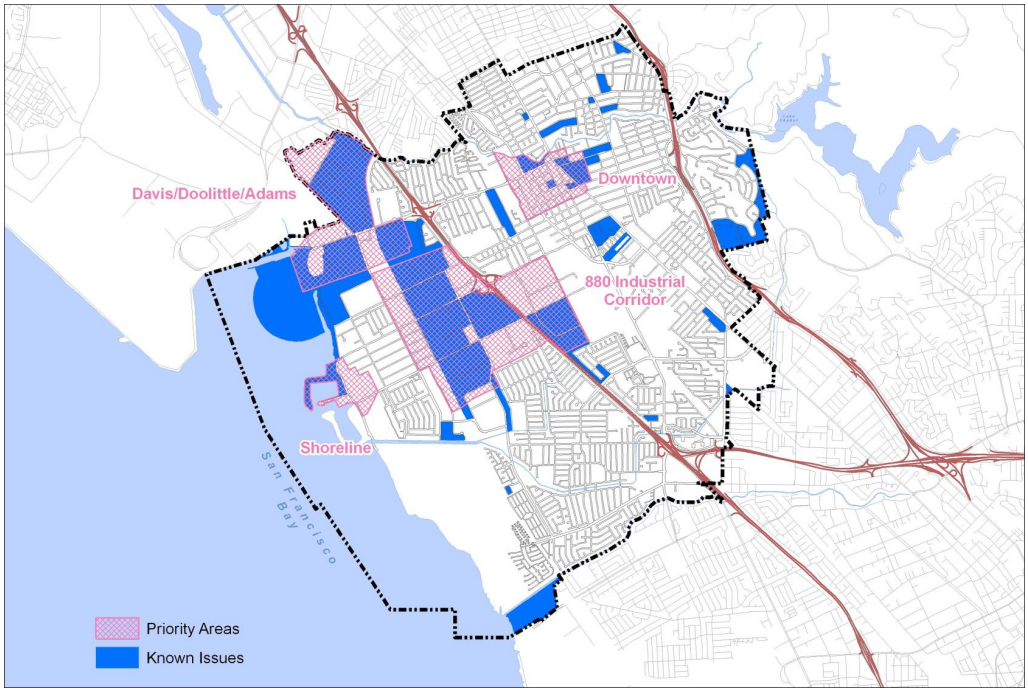


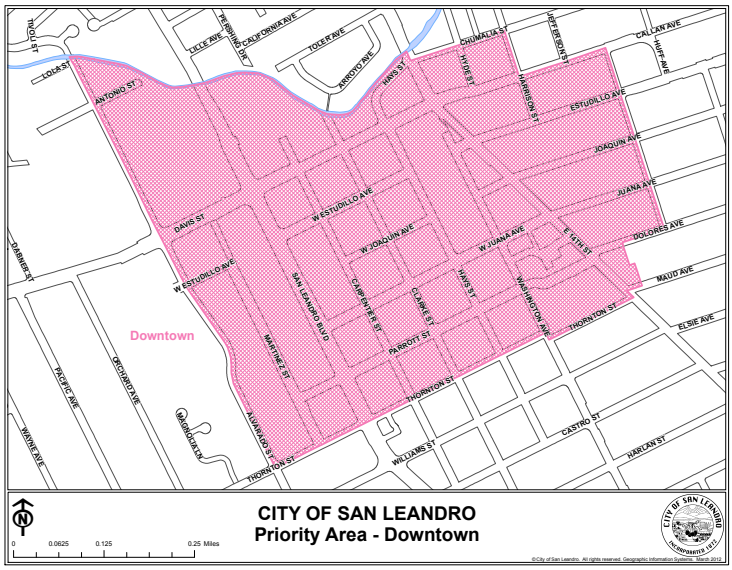
Figure 2.2 Map showing broadband development priority areas identified by research. A full size map can be found in Appendix C.

Downtown San Leandro

Downtown San Leandro is, and will remain, the focal point for office and professional uses in the City. Creekside Plaza is currently the City's only class-A office development and is home to over 1,300 high-quality jobs. OSIsoft and Wells Fargo also have sizable facilities in Downtown San Leandro. Additionally, the City's 2007 Transit Oriented Development Strategy laid the groundwork and provided environmental clearance for

over 700,000 square feet of new office development downtown. Commercial-grade broadband availability will be essential if the City is to be successful in attracting and retaining office tenants and quality jobs in growth industries.

Unlike the Davis/Doolittle/ Adams area, AT&T has installed some Project Lightspeed nodes in Downtown San Leandro. However, the pattern of placement is more consistent with a coverage plan intended to extend consumer services (including video) into residential areas than it is with directly supporting commercial grade service.



Businesses and property owners in Downtown San Leandro report problems obtaining reliable, commercial grade DSL or cable modem service, stating that it is completely unavailable or subject to lengthy – sometimes several months long – installation delays. The same is true of industrial grade service. These problems are anecdotally said to occur throughout the Downtown San Leandro area, but there is a cluster of reported broadband availability problems in the area bounded by Parrott Street/Dolores Avenue, Santa Rosa Street, Hayes Street and Estudillo Avenue. Broadband availability data provided by the CPUC is consistent with these reports.

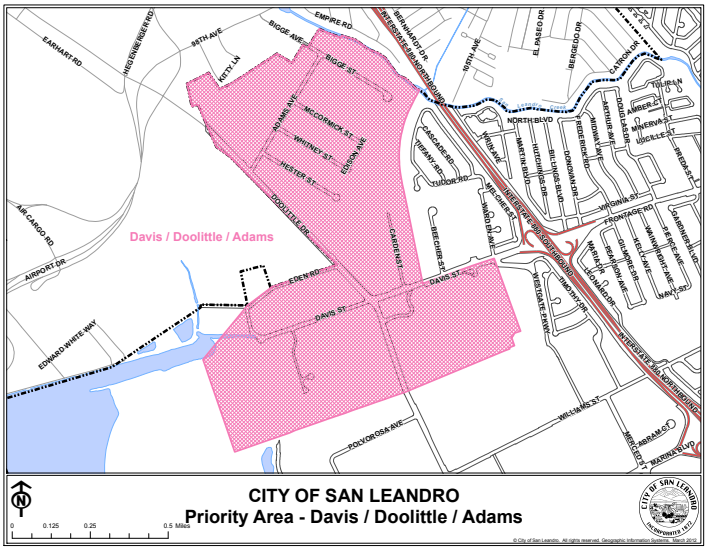
This lack of broadband availability is seen as a disadvantage for the area. Improving commercial broadband availability will benefit smaller offices as well as larger, planned developments such as OSI Soft's office expansion and Town Hall Square.

Lack of broadband service can even inhibit foot traffic as some shoppers, visitors and business people prefer to go where wireless Internet service, for example from WiFi hotspots, is more widely available. WiFi Internet access is an amenity that can attract visitors and add value for the local business community.

Davis/Doolittle/Adams area

The industrial zoned area surrounding Davis Street, Doolittle Drive and Adams Avenue is particularly problematic.

Wireless carriers claim to serve this area but, as noted above, wireless service is not always actually available in claimed service areas and does not support the full range of service standards applicable to industrial and, frequently, commercial grade service. Comcast claims to provide cable modem service to one street in the area. Otherwise, the area depends solely on AT&T's legacy copper wires[5] for broadband service.



Business owners in this area and smaller service providers report that these lines cannot support even the minimal, decades-old T-1 service standard.

For example, staff of a chemical company located in this area reports that they have had trouble obtaining reliable commercial grade broadband service. Originally, they used a microwave-based service that delivered adequate performance, but that service is no longer available. Currently, they are paying for a T-1 class connection, but it is unreliable and only performs at about two-thirds of its rated speed. The company considers this situation to be unacceptable and a detriment to conducting business.

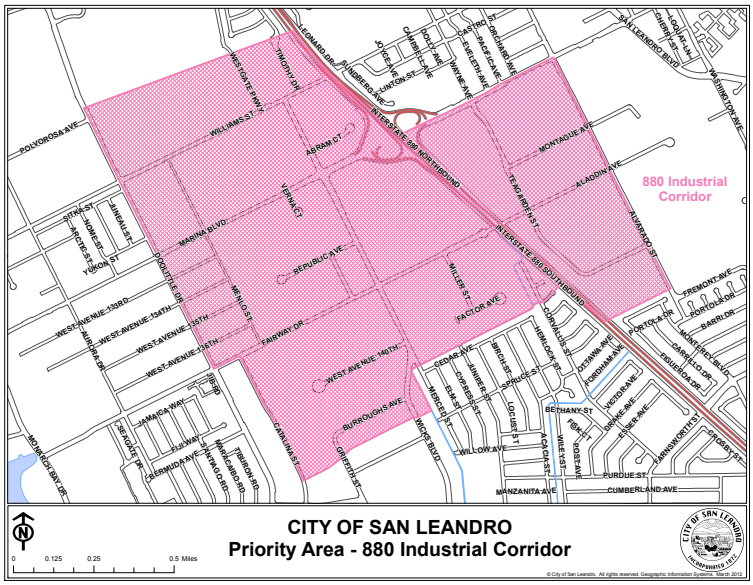
Although AT&T denies there is a complete lack of modern telecommunications facilities, its representatives admit to having problems in the area and do not contest the specific reports of broadband unavailability. The CPUC's data similarly supports a conclusion that substandard service exists in at least some of this area.

Improved broadband service availability will create an opportunity to upgrade and reposition blighted and underutilized properties in this area.

[5] A significant portion of the basic infrastructure that supports local telephone and broadband connectivity is comprised of bundles of copper wire that were installed more than fifty ago by the former Bell System. The T-1 standard was introduced in 1961 in order to support a bi-directional speed of 1.5 Mbps at a high quality-of-service level, using the copper wires of the time. Because it is a dedicated and managed circuit, its performance is usually substantially better than shared services such as DSL or cable modem, even in cases where the claimed top speed of those shared services is many times higher. A T-1 circuit is generally considered to be the lowest level of service that can be described as industrial or carrier grade.

880 Industrial Corridor

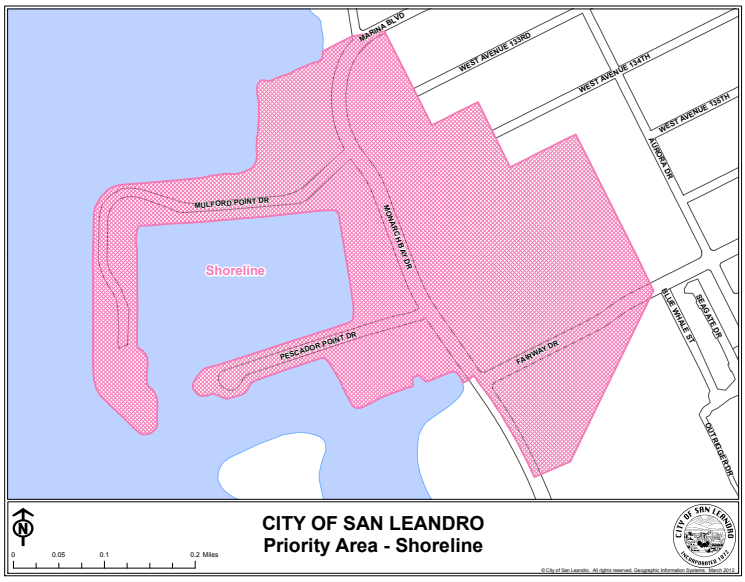
This area can be generally described as the industrial properties on either side of Interstate 880, south of Davis Street and north of Manor Boulevard, between Doolittle Drive on the west and Alvarado Street on the east. As in Downtown San Leandro, property and business owners report problems obtaining commercial or industrial grade broadband service.



The map analysis supports this perception. There is only one AT&T Project Lightspeed node in the area, although there are others in adjacent residential areas. Likewise, Comcast's ability to serve this area is limited. The CPUC data indicate that there are gaps in land line-based broadband service, although it also shows that at least one carrier is reporting that it provides 1 Gbps service to at least one property on the east side of Alvarado Street.

The state-of-the-art Kaiser Medical Center which is currently under construction is an example of one of the businesses in this area that will benefit from improved service availability.

Shoreline



Following the general pattern of broadband availability decreasing west of I-880, areas along the San Leandro shoreline have less access to commercial and industrial grade broadband service than most other parts of the City. In particular, the CPUC data show a fall off in available service levels along Monarch Bay Drive and the Marina area.

High quality broadband service to the shoreline area will be particularly important in the future because planning is underway for a substantial development project at that location. A conceptual master plan developed by Cal-Coast Companies and a 30-plus member Citizens Advisory Committee includes plans for a 200-room hotel, a 15,000 square foot conference center and a 250,000 square foot office campus, in addition to retail spaces, residential development, and several community amenities.

Development of the hotel, conference center, and office complex will be dependent on the availability of commercial and industrial grade broadband service. would be significantly less viable if broadband availability in the area does not improve. Conversely, exceptional broadband service (such as a direct fiber connection to the site) would assist efforts to attract top quality users and tenants.

3. City Policy Review

3.1. Placement of broadband facilities in public right of ways

The Encroachments Chapter (5-1) of the San Leandro Municipal Code sets out a clear process for anyone who wishes to install broadband facilities – such as conduit, fiber optics or equipment vaults – in a public right of way. It begins by stating "no person shall...place on, over or under [a] street any pipe line, conduit or other fixture...without having first obtained a permit." It then goes on to detail the required steps and applicable standards for obtaining a permit. The same rules apply to street side cabinets, underground vaults and other equipment placements, and indeed nearly any other kind of encroachment, for example building a fence, blocking a street or planting a tree. There are no specific requirements pertaining to fiber optic lines and other telecommunications gear.

The general requirements that do apply concern things such as maintaining public access to streets, having proper insurance, performing the work to a proper standard and repairing any damage caused.

Any activity in a public right of way is exempt from zoning or similar restrictions. Applicants are only required to apply to the Engineering and Transportation Department for an encroachment permit, which are typically granted if the proposal meets the technical standards referenced in the Municipal Code. City staff have thirty days to either grant the permit, with or without conditions, or provide specific reasons in writing for its rejection.

AT&T's Project Lightspeed is a recent exception. The Community Development Department was asked to review AT&T's request to place 114 equipment cabinets on city streets as part of a proactive effort to make sure residents understood what was happening and why, and to ensure that there were consistent and acceptable measures taken to address aesthetic concerns throughout the City. The result was a staff memo (Appendix B) issued in September 2007 that outlined a cooperative process intended to facilitate the upgrading of AT&T's residential broadband service while addressing public concerns.

City staff worked with AT&T to evaluate each specific location, identify and implement any mitigation measures necessary to avoid problems such as negative aesthetic or public safety impacts and provide detailed notice to people living and working in the vicinity. Where it was deemed necessary, proposed box sites were moved to more appropriate locations.

Staff developed fourteen standard conditions for the overall project, addressing public notice, traffic and neighborhood disruption, visual impact, public safety, emergency procedures, environmental concerns and compliance with City requirements. Then, each site was evaluated on an individual basis and specific conditions were imposed where appropriate. The work was performed by staff on a cost recovery basis.

3.2. Utility line undergrounding

The City has a long term program to move electrical and telecommunications lines from poles to underground conduit along major thoroughfares and other key streets. When doing this work, the City's Zoning Code also requires that all new developments on these streets either put utilities underground or pay an underground utility fee. When doing this work, the City routinely specifies additional conduit for broadband purposes.

3.3. Wireless towers and antennas

The City of San Leandro's zoning policy for wireless telecommunications facilities installed by service providers is intended to "enhance the ability of the providers of telecommunications services to provide such services to the community quickly, effectively and efficiently", while steering antenna and tower construction to non-residential areas and encouraging sharing of tower sites amongst service providers. It is also intended to reduce the visual impact of wireless telecommunications facilities.

The approval process is well-defined (see Appendix B) for permit applications, and encourage proposals that maximize use of existing towers and structures, minimize visual impacts and locate new structures in industrial areas. An established process for reviewing wireless telecommunications proposals tends to encourage the development of broadband facilities in a city.

First, wireless telephone and broadband companies are likelier to prioritize areas that have a predictable and finite process for evaluating proposed facilities. It is not so much a question of how rigorous or restrictive the policies are, but rather a question of knowing in advance what the rules and expectations are, and how long it will take to reach a definitive yes or no answer.

Second, wireless telecommunications are one of the major drivers of new fiber optic line construction. It seems a little counterintuitive at first, but providing faster fiber optic connections to a cell site or other wireless hub means more traffic can be carried by that site and more wireless bandwidth can be delivered to the surrounding area. When a fiber optic line is built to serve a cell site, that line can also be used to support commercial and industrial service to nearby businesses.

During the review process, applicants must provide information regarding all their existing and planned wireless facilities in or near the City. Initial review of applications is usually complete within 30 days.

When a project doesn't qualify for automatic or administrative approval, the process is more complicated. In those cases, the City's Board of Zoning Adjustments has to grant a Conditional Use Permit (CUP).

To qualify for a CUP, applicants have to meet a tougher set of requirements directly related to visual impact on the public and adjacent properties. For example, applicants may be asked to submit detailed plans, visually screen facilities with plants and show that no alternatives, such as colocation on an existing tower, are feasible. This process is consistent with the City's goal of maintaining certain standards in areas with various classes of zoning while still encouraging telecommunications service upgrades.

There is no particular time limit for the Board's review and approval process, but the City has a standard time frame of three to five months to process conditional use permits, regardless of the purpose. Most of the review process is handled by staff prior to submitting it to the board for its consideration and a public hearing.

The fee for an administrative review is a flat $1,531. The City charges applicants with the direct costs for processing a conditional use permit, requiring an advance deposit of $2,500 to $3,500.

Terrestrial microwave links and satellite earth stations installed by individual users are handled by a separate section of the Zoning Code. Examples include DirecTv or DISH equipment installed on a home or point-to-point wireless broadband links installed at a business. This type of equipment is generally allowed anywhere in the City, subject to some requirements imposed for the purpose of avoiding "adverse impact on aesthetic values and public safety". These requirements primarily concern the choice of the specific location of this equipment on a given property, but don't generally prevent it from being installed somewhere on the property.

3.4. Location of broadband-intensive businesses

The City's zoning code does not specifically address high technology businesses, such as data or call centers, that might use high capacity, industrial grade broadband connections. There are no particular incentives or restrictions, and defined high technology uses. When reviewing something that doesn't neatly fit into a specific category, the City's planning staff generally relies on common sense and looks at the

original intent of a given land use rule and how it can logically be applied to new technology. Staff considers the impact on and compatibility with neighboring properties and the public, which also ties back in to original intent.

3.5. City use of broadband services

There are no particular restrictions on access to City data, which is treated as civic capital and as such is subject to full disclosure. There is an ongoing project to move public meeting agenda and minutes to an electronic access system. A considerable amount of electronic information, including GIS data, is available via the City's website and, similar to printed materials, is subject to retention and public disclosure requirements.

Similarly, there are no general policies regarding telecommuting. Although open data and telecommuting programs are not directly related to commercial broadband development, initiatives such as these can help stimulate demand and provides an opportunity for the City to lead by example.

The City participates in the CALNET 2 bulk purchasing program for telecommunications services, including broadband, run by the State of California. This program affords lower pricing than the City could reasonably expect to obtain on its own.

4. Broadband Policy Benchmarking

4.1. Policy environment

In general, California and federal policy is moving towards greater support of broadband projects and services.

The Federal Communications Commission has enacted rules that attempt to put limits on local and state review of cell tower permit applications, for example. On the other hand, those rules are being challenged and so far the federal courts have not allowed a complete preemption of local authority by the FCC. Other rules streamline procedures for installing new cables on existing utility poles.

Bay Area congresswoman Anna Eschoo introduced a bill (HR 1695) that would require federal agencies engaged in highway construction projects to routinely install broadband conduit at the same time. This initiative was similar to an executive order issued in 2006 by then California Governor Arnold Schwarzenegger.

Besides directing state agencies to include conduit in construction projects, the order included expedited review of broadband projects by state agencies, such as Caltrans, and severely limited fees that may be imposed on broadband projects in order to permit access to public right of ways.

The order also created a California broadband task force that issued a report[6] that made further recommendations to encourage the growth and deployment of broadband facilities. Those recommendations included greater state funding for broadband projects, using the state's purchasing power and anchor tenant status in many locations to support improved infrastructure, create statewide standards for broadband construction projects and take other steps to support the deployment of both wired and wireless facilities.

Other broadband policies initiatives are being pursued at a local level. Cambridge, Massachusetts has implemented an "open trench" policy that requires cooperation with broadband providers when street cuts are made and generally requires open access to conduit when space is available.

In Santa Cruz, California the city council has enacted an open data policy and embarked on a project to provide a greater degree of online access to public documents and to

[6] The State of Connectivity: Building Innovation through Broadband, final report of the California Broadband Task Force, January 2008.

make it easier for the public to conduct business with the City online. Other California cities, such as Victorville, Corona and Grover Beach have developed plans and policies to encourage broadband deployment and use. These plans address the particular needs of each community, and concern issues such as residential and commercial service gaps, future institutional network needs and construction standards, and the impact of large scale greenfield developments.

4.2. Benchmark analysis

Existing broadband-related policy in San Leandro was evaluated on the basis of how well it supports development, construction and access to commercial and industrial-grade service. Four policy goals were benchmarked:

- Facilitation of infrastructure development.
- Support for smart infrastructure and connected communities.
- Protection for environmental quality and visual aesthetics.
- Efficiency of government operations and delivery of services.

Specific benchmarks for those goals, as adopted by the State of California, the California Emerging Technology Fund (CETF) and other California local governments, were used for evaluating San Leandro's current policies. A complete list of goals and benchmarks is in Appendix D.

The benchmarks used in this study are, to a large degree, derived from work done by CETF. It was established by the CPUC with the mission to "close the digital divide by accelerating deployment and adoption of broadband to unserved and underserved communities and populations." Among other initiatives, CETF has published a broadband policy guide[7] for local and regional governments.

4.3. Existing San Leandro practice meets or exceeds best practices

In many respects, San Leandro's broadband related policy is consistent with or better than the standards adopted at a state level and elsewhere in California. Particularly, San Leandro has a straightforward process for reviewing proposed projects, conditional use permits and encroachments. For the most part, high technology projects, including broadband infrastructure, tend to be evaluated within traditional planning and operational frameworks on a common sense basis. Staff generally consider high technology uses as having a positive effect on the community while giving due consideration to any specific negative aspects on a timely basis.

[7] Getting Connected for Economic Prosperity and Quality of Life, California Emerging Technology Fund, October 2010.

Table 4.1 San Leandro policy meets or exceeds best practices

Meets or exceeds best practices	San Leandro Status	Strategy
Delineates the process for ensuring fairness and competition, including transparency, public notice and timetables and deadlines for timely review of any required local permits.	Yes. Broadband related projects handled routinely, standard 3 to 5 month process if a conditional use permit is required. City's work performed on a cost recovery basis.	Consistent with current needs, review when commercial broadband build out is complete.
Accommodates high technology, broadband intensive businesses in zoning ordinances and procedures.	Yes. High tech/broadband not specifically named, but considered routine and covered by existing use definitions.	
Incorporates routine placement of broadband conduit into utility undergrounding programs.	Yes.	No change needed.
Sets forth the process and procedures for preventing and/or mitigating environmental impacts and protecting and/or preserving visual integrity of jurisdiction.	Yes.	
Promulgates procedures to streamline the approval of easement encroachment permits consistent with principles of fairness and competition for all providers.	Yes. Transportation and Engineering Department reviews in a timely manner.	
Makes the use of public assets available to all providers on a competitive basis, commensurate with adopted policies regarding public benefits.	Yes.	
Establishes an ongoing role for the City to play in identifying broadband needs and working proactively with businesses and service providers to meet those needs.	City staff actively engaged, but no formal policy.	
Articulate the interest of the jurisdiction in monitoring the reliability and quality of broadband connectivity in the local jurisdiction and ensuring appropriate speed availability.	Community Development Department plays active and ongoing role.	

One example is the approach, described above, that the City of San Leandro took to a request by AT&T to place more than 100 utility boxes on public right of ways for its Project Lightspeed system upgrade. Although the project was out of the ordinary, standard practices were adapted to the task. The result was a well defined process that minimized uncertainty and efficiently provided answers to the applicant while safeguarding City interests such as public safety and aesthetics.

One area where the City's planning process specifically addresses broadband-related issues involves the review and approval of wireless towers, antennas and related facilities. The City makes a clear distinction between smaller broadband links installed by end users and larger carrier sites that serve the general public, and treats both types of facilities appropriately. The City's policy tends to encourage colocation by multiple carriers and does not impose any significant obstacles to expanding or upgrading wireless broadband availability, while still safeguarding legitimate City concerns such as public safety and aesthetics.

Many of the policy areas where the City meets or exceeds statewide benchmarks involve construction, maintenance and upgrading of broadband facilities, providing the most basic, and consequently most important, support for expansion of commercial broadband access.

4.4. Recommendation 1: formalize broadband-friendly policies

The City of San Leandro's existing policy and practices regarding development of broadband facilities, monitoring broadband availability and issues, and working with telecommunications providers are competitive advantages. Formalizing these practices and promoting them to business relocation and expansion prospects, real estate developers and telecommunications companies will allow the City to maximize the opportunities that those advantages create.

The process followed by the City in approving AT&T's Project Lightspeed upgrade should be considered to be a model for future broadband projects and, along with its current wireless facilities policy and expeditious review process, communicated to service providers as a way of capitalizing on these broadband friendly competitive advantages.

The same should be done with its practice of making City facilities available to service providers on a non-discriminatory basis,with its ongoing proactive broadband development efforts within the local business community, with prospective new businesses and with current and prospective telecommunications service providers.

5. Broadband as a Development Policy Component

5.1. Broadband infrastructure standards

The City of San Leandro does not include broadband facilities, such as empty conduit or fiber optic lines, in its review of private development plans or permit applications, for either new construction or major remodeling projects. However, broadband facilities, such as fiber optic lines, are routinely integrated into plans for City projects.

On the other hand, the City does have standard practices that encourage improvement of broadband facilities, but not a formal, stated policy. As a result, it may not always fully benefit from opportunities to encourage deployment and upgrading of facilities or maximize benefits to the community as a whole. Table 6.1 identifies broadband-development and planning policy issues that have been addressed in other California communities and statewide. These policy issues affect both public projects and private development.

The most aggressive policies regarding broadband deployment in private developments are usually found in communities where extensive greenfield residential construction is planned. For example, requirements regarding installation of fiber optic trunk lines can be appropriate when a large development involving significant new street construction is concerned, but might not make sense when reviewing a remodel proposal for a single parcel.

Since private construction in San Leandro is infill and redevelopment oriented, it is not appropriate to benchmark broadband policy against the comprehensive approaches adopted by rapidly expanding communities. On the other hand, many specific policies addressing major private sector redevelopment, remodel and infill projects, and telecommunications facilities are applicable. Policies involving publicly funded projects are more universally applicable in nature.

San Leandro's current policies and practices are either consistent with or neutral towards these benchmarks, and do not create an obstacle to deployment or adoption of commercial broadband facilities and service.

Formally addressing some or all of these issues as a matter of policy will allow the City to take long range broadband development goals and cost-benefit calculations into consideration when reviewing or implementing projects. The construction of

telecommunications facilities is capital intensive and decisions are based on both short term and long term return on investment.

Table 5.1 Broadband infrastructure standards

Broadband facility, construction and development standards	San Leandro Status	Strategy
Sets forth the process and procedures for incorporating broadband into all public infrastructure projects.	No current policy.	Develop a simple and consistent set of broadband facilities and construction standards.
Requires projects to provide broadband connectivity and include the infrastructure components necessary to support broadband.	No current policy.	
Encourages broadband providers to size underground and overhead facilities to accommodate future expansion, changes in technology, and where possible the facilities of other telecommunications and utility providers.	Current policy encourages sharing of tower sites, no policy regarding "future proofing".	
Promotes the provision of broadband infrastructure in all public buildings, major transportation and other infrastructure projects and commercial developments.	Yes, but not formalized into a standing policy.	
Requires all public works projects include broadband conduit to be useable by multiple government agencies.	No current policy.	

Explicit and consistent standards for incorporating broadband connectivity into public projects provide telecommunications companies with greater assurance that good investments in infrastructure construction and upgrades can be made prospectively.

Specifying particular review standards relating to broadband access and facilities in private sector projects can increase the regulatory burden placed on prospective businesses and developers. When evaluating these kinds of requirements, the additional, individual burden needs to be weighed against the general economic benefits of better and lower cost broadband infrastructure, reduced street construction and traffic

disruption, and more effective and efficient use of broadband services by local businesses.

Although future demand cannot be guaranteed, the knowledge that a certain standard of broadband connectivity will be predictably met as the City's overall development goals are achieved provides a basis for telecommunications companies to project demand. The greater the confidence in projected demand, the higher a given community will be on corporate capital investment priority lists.

The same considerations apply to public infrastructure investment. Consistently including broadband facilities, such as conduit or lateral connections, into public infrastructure projects can, over time, reduce the cost and the risk of future broadband facilities. An example is the current Lit San Leandro project which was made possible by the availability of an extensive City-owned conduit network originally installed for traffic signal control purposes. The fact that City construction decisions taken many years ago met the needs of a telecommunications project today was serendipitous. Going forward, the more consistently public infrastructure projects take future broadband needs into account, the likelier similar outcomes will be.

5.2. Recommendation 2: make broadband a standard review criterion

As discussed above, many jurisdictions have specific broadband facilities requirements for various aspects of planning and use policies and approval procedures. In this respect, broadband is treated no differently than other essential utilities such as water, electricity and waste water.

Broadband facilities and service availability should be included as criteria when reviewing private sector development plans, much in the same way that the City currently considers electrical and water provisioning. Consideration should be given to:

- Standards or requirements for fiber connections to existing networks.
- Placement of empty conduit to support future network connections.
- Design and scale of telecommunication service entry points, vaults and closets.
- Access opportunities for competitive providers.
- Conduits and cabling for internal networks.
- Accommodation of future internal and external upgrades.

As with other utilities, this review should be appropriate to the type and scale of the project under consideration and should be justifiable on a cost-benefit basis. This review could be advisory in nature or it might lead to specific performance requirements, depending on the size, type and value of a project.

The City should also develop simple and consistent requirements for broadband inclusion in public construction projects in order to reduce the cost and risk of building telecommunications facilities now to meet future demand, and to insure that the City's infrastructure will comprehensively support it.

Telecommunications service providers should be routinely notified of any such planning or review processes, for both private and public sector projects.

6. Comprehensive Open Trench Policy

6.1. Background

Most of the cost of building utilities, including fiber optic lines, in urban areas is related to cutting open streets, placing conduit and repairing the damage done. If projects can be combined, then costs can be shared, damage and disruption minimized and timely deployment can be encouraged.

So-called open trench policies are designed to maximize this opportunity by creating a consistent and reliable procedure for sharing advance information about street cuts and facilitating cooperation between public works projects, utility companies of all kinds and both incumbent and competitive telecommunication service providers.

The intended result is to install telecommunications conduit at a greatly reduced cost and minimize future digs by providing an opportunity to inexpensively install facilities on a cooperative basis. Most of the expense involved in installing underground fiber optic lines is for digging into roadways and repairing the subsequent damage, so opportunities such as these could save money and speed construction.

For example, if a telecommunications company was notified that a water district was digging a trench on a particular route and given an opportunity to place conduit in that trench on a predetermined cost-sharing basis, it might accelerate plans to extend high speed Internet service to that area.

Other open trench policies go further, mandating the installation of empty conduit on a prospective basis any time a street is opened. Ownership of the new, empty conduit is typically in the hands of the public agency that controls the right of way.

As with broadband facility reviews, adding open trench notification procedures to City approval processes has the potential to increase project compliance costs. However, a slight increase in cost for an initial applicant would be offset by any subsequent cost sharing arrangements, and by the significant decrease in cost for potential partners. Taken as a whole, costs should decrease for everyone because over time any given company would realize more cost sharing opportunities than be subject to notification requirements.

6.2. Current status

San Leandro does not have a formal open trench policy, as recommended by Governor Schwarzenegger's executive order and the California Broadband Task Force's 2008

report, and as implemented on a pilot basis by Caltrans. As a matter of practice, the City does routinely install broadband conduit during street construction or other appropriate public works projects, and as a part of its utility undergrounding initiative. However, information about prospectively installed conduit is not systematically collected and made available to interested parties.

Table 6.1 Open trench policy

Open Trench Policy	San Leandro Status	Strategy
Requires and provides a process for notification and information about all major infrastructure and construction projects, including transportation projects and new residential subdivisions, to a shared data base so that broadband and other utility providers have the opportunity to coordinate infrastructure deployment in shared trenches, conduit, poles and towers, and other appurtenances.	No current open trench policy.	Develop an open trench policy for the City, and adapt and include it in any regional or statewide initiatives that develop. Policy should cover notification, and mandatory installation of conduit and, along key corridors, fiber. Also should address sharing of facilities.
Requires conduit space within joint utility trenches for future high speed data transmission systems.	No current policy.	
Requires installation of broadband conduit as a part of any suitable public works project.	Yes. Informal policy.	

6.3. Recommendation 3: adopt a comprehensive open trench policy

A formal notification procedure coordinated with regional and statewide programs should be implemented for street cuts. The goal of placing conduit any time a street or right of way is dug into should be established. Conduit could be installed by telecommunications service providers or the City. The cost of doing so is relatively low, involving staff time and inexpensive materials. Similarly, information regarding construction or upgrading of wireless facilities should be shared widely to encourage joint use.

7. Lateral and System Expansion Opportunities

7.1. Need for new connections

As described in Chapter 2 above, four areas of the City have a particular problem with commercial broadband availability: Downtown San Leandro, the Davis/Doolittle/ Adams tract area, the 880 Industrial Corridor and the Shoreline. Although each of these areas has unique characteristics, there is a common need to build service connections from current and planned fiber routes to businesses.

The City's existing conduit, including that leased by Lit San Leandro, goes through or near three of the four areas (the Shoreline area is the exception). Fiber routes owned by other providers also pass through the three areas (again excluding the Shoreline). In order to fully serve these areas, extensions and lateral connections will have to be built to existing lines.

This work could be paid for by service providers, however in the past the providers have not always been able to justify the investment. To assist in identifying opportunities that meet investment goals, junction boxes, empty conduit, splice points and other potential connection points should be mapped. This information, together with the schedule for any planned public works projects in the area and metrics for local businesses, should be presented to potential wholesale and retail service providers to make them aware of opportunities to inexpensively reach new customers.

7.2. Recommendation 4: encourage expansion via cooperative efforts

Promoting the opportunity

Wholesale level "middle mile[8]" companies provide backbone connectivity to "last mile" broadband companies who then provide a managed level of retail Internet service to individual commercial accounts. In some cases, particularly with industrial grade service, last mile connectivity might be provided by a middle mile network. But most businesses customers opt for a packaged solution from a dedicated last mile provider, which could include add-ons such as technical support, connecting equipment and Internet bandwidth.

---

[8] "Last mile" refers to infrastructure (e.g. fiber optic lines, distribution boxes, equipment vaults, poles, conduit) that provides broadband service to end users or end- user devices (including households, and businesses). "Middle mile" refers to broadband infrastructure that does not predominantly provide broadband service to end users or to end-user devices, and may include interoffice transport, backhaul, Internet connectivity, or special access. Middle mile facilities are the link between last mile facilities and major interconnection points, such as those that form the core of the Internet.

Many last mile service providers do not own the physical assets, such as DSL or fiber lines, that they use to connect to customers, but instead lease those assets from other companies. In some specific cases, though, a last mile provider might be interested in building short connections or partnering with others to do so, if problems such as middle mile capacity, access to lateral connections, permitting and funding can be addressed.

The California Public Utilities Commission provides broadband availability data, in some cases down to the street level, which can be used to identify need and plan extensions and lateral connections. It can be also be used to support or challenge eligibility for state broadband subsidies.

The City will be in position to provide much of this information and access, and it should be presented as partnership opportunities to both middle and last mile companies. These presentations can be done individually, but group presentations regarding all four under/unserved areas should also be scheduled.

Fiber-to-the-basement

A middle mile provider could potentially build a lateral connection to a multi-tenant building and then the owner, a tenant organization or specialty company could install the internal wiring necessary to distribute Internet service to tenants.

In this model, the owner and/or tenants would be their own last mile provider. The cost of the lateral and internal distribution facilities would be paid directly or indirectly by the property owner, perhaps on a cost sharing basis with other owners. It is possible that such an installation could be used as a hub to provide retail service to nearby businesses and smaller properties, in addition to serving building tenants.

The City can also make use of the fiber strands it is receiving from Lit San Leandro to encourage property owners to initiate fiber-to-the-basement projects.

Interim wireless solutions

Wireless Internet service comes via a variety of methods, including mobile broadband, WiFi, high capacity point-to-point links and lower capacity multipoint, hub-and-spoke systems. It is difficult, if not impossible, to guarantee that all properties in a given area will be reachable, or that if reached, service levels will be acceptable.

However, if there are delays in finding suitable last mile partner(s), an interim multipoint service might be capable of filling a sizable fraction of unmet downtown demand. Although there are other areas of the City where an interim wireless solution could work, it is particularly suited to Downtown San Leandro because of the concentration of smaller businesses that need commercial grade connections and the difficulty existing wireless broadband companies have in reaching them.

One possible business model would be to have businesses pay for their own premise equipment (similar to a fiber-to-the-basement model) and have a last mile company or cooperative organization install the hub equipment and provision service. The City could play a coordinating role in this effort, and might be able to add an incentive by waiving fees if an antenna placement triggers an administrative review or conditional use permit process.

8. Lit San Leandro

In 2011, the City of San Leandro worked closely with a local entrepreneur, Dr. J. Patrick Kennedy, to provide non-exclusive access to city-owned conduit for the purpose of building an 11-mile fiber optic loop through commercial and industrial areas of the City. The agreement reached provides the City with direct benefits, including ownership of a substantial number of dark fibers in the system and potential future revenue. The indirect benefits to local business activity and property values are likely much greater.

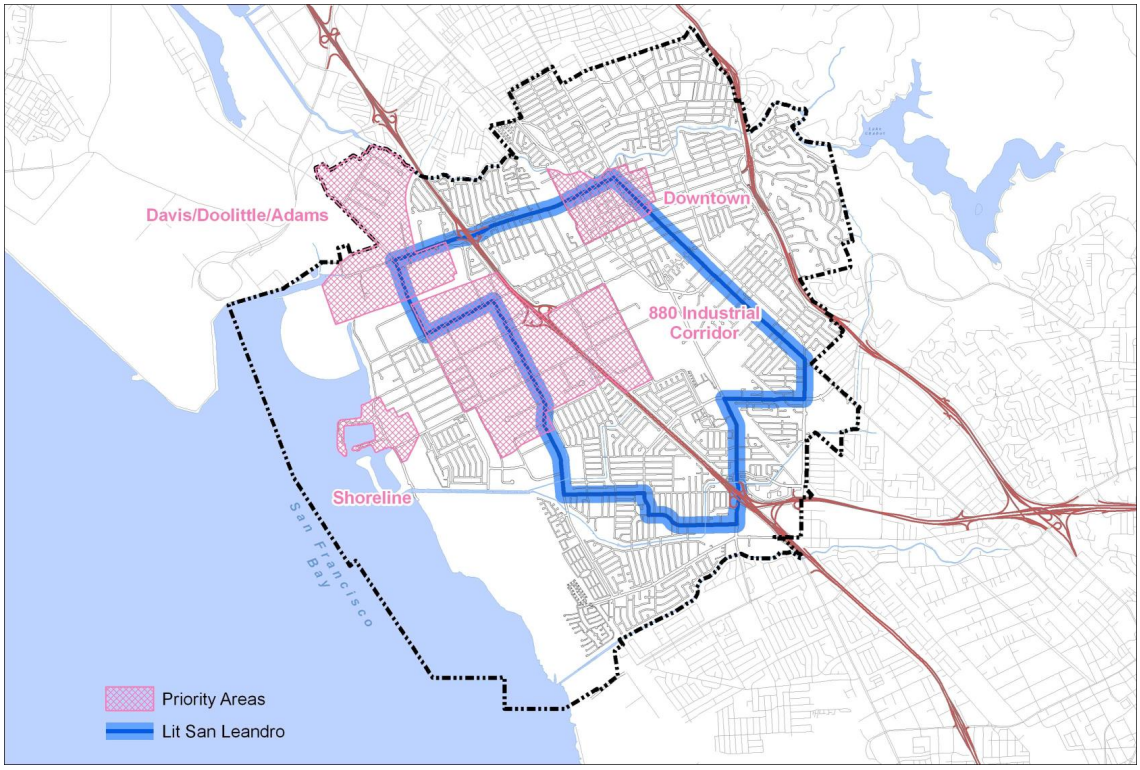


Figure 8.1 Path of Lit San Leandro's dark fiber loop. Construction is underway.

The Lit San Leandro project will provide industrial-grade connectivity directly to companies on or near its route and will provide backbone connectivity to commercial-grade Internet service providers, both incumbents and new entrants into the local broadband market. It provides a high level of commercial broadband service availability to San Leandro that few cities can match.

The Lit San Leandro public-private partnership provides opportunities for the City and private businesses to cooperate on expansion efforts aimed at promoting the public good. For example, Lit San Leandro is actively pursuing expansion of its service into the four underserved areas of the City identified in this report. By cooperating with these efforts – or with similar efforts by other service providers – the City can increase

the chances that much needed broadband facilities will be built and be financially successful in the long run.

8.1. Recommendation 5: support Lit San Leandro on a non-discriminatory basis

Because it can generally expand broadband availability in the City and specifically can reach under and unserved properties and enable new kinds of businesses to be established, the Lit San Leandro project has the potential to be a significant economic development driver. It should be supported by the City's business development efforts to the same extent as any other positive, major player in the local economy.

However, the Lit San Leandro project will not, by itself, solve all of the City's commercial broadband access problems or be the preferred solution for every potential new business relocation or existing business upgrade. By supporting service providers non-exclusively and at a level appropriate to case by case circumstances, the City will maximize the benefit of its commercial broadband initiatives to all local businesses, including Lit San Leandro.

The agreement with Lit San Leandro will provide the City with up to 28 dark fiber strands throughout the network. Some of this capacity can be used to support City operations, and assist other public agencies. However, a small number of fiber strands will be sufficient for this purpose. The City has the contractual right to re-market its unused strands at its sole discretion, and it should hold these strands in reserve against the possibility that capacity offered by Lit San Leandro or other service providers is unavailable or unsuited for meeting economic development goals.

Whether it is by working cooperatively with the venture or by utilizing the fiber strands it provides, the City can make use of the funding sources described below to assist the development of Lit San Leandro, in the same way it could for other telecommunications service providers.

9. Downtown San Leandro Hotspots

Downtown San Leandro has a higher density of small businesses and a higher amount of foot traffic and retail activity than the other three identified under/unserved areas.

Problematic wireless connectivity was cited in the research conducted for this study as an issue for Downtown San Leandro businesses. Improving public broadband availability can overcome this problem and potentially create a competitive advantage for existing business and an incentive for business considering relocating to Downtown San Leandro.

9.1. Recommendation 6: limited, free WiFi

One solution is to install outdoor WiFi access points at key locations, connect it to existing City fiber or other network infrastructure and offer free, unsupported service. Depending on the type of area and the equipment required, these kinds of hotspots can cost from less than $1,000 to about $6,000 each to build, plus the cost of network access.

Operating costs (exclusive of connectivity) are generally less than $1,000 per location per year, sometimes considerably less. The cost of Internet connectivity could range from a high of around a $1,000 per location per year down to very little, if existing resources such as Lit San Leandro fiber and shared Internet bandwidth could be brought into play.

The City could play several different roles in the project, for example owning and operating it outright, coordinating an opt-in program funded by local merchants or including it in the scope of a public improvement district. Providing fiber connections to hotspots or arranging for Internet bandwidth sharing are other roles the City could play.

10. City Business Assistance Grants

The City of San Leandro has incentive programs that provide small grants and forgivable loans for eligible business projects. Traditionally these programs have been used to support facade improvement projects and energy efficiency projects.

10.1. Recommendation 7: support business connections to broadband services

A broadband connections program should be added to the list of incentives the City offers, in order to assist local businesses in meeting the upfront capital costs of connecting to broadband networks. Doing so will benefit small, medium and large businesses in the short term and improve the long term viability of buildings that will also benefit from improved broadband access.

Making broadband an eligible use of these programs would not necessarily require additional funding if broadband projects were simply included as part of the current budget appropriation.

11. Potential Funding Sources

Although the end of redevelopment agencies in California eliminated an important source of financing for economic development and infrastructure, other federal and state programs offer an opportunity for local agencies to partner with service providers and facilitate access to funds. Some of these programs might provide financial assistance to service providers that want to build facilities to reach under and unserved commercial areas of San Leandro.

1. *Federal economic development programs*. The federal Department of Commerce, through the Economic Development Administration, will partially fund public works projects used for economic development purposes. Broadband projects are theoretically eligible for this funding, and it is ideally suited to funding lateral extensions to under and unserved commercial and industrial areas.

2. *California Advanced Services Fund*. The California Legislature has renewed this program and provided the California Public Utilities Commission with an additional $125 million to use in extending broadband service to underserved and unserved areas of the state. Although this program is more commonly thought of in connection with rural areas, it does not preclude urban infill projects. CASF funding is available to telecommunications companies that meet certain requirements for projects in geographical areas that lack defined levels of broadband service. The City can assist companies in applying for this funding by providing and validating information regarding unserved areas, including those areas identified in this study.

4. *Educational broadband programs*. The federal E-rate program provides subsidies to schools and libraries, including funds to upgrade services under certain circumstances. The Corporation for Education Network Initiatives in California (CENIC) funds, builds and manages educational broadband networks in California, including high capacity networks for higher education. Generally, the specific resources funded through these sorts of programs are restricted to use only by qualified schools, libraries and research institutions, but in many cases those specific resources can be purchased from or be made part of a larger project. When lateral construction and other network extensions are planned in San Leandro, consideration should be given to opportunities to link to eligible schools and libraries that might be able to contribute such funds.

5. *Telemedicine programs*. As with educational broadband programs, federal and state agencies provide funding for broadband resources that support telemedicine programs. For example, the California Telehealth Network, based at U.C. Davis, receives federal funding to provide network services to, primarily, rural health care facilities. Typically, telemedicine programs buy services from existing providers rather than constructing

facilities, and can potentially be anchor tenants of new broadband projects. The possibility of tapping into these funds should be considered whenever a health care provider can be served by proposed lateral or other network extensions in San Leandro.

6. *Public agencies as anchor tenants*. Local governments are no different than any other large organization: broadband access is essential and is included, to one extent or another, in budgets. The assumptions that underly many public agency budgets will be changing dramatically in the next few years. In cases where public agencies face rising costs for telecommunications services, it might make more sense to spend information technology and telecommunication budgets on building facilities rather than leasing increasingly expensive services. If a public building is located in (or proposed for) a prospective broadband project area, it might be possible to negotiate a long term lease that provides an assured source of income for the project while saving money for the agency involved.

7. *Public works projects*. If coordinated with service providers through an open trench program, planned street and other improvements create an opportunity to greatly reduce the cost of broadband facility construction. There might be cases where broadband facilities, particularly empty conduit, can be included in project budgets.

12. Appendix A – Research

12.1. Online survey questions

1. What is the name of your business?
2. What is your business address?
3. Business zip code.
4. Type of business.
5. How many people are employed at this location?
6. What broadband services do you presently subscribe to?
7. From what provider do you presently receive internet service?
8. If other, please specify service provider(s)
9. What is the internet speed of your current connection (in megabits per second, or mbps)
10. What do you presently pay per month for you broadband service?
11. Is this a bundled service (includes phone and/or other services)?
12. How satisfied are you with the speed of your current broadband service?
13. How satisfied are you with the reliability of your current service?
14. How satisfied are you with the value you are currently receiving?
15. How satisfied are you with the range of broadband options available at your location?
16. How important is broadband availability to your business operations?
17. What improvements would you most like to see in broadband availability for your business?
18. What broadband services would you like to have that are not presently available to your location?
19. Please provide any additional information about your broadband needs. Specifically, what improvements would be most beneficial to your business?
20. Name.
21. Phone.
22. Email.

12.2. Business workshop responses and notes

Workshop 1: 19 July 2011, 12:00 pm

What they have:
T-1 1.5 Mbps, unreliable, on Davis west of Doolittle
Dial up at first then Comcast come in and tenants started using that. Estudillo.
Uverse – 12 mbps -plus mobile/mifi up to 3 mbps, on Bancroft
Mobile/wireless
DSL – 1 Mbps, Bancroft near Sybil and Pontiac near Broadmoor
Mobile/ wireless
Bank of America – get it from ATT, having problems

Next generation business:
Critical need for business – 3 said yes, for design work, for doctors and dentists and to attract new business.
Broadband is a barrier to expansion, need it for communication and doing business online. Voice service is OK.
One said "nice to have", consistency is the issue.
Willing to pay more for more options
- data caps are an issue
- want more options
- cost of new construction/installation is an issue
- would be happy with 5-6 Mbps if it was consistent

Ranking concerns:
1. Reliability
2. Speed
3. Cost

Future issues:
Consistency will be increasingly important
Reliability – agree
More mobile usage
Amount of bandwidth increasing, demand increasing, eg Netflix
More Ethernet backbone
Demand will skyrocket
Broadband will be a key competitive issue for cities
All businesses are becoming information businesses,
- time frames increasingly shorter
- the chemical industry is becoming an information industry

Locations for expansion:
Estudillo
Davis
Closer to the water is better
Two said Marina/Westside
Everywhere
Residential
Marina and Merced
Actually at the marina

Risks to city:
Not doing it
Wireless
Damage to city fiber
Manufacturers - broadband increasingly critical.

Attendees had the following general comments about the impact of broadband on their availability:
Broadband is not a substantial cost of doing business
Would be willing to pay more for better options
Worried about the possibility of data caps in the future
Reliability is more important than cost and speed

Within the next 20 years, the following needs are possible/expected:
Consistent control of speed
Speed improvements
More mobile options
Large-scale system capacity
A stronger Ethernet backbone
Competition from other cities
Increased need for data transfer
More cloud computing

Reactions to the proposed fiber loop:
We should do it
How does this relate to the expansion of wireless networks?
Risk of damage to City networks
If built, what are the priority areas for expansion of the fiber network? Estudillo?

Get as close as possible to the Bay
Other service providers could use this to improve service
Serve the Marina area
Push to industrial areas, don't duplicate residential capabilities

Workshop 2: 26 July 2011, 8:00 a.m.

Current access:
Custom
T1
Uverse at home, about $100, fast. On Joaquin, use Comcast. OSI - 10 Mbps MPLS, T1s, T3. Quality is the biggest issue. Stressing the network with VOIP, teleconferencing, data.
Formerly Comcast, now Uverse DSL advertised at 1.5 Mbps but delivering 300K. Price is high.
Westside of town: no DSL available for years. Comcast and Uverse difficult to get, difficult for families, particularly for children with homework, difficult for the schools. Complicated, expensive menu, paying too much.

Next Generation Business:
Heavy user of technology.
Access situation is very hard now.
Leads to growth and jobs.
Concern - site locations, cell sites near certain places. Underground is OK though.
Need capacity to handle residential and business demands simultaneously.
Would like next gen service like FIOS.
Expect to see more traffic-based cost structures.
San Leandro seems to be low priority for upgrades.
Need to plan ahead, 20 years? More?
Need to consider impact on health.

Risks to City:
It's a good idea to worry about where to go, need to worry about residences too.
Why wasn't this done years ago. It'll increase the tax base.
How do you build off ramps -- the City should be concerned with that.
Regulation? How is it regulated?

General comments about the impact of broadband on their availability:
Would like to see expanded fiber to residential users
Some concerns on residential, but business service is a priority
Also need to consider service to the schools

With increased use of telecommuting, residential service often is business service
If history repeats itself, San Leandro will be last on the list as new technology comes online

Reactions to the proposed fiber loop
Any City revenue should be used for smaller residential customer price relief
Bigger conduits will facilitate expansion in the future
How will you build the off-ramps to make connections?
Look at Silicon Valley Power as a model, service providers are customers, not competition
What will be the impact of PUC regulation?
How does this relate to the East Bay EDA Broadband Consortium?

13. Appendix B – City Policy Documents

Memorandum

To: Luke Sims, Community Development Director
Via: Kathleen Livermore, Interim Planning Manager
From: Maryann Miller, Planner III
Date: September 19, 2007
Re: AT&T Project Lightspeed Information for Weekly Update

After researching what other cities, including Oakland and San Ramon, did regarding granting encroachment permits for AT&T Project Lightspeed, the City of San Leandro developed its own process for evaluating the placement of utility boxes in the public Right-of-Way (ROW). The following is a brief outline of the process that the City is currently following, in cooperation with AT&T.

Background

Project Lightspeed is a network upgrade that will allow AT&T to replace existing facilities so that they can provide additional digital transmission using the common language of the Internet – Internet Protocol or "IP" as the universal platform for all of its services.

In order to accomplish this, AT&T is proposing to place approximately 114 utility boxes (59" wide by 48" high by 26" deep) in the public ROW throughout various neighborhoods in San Leandro. Each location is being evaluated by both the Engineering and Planning Departments to ensure that their placement is associated with the fewest impacts possible to San Leandro neighborhoods and to avoid any potential aesthetic or sight distance issues, as well as other any other potential concerns.

San Leandro, unlike other jurisdictions, is not requiring a formal entitlement process for the project. Instead, Planning & Engineering are using a cost recovery process wherein staff time is allocated to evaluate each of the sites and this information is conveyed to AT&T. AT&T then is required to either relocate the utility box to a more suitable location, paint the utility box to blend in with existing natural features, or is otherwise conditioned to improve the project.

Public Notification

The City of San Leandro is sending out courtesy notices (with a photograph of a typical utility box) to adjacent property owners and tenants, informing them about the project and providing them with a 14-day comment period. City staff is fielding questions as they arise from the public about the project. Additionally, AT&T's contact information is posted on the notices in case residents have additional questions about Project Lightspeed.

If, after the notification period commences, no additional comments are received from the public and no new issues are raised, Engineering issues an encroachment permit to AT&T to begin work within the public right-of-way.

CONDITIONS OF APPROVAL
AT&T PROJECT LIGHTSPEED
16 Preda Street (CN#0812-6368040)

The following Conditions of Approval shall apply to the encroachment permit issued for the AT&T Project Lightspeed location at 16 Preda Street, San Leandro. The encroachment permit conditions are not limited to the Standard Conditions. The applicable provisions of the Federal and State law, and City of San Leandro laws, ordinances, regulations and standards shall also be considered as conditions of all encroachment permits. The City of San Leandro may modify any of these conditions or add conditions as necessary.

Standard Conditions

1. AT&T representatives shall be available to answer inquiries from adjacent property owners and members of the public who may be affected by placement of utility boxes adjacent to their business or residence.
2. Notice shall be provided to adjacent property owners at least fourteen (14) days prior to commencement of construction.
3. Additional notification shall consist of a 48-hour door hanger notice provided by AT&T with their logo and contact information.
4. Construction activities shall be generally limited to weekdays between the hours of 8:00 a.m. to 4:00 p.m., Monday through Friday, unless otherwise directed by the Engineering Department. Any Saturday work requires prior City approval by the Wednesday before that week-end. Construction activities on Sundays and City-observed holidays are prohibited.
5. Placement of structures should be done as closely as possible to the nearest building, fence or other existing structure, or as otherwise directed by the City, to minimize potential visual impacts and blend in with the existing environment as much as possible.
6. Whenever feasible, placement of the boxes shall consider existing, mature landscaping or other natural features in order to allow the utility boxes to blend in as much as possible with existing conditions.
7. Utility boxes in residential areas shall be scattered to avoid "clustering" of more than one box in a single location unless otherwise instructed to reduce visual impacts.
8. No utility boxes shall be allowed at a major intersection that fall within the visibility triangles of that intersection, whenever feasible.
9. During the closure of a sidewalk during construction, signs shall be placed directing pedestrians to nearby alternative sidewalks or walkways.
10. Access to driveways for businesses, apartments, homes and side streets shall be maintained at all times.
11. AT&T shall submit to the City a list of their "on-call" contractors, in case of emergency during construction activities.
12. AT&T shall comply with Bay Area Air Quality Management District, Federal Clean Air Act and State of California Air Quality Standards.
13. AT&T shall use Best Management practices to comply with the City of San Leandro Stormwater Management Discharge and Control Ordinance, Title III, Chapter 14 of the San Leandro Municipal Code.
14. AT&T shall comply with all other applicable City standards and specifications.

Site Specific Conditions:

15. AT&T shall relocate proposed utility box next to existing SAI, closer to Davis Street to move further away from single-family residences.
16. AT&T shall provide City of San Leandro with revised plans and photo-simulations showing the proposed utility box in its new location.

4 April 2012

Dear Property Owner:

RE: Job # 6368040

AT&T California plans to provide your neighborhood with enhanced communication services through an initiative called Project Lightspeed. AT&T is upgrading its network to deliver new services that will bring your neighborhood next-generation interactive TV, enhanced video\home entertainment services and super high-speed Internet connections —all through your phone line.

As they do so, they are committed to being a good neighbor and working with communities like San Leandro, as well as individual property owners. You'll likely see signs of their upgrade progress in your neighborhood. AT&T is working cooperatively with the City of San Leandro to keep you informed.

Above ground cabinetry is an integral component of the infrastructure upgrade. In most cases they are about 48 inches high, 26 inches deep, and 59 inches wide, and one cabinet will service your neighborhood. It will be located adjacent to 16 Preda Street, near Davis Street. There will also be some associated trenching of the pavement near the new boxes which will be restored to like-new condition.

Construction will begin in the next several weeks and will take about 10 to14 days to complete. This will be done with the utmost consideration to you and your neighbors.

If you have any questions about Project Lightspeed overall, please contact AT&T within the next fourteen (14) days, or by January 4, 2008, by leaving a message at (866) 476-1212. An AT&T representative will contact you by the next business day. For further information about the project location, you may also contact Kelly Hamer, Planner, City of San Leandro Community Development Department, at (510) 577-3348.

{ 16.79 Preda St –Job #6368040 }

Typical utility box installation for Project Lightspeed

{ 16.79 Preda St –Job #6368040 }

City of San Leandro
Table Summarizing the Review Process for the
Telecommunication Facility based on the Zoning District

Zoning Districts	Towers	Antennae	Alternative Tower Structure
RS Res. Single-Family	NP*	CUP*	CUP
RO Residential Outer	NP	CUP	CUP
RD Res. Duplex	NP	CUP	CUP
RM Res. Multi-Family	NP	AR*	AR
CN Comm. Neighborhood	CUP	AR	AR
CC Comm. Community	CUP	AR	AR
CD Comm. Downtown	CUP	AR	AR
CS Comm. Services	AR up to 50 ft CUP +50 ft	P	P
CR Comm. Recreation	CUP	AR	AR
CRM Comm. Regional Mall	AR up to 50 ft CUP +50 ft	P	P
P Professional	CUP	AR	AR
PHD Professional HighDensity	CUP	AR	AR
DA-1 Downtown Area-1	CUP	AR	AR
DA-2 Downtown Area-2	CUP	AR	AR
DA-3 Downtown Area-3	NP	AR	CUP
DA-4 Downtown Area-4	NP	AR	CUP
DA-5 Downtown Area-5	NP	AR	AR
DA-6 Downtown Area-6	NP	AR	AR
NA1 North Area-1	CUP	AR	AR
NA2 North Area-2	CUP	AR	AR
SA1 South Area 1	CUP	AR	AR
SA2 South Area 2	NP	CUP	CUP
SA3 South Area 3	CUP	AR	AR
IL Industrial Limited	P up to 35 ft AR +35 ft	P	P
IG Industrial General	P up to 60 ft AR +60 ft	P	P
IP Industrial Park	P up to 35 ft AR +35 ft	P	P
OS Open Space	CUP	CUP	CUP
PS Public & Semipublic	CUP	CUP	CUP

* Table abbreviations:
P-Permitted
NP-Not Permitted
AR-Administrative Review
CUP-Conditional Use Permit

Fees 2011-2012

Admin Review:	$1531 flat fee
CUP – Direct Costs:	$2500 - $3500 deposit

Updated 7/2011

14. Appendix C – Maps

Prepared by City of San Leandro Geographic Information Systems.

1. Preliminary map showing areas with problems accessing commercial and industrial grade Internet connectivity, based on information developed in the course of research conducted for this study. This map also shows AT&T Project Lightspeed node locations and illustrative service radii, per Map 7 below.

2. Broadband development priority areas identified in the City of San Leandro, in relation to the Lit San Leandro fiber route.

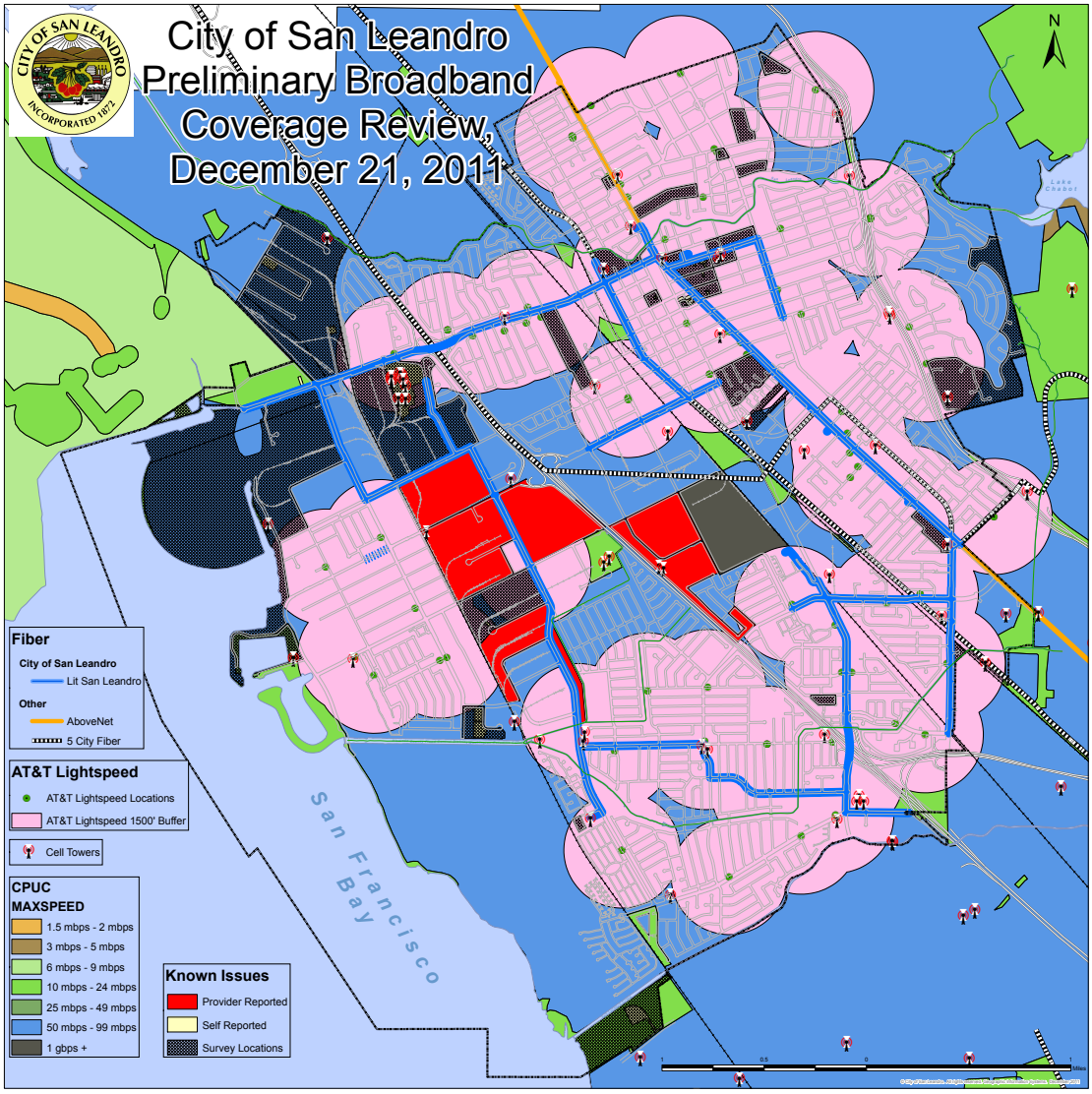
3. Overall broadband availability data claimed by local carriers, as provided to the California Public Utilities Commission (CPUC). This data includes wireless as well as incumbent wireline carriers such as AT&T and Comcast, and may not fully reflect actual availability.

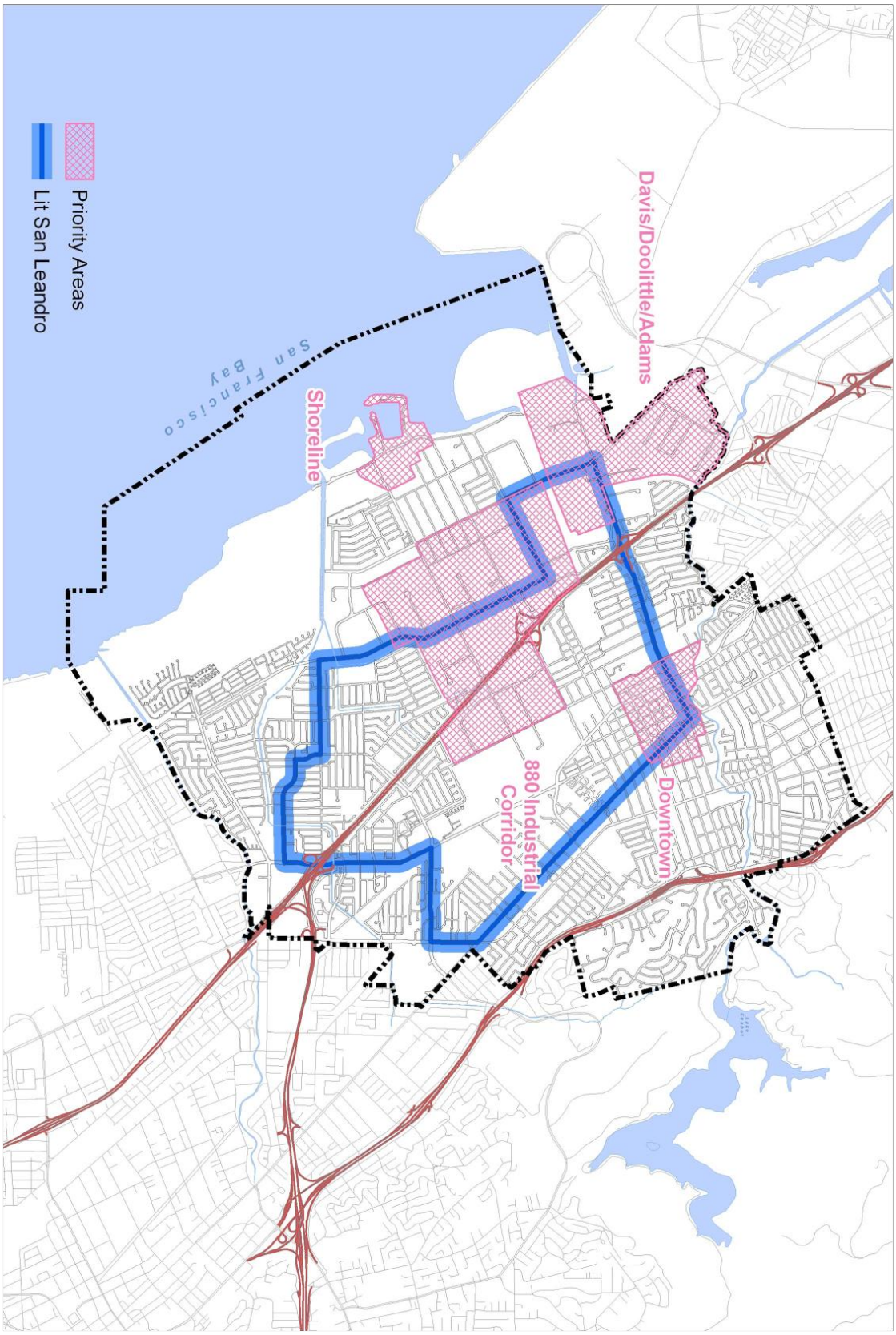
4. Areas of San Leandro where AT&T and/or Comcast claim to offer service that meets the CPUC's minimum 6 Mbps download and 1.5 Mbps upload standard. Data provided by CPUC.

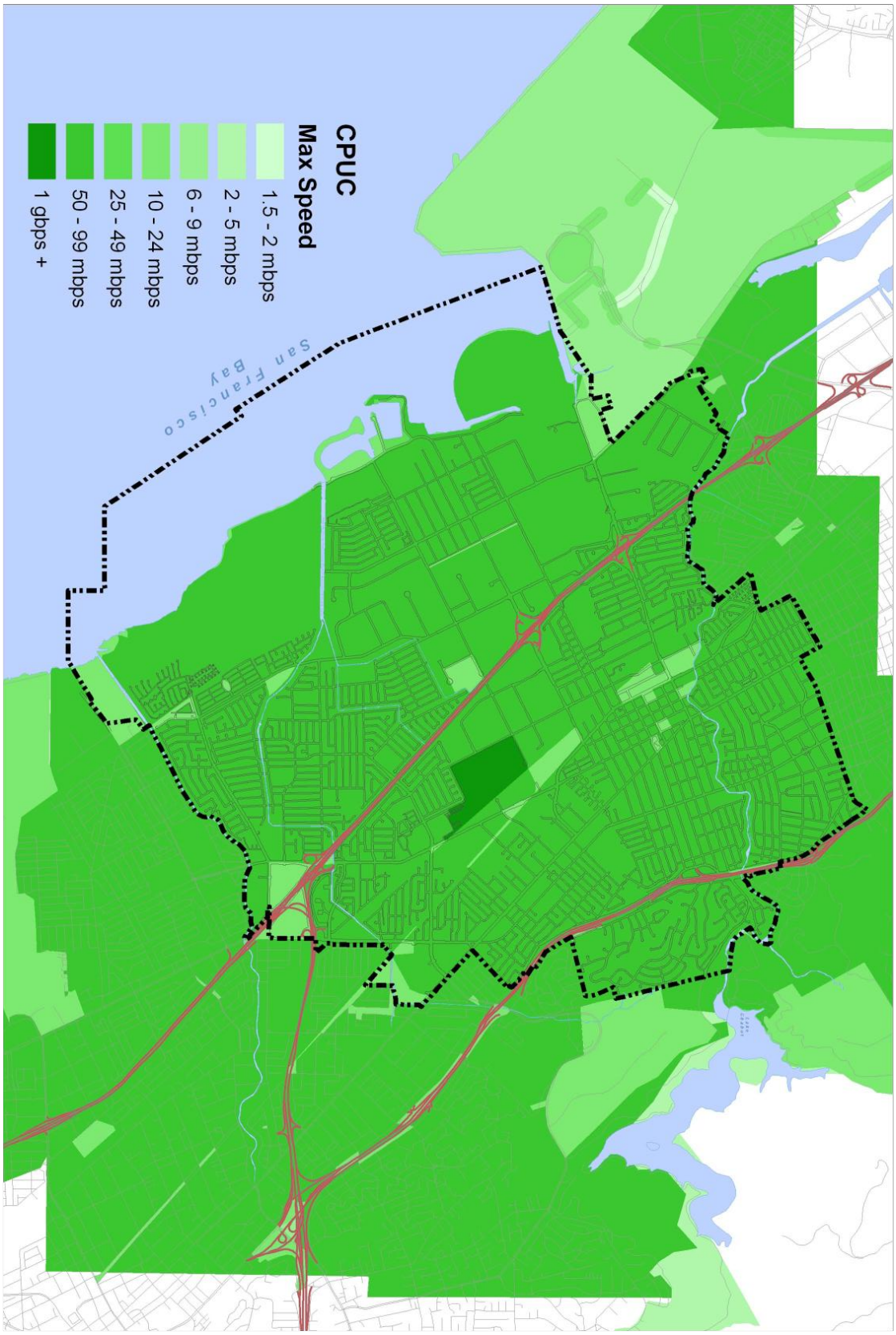
5. Areas of San Leandro where Comcast claims to meet the CPUC's minimum 6 Mbps download and 1.5 Mbps upload standard. Data provided by CPUC.

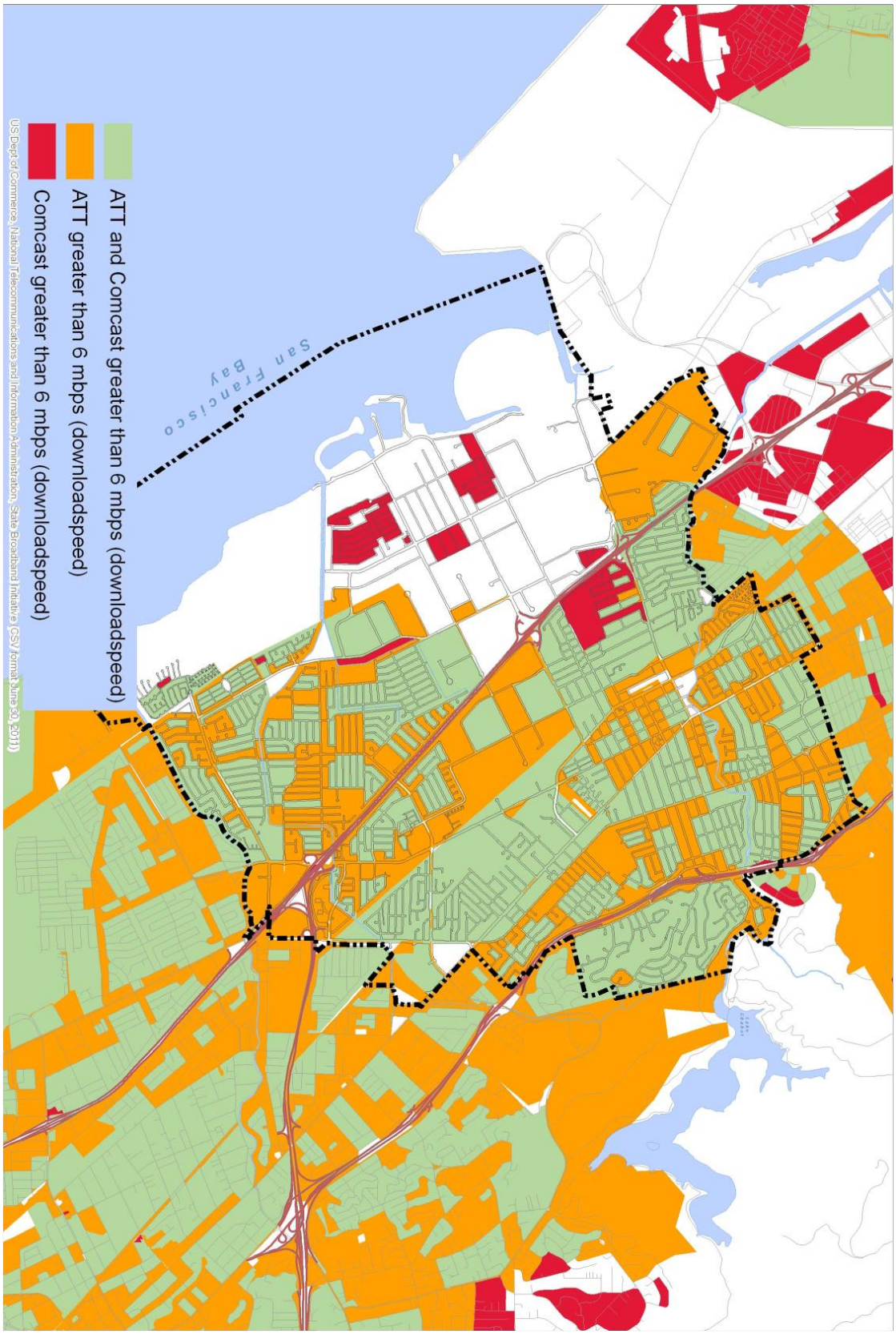
6. Areas of San Leandro where AT&T claims to meet the CPUC's minimum 6 Mbps download and 1.5 Mbps upload standard. Data provided by CPUC.

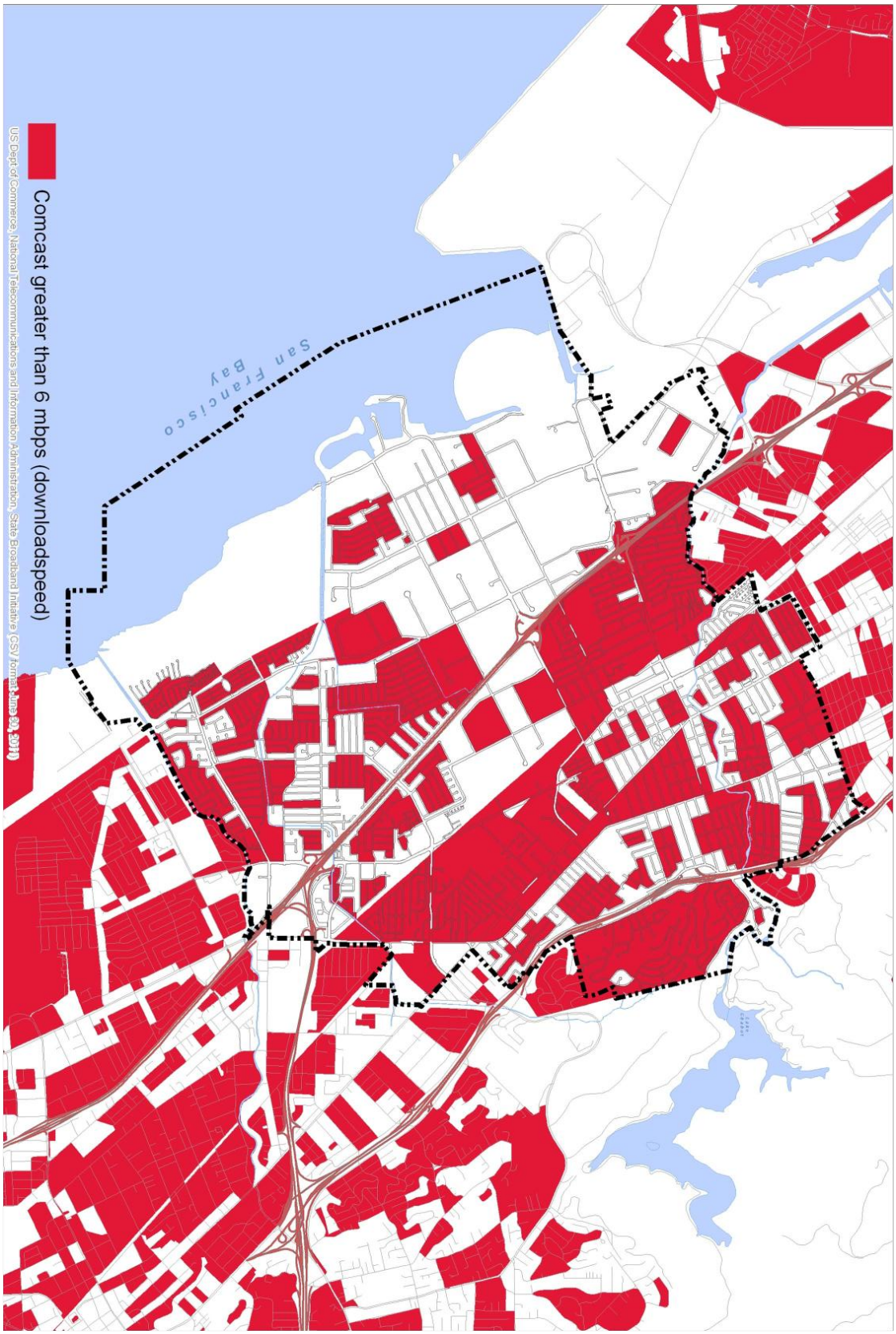
7. AT&T Project Lightspeed node locations and illustrative service radii. The actual service area of any given node will be different from that shown, perhaps greatly different. However, the overall pattern shows generally that Project Lightspeed upgrades were targeted to residential rather than commercial or industrial areas of San Leandro.

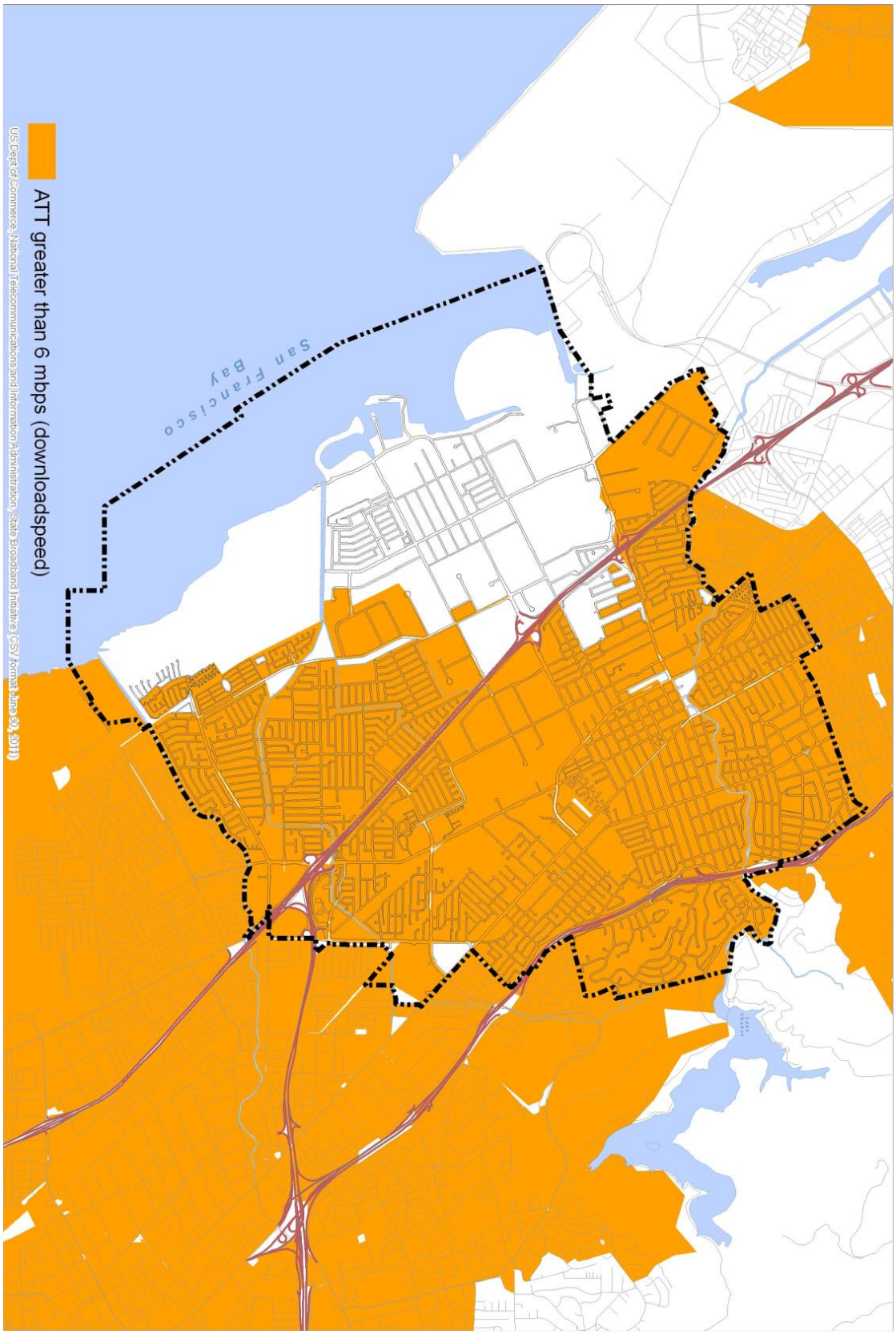

City of San Leandro
Preliminary Broadband
Coverage Review,
December 21, 2011
N
Fiber
City of San Leandro
Lit San Leandro
Other
AboveNet
5 City Fiber
AT&T Lightspeed
AT&T Lightspeed Locations
AT&T Lightspeed 1500' Buffer
Cell Towers
CPUC
MAXSPEED
1.5 mbps - 2 mbps
3 mbps - 5 mbps
6 mbps - 9 mbps
10 mbps - 24 mbps
25 mbps - 49 mbps
50 mbps - 99 mbps
1 gbps +
Known Issues
Provider Reported
Self Reported
Survey Locations
San Francisco
Bay

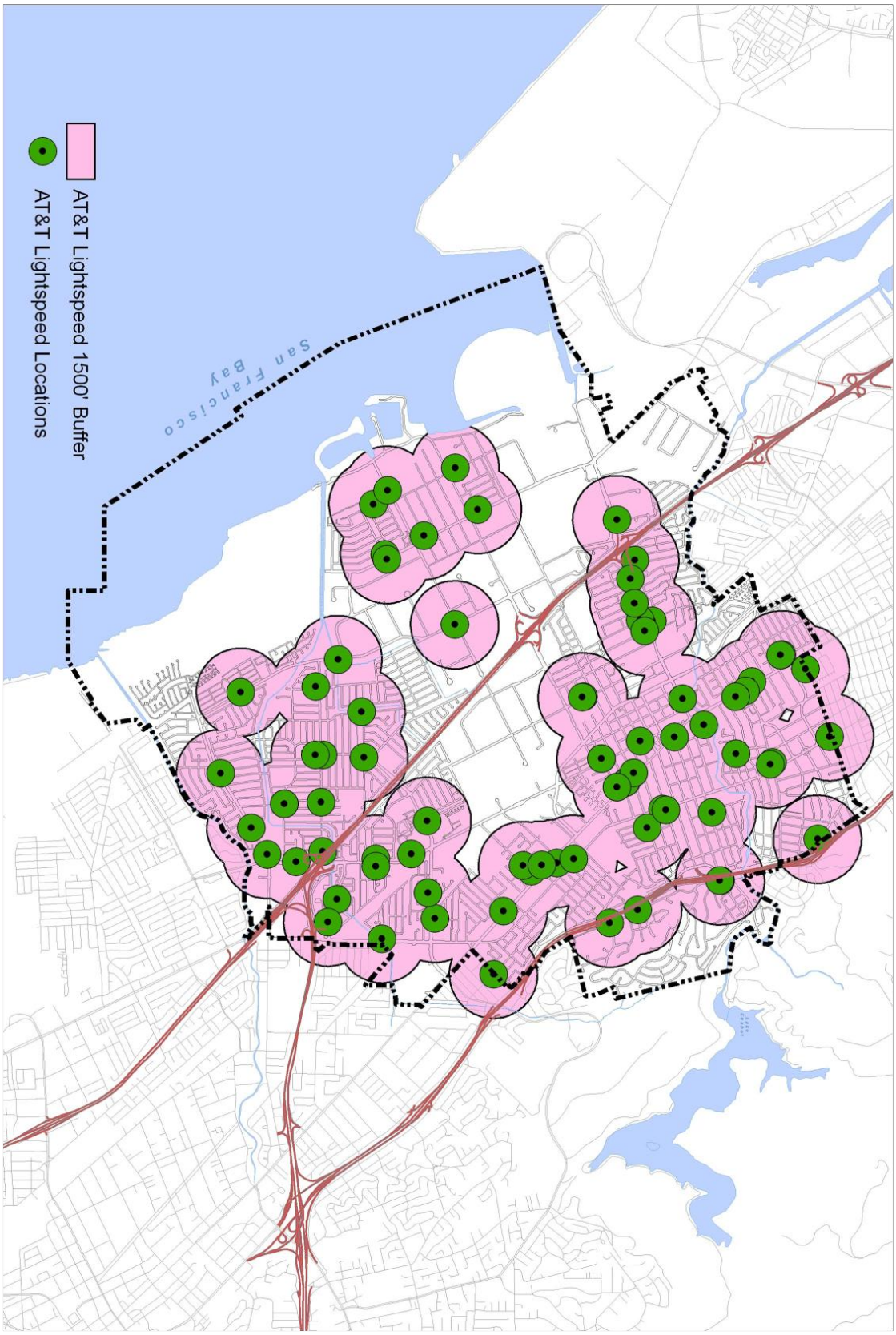

Lit San Leandro
Priority Areas
San Francisco Bay
Shoreline
Davis/Doolittle/Adams
880 Industrial Corridor
Downtown


CPUC
Max Speed
1.5 - 2 mbps
2 - 5 mbps
6 - 9 mbps
10 - 24 mbps
25 - 49 mbps
50 - 99 mbps
1 gbps +
San Francisco Bay


ATT and Comcast greater than 6 mbps (downloadspeed)
ATT greater than 6 mbps (downloadspeed)
Comcast greater than 6 mbps (downloadspeed)
San Francisco Bay
US Dept of Commerce, National Telecommunications and Information Administration, State Broadband Initiative (GSV format, June 30, 2011)


Comcast greater than 6 mbps (downloadspeed)
San Francisco Bay
US Dept of Commerce, National Telecommunications and Information Administration, State Broadband Initiative (GSV formats June 30, 2010)


ATT greater than 6 mbps (downloadspeed)
San Francisco Bay
US Dept of Commerce, National Telecommunications and Information Administration, State Broadband Initiative (GSV format June 30, 2011)


AT&T Lightspeed 1500' Buffer
AT&T Lightspeed Locations
San Francisco Bay

15. Appendix D – Broadband Policy Benchmarks

Policy Benchmark	Source
Facilitation of Infrastructure Development	
Delineates the process for ensuring fairness and competition, including transparency, public notice and timetables and deadlines for timely review of any required local permits.	CETF
Promulgates procedures to streamline the approval of easement encroachment permits consistent with principles of fairness and competition for all providers.	CETF
Requires and provides a process for notification and information about all major infrastructure and construction projects, including transportation projects and new residential subdivisions, to a shared data base so that broadband and other utility providers have the opportunity to coordinate infrastructure deployment in shared trenches, conduit, poles and towers, and other appurtenances.	CETF
Sets forth the process and procedures for incorporating broadband into all infrastructure projects.	CETF
Establishes an ongoing role for the City to play in identifying broadband needs and working proactively with businesses and service providers to meet those needs.	San Leandro
Requires conduit space within joint utility trenches for future high speed data transmission systems.	CETF
Incorporates routine placement of broadband conduit into utility undergrounding programs.	San Leandro
Requires installation of broadband conduit as a part of any suitable public works project.	HR 1695
Identifies local public rights-of-way and public facilities that can be used for broadband deployment.	CETF
Makes the use of public assets available to all providers on a competitive basis, commensurate with adopted policies regarding public benefits.	CETF
Authorizes longer-term “evergreen” permits that provide a right to providers to enter specified easements to upgrade their infrastructure for an indefinite or significant period of time (such as 20 years) to upgrade the broadband service consistent with the adopted policies.	CETF
Support for Smart Infrastructure and Connected Communities	
Accommodates high technology, broadband intensive businesses in zoning ordinances and procedures.	San Leandro
Specifies “smart building” requirements for land use and construction permits for all projects (public, commercial, residential, industrial).	CETF

Policy Benchmark	Source
Promotes the provision of broadband infrastructure in all public buildings, major transportation and other infrastructure projects and commercial developments.	CETF
Requires projects to provide broadband connectivity and include the infrastructure components necessary to support broadband.	CETF
Incorporate into conditional use permits the requirements to ensure continuity of broadband service and periodic upgrades (such as every 10 years) to state-of-art broadband technologies.	CETF
Encourages broadband providers to size underground and overhead facilities to accommodate future expansion, changes in technology, and where possible the facilities of other telecommunications and utility providers.	CETF
Establishes a telecommuting program for employees.	CETF
Encourages local businesses to develop telecommuting programs.	CETF
Articulate the interest of the jurisdiction in monitoring the reliability and quality of broadband connectivity in the local jurisdiction and ensuring appropriate speed availability.	CETF
Protection for Environmental Quality and Visual Aesthetics	
Sets forth the process and procedures for preventing and/or mitigating environmental impacts and protecting and/or preserving visual integrity of jurisdiction.	CETF
Efficiency of Government Operations and Delivery of Services	
Directs how government operations and services are to be provided online.	CETF
Streamline and provide online access to business and development permit processes.	Santa Cruz
Establishes an "open data" policy.	Santa Cruz
Requires all public works projects include broadband conduit to be useable by multiple government agencies.	Nevada County
Leverages City budget to stimulate demand for broadband facilities.	S-23-06
Participation in regional and statewide planning and standards organizations.	CETF

16. Appendix E – Reference Material

Links at: http://www.tellusventure.com/community/presentations/sl/

Broadband Deployment in California, California Public Utilities Commission, May 2005.

Building broadband: Strategies and policies for the developing world, World Bank, January 2010.

Canada's Productivity Dilemma: The Role of Computers and Telecom, Bell Canada, March 2005.

Case study: $12 million raised for regional fiber optic network on California's central coast, Tellus Venture Associates, March 2010

City of Palo Alto fiber market research report, Tellus Venture Associates, May 2011.

Connecting California: Broadband Update, California Public Utilities Commission, September 2006.

Economic Effects of Increased Broadband Use in California, Sacramento Regional Research Institute, November 2007 (prepared for AT&T).

Economics of WiFi-based Metropolitan Internet Service: A Postmortem on the Wireless Internet Utility, Tellus Venture Associates, November 2008

Encroachments Permit Manual, Caltrans, January 2009.

Fiber Optic Network Master Plan, City of Victorville, July 2005.

Financial Analysis of FTTH System Proposals: An Operations-Based Approach, Tellus Venture Associates, October 2005.

Getting Connected for Economic Prosperity and Quality of Life: A Resource Guide for Local and Regional Government Leaders to Promote Broadband Deployment and Adoption, California Emerging Technology Fund, October 2010.

Guide to the Legal Aspects of Trench Cuts, Metropolitan Transportation Commission, September 1999.

Living in a Networked World: Humboldt County Telecommunications Infrastructure and Usage Assessment, Tina Nerat, NERATech, December 2004.

The State of Connectivity: Building Innovation through Broadband, final report of the California Broadband Task Force, January 2008.

Strategies for effective communication in the new digital media landscape, Santa Cruz City Council Ad Hoc Committee on Technology, September 2011.

Technology Master Plan, City of Grover Beach, February 2010.

Telecommunications Master Plan, City of Corona, November 2002.

WiMAX feasibility study for the City of Folsom, Tellus Venture Associates, November 2005

Wireless broadband feasibility study for the City of Oakland, Tellus Venture Associates, August 2009

17. Appendix F – Glossary

ADSL	Asymmetric Digital Subscriber Line: DSL service with a larger portion of the capacity devoted to downstream communications, less to upstream. Typically thought of as a residential service.
ATM	Asynchronous Transfer Mode: A data service offering by ASI, that can be used for interconnection of customer's LAN. ATM provides service from 1 Mbps to 145 Mbps utilizing Cell Relay Packets.
Backhaul	Connecting Internet access to a location over long or short distances. Traditionally, wired networks have been necessary for backhaul, but with 802.16, also known as WiMAX, backhaul via wireless will become even more common than it is with WiFi.
Bandwidth	The amount of data transmitted in a given amount of time; usually measured in bits per second, kilobits per second, and megabits per second.
Bit	A single unit of data, either a one or a zero. In the world of broadband, bits are used to refer to the amount of transmitted data. A kilobit (Kb) is approximately 1,000 bits. A megabit (Mb) is approximately 1,000,000 bits.
Broadband	"Broadband" refers generally to any telecommunications service capable of supporting digital data transmission at high speeds. These services can include and/or support Internet, television, telephone, private data networks and various specialized uses. Broadband service can be delivered in a variety of ways, including telephone lines (e.g. DSL), coaxial cable (e.g. cable modem), fiber optic cable (e.g. Lit San Leandro), wireless cellular/mobile service (e.g. cell phones, tablets, wireless modems), WiFi, point-to-point and point-to-multipoint wireless service (e.g. TelePacific, Etheric) and hybrid networks (XO Communications). Although different organizations use different criteria, the California Public Utilities Commission considers 6 Mbps download and 1.5 Mbps upload speed to be a standard for adequate broadband service availability. Unless otherwise stated, this report uses the CPUC definition.
Byte	The amount of memory space needed to store one character, which is normally 8 bits.

Cable modem	A device that hooks to your cable TV line to allow your computer to receive data at about 1.5 Mbps. The theoretical maximum for downstream transactions is 27 Mbps and 2.5 Mbps upstream, but the connection is usually much slower because the provider may be hooked to the Internet via a T-1 line.
CDMA	The type of digital cellular phone network used throughout most of the United States, but rare elsewhere in the world. CDMA stands for Code Division Multiple Access, and CDMA2000 1x is the third-generation, or 3G, extension to which CDMA cellular operators are upgrading their networks. It is a digital cellular technology that uses spread-spectrum techniques. Unlike competing systems, such as GSM, that use TDMA, CDMA does not assign a specific frequency to each user. Instead, every channel uses the full available spectrum. Individual conversations are encoded with a pseudo-random digital sequence. CDMA consistently provides better capacity for voice and data communications than other commercial mobile technologies, allowing more subscribers to connect at any given time, and it is the common platform on which 3G technologies are built.
Cell	The geographic area covered by a cellular telephone transmitter. A connected group of cells form a cell system, which is what you gain access to when you sign up for cellular telephone service.
Cellular	A mobile communications system that uses a combination of radio transmission and conventional telephone switching to permit telephone communications to and from mobile users within a specified area.
CLEC	Competitive Local Exchange Carrier: Wireline service provider that is authorized under state and Federal rules to compete with ILECs to provide local telephone service. CLECs provide telephone services in one of three ways or a combination thereof: a) by building or rebuilding telecommunications facilities of their own, b) by leasing capacity from another local telephone company (typically an ILEC) and reselling it, and c) by leasing discreet parts of the ILEC network referred to as UNEs.

Coaxial cable	A type of cable that can carry large amounts of bandwidth over long distances. Cable TV and cable modem service both utilize this technology.
Commercial grade	Broadband service similar to residential service in that the provider takes effectively all responsibility for installing, maintaining and supporting the service. Speeds are similar (6 to 100 Mbps), but service levels, reliability, consistency and pricing are higher.
CPCN	Certificate of Public Convenience and Necessity: Authorization given by the CPUC to telecommunications carriers in order to provide service in the state of California.
Dial-Up	A technology that provides customers with access to the Internet over an existing telephone line.
DS3	A dedicated phone connection supporting data rates of about 43Mbps (megabits per second). Also called a T-3, the line actually consists of 672 individual channels, each of which supports 64Kbps. DS3 lines are used mainly by Internet Service Providers (ISPs) connecting to the Internet backbone. Large businesses also use DS3 lines when they have large sites to interconnect.
DSL	A common form of broadband Internet connection. DSL stands for Digital Subscriber Line.
E-Rate	A Federal program that provides subsidy for voice and data lines to qualified schools, hospitals, CBOs, and other qualified institutions. The subsidy is based on a percentage designated by the FCC. CTF benefits are calculated net of the E-rate subsidy.
E911	Enhanced 911, an emergency service that automatically sends phone number and location information to the operator. E911 comes in handy, say, when you need to get emergency help and are unable to speak or don't know your location.
Ethernet	The most common networking standard in the world, formally known as IEEE 802.3.
Fixed wireless	The operation of wireless devices in a specific location, such as an office. This term is usually reserved for devices that need to be plugged in to operate, such as a desktop computer. If it runs off a battery, it's not fixed wireless. The point-to-point signal transmissions occur through the air over a terrestrial microwave

	platform rather than through copper or fiber cables; therefore, fixed wireless does not require satellite feeds or local phone service. The advantages of fixed wireless include the ability to connect with users in remote areas without the need for laying new cables and the capacity for broad bandwidth that is not impeded by fiber or cable capacities.
FTTN	Fiber To The Neighborhood: A hybrid network architecture involving optical fiber from the carrier network, terminating in a neighborhood cabinet with converts the signal from optical to electrical.
FTTP	Fiber To The Premise (Or FTTB
Gigahertz	A measure of electromagnetic wave frequency equal to one thousand million (1,000,000,000) hertz, often abbreviated as GHz and used to specify the radio frequency used by wireless devices. 802.11a networks operate at 5 GHz. 802.11b and g networks use 2.4 GHz, which is susceptible to interference from nearby cordless phones and microwave ovens that use the same frequency.
GPON	Gigabyte-Capable Passive Optical Network: GPON uses a different, faster approach (up to 2.5 Gbit/s in current products) than BPON.
GSM	Global System for Mobile Communications: This is the current radio/telephone standard in Europe and many other countries except Japan and the United States.
Hub	A common connection point for devices, such as computers and printers, in a network.
ILEC	Incumbent Local Exchange Carrier. An ILEC is a telephone company that was providing local service when the Telecommunications Act of 1996 was enacted. Compare with CLEC, a company that competes with the already established local telephone business.
Industrial grade	Broadband service where the customer plays a much greater role in provisioning and supporting the service, including buying different elements from different vendors and managing installation and support. Speeds would be higher – perhaps as high as a Gigabit per second or more – and quality of service levels could be as high as Tier 1. Comcast's Business Class service or AT&T's business DSL service are examples of

	commercial grade service. A DS-3 or dark fiber strands are examples of industrial grade service.
Inet	Institutional Network. Provides a high-speed connection between government, educational and community entities. It is often negotiated with a cable franchise, in exchange for using right- of-way in a jurisdiction.
ISP	Internet Service Provider: A company providing Internet access to consumers and businesses, acting as a bridge between customer (end-user) and infrastructure owners for dial-up, cable modem and DSL services.
LAN	Local Area Network: A geographically localized network consisting of both hardware and software. The network can link workstations within a building or multiple computers with a single wireless Internet connection.
Last mile	Infrastructure (e.g. fiber optic lines, distribution boxes, equipment vaults, poles, conduit) that provides broadband service to end users or end- user devices (including households, and businesses).
Local Loop	A generic term for the connection between the customer's premises (home, office, etc.) and the provider's serving central office. Historically, this has been a wire connection; however, wireless options are increasingly available for local loop capacity.
MAN	Metropolitan Area Network: A high-speed date intra-city network that links multiple locations with a campus, city or LATA. A MAN typically extends as far as 50 kilometers.
Mbps	Megabits per second: 1,000,000 bits per second. A measure of how fast data can be transmitted.
Middle mile	Broadband infrastructure that does not predominantly provide broadband service to end users or to end-user devices, and may include interoffice transport, backhaul, Internet connectivity, or special access. Middle mile facilities are the link between last mile facilities and major interconnection points, such as those that form the core of the Internet.
Modem	Short for modulator/demodulator. A modem modulates outgoing digital data into analog signals so they can be sent over copper

	phone lines, and demodulates incoming analog signals into digital.
Overbuilders	Building excess capacity. In this context, it involves investment in additional infrastructure project to provide competition.
PON	Passive Optical Network: A Passive Optical Network consists of an optical line terminator located at the Central Office and a set of associated optical network terminals located at the customer's premise. Between them lies the optical distribution network comprised of fibers and passive splitters or couplers. In a PON network, a single piece of fiber can be run from the serving exchange out to a subdivision or office park, and then individual fiber strands to each building or serving equipment can be split from the main fiber using passive splitters / couplers. This allows for an expensive piece of fiber cable from the exchange to the customer to be shared amongst many customers thereby dramatically lowering the overall costs of deployment for fiber to the business (FTTB) or fiber to the home (FTTH) applications.
Rights-of-Way	Legal rights of passage over land owned by another. Carriers and service providers must obtain rights-of-way to dig trenches or plant poles for cable systems, and to place wireless antennae.
Router	An intelligent network device that goes one step beyond bridging by converting address-based protocols that describe how packets move from one place to another. In practice, this generally comes down to translating between IP addresses and MAC addresses for data flowing between your local network and the Internet. Many people use the term interchangeably with "gateway." You must enter the IP address of your router when configuring network settings manually.
Subscribership	Subscribership is how many customers have subscribed for a particular telecommunications service.
Switched Network	A domestic telecommunications network usually accessed by telephones, key telephone systems, private branch exchange trunks, and data arrangements.
T-1	The T-1 standard was introduced in 1961 in order to support a bi-directional speed of 1.5 Mbps at a high quality-of-service level, using the copper wires of the time. Because it is a dedicated and managed circuit, its performance is usually

	substantially better than shared services such as DSL or cable modem, even in cases where the claimed top speed of those shared services is many times higher. A T-1 circuit is generally considered to be the lowest level of service that can be described as industrial or carrier grade.
Telco	An abbreviation for Telephone Company.
Telecommunications	Refers to all types of data transmission, from voice to video.
Throughput	The amount of data that can be transmitted in a given amount of time. Throughput is commonly measured in bits per second. (Although throughput is not really a measurement of speed, most people, including us, use the word "speed" when talking about a high-throughput network.)
Universal Service	The idea of providing every home in the United States with basic telephone service.
Videoconferencing	Conducting a conference between two or more participants at different sites by using computer networks to transmit audio and video data.
VLAN	Virtual Local Area Network. A network of computers that behave as if they are connected to the same wire even though they may actually be physically located on different segments of a LAN.
VoIP	Voice Over Internet Protocol: A new technology that employs a data network (such as a broadband connection) to transmit voice conversations.
VPN	A method of creating an encrypted tunnel through which all traffic passes, preventing anyone from snooping through transmitted and received data. VPN stands for virtual private network.
WAN	Wide Area Network, A collection of local area networks connected by a variety of physical means. The Internet is the largest and most well-known wide area network. Wide area network is generally abbreviated to WAN.
WiFi	Short for wireless fidelity and is meant to be used generically when referring of any type of 802.11 network, whether 802.11b, 802.11a, dual-band, etc. The term is promulgated by the WiFi Alliance. Any products tested and approved as "WiFi Certified" (a registered trademark) by the WiFi Alliance are

	certified as interoperable with each other, even if they are from different manufacturers. A user with a "WiFi Certified" product can use any brand of access point with any other brand of client hardware that also is certified. Typically, however, any WiFi product using the same radio frequency (for example, 2.4 GHz for 802.11b or 11g, 5 GHz for 802.11a) will work with any other, even if not "WiFi Certified." Formerly, the term "WiFi" was used only in place of the 2.4 GHz 802.11b standard, in the same way that "Ethernet" is used in place of IEEE 802.3. The Alliance expanded the generic use of the term in an attempt to stop confusion about wireless LAN interoperability.
WiMAX	Another name for the 802.16 wireless networking specification used for long-haul and backhaul connections.
Wireless ISP	A company that provides wireless Internet access. The term is often abbreviated to WISP.
WLAN	Wireless Local Access Network, a LAN that can be connected to via a wireless connection.

Sources: Tellus Venture Associates, California Public Utilities Commission, Neratech, Wikipedia.