The State of Connectivity

Building Innovation Through Broadband

THE CALIFORNIA BROADBAND TASK FORCE

Co-Chairs:

Dale E. Bonner, Co-Chair
State of California, Business, Transportation, & Housing Agency

Charles H. Giancarlo, Co-Chair
Cisco Systems, Inc.

Members:

Ellis Berns
City of Mountain View

Commissioner Rachelle Chong
California Public Utilities Commission

William Geppert
Cox Communications

Paul Hernandez
MAAC Project

William Huber
AT&T

Senator Christine Kehoe
California State Senate

Wendy Lazarus
The Children's Partnership

Assemblymember Lloyd Levine
California State Assembly

Bryan Martin
8x8 Incorporated

Timothy McCallion
Verizon

Sunne Wright McPeak
California Emerging Technology Fund

Milo Medin
M2Z Networks

Peter Pardee
Hughes Network Systems

Peter Pennekamp
Humboldt Area Foundation

Debra Richardson
UC Irvine

Rollin Richmond
Humboldt State University

Larry Smarr
Calit2

Jonathan Taplin
University of Southern California

Emy Tseng
City and County of San Francisco

Letter From the Co-Chairs

December 15, 2007

Governor Schwarzenegger and Members of the Legislature:

As a result of Executive Order S-23-06, the California Broadband Task Force has spent the last year identifying opportunities for—and challenges to—broadband deployment and adoption. The enclosed report represents the culmination of that work, including maps of current broadband availability and speed, recommendations to achieve ubiquitous access and increased use, and a timeframe in which to meet these critical goals.

Developed by a diverse group of experts—representing businesses, non-profit organizations, educational institutions, and public servants across the state—this report provides a foundation to guide the often-contentious public policy debate that surrounds broadband. Quickly implementing the policies and programs recommended by the Task Force will require significant leadership from all sectors, including government. A number of the recommendations require changes that can be made only through law or executive order. Many others require the government to convene experts and facilitate action by stakeholders. When California succeeds in realizing the goals of this report, our state will maintain its longstanding position as the premier place in the world to live and work.

The benefits that result from this technology are many. As broadband deployment and use increases throughout the state, we will see the benefits accrue to communities, businesses, families, education and healthcare institutions, government, arts and culture organizations, and transportation systems. Broadband is a new type of infrastructure, and it is critical that California build a next-generation network capable of delivering the applications that Californians need both now and in the future.

California has consistently had higher levels of broadband availability and usage than many other states, but we have already begun to fall behind other regions and countries. We urge you to review this report and the maps detailing broadband availability, and consider the recommendations needed to help restore and advance California's competitive position.

On behalf of the California Broadband Task Force, we thank you for the opportunity to develop this report for the state. We are committed to helping you realize your vision for a digitally connected California and we look forward to working with you on this important issue.
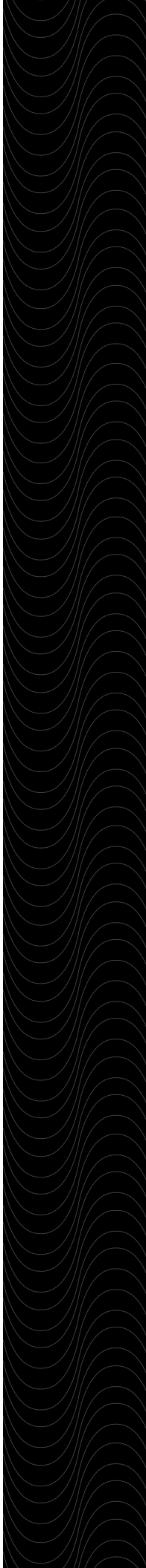
Sincerely,

Dale E. Bonner
California Broadband Task Force Co-Chair
Secretary
State of California
Business, Transportation & Housing Agency

Charles H. Giancarlo
California Broadband Task Force Co-Chair
Executive Vice President and Chief Development Officer
Cisco Systems, Inc.

Table of Contents

Executive Summary

Governor Arnold Schwarzenegger commissioned the California Broadband Task Force (CBTF) to "remove barriers to broadband access, identify opportunities for increased broadband adoption, and enable the creation and deployment of new advanced communication technologies." The governor also requested that the CBTF "pay particular attention to how broadband can be used to substantially benefit educational institutions, healthcare institutions, community-based organizations, and governmental institutions." This document meets both those objectives and also includes specific recommendations to achieve the governor's goals.

The CBTF adopted three key goals:
- California must ensure ubiquitous and affordable broadband infrastructure, made available through a variety of technologies to all Californians.
- California must drive the creation and use of applications that produce the greatest economic, educational, and social benefits for California's economy and communities.
- California must construct next-generation broadband infrastructure, positioning California as the global economic leader in a knowledge-based economy.

Through analysis of CBTF's broadband mapping project and independent research, the Task Force determined that California is better positioned than most states on broadband availability and adoption, yet the state lags behind key foreign competitors. Specifically, the CBTF found:
- 96% of California residences have access to broadband.
- 1.4 million mostly rural Californians lack broadband access at any speed.
- Barely more than half of Californians have adopted broadband at home.
- Only half of Californians have access to broadband at speeds greater than 10 Mbps (including both upstream and downstream speeds).
- Broadband infrastructure is deployed unevenly throughout the state, from state-of–the-art to nonexistent.

Just as California has invested in other critical infrastructure such as roads, electricity, and water, the CBTF believes that the state must seize the opportunity to promote private-sector investment, leverage public-private partnerships, and lead the effort to increase broadband availability and adoption. But unlike roads, electricity, and water, California's investment in broadband should not be limited to physical infrastructure, but instead should include policies to increase adoption of broadband technologies. Increasing both access to and use of broadband will build economic capital, strengthen public safety resources, improve living standards, expand educational and healthcare opportunities, and raise the levels of civic engagement and governmental transparency. In addition to growing consumer needs, business, research, government, education, library, healthcare, and community institutions require high-speed connectivity to:
- Share information;
- Promote environmentally friendly technologies such as telecommuting, video conferencing, and high-quality video collaboration;
- Provide distance-learning opportunities;
- Enable remote analysis of medical information; and
- Foster a greater civic discourse.

The CBTF recommends seven key actions to help our state achieve fast, reliable, and affordable broadband service:

1. Build out high speed broadband infrastructure to all Californians
   Advancing new incentives for deployment and improving existing programs will create a world-class broadband infrastructure in California.

2. Develop model permitting standards and encourage collaboration among providers
   Developing a public-private partnership between local governments and broadband providers to endorse permitting standards will improve the speed with which broadband is deployed.

3. Increase the use and adoption of broadband and computer technology
   Expanding the opportunities for Californians to access, use, and learn broadband, at home and in the community, will provide the foundation for a digitally literate society that is able to fully benefit from broadband technology.

4. Engage and reward broadband innovation and research
   Promoting innovative uses of broadband technology and encouraging wider e-government use will result in quality-of-life improvements, while increasing demand for a robust broadband infrastructure.

5. Create a statewide e-health network
   Implementing a sustainable statewide e-health network will improve quality of care across the state and simultaneously increase demand for broadband services.

6. Leverage educational opportunities to increase broadband use
   Ensuring high-capacity broadband connections coupled with a robust technology support system, relevant curriculum, literacy standards, and off-campus educational partnerships will provide California's students with the skills they need to compete in a 21st century economy.

7. Continue state-level and statewide leadership
   Continuing the California Broadband Initiative and supporting the creation of Community Broadband Leadership Councils will strengthen the statewide leadership necessary to drive broadband access and adoption across California.

Broadband is the Foundation for a 21st Century Economy

High-speed Internet access, or broadband, is a fundamental aspect of the infrastructure required to educate our youth, create jobs, promote public safety, improve our standard of living, and deliver essential services like health care. In years past, the building of roads, highways, and railroads fostered additional trade, commerce, and jobs; so, too, does this new superhighway as it moves information 24 hours a day, at a speed dictated only by the capacity of the infrastructure. In short, competing and succeeding in tomorrow's economy requires California to deploy and use an affordable broadband infrastructure that delivers connectivity to all its communities. Unfortunately, far too many Californians either do not have access to or do not use broadband today. It is the mission of the California Broadband Task Force (CBTF) to turn this "digital divide" into a "digital opportunity."

Overcoming this divide to become the global leader for broadband availability, capacity, and adoption will be challenging. The state's 37 million residents, which represent 12 percent of the U.S. population, are spread across a diverse topography that spans some 155,000 square miles. According to the California Rural Health Policy Council, 92 percent of the state's landmass is rural, yet only 8 percent—or 2.96 million residents—live in these regions.[1] Nevertheless, this rural population is still larger than the individual populations of 20 other states. In some of these rural, remote, or tribal lands, broadband deployment may not be achieved through the current regulatory framework, because providers perceive that the costs to deploy current- or next-generation technologies may be higher than the potential benefits. As a result, those areas may lack either broadband providers or a variety in the choice of broadband providers, as compared to urban and suburban areas. While private-sector investment will provide broadband infrastructure to the vast majority of Californians, the state will need to ensure that adequate infrastructure is available to all.

California is also diverse in its populations and the wide range of needs among its citizens. Across the state, 13.2 percent of Californians and 19 percent of children live in poverty. Indeed, if poverty statistics were adjusted for California's high cost of living, the percentage of Californians in poverty would be significantly higher.[2] More than 200 languages are also spoken in communities that span from San Ysidro on the Mexican border to Tulelake on the Oregon border. One

in four Californians is an immigrant. These statistics indicate the challenge in ensuring that Californians have access to affordable broadband infrastructure and equipment, as well as multilingual, culturally relevant content and applications. Increasing broadband infrastructure will require a creative and coordinated effort among all stakeholders.

California's effort, however, must reach beyond traditional regulatory paradigms. Broadband policies have been driven primarily by federal policies at both the U.S. Congress and the Federal Communications Commission, and to date the federal government has pursued a competitive, very lightly regulated broadband policy. State agencies have limited or no jurisdiction over broadband providers, including telecommunications, wireless, and video carriers and satellite providers. This policy has been largely successful in driving more private-sector investment in broadband infrastructure; however, it has not fully addressed deployment in rural high-cost areas.

Despite these challenges, California enjoys significant advantages that can propel the state into leading the nation and the world in broadband; the state is the home of a true 21st century economy. With a $1.7 trillion gross state product, California, the nation-state, boasts the eighth largest economy worldwide, ranking between Italy and Spain. In addition, California's technology sector, which has innovated many of the broadband technologies and applications in use today, continues to thrive. Kevin Starr, historian and author of *California: A History,* observed, "California emerged as a society with a special capacity for technology."[3] This is as true today as it was in the state's early days of innovation. With $52 billion in exports, California was the nation's leading high-tech exporter in 2006.[4] The state is also home to some of the finest public and private universities in the nation. Innovation throughout these campuses, independently and in collaboration with the private sector, fosters new technologies that can drive broadband availability and use. Even so, solving the broadband problem will require considerable investment in human and financial capital. Of course, the benefits of this technology to ensure California's place as a world-class, 21st century economy are undoubtedly worth the effort and expenditure.

What is Broadband?

To evaluate the status of and set metrics for broadband deployment in California, the CBTF developed a working definition of broadband.

- Broadband is defined by the ability to perform online applications at a reasonable performance level for the end user.
- Broadband is a range of speeds and will evolve over time as applications and needs change. It is a summation of the downstream data rate (transmission to the user) and upstream data rate (transmission from the user).
- The ratio of the downstream and upstream must be a minimum of 10:1 (the ratio of the downstream and upstream data rates can increase from 10:1 to a fully symmetrical 1:1).
- Broadband must have the capability to be always on, and have a sustainable steady state data rate.
- Burst-able speeds provide benefit to users, but should not be considered in the same manner as steady data rates.
- The minimum speed required to use the most basic of broadband-enabled applications is 512 kbps, and this minimum data rate is expected to increase over time.
- An increasing scale that continues to differentiate within speed tiers allows stakeholders to measure specific broadband availability over time.

Upstream and Downstream Speed Range	Applications
500 kbps - 1 Mbps	Voice over IP SMS Basic Email Web Browsing (simple sites) Streaming Music (caching) Low Quality Video (highly compressed)
1 Mbps - 5 Mbps	Web Browsing (complex sites) Email (larger size attachments) Remote Surveillance IPTV-SD (1-3 channels) File Sharing (small/medium) Telecommuting (ordinary) Digital broadcast video (1 channel) Streaming Music
5 Mbps - 10 Mbps	Telecommuting (converged services) File Sharing (large) IPTV-SD (multiple channels) Switched Digital Video Video on Demand SD Broadcast SD Video Video Streaming (2-3 channels) HD Video Downloading Low Definition Telepresence Gaming Medical File Sharing (basic) Remote Diagnosis (basic) Remote Education Building Control & Management
10 Mbps - 100 Mbps	Telemedicine Educational Services Broadcast Video SD and some HD IPTV-HD Gaming (complex) Telecommuting (high quality video) High Quality Telepresence HD Surveillance Smart/Intelligent Building Control
100 Mbps - 1 Gbps	HD Telemedicine Multiple Educational Services Broadcast Video full HD Full IPTV Channel Support Video on Demand HD Gaming (immersion) Remote Server Services for Telecommuting
1 Gbps - 10 Gbps	Research Applications Telepresence using uncompressed high definition video streams Live event digital cinema streaming Telemedicine remote control of scientific/medical instruments Interactive remote visualization and virtual reality Movement of terabyte datasets Remote supercomputing

How Will Broadband Availability and Use Impact California?

Economic and Community Development

Without broadband, communication is limited, innovation is stifled, productivity decreases, and quality of life is depressed. With broadband, the potential for economic development is an order of magnitude greater. The body of research now demonstrates that broadband has a substantial impact on individuals and on the economy.

Initial economic development studies were predicated on forward-looking assumptions, as broadband had not yet been widely deployed or adopted. In 2002, for example, one report estimated that if broadband were deployed universally by 2006, it would result in an increase to the GDP of $500 billion.[5] Another from 2002 estimated that broadband would create 1.2 million new, permanent jobs in the United States.[6] A 2007 report estimates that a 1 percent increase in broadband adoption results in a 0.2 to 0.3 percent increase in employment.[7] Studies show that broadband supports job growth and increases the number of businesses, particularly in the IT-sector. For example, a 2005 study showed that "[b]etween 1998 and 2002, communities in which mass-market broadband was available by December 1999 experienced more rapid growth in employment, the number of businesses overall, and businesses in IT-intensive sectors, relative to comparable communities without broadband at that time." During this same period, the authors of this report also saw increases in the communities' employment growth rates of over 1 percent.[8]

Broadband is also critical to expanding job opportunities to rural residents, people with disabilities, and older adults. Broadband, for example, has facilitated the use of "home-shoring" or using home-based workers for customer service.[9] Before the advent of this technology, many of these jobs required employees to adhere to a strict work schedule at a centralized location. Workers who required flexible work schedules or those that lived far from commercial centers were often drastically limited in their ability to find work. Broadband also offers farmers better access to market information and allows them to expand their potential customer base. For people with disabilities in particular, broadband provides an important link to employment and education opportunities. This group is typically employed at half the rate of people without disabilities, but access to advanced technology at home increases, for example, the availability of distance-learning programs that provide job certifications and other preparation. High-speed Internet access combined with assistive technology also creates opportunities for home-based businesses.[10] Despite these benefits, children and adults with disabilities are still less likely to have broadband and computer access at home.[11]

In California, home to many of the most innovative, successful, and entrepreneurial companies in the country, broadband is not just a prerequisite to growth, it is a key piece of infrastructure needed to retain the high-tech community. High-tech corporations could relocate if the state's infrastructure cannot support their needs. For many of these companies, broadband is not just critical to doing business—it is their business. For example, increased broadband availability has also been cited as the major "driver of consumer online

shopping growth."[12] Given the number of e-commerce businesses in California, an increase in online shopping will also provide benefits to both California's businesses and economy.

Education

One of the greatest benefits of broadband and related technology is the ability to provide high-quality education in a variety of settings. Youth who might otherwise be unable to benefit from supplemental tutoring programs due to parents' work schedules or family obligations can access one-on-one tutoring online with a broadband connection capable of transmitting real-time video and audio. Students studying for the California High School Exit Exam can receive free help from instructors via two new online courses that offer graphically rich, interactive practice lessons similar to the material tested by the exam. For high school students in schools with limited Advanced

gain simulated "hands-on" experience comparable to those in a hospital setting. And the future holds even more opportunity. The National Science Foundation (NSF) report "Cyberinfrastructure Vision for 21st Century Discovery,"predicts that the "future will see increasingly open access to online educational resources including courseware, knowledge repositories, laboratories, and collaboration tools.[13]" To effectively realize this future, access to a robust broadband infrastructure is imperative.

Environment

Increased broadband access and adoption may create significant environmental savings. Companies can decrease carbon emissions and travel costs by holding meetings via videoconference. Together, workers and their employers can reduce greenhouse gases by telecommuting, an activity that is

Placement courses, online instruction is available. In addition, adults and youth alike can access archived versions of UC Berkeley's classes free of charge—as long as they have a Web connection capable of downloading video.

Broadband networks also have enhanced education by providing students and teachers with access to a vast array of resources. Text-based materials, photos and images, videos, animations, interactive lessons, data-manipulation tools, oral history collections, music, and educational gaming programs are just a few of the valuable benefits. Interactive 3-D experiences and visual-simulation software allows critical-care nurses, for example, to effectively train from their homes and

virtually impossible without a broadband connection. A recent report estimates that a single person with a 22-mile one-way commute who telecommutes five days a week will achieve environmental savings that add up to 81,000 megajoules of energy—equivalent to 50 percent of an average household's annual electricity consumption. Approximately 3.9 million people now telecommute, saving 840 million gallons of fuel and 10 to 14 million metric tons of carbon dioxide per year. The fuel savings equals the output of 1.5 to 2.1 million light-duty trucks.[14] While participation among workers must be widespread to effect significant change, even participation by one-quarter of 1 percent of the workforce for one or two days per week could reduce the presence of

volatile organic compounds by 25 tons in California's largest cities.[15]

Savings can also be generated through changes in everyday behavior such as renting a movie through a video-on-demand service rather than driving to and from a rental store. Nationwide, if just half of today's rentals were accessed by video on demand, the country would save the equivalent of 200,000 household's annual electricity consumption.[16] When people and businesses adopt smart building infrastructure, controlled by broadband, energy savings also accrue through decreases in air conditioning and electricity use. Some have predicted that the widespread adoption of broadband-based applications will result in a 1 billion ton reduction in greenhouse gases over 10 years.[17]

Public Safety

Ubiquitous broadband capability also creates opportunities to enhance public safety operations. For example, video cameras armed with wireless broadband can enable a quantum leap in situational awareness by public safety commanders both in the field and at command centers. In addition, broadband increases productivity. A 2004 study showed that police officers who had broadband-enabled laptop connections in their police cars were able to increase patrols by two hours per week because of time saved by electronically filing reports.[18] Broadband-enabled devices also allow public safety field personnel to immediately receive data files and video, such as photographs associated with Amber Alerts, which enhances their ability to respond quickly to crisis situations. Citizen-originated photographs and videos taken with cell phones can also instantly be incorporated into the information flowing from command centers to public safety personnel. Broadband capability can be critical during disasters, providing real-time geo-locational information about damage, dangers (such as release of airborne chemicals or radiation), road conditions, and personnel and vehicle locations. In the event of evacuations, virtual command centers allow critical systems to be accessed from anywhere, reducing the probabil-

ity of on-site system failure because of the disaster. The City of Anaheim's Enterprise Virtual Operations Center is a multiuse portal that incorporates all law enforcement and public safety systems into a unified virtual command center that officials can operate from any location. Broadband, however, is required to effectively use the portal's numerous mapping and video applications.

Health Care

The growth of e-health in California will improve the quality of life for residents, and the benefits of e-health for patients are well-documented: increased access to health care; availability of health education in underserved communities; enhanced integration of clinical data; and point-of-care systems that provide better treatment and fewer medical errors. A robust broadband structure for e-health can also be leveraged to support digital inclusion and increase economic benefit.[19]

What may be less obvious are the benefits beyond those to the patient. For example, 83 percent of parents of children with special healthcare needs report driving more than an hour to see a specialist. For many of these families, this driving time results in lost work and missing wages.[20] By allowing families the opportunity to be served at local clinics through telemedicine applications that enable remote screening, diagnosis, treatment, and monitoring, families can receive quality care in the communities in which they work and live. Though e-health applications have different bandwidth requirements, applications such as video conferencing, digital x-ray transmission, and remote monitoring require fast broadband connections.

Nationwide, the benefits that accrue from health information technology (HIT), the applications of which often require broadband connectivity, are considerable. In 2005, the RAND Corporation estimated a nationwide annual savings of $81 billion from increased efficiency and a reduction in adverse drug events (at a 90 percent adoption rate over a 15-year period). This number could double when accounting for savings realized through patient safety and improved disease

prevention and chronic disease management.[21] When families take advantage of the opportunities presented by e-health, evidence suggests that health costs decrease "due to better management of chronic diseases, fewer hospital visits, and health system transportation savings."[22]

Smart Infrastructure Development

Integrating broadband into the state's physical infrastructure creates an opportunity to become proactive caretakers of the state's roads, levees, and water systems, among other elements. Broadband enables support of distributed networked sensors and actuators creating an active synergy between the digital and physical infrastructure of the state. Many countries are already moving rapidly to this new paradigm. These "smart infrastructure" systems use networked sensors to monitor the health of physical structures and their environment, initiating maintenance and rehabilitation as warning signs develop. The persistence of these integrated sensor-nets allows for daily monitoring, while also enabling more intelligent response to natural emergencies or man-made disasters.

Smart infrastructure using broadband technologies will also extend the reach, connectivity, and functionality of today's Internet to other networks, such as the state's utility system. Connecting every piece of equipment—including customer-premise appliances—to the state's electricity grid would enable real-time monitoring and outage detection, and greatly reduce the state's impact on the environment through efficiencies in operations, repairs, and upgrades. For example, broadband technologies, in conjunction with emerging smart-meter and home-appliance technologies, would change the electric meter from a dumb recorder of kilowatt hours into a conservation tool capable of helping people monitor their electricity use.[23]

Civic Engagement and Access to Information

Broadband accelerates the type and quality of governmental information delivered to consumers and increases the ability of all residents to take part in democratic governance. For example, video applications, which require considerable band-width capacity, have exponentially increased citizen access to elected leaders and governmental processes. The California Channel—California's version of C-SPAN—offers live streaming and archived video of press conferences, legislative committee hearings, and floor sessions.[24] Additionally, some government agencies now allow residents to testify remotely, increasing opportunities for everyone to participate in the policymaking process, regardless of location. In California, any person or organization with broadband can download and review the voluminous state budget, allowing more transparency in the state's fiscal decisions.

Information and news is now more readily available because of broadband. For example, during the 2007 political upheaval in Myanmar, citizen-journalists captured protests by the country's monks, uploading videos to the Internet before government censors actually shut down all in-country Internet access. Domestically, online news articles, videos, and photos, available in myriad languages, no longer provide news and commentary just to a select group of subscribers. The access to information that is facilitated by a broadband connection also allows consumers to better research product information and costs. Many people now use their broadband connection to help them research prices on goods and services, allowing a first-time car buyer to become a savvier negotiator or a parent to find the best prices on needed school supplies. Whether consumers are using the Internet to research vital health information or uploading independent music and art to share with the world, the connectivity must be fast enough to make the experience meaningful to users. Broadband connections are the key to ensuring that experience.

Why Government Leadership is Critical

As numerous reports have cited, the United States, including California, is no longer the global broadband leader. The Organisation for Economic Cooperation and Development (OECD) currently ranks the United States 15th in the world for broadband adoption, down from 4th in 2001.[25] If California were its own country, it would have ranked 3rd among OECD countries in 2001, but 10th in the world today.[26] While the average broadband monthly price, in price per megabit, is $12.60 in the United States, it is less expensive than that in 10 other OECD countries, including Portugal, the United Kingdom, and Italy. In Japan the average monthly advertised price, in price per megabit, is $3.09.[27] The average advertised download speeds of 13 other OECD nations are higher than that available to U.S. residents. The average advertised download speed available in Japan is almost 95 Mbps, while the average in the United States is just under 9 Mbps.[28] These high speeds allow innovation to flourish. For example, Japan's tele-pathology system, which is expected to be used nation-

ally by next spring, gives doctors the ability to diagnose cancer and other diseases remotely with just a microscope and a fiber optic line.[29] Californians will lose significant economic and quality-of-life opportunities if leadership is not undertaken now to regain the state's world-class position in broadband.

Within different areas of California, unequal deployment and adoption of broadband is also a concern that calls out for action. Research by the CBTF shows that broadband is widely available throughout the state, but enormous disparities exist between rural and urban California. Urban areas typically meet or exceed the state's overall availability, 96 percent of households, but in rural regions availability can fall to as low as 57 percent of households. The speeds available also differ considerably. Ninety-five percent of Los Angeles and Orange County residents can subscribe to speeds of 10 Mbps or higher, while only 6 percent of Bay Area households are able to do so. Additionally, according to a report released by the Public

At a Glance: California in 2006*

Population	35.9 Million
Race/Ethnicity	
White	44.40%
Hispanic	34.90%
Asian	11.90%
Black	6.40%
Multiracial	1.70%
American Indian/Alaskan Native	0.30%
Hawaiian/Pacific Islander	0.40%
Age	
< 18	27.10%
18-64	62.10%
>65	10.80%
Median Age	34
Residence	
Households	12.6 million
Average Household Size	2.8 persons
Owner-Occupied Households	59.20%
Renter-Occupied Housholds	40.80%
Average Fair Market Rent: Studio (2007)	$821
Range	$470-$925
Average Fair Market Rent: Two Bedroom (2007)	$1,160
Range	$666-$1312
Education	
High-School Diploma or Greater	81%
Bachelor's Degree or higher	30%
Labor Force	
Unemployed	5.30%
Highest Median Earnings by Industrial Group: Information	$50,000
Lowest Median Income by Industrial Group: Agriculture, Forestry, Fishing and Hunting	$18,000
Industries With Greatest Employment	
Educational and Health Services	19.50%
Wholesale and trade	14.90%
Professional and Business Services	12.80%
Manufacturing	10.80%
Income	
Median Household Income	$51,831
2006 Federal Poverty Level	$20,000
Population Below Poverty Level	13.40%
Families Below Poverty	10.60%
Families Between 100-149% of Poverty	8.20%

*All statistics except for Average Fair Market Rents are sourced to: State of California, Department of Finance, California Current Population Survey Report: March 2006. Sacramento, California, September 2007. Fair Market Rents are sourced to: "Caroll, David et al. "What Does It Taske for a Family to Afford to Pay for Health Care" UCLA Center for Health Policy Research and the California Budget Project. August 2007. Page 7 (Compiled through HUD's 2007 Fair Market Rent Documentation System).

Policy Institute of California and authored by economist Jed Kolko, broadband subscription in California "is significantly higher in higher income and denser zip codes, even after controlling for individual demographics. That is, people of the same age, race, income and so on are more likely to adopt broadband if they live in a richer or denser area."[30] These disparities are a fundamental driver preventing digital inclusion by all Californians.

California must invest in leadership not only for competitive reasons, but also because government support and leadership in broadband technology sends signals to markets, philanthropists, and consumers that a state or country will serve as a fundamental driver of economic and human capital growth in the New Economy.[31] Moreover, the state must continue to partner with other stakeholders to best leverage everyone's resources. For example, in the philanthropic sector, inroads will be made if the state and the California Emerging Technology Fund (CETF) continue to work together to increase digital inclusion. Broadband does not exist without infrastructure—and government policy must be geared toward creating the necessary infrastructure for a state to thrive. As broadband is a delivery mechanism for better education, health care and public safety, a cleaner environment, and a stronger economy, it cannot be ignored by our government. The state must invest the leadership and resources required to convert good ideas into bold action. Just as communities without adequate roads became marginalized in favor of those with transportation infrastructure, places without adequate broadband risk economic isolation.

Portions of Executive Order S-23-06
11/28/06

Twenty-First Century Government:
Expanding Broadband Access and Usage in California (Revised)

WHEREAS
deploying broadband networks and advanced communication services throughout California will enable continued improvements in health care, public safety, education, and the economy; and

WHEREAS
advanced communication services have become central to the financial health of our state, as these services have increased individual worker productivity and connected California businesses to international markets; and

WHEREAS
California's Web content, e-commerce, networking, telecommunications, entertainment, broadcasting, and computer software and hardware businesses have placed the state at the forefront of the Internet revolution, but to continue to be a world-class leader, California must adopt next-generation policies and practices that spur on further broadband innovation; and

WHEREAS
state action is needed to continue investment in, stimulate adoption of, and remove further barriers to the development of world-class broadband networks; and

WHEREAS
it is an executive priority to promote widespread access to, adoption of, and new applications for broadband networks and advanced communication services; and

WHEREAS
section 709 of the California Public Utilities Code establishes that it is the state's policy to encourage expanded access to state-of-the-art technologies for rural, inner-city, low-income and disabled Californians; and ...

Broadband
Availability
and Adoption
in California

Broadband can provide powerful educational, economic, health, governance, and public safety benefits to the Californians who use it. There are a number of factors that guide whether a person, family, or business adopts broadband. First, they must have access to it. That is, a broadband provider must offer reliable service at that address. The service must also be available at speeds that allow people to use current applications and to support innovation in services and applications. The subscriber must believe that the broadband access is valuable in and of itself and that the price is affordable given the available benefits, including relevant content. Even with these factors in place, Californians must have the means to own or lease a computer (or other access device) and the knowledge to effectively use the computer and to navigate the Internet. All these elements, inextricably bound to each other, are necessary in order for the benefits of broadband to come to fruition. The recommendations that follow in this report suggest actions to immediately expand broadband in unserved and underserved areas of the state; innovate new applications; increase awareness about broadband; and ensure that Californians have the resources and skills to take advantage of broadband.

The difficulty in gathering the data necessary to determine broadband availability has historically led most analysts to use broadband adoption as a proxy for availability, since one is impossible without the other. The FCC, for example, measures availability by determining if there are broadband subscribers in various zip codes. Many believe that this methodology masks some broadband unavailability, given the significant geographic reach of many zip codes, and consequently the FCC has begun a proceeding to assess the appropriateness of this data-collection method. To determine broadband availability by speed in California, the CBTF embarked on a major research effort to gather current availability and speed information in the state. The availability and speed maps presented here are the result of over 22 million supplied addresses or address equivalents. Calit2 researchers, on behalf of the CBTF, also analyzed over 1.2 million speed tests, providing critical information about speed availability and subscription in the state. Finally, the CBTF assessed recent broadband adoption and computer ownership data for California and surveyed advertised prices at various speed points across the state. The results of this effort provide a comprehensive view of availability and adoption in California.

Primary Broadband Technologies in Use in California

Broadband is a fairly new technology. For the most part, broadband networks have evolved from two existing networks: cable and telephone. Only in the last few years have new networks been deployed that are specifically built for the purpose and use of broadband. There are a number of broadband technologies already deployed, or beginning to be deployed, in California today, including: cable, copper-based digital subscriber lines (DSL), fiber-to-the-home (FTTH), fixed and mobile wireless (also known as 3G/4G), satellite, and Wi-Fi/Wi-Max. Each of these broadband technologies has its advantages and a place in the larger broadband market.

Cable: While the coaxial or cable plant was originally engineered and designed for the transmission of video to residential subscribers, there is a large available spectrum in traditional coaxial and hybrid fiber coaxial cable plant to support broadband requirements. In addition, newer compression technologies such as MPEG-4 have made it possible to fit a 20 Mbps video stream into 8 or 9 Mbps. Changes and upgrades to the underlying cable protocol, DOCSIS, which can increase speeds up to 150 Mbps and beyond, have provided additional bandwidth. Providers are transitioning to a protocol that will increase their ability to provide more symmetrical upstream and downstream speeds, a key component as user-generated content increases.

DSL: DSL uses existing telephone copper pairs, and, with DSL coding techniques, gains additional bandwidth beyond the traditional 64 kbps line rate. There have been many advances in DSL technology, some currently capable of providing service up to 25 Mbps and potentially more. While DSL speeds are very sensitive to distance—the further from the source, the lower the bandwidth—companies can extend their range by adding fiber to the copper network.

Fiber-to-the-home (FTTH): FTTH is an example of a technology designed specifically to deliver a triple-play service package, which includes Internet, video, and voice service. FTTH has been in development and deployment for close to 20 years. However, only in the last five years has FTTH deployment made significant gains. Because it is a new architecture and requires new construction, it is a fairly high-cost network to deploy. The higher cost is outweighed by the very scaleable and flexible nature of the fiber cable. Fiber optics provide the highest possible data rates of all the broadband technologies and with upgraded electronics can support services at or beyond 1 Gbps. A lower cost variation deploys fiber cable to nodes placed in neighborhoods, and then utilizes existing infrastructure from the nodes to the home.

Satellite: Satellite broadband is provided to the customer via geosynchronous satellite. Satellite broadband ground-based infrastructure includes remote equipment consisting of a small antenna and indoor unit. Gateways connect the satellite network to the terrestrial network. Except for gateway locations, satellite broadband is independent of terrestrial infrastructure such as conduits and towers. Satellite broadband provides ubiquitous coverage throughout the United States and is available to anyone with a clear view of the southern sky. There are some challenges to consumers in using satellite

services, such as delay for certain services/applications (e.g., voice and video conferencing). Satellite broadband packages up to 2 Mbps are offered in California.

Wireless: Wireless broadband technologies include the 3G and 4G wireless/cellular networks and the newer Wi-Fi/Wi-Max technologies. Both services can provide freedom to users, as they are mobile. Mobile devices have become more feature-rich and capable, allowing users to access the Web, make and receive telephone calls, and share content. These technologies are also capable of long reach (up to 70 km for Wi-Max) and high data rates (100 Mbps). Challenges include interference and a decrease in bandwidth over distance. Since the networks are shared, consideration needs to be made to the load sharing versus quality of experience for the users.

Companies use six different types of broadband technologies across the state, in addition to a number of municipal and commercial Wi-Fi hot spots. Research by the CBTF indicates that satellite, mobile wireless, DSL, and cable are most widely available, while fiber-to-the-home and node services are currently available only in a few areas of the state but are expanding. The table below lists the major technologies and the advertised product range.

Of course, these technologies are always improving. DSL is today capable of providing service up to 25 Mbps, and even more in exceptional circumstances. Cable can provide 150 Mbps with current technology, and will be able to provide more in the future. Recently launched and next-generation satellites will offer significantly higher capacity and performance. A satellite system planned to enter service next year is designed to provide 10-30 Mbps aggregate bandwidth, though latency issues will continue to limit the usability of satellite for certain broadband applications. Wireless speeds will largely be constrained by spectrum availability. Fiber technologies hold practically unlimited capabilities. However, to realize these speeds, all of these technologies require significant infrastructure investments.

Technology	Advertised Broadband Product Speed Ranges in California *(Downstream rate)*
Cable	768 kbps - 15 Mbps
DSL	384 kbps - 6 Mbps
Fixed Wireless	768 kbps - 3 Mbps
FTTH	1 Mbps - 50 Mbps
Mobile Wireless	200 kbps - 1.4 Mbps
Satellite	512 kbps - 2 Mbps

Broadband Adoption: How Does California Compare?

Broadband adoption rates have increased quickly throughout the United States. In June of 2000, only 2.5 percent of Americans subscribed to broadband at home.[32] By March 2007, 47 percent of Americans had subscribed to broadband at home.[33] This represented an eleven-fold increase in the number of U.S. homes with high-speed lines, defined by the FCC as providing over 200 kbps in at least one direction, growing from 5.17 million to 58.24 million lines. During the same period, satellite and wireless broadband grew by 5,998 percent.[34] Despite these dramatic increases, the United States has lost considerable ground in comparison to other countries. In 2001, the country was ranked 4th in the world, according to statistics from the Organisation for Economic Development (OECD). As of June 2007, however, 14 of the 30 member nations had higher levels of adoption rates than did the United States.[35]

As a whole, California remains a domestic leader in broadband adoption. Dividing the latest FCC figures (December 31, 2006) for residential high-speed lines in California by the number of residences in California yields a current adoption rate of approximately 59 percent. The Public Policy Institute of California, using data collected between March and June 2007, estimates that 53 percent of Californians currently subscribe to broadband services at home.[36] Using these two statistics as guide posts, it is reasonable to assume that California's current level of broadband adoption is approximately 56 percent. California currently ranks first in the total number of (i) broadband lines, (ii) residential broadband lines, and (iii) business broadband lines when compared to the other 49 states. The state also ranks first in the number of broadband lines per household when compared with the four other largest U.S. states, and fifth when compared to all states.[37]

Unfortunately, this domestic leadership has not translated into world leadership. If California data alone is analyzed and compared to OECD data, California would have ranked 3rd in the world in 2001. Today, the state would rank 10th.[38] While this story is better than for the nation as a whole, broadband adoption is simply not increasing quickly enough to compete internationally.

Broadband Adoption: California and U.S. Rankings Among the 30 OECD Countries
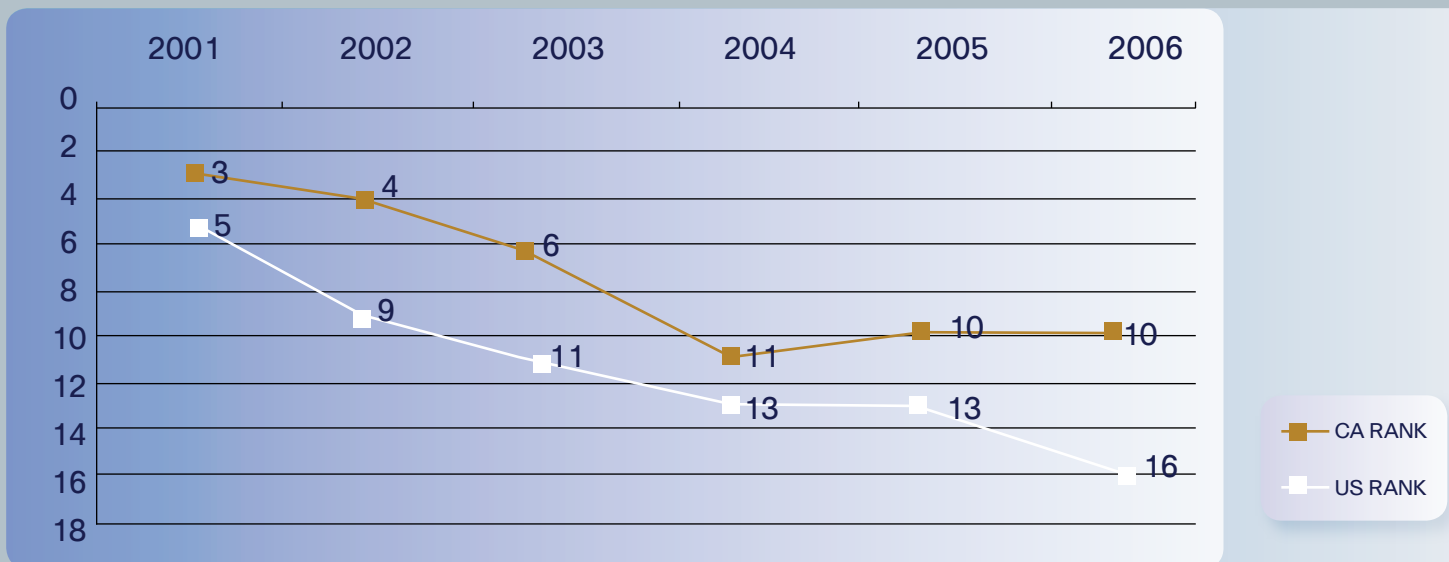
Examining Disparities in Broadband Adoption

Broadband adoption is first predicated on basic availability. For example, year-over-year increases in rural adoption rates nationally are similar to those in urban and suburban areas, but total penetration rates are significantly lower.[39] According to the 2007 Pew Internet and American Life report, only 31 percent of rural households subscribed to broadband at home, while 52 percent of urban and 49 percent of suburban households had adopted broadband.[40] Yet, research shows that if other characteristics were equal across both rural and urban areas (e.g., income, education), then the rate of broadband use would be equal.[41] This underscores the notion that broadband is less available in rural areas and that this contributes to lower levels of broadband adoption in these communities.
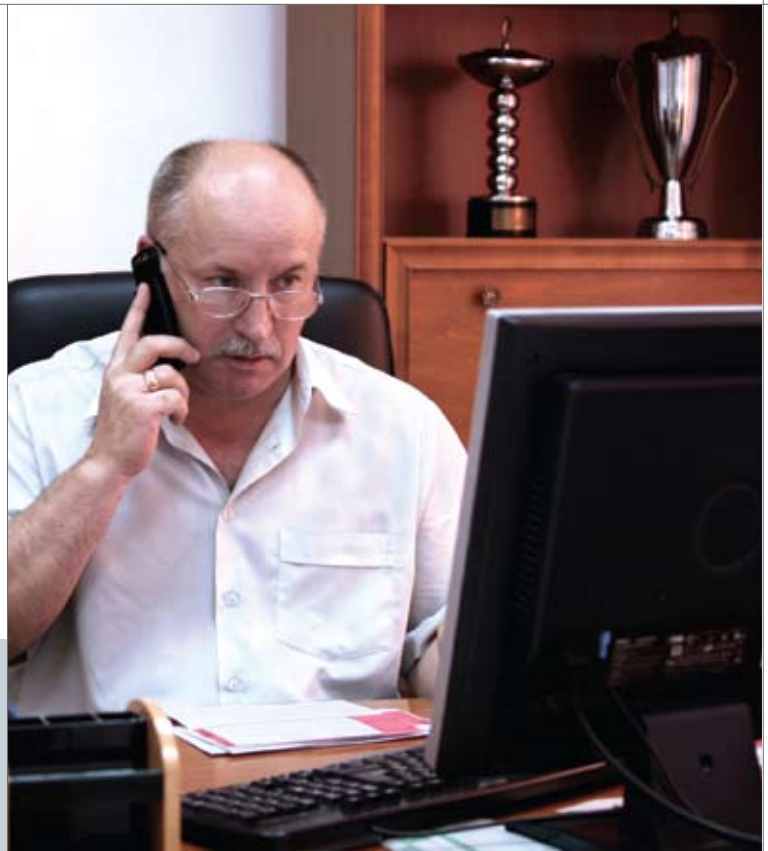
Broadband and Computer Ownership by California Region, 2005

Region	Broadband %	Computer %
Northern California	29	77
Northern Sacramento Valley	28	79
Greater Sacramento	44	83
San Francisco Bay Area	51	80
Northern San Joaquin Valley	36	74
Southern San Joaquin Valley	35	73
Central Sierra	21	76
Central Coast	48	80
Greater Los Angeles	52	81
Inland Empire	45	82
San Diego Border	48	78

Source: Kolko, Jed, " Broadband for All? Gaps in California's Broadband Adoption and Availability," Public Policy Institute of California (July 2007).

Broadband and Computer Ownership in California by Income, 2005

Income strata	Broadband (%)	Computer %
<25	24	48
25-49	40	70
50-69	49	78
70-99	59	87
100+	68	89

Source: Kolko, Jed, " Broadband for All? Gaps in California's Broadband Adoption and Availability," Public Policy Institute of California (July 2007).

As has been the trend nationally, however, subscription levels in California are also closely associated with income, education, and ethnicity. In 2005 only 24 percent of California households with incomes under $25,000 subscribed to broadband, while nearly 70 percent of those earning above $75,000 had adopted broadband. 2007 data from the Public Policy Institute of California (PPIC) show similar results: only 51 percent of Californians earning under $40,000 a year subscribed to either dial-up or broadband at home, but over 95 percent of those earning $80,000 or more a year subscribed to either one of the services.[42] While 91 percent of college graduates in California subscribe to the Internet at home, less than 50 percent of those without any college education do.

Racial/ethnic and language differences also persist. Just over half of Latinos in California subscribe to either

Households with Broadband (%)
(2005)

48.8 - 58.0

38.9 - 48.7

29.1 - 38.8

21.0 - 29.0
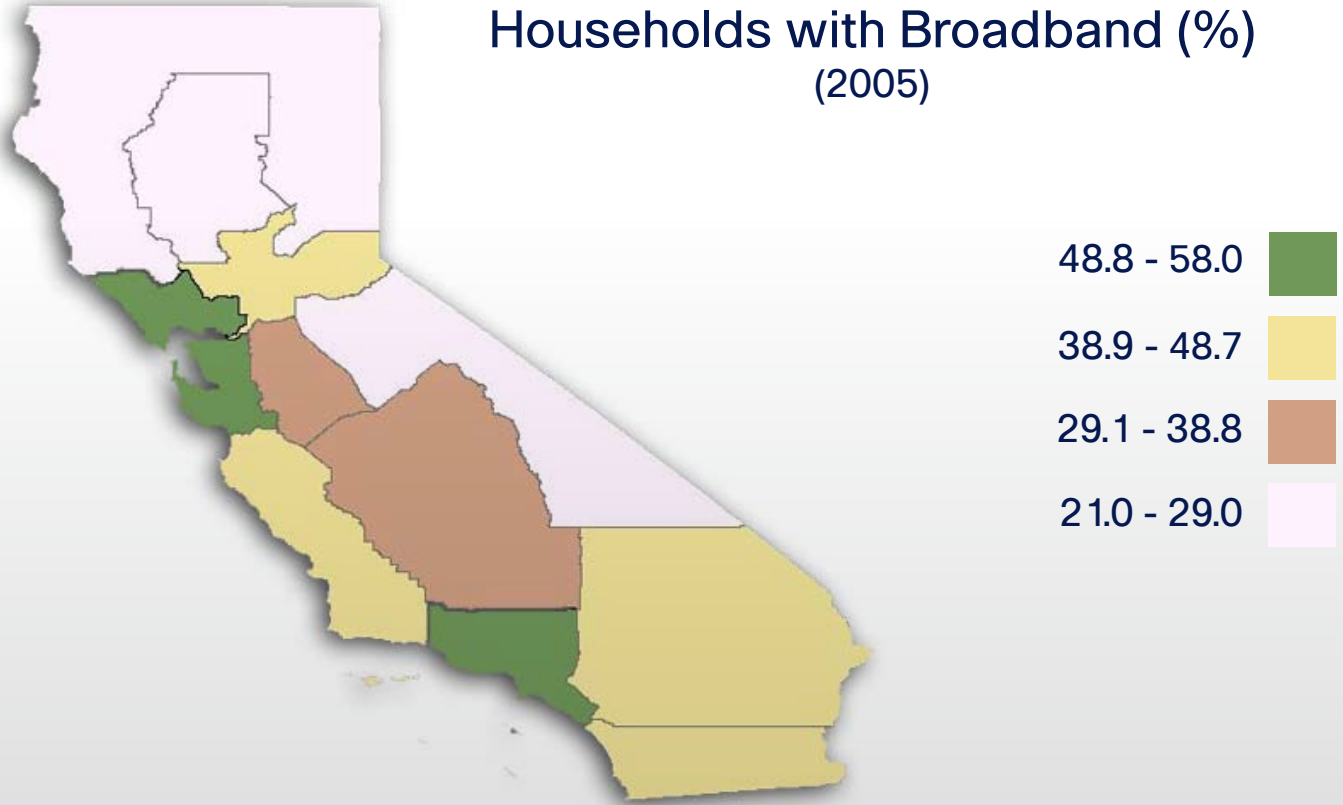
This graphic was provided by the Public Policy Institute of California and created by Jed Kolko.

broadband or dial-up services, while 75 percent of blacks, 83 percent of whites, and 89 percent of Asians subscribe to the Internet. When language is considered, however, Latino adoption characteristics change significantly. Only 37 percent of non- or limited-English speaking Latinos subscribe to broadband or dial-up, while 82 percent of English-speaking Latinos subscribe.[43]

As discussed above, subscription levels also differ significantly by region. In 2005, broadband adoption was only 29 percent in the Northern California region, which includes both the Northern Sierra and North Coast regions as outlined in the CBTF availability and speed maps. At the same time, adoption in greater Los Angeles was already at 52 percent.[44]

Computer ownership, the perceived value of broadband, and the price of broadband also hinder broadband adoption.[45] Studies have documented a strong relationship between computer ownership and Internet access. In 2003, for example, 58 percent of households in the United States owned a computer and had Internet access (either broadband or dial-up). Only 8 percent of those who owned a computer did not subscribe to either dial-up or broadband.[46] Like broadband adoption more generally, computer ownership in California varies widely among income brackets: 58 percent of households earning less than $25,000 annually owned a computer in 2005, compared to 93 percent of households earning over $100,000.[47]

Residential Broadband Prices in California

Across the United States, residential customers pay an average of $44.09 per month for broadband services.[48] Prices range between $14.99/month and $199.99/month.[49] To determine the range of prices available to residential Californians, the CBTF surveyed the non-promotional, publicly advertised speeds and prices of providers across the state. This data was collected between October and November 2007. To view the data collected for this effort, please see the CBTF's online appendix available at http://www.calink.ca.gov/taskforcereport.

Prices vary substantially depending on speed, technology, and provider. For example, services offering download speeds of between 1-1.5 Mbps with upload speeds of between 200-384 kbps range in price from $19.99 to $119.99 per month, depending on technology, and location. Set-up costs for this service, which exclude the cost of a computer, range between free and nearly $700.

Providers appear to charge the same price per service regardless of location. That is, if the company offers the service in both San Diego and Winters, then they appear to offer it for the same price. Prices differ depending on whether a customer bundles the service; that is, if a customer purchases the broadband service in conjunction with other services like cable, telephone, or cellular. Whether a customer subscribes to a month-to-month, a one-year, or a two-year plan often impacts the price of the service, and sometimes whether he or she can purchase the service at all. Depending on these factors, prices within the same company for the same service can differ by a few dollars to as much as $30 per month. In some rural areas, while there may be wireline connectivity available, it is often slow and/or expensive. For example, in some areas of the state, a 144 kbps IDSL service is available for $119 per month. In this same location, a 3 Mbps bonded T1 can exceed $700 per month.

Though two companies offer a 768/256-384 kbps service for approximately $10 per month, a price of $14.99 for the 768/384 kbps was more widely advertised throughout the state. The fastest speed available for purchase is a 50 Mbps symmetrical service. This plan is $191.99 per month if a customer bundles it with either digital TV or telephone service, and it is priced at $261.99 per month if purchased independently. The least costly service, measured in terms of price per megabit, is a 25/5 Mbps service offered at $79.99 per month with a one-year contract. While customers using this plan pay $3.23 per downstream megabit, the service is only available to a few communities in the state at present. The most expensive residential plan, measured in price per megabit, is a 256/256 kbps plan offered at $36.90/month. Customers that buy this plan pay $144.27 per downstream megabit.

The following chart details advertised residential speeds by price, clustering the speeds within the speed tiers that the CBTF used to measure broadband availability. This is not an exhaustive list of every service plan available in the state, but it is comprehensive and should provide policymakers with a guide to current broadband price offerings. Of course, pricing data is not the only indicator of a provider's cost, and prices may reflect additional factors.

Widely Advertised Residential Speeds by Speed Tiers Used to Map California

Combined Upstream/ Downstream Speed	Low Price	High Price	Low Price/Mb (Downstream)	High Price/Mb (Downstream)	Set-Up Costs
500 kbps - 1 Mbps	$14.99	$79.99	$19.52	$144.27	0-$425.00
1 Mbps - 5 Mbps	$9.95	$199.99	$7.65	$100.00	0-$699.98
5 Mbps - 10 Mbps	$31.95	$66.99	$4.56	$12.40	0-$189.94
10 Mbps - 100 Mbps	$46.95	$261.99	$3.20	$8.00	0-$99.98

Actual Broadband Usage in California

A consumer's broadband experience is typically based on the speed realized on a shared medium. Many broadband infrastructures are "shared"—that is, Internet traffic is aggregated at various points, depending on technology, such that multiple users typically share a connection at some point in their Internet experience. For example, one version of FTTH has 32 users sharing a single 1.2 Gbps data stream. However, broadband rate measurements (both at the national and state level) have focused on networking "capability," with vendors reporting on the physical capacity of their network to deliver data. Therefore, the physical capability of the network may not adequately indicate the actual bandwidth experienced by the consumer. Moreover, not all consumers purchase broadband with the highest speed available. Similarly, while a service may offer up to a specific megabit per second, a customer may not routinely experience that speed. The actual performance changes as a function of the number of simultaneous users and the peak hours of usage.

Simple Web interfaces allow broadband users, using tools provided by third-party companies, to measure their own experienced networking speeds. Working on behalf of the CBTF, the California Institute for Telecommunications and Information Technology (Calit2) partnered with one of the nation's largest providers of broadband measurement, Speed-test.Net, to acquire 2006 California data. This set included 350,000 users in California who conducted 1,243,278 tests of their effective bandwidth.

Calit2 researchers then combined these individual users' data to provide a data-driven insight into the consumer broadband experience in California. The chart to the right depicts the average effective upload and download speeds aggregated into 975 named municipalities throughout the state. This data averages the effective bandwidth received over a variety of networks (private vendor, public sector, academic).

The CBTF reached consensus on three preliminary conclusions from this data:
- Of consumers with broadband access, the majority receives between 1-5 Mbps of download speeds, but less than 1 Mbps of upload speed. This asymmetry results from a broadband infrastructure that was built to support consumption, not production, of broadband content.
- The distribution of broadband user experiences across the 975 named areas ranges from essentially dial-up rates (~50 kbps) up to 20 Mbps—an alarming disparity.
- Tools should be developed to support better user-measurement across California.
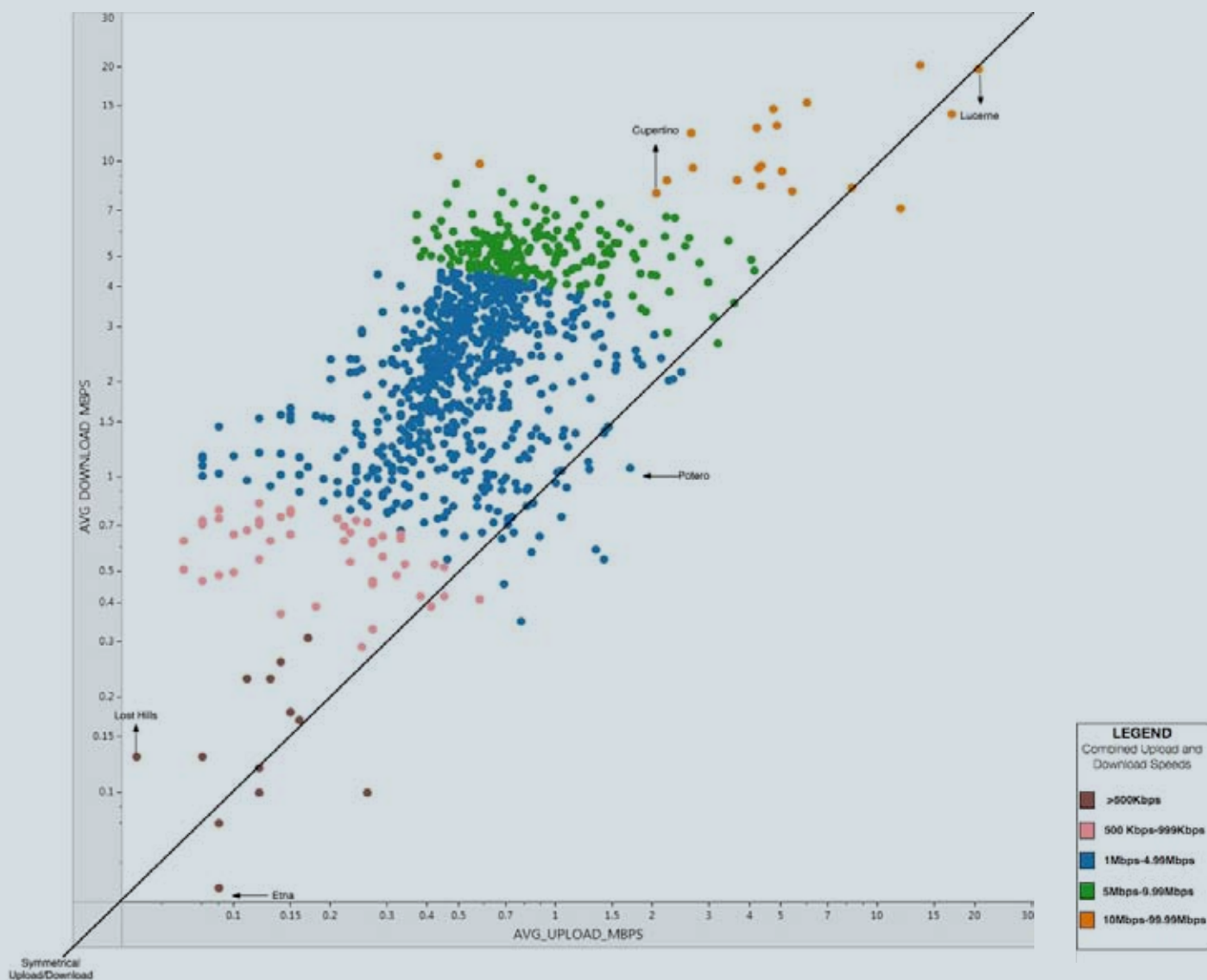
Broadband Availability and Speed Maps

Mapping Background

As policymakers determine whether and where to direct scarce resources, it is critical for them to have access to current broadband deployment information. The data underlying these maps is the result of a project undertaken by the CBTF to map broadband availability throughout California. Through the California Emerging Technology Fund, broadband providers voluntarily submitted availability data to a neutral third party. The Office of State Health Planning and Development, acting as staff to the CBTF, created these maps using an aggregated dataset gathered by the third party.

This project would not have moved forward without the investment of significant time and effort by the individual broadband providers in California and the support of the industry trade groups. All of the largest wireline broadband providers participated in this effort, and a high percentage of the small providers also submitted the requested data. Of the providers that chose not to participate, most cited resource issues. Through this effort, over 15 million supplied addresses and 7 to 8 million address equivalents were processed. In total, 11 of 12 Incumbent Local Exchange Carriers (ILECs) and 6 of 10 cable companies participated in this project. The data provided is current as of October 2007, though it is important to note that several companies expressed that they had planned and funded deployment that was planned to occur by the end of 2007, but had not been completed at the time of the mapping project. These expansions are not included here.

These maps illustrate current broadband availability in California and are based on information received from wireline broadband providers. Residents are also able to access broadband through satellite and wireless broadband service. Satellite is available to all households with a clear view of the southern sky and, therefore, most locations in California have the ability to receive broadband service through satellite.

Mobile wireless is available in most areas where cellular service is available. However, just as the quality of mobile phone service differs depending on location, so does the speed that is available through mobile broadband. For this reason, mobile broadband information is not included in these maps. With assistance from several of the major wireless providers, however, the CBTF has developed the first comprehensive vendor-anonymous map of mobile broad-

Region	Counties Included in Each Region
Bay Area	Alameda, Contra Costa, Marin, Napa, San Benito, San Luis Obispo, Santa Clara, Santa Cruz, San Francisco, San Mateo, Solano, Sonoma
Central Coast	Monterey, San Luis Obispo, Santa Barbara, Ventura
East Side	Alpine, Inyo, Mono
Inland Empire	San Bernardino, Riverside
Los Angeles/Orange	Los Angeles, Orange
Mother Lode	Amador, Calaveras, Tuolumne, Mariposa
North Coast	Del Norte, Humboldt, Lake, Mendocino, Trinity
Northern Sierra	Lassen, Modoc, Plumas, Siskiyou, Sierra
Sacramento Metro	El Dorado, Nevada, Placer, Sacramento, Sutter, Yolo, Yuba
Sacramento Valley	Butte, Colusa, Glenn, Shasta, Tehama
San Joaquin	Fresno, Kern, Kings, Madera, Merced, San Joaquin, Stanislaus
Southern Border	Imperial, San Diego

band availability in California. The map is available at: http://www.calink.ca.gov/taskforcereport. Wi-Fi hotspots are also located throughout the state. While future mapping efforts should include this information, the CBTF does not believe that the exclusion of the data significantly alters the availability picture since nearly all Wi-Fi hotspots become hotspots because broadband already exists there.

Readers will see data breakouts by region. These 11 regions represent a slight variation from the nine California Economic Strategy Panel regions and were chosen because the difference in broadband availability was significant enough to warrant differentiation. The CBTF expects that the maps presented in this report provide an accurate snapshot of California's broadband availability today. Nonetheless, since not all providers participated, and it was impossible to verify the reliability of all data points, there may be inaccuracies. Accordingly, if readers find an inaccuracy, please submit the necessary correction to broadbandmaps@bth.ca.gov.

The Web-only appendix, available at http://www.calink.ca.gov/taskforcereport, contains the methodology used to calculate the level of broadband availability and speed tiers in the state.

California Wireline Broadband Availability

Availability Speed

- No Availability
- 0.5 to 1 Mbps
- 1 to 5 Mbps
- 5 to 10 Mbps
- 10 to 100 Mbps
- 0.1 to 1 Gbps
- Unpopulated Areas
- Counties
- Regions
- Highways

Percent Available (Housing Units)

4% Unavailable
2%
1%
1%
38%
54%

Notes:
Percents availability based on number of housing units.
Dots in 'No Availability' are USGS place names lacking availability.
Availability data furnished by the California Emerging Technology Fund.
Unpopulated Areas include lakes, rivers, steep slope and barren landscape.
Regions are slight modification of Economic Development Regions.

Del Norte
Siskiyou
Modoc
Northern Sierra
Humboldt
Trinity
Shasta
Lassen
North Coast
Tehama
Sacramento Valley
Plumas
Glenn
Butte
Sierra
Mendocino
Nevada
Lake
Colusa
Yuba
Placer
Sutter
Sacramento Metro
El Dorado
Yolo
Alpine
Sonoma
Napa
Sacramento Amador
Bay Area Solano
Calaveras
Marin
Tuolumne
Mono
Contra Costa San Joaquin
Mother Lode
San Francisco
Alameda
Mariposa
San Mateo
Stanislaus
Santa Clara
Merced
Madera
Santa Cruz
San Benito
Fresno
East Side
Monterey
San Joaquin Valley
Inyo
Tulare
Kings
Central Coast
Kern
San Luis Obispo
San Bernardino
Inland Empire
Santa Barbara
Ventura
Los Angeles
Los Angeles/Orange
Riverside
Orange
Southern Border
San Diego
Imperial

Pacific Ocean

Source Data Providers:
- California Emerging Technology Fund
- Office of Statewide Health Planning and Development
- Business Transportation and Housing Agency
- United States Geological Survey (USGS)

Map Created by:

osbpd
Office of Statewide Health Planning & Development
Health Information Division
Data Management Office
Enterprise GIS

0   25   50   100
Miles

N

Broadband Availability by Region

Region	Unavailable	500 kbps-1 Mbps	1-5 Mbps	5-10 Mbps	10-100 Mbps	1-10 Gbps	Communities Without Broadband
Bay Area	1%	0%	0%	93%	6%	0%	92
Central Coast	5%	1%	1%	44%	49%	0%	117
East Side	40%	0%	3%	56%	0%	0%	115
Inland Empire	4%	0%	0%	18%	78%	0%	189
Los Angeles/Orange	2%	0%	0%	3%	95%	0%	48
Mother Lode	23%	16%	26%	36%	0%	0%	79
North Coast	33%	8%	9%	28%	22%	0%	279
Northern Sierra	43%	10%	25%	22%	0%	0%	240
Sacramento Metro	4%	3%	2%	39%	20%	32%	215
Sacramento Valley	11%	4%	6%	78%	1%	0%	197
San Joaquin	6%	2%	2%	70%	19%	1%	285
Southern Border	5%	1%	1%	2%	91%	0%	119
Percent Availability	4%	1%	1%	38%	54%	2%	1975

Analysis of Availability

California is a vast state: 37 million residents, a number equal to 12 percent of the U.S. population, are spread across a diverse topography that spans 155,000 square miles. While 92 percent of the landmass in the state is rural, only 8 percent—2.96 million residents—live in these regions. Nevertheless, this rural population is still larger than the individual populations of 20 other states.

For the state as a whole, wireline broadband is available to 96 percent of households. While availability in dense urban areas is extremely high, often in the high-90 percent range, only slightly more than half of rural residents in some regions are able to access broadband, and many more do not have access to the higher broadband speeds. For example, basic broadband is only available to 57 percent of households in the Northern Sierra region, but it is available to 99 percent of the Bay Area's households. This disparity means that throughout the state approximately 500,000 households—almost 1.4 million Californians—are unable to subscribe to broadband.

Nearly 2,000 communities—located in every region from the Southern Border to the North Coast—are still without broadband access (see the online appendix, available at www.calink.ca.gov/taskforcereport for a list of all unserved communities). In Los Angeles/Orange, in which 95 percent of the households have access to speeds of 10 Mbps or more, 48 communities are still without broadband service. In the Bay Area, where 99 percent of households have access to basic broadband, 92 communities still lack broadband service. In the San Joaquin Valley, 94 percent of all households are able to subscribe to broadband, but 285 communities remain unconnected. Communities included here are those listed as populated places in the United States Geological Survey, Geographic Names Information System (GNIS). GNIS can be found at geonames.usgs.gov.

Of the 12 regions in California, the Northern Sierra, where only 57 percent of households are connected, is the least connected. In this region, less than half of households are able to subscribe to services greater than 1 Mbps. Forty percent of households in the East Side lack any broadband and in the North Coast 33 percent of households lack any broadband. Just over 60 percent of households in the Mother Lode have access above 1 Mbps.

Demographics of Counties in Regions With Lowest Levels of Broadband Availability

Region: Northern Sierra

Percentage of Households Without Access to Broadband: 43%

Example County: Siskiyou County [50]

2006 Total Population	46,146
2006 Population Density	7.3 per sq. mile (CA = 238)
2004 Per Capita Income	$25,521 (CA = $35,219)
2004 Poverty Rate	15.1% (CA = 13.2%)
2006 Largest Employer	Siskiyou County

Region: East Side

Percentage of Households Without Access to Broadband: 40%

Example County: Alpine County [51]

2006 Total Population	1,180
2000 Population Density	1.6 per sq. mile (CA = 238)
1999 Per Capita Income	$24,431 (CA = $35, 219)
2004 Poverty Rate	13.2% (CA = 13.2%)
2004 Largest Employer	Kirkwood Mountain Resort

Region: North Coast

Percentage of Households Without Access to Broadband: 33%

Example County: Del Norte County [52]

2006 Total Population	29,196
2006 Population Density	29.0 per sq. mile (CA = 238)
2004 Per Capita Income	$20,534 (CA = $35,219)
2004 Poverty Rate	19.2% (CA = 13.2%)
2006 Largest Employer	Pelican Bay State Prison

Thirty-eight percent of households in California are able to subscribe to services advertised up to 5-10 Mbps, and 56 percent have availability that is more than 10 Mbps. Urbanized areas consistently experience higher speed availability in comparison to rural communities. At 98 percent connectedness, Los Angeles/Orange is the most connected region in the state. The Bay Area follows at 92 percent and the Southern Border ranks third at 89 percent. Only 5 percent of the Southern Border is unconnected, and 91 percent of households have access to speeds above 10 Mbps. Similarly in Los Angeles, 95 percent of households have access to speeds above 10 Mbps, and only 2 percent of the population is unable to subscribe to broadband. In the Bay Area, however, only 6 percent of households are able to subscribe to services that exceed 10 Mbps. The Sacramento Metro region leads the state for speed; 32 percent of homes have access to speeds of 100 Mbps or greater, but in the state as a whole, only 2 percent of households can subscribe to these services. This ranking is most likely a result of a highly publicized symmetrical fiber-to-the-home deployment by the incumbent phone provider.

As a reminder, the speeds depicted in the maps and analysis are the sum of the upstream and downstream speeds. For example, both providers offering a 768k upstream and a 384k downstream speed and providers offering a 3 Mbps upstream and a 1 Mbps downstream speed are included in the 1-5 Mbps speed tier.

Conclusions:

Broadband is widely available across California, but in certain locations, particularly rural, remote communities, residents do not have access to the range of speeds necessary to leverage the powerful benefits of this technology. Given wide expansion in most areas of the state, and the unique topography of the areas with no or low-speed broadband, it is likely that the expense of building or upgrading infrastructure in these areas and the sparse population base has rendered deployment a money-losing proposition for broadband providers. Strategies that aggregate demand, improve access to Rights-of-Way, and infuse funding sufficient to create a business case will increase availability of current and next-generation infrastructure in these communities.

The data shows considerable availability in the 1-5 Mbps and 10-100 Mbps range throughout the state. It is likely, given other statistics cited in this report, that the speeds available in the 10-100 Mbps range center between 10-20 Mbps. This is no small accomplishment, however, particularly given the number of applications that consumers can utilize at these speeds. Moreover, with the right investment in infrastructure upgrades, a technology capable of producing speeds of 10-20 Mbps today has the capacity to provide the increased speeds necessary for advanced applications.
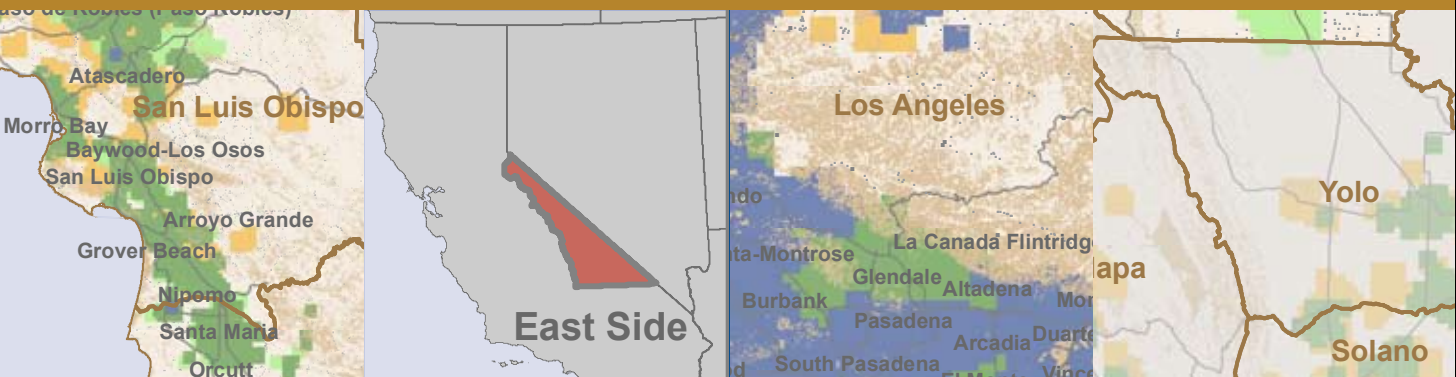
Like most modern technologies, broadband applications have been growing and improving at a rapid pace. Once largely limited to text applications like bulletin boards and e-mail, the Internet has grown into audio and video applications of increasing complexity. The major gating factor in the improvement of broadband applications is the speed of access to the network. Just as text-oriented applications improved in quality and quantity as dial-up modem speeds increased from 9.6 kbps to 56 kbps, so too have broadband applications exploded as businesses and consumers have moved from 56 kbps modems to 500 kbps to 1 Mbps to 3 Mbps broadband connections. Newer, better broadband applications like high-quality video conferencing, remote medical care, distance learning, and

remote monitoring will require broadband connections of symmetrical 10 Mbps services and more. If Californians do not have access to broadband infrastructure that is capable of providing these higher speeds, they will be separated from the benefits that broadband applications can bring them. Thus, it is critical not only for all Californians to be connected to the Internet via broadband, but also that the quality and speed of the connections must improve over time.

While broadband adoption is increasing quickly, it is estimated that only a little over half of Californians use the technology. There are a number of reasons why this digital divide exists, including a belief that broadband does not provide value, lack of relevant content, computer literacy, and affordability of services and computers. A public campaign led by stakeholders, including the governor, the private sector, and non-profit organizations can increase awareness about the value of broadband and also develop new ways to increase computer ownership.

California faces some significant challenges in building out world-class networks. For example, laying fiber and even building wireless networks is clearly easier and less expensive under conditions of (i) a small land mass and (ii) a densely situated population.[53] Nearly 3 million Californians live in rural communities, often surrounded by rugged terrain. Regardless of whether it is easier or more difficult to deploy broadband infrastructure in one place than another, it is clear that other countries are improving their broadband infrastructures at a rapid pace and that California must do the same if it is to retain its world-class leadership in technology.

Regional Broadband Maps of California

Atascadero

San Luis Obispo

Morro Bay

Baywood-Los Osos

San Luis Obispo

Arroyo Grande

Grover Beach

Nipomo

Santa Maria

Orcutt

East Side

Los Angeles

La Cañada Flintridge

ta-Montrose

Glendale

Altadena

apa

Burbank

Pasadena

Arcadia

Duarte

South Pasadena

El Monte

Vince

Yolo

Solano

Wireline Broadband Availability: Bay Area

Lake
Sutter
Placer
Yolo
Sonoma
Napa
Sacramento
Solano
Marin

P a c i f i c   O c e a n

Contra Costa
San Joaquin
San Francisco
Alameda
San Mateo
Stanislaus
Santa Clara
Santa Cruz
Merced

0   5   10   20
                              Miles

Legend

- No Availability
- 0.5 to 1 Mbps
- 1 to 5 Mbps
- 5 to 10 Mbps
- 10 to 100 Mbps
- 0.1 to 1 Gbps
- Unpopulated Areas
- Counties
- Highways

Percent Availability (Housing Units)

0%   1% Unavailable
6%   0%
                0%

93%

Bay Area

Notes:
 - Percents availability based on number
   of housing units.
 - Dots in 'No Availability' are USGS place
   names and modeled housing units lacking availability.
 - Availability data furnished by the California Emerging Technology Fund.
 - Unpopulated Areas include lakes, rivers, steep slope and barren landscape.
 - Regions are slight modification of Economic Development Regions.

Wireline Broadband Availability: Central Coast

Pacific Ocean

Hollister
Prunedale
Pacific Grove
Marina
Salinas
Seaside
San Benito
Soledad
Greenfield
King City
Monterey

Fresno

Tulare

Kings

Kern

El Paso de Robles (Paso Robles)
Atascadero
Morro Bay
San Luis Obispo
Baywood-Los Osos
San Luis Obispo
Arroyo Grande
Grover Beach
Nipomo
Santa Maria
Orcutt
Santa Barbara
Lompoc

Los Angeles

Santa Barbara
Goleta Montecito
Ventura
Fillmore
Santa Paula
Simi Valley
San Buenaventura (Ventura)
Moorpark
Camarillo
Oxnard

Source Data Providers:
- California Emerging Technology Fund
- Office of Statewide Health Planning and Development
- Business Transportation and Housing Agency
- United States Geological Survey (USGS)

Map Created by:

osbpd
Health Information Division
Data Management Office
Enterprise GIS

0 5 10   20
|__|__|_____| Miles

Legend

	No Availability
	0.5 to 1 Mbps
	1 to 5 Mbps
	5 to 10 Mbps
	10 to 100 Mbps
	0.1 to 1 Gbps
	Unpopulated Areas
	Counties
	Highways

Percent Availability (Housing Units)

5% Unavailable
0.1 to 1 Gbps 0%
1%
1%
49%
44%

Notes:
- Percents availability based on number of housing units.
- Dots in 'No Availability' are USGS place names and modeled housing units lacking availability.
- Availability data furnished by the California Emerging Technology Fund.
- Unpopulated Areas include lakes, rivers, steep slope and barren landscape.

Central Coast

Wireline Broadband Availability: East Side

Legend

- No Availability
- 0.5 to 1 Mbps
- 1 to 5 Mbps
- 5 to 10 Mbps
- 10 to 100 Mbps
- 0.1 to 1 Gbps
- Unpopulated Areas
- Counties
- Highways

Percent Availability (Housing Units)

- 0% 10 to 100 Mbps
- 0% 0.1 to 1 Gbps
- Unavailable 40%
- 5 to 10 Mbps 56%
- 0% 0.5 - 1 Mbps
- 1 to 5 Mbps 3%

Notes:
- Percents availability based on number of housing units.
- Dots in 'No Availability' are USGS place names and modeled housing units lacking availability.
- Availability data furnished by the California Emerging Technology Fund.
- Unpopulated Areas include lakes, rivers, steep slope and barren landscape.
- Regions are slight modification of Economic Development Regions.

El Dorado
Mesa Vista
Markleeville
Alpine
Tuolumne
Mono
Mariposa
Mammoth Lakes
Round Valley
Mesa
Dixon Lane-Meadow Creek
West Bishop
Bishop
Wilkerson
Madera
Big Pine
Fresno
Independence
Lone Pine
Keeler
Inyo
Furnace Creek
Cartago
Olancha
Darwin
Tulare
Shoshone
Homewood Canyon-Valley Wells
Tecopa
Pearsonville
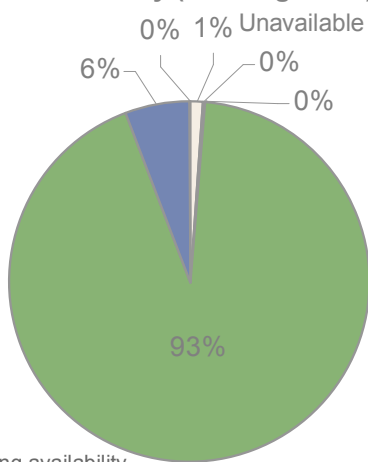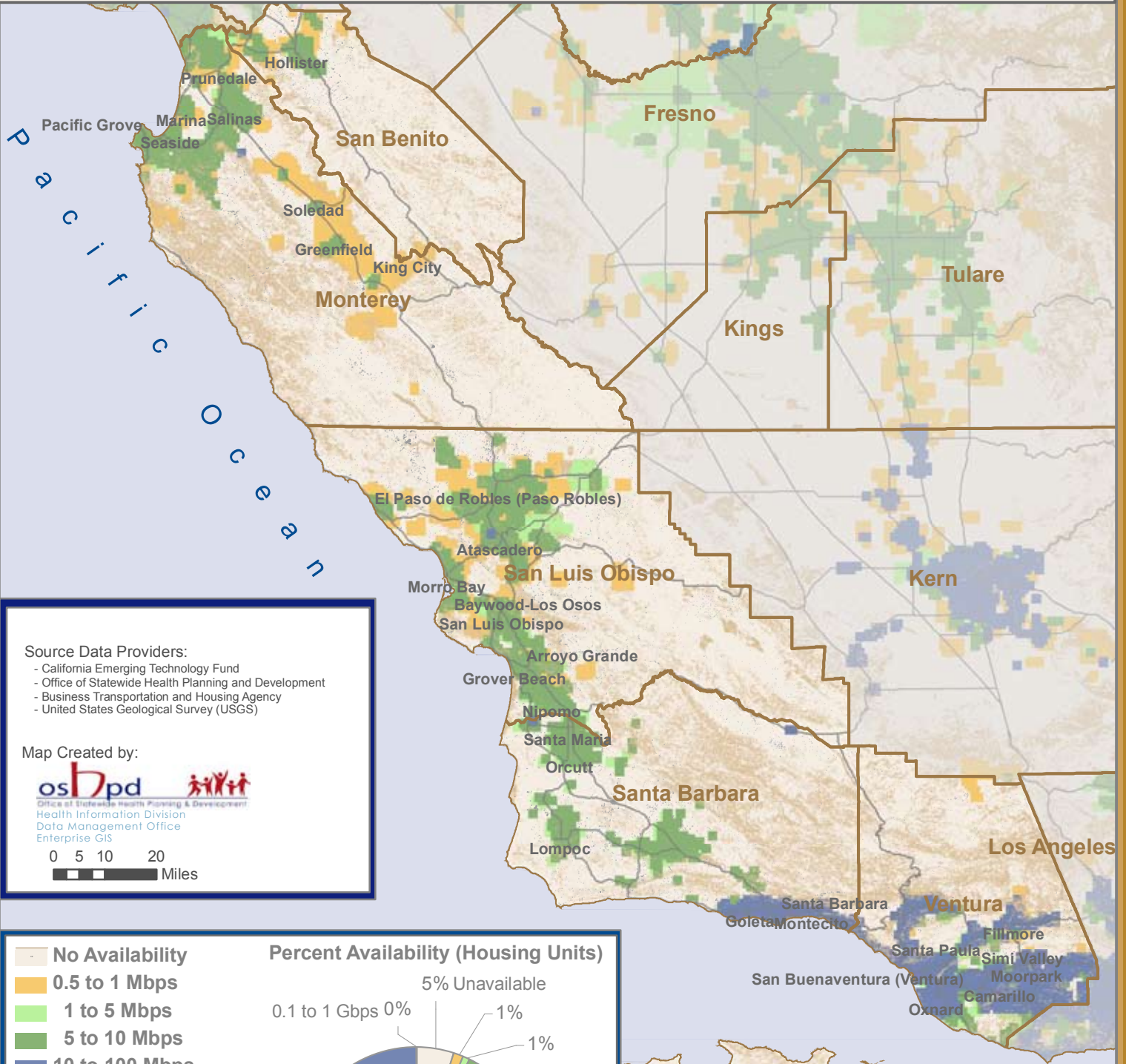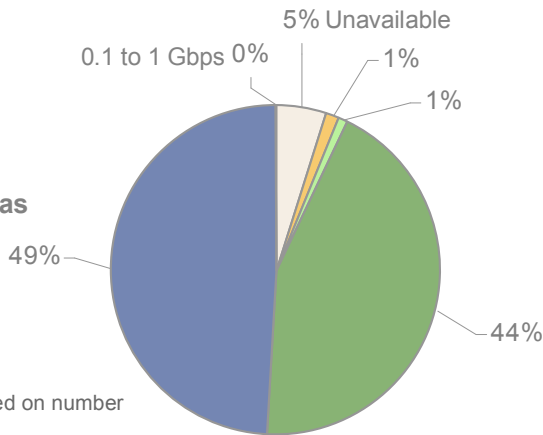San Bernardino

East Side

Source Data Providers:
- California Emerging Technology Fund
- Office of Statewide Health Planning and Development
- Business Transportation and Housing Agency
- United States Geological Survey (USGS)

Map Created by:

oshpd
Office of Statewide Health Planning & Development
Health Information Division
Data Management Office
Enterprise GIS

0 5 10   20
                     Miles

Wireline Broadband Availability: Inland Empire

Inland Empire

Kern

San Bernardino

Barstow

Adelanto
Victorville Apple Valley
Los Angeles
Hesperia

Crestline
Highland
Fontana Redlands
Upland Rialto
Rubidoux Yucaipa
Chino
Pedley
Norco Moreno Valley Banning
Corona
Perris San Jacinto
East Hemet Palm Springs
Lake Elsinore Hemet
Orange Sun City Palm Desert Indio
Wildomar
Murrieta
Temecula

Yucca Valley Twentynine Palms

Desert Hot Springs

Cathedral City

Riverside

Coachella

Blythe

Imperial

Legend

- No Availability
- 0.5 to 1 Mbps
- 1 to 5 Mbps
- 5 to 10 Mbps
- 10 to 100 Mbps
- 0.1 to 1 Gbps
- Unpopulated Areas
- Counties
- Highways

Percent Availability (Housing Units)

4% Unavailable
0%
0.1 to 1 Gbps 0%
0%
18%
78%
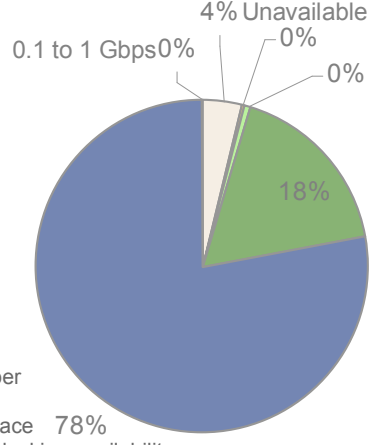
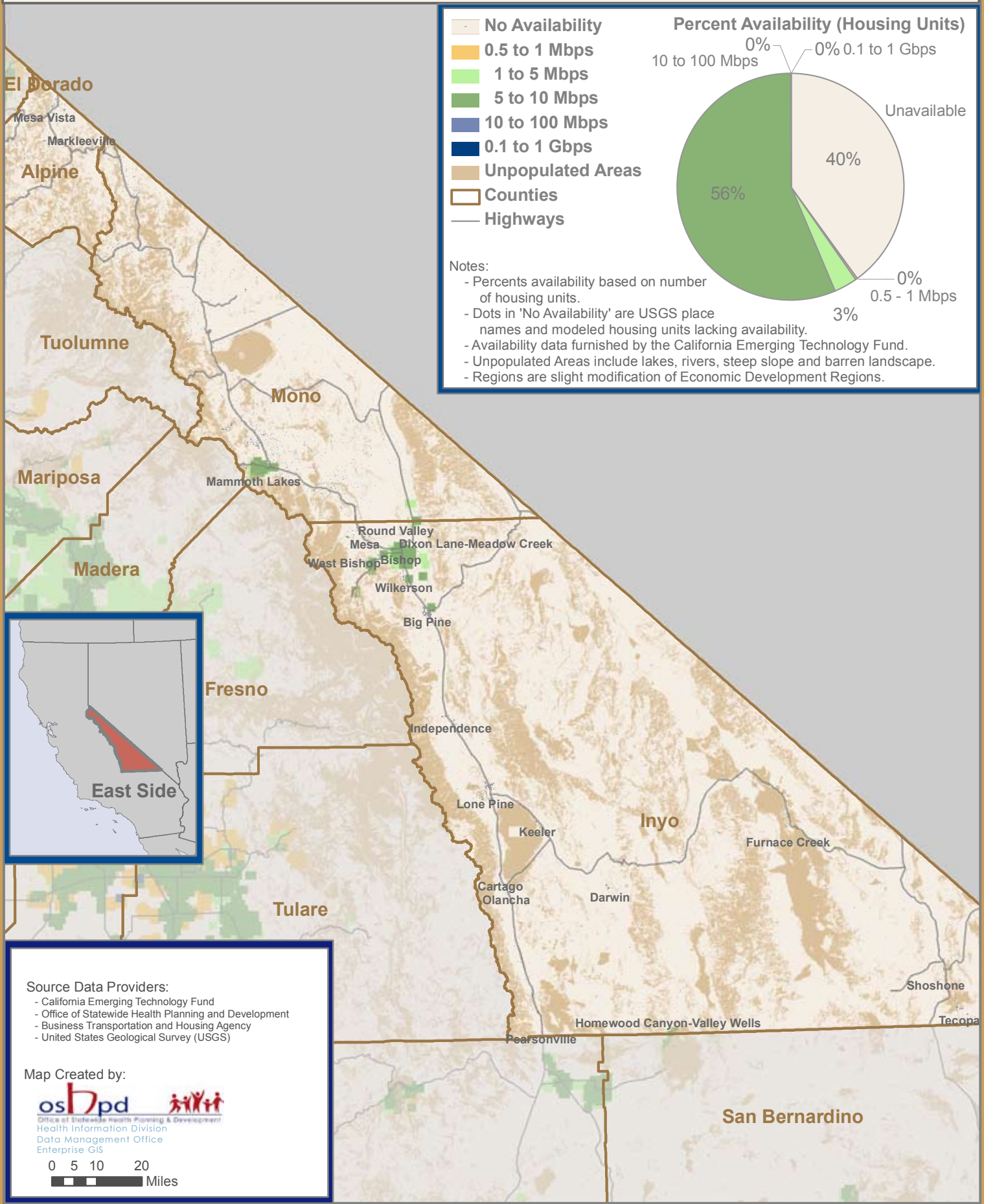Notes:
- Percents availability based on number of housing units.
- Dots in 'No Availability' are USGS place names and modeled housing units lacking availability.
- Availability data furnished by the California Emerging Technology Fund.
- Unpopulated Areas include lakes, rivers, steep slope and barren landscape.
- Regions are slight modification of Economic Development Regions.

Source Data Providers:
- California Emerging Technology Fund
- Office of Statewide Health Planning and Development
- Business Transportation and Housing Agency
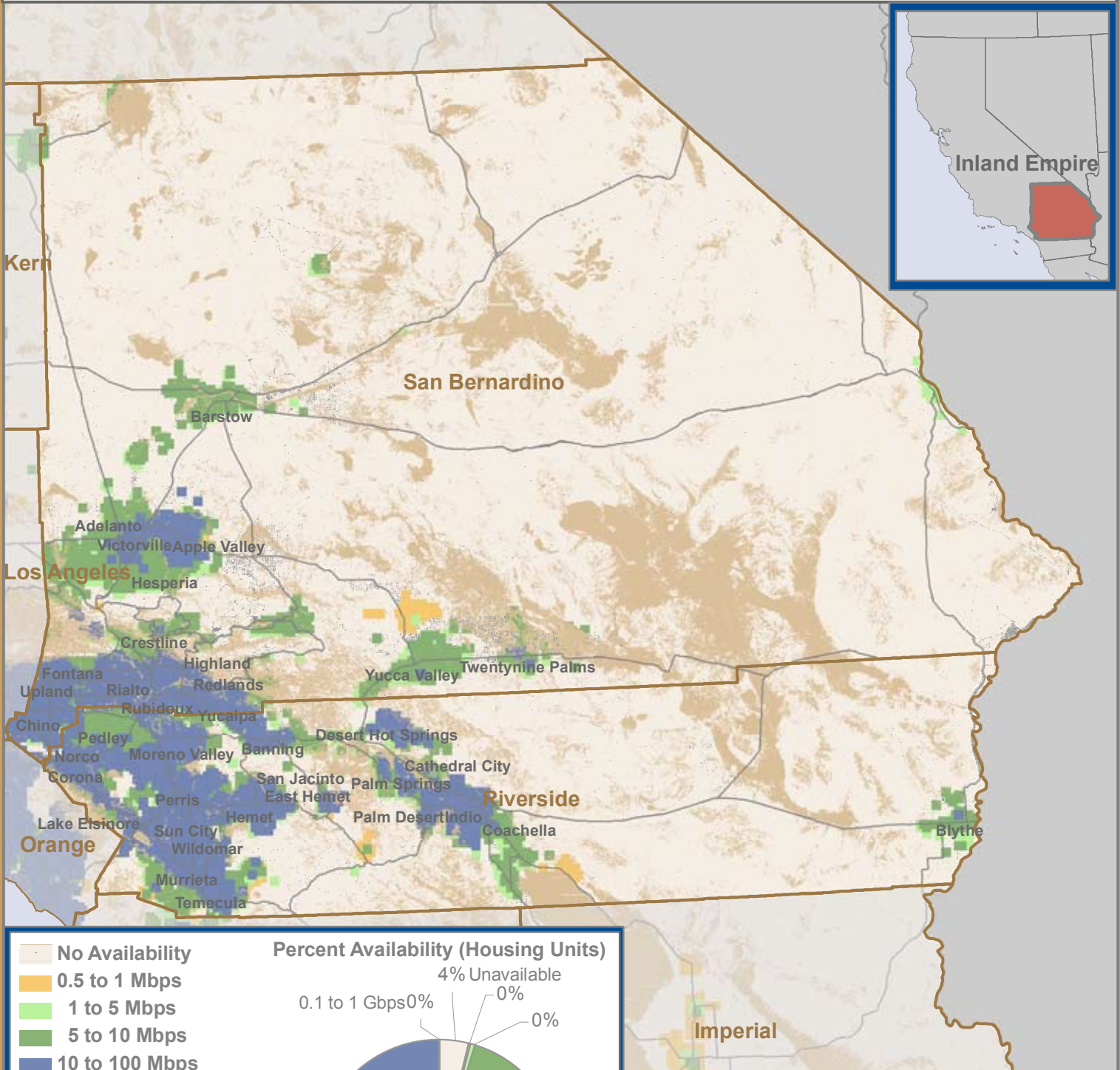- United States Geological Survey (USGS)

Map Created by:

oshpd
Office of Statewide Health Planning and Development
Health Information Division
Data Management Office
Enterprise GIS

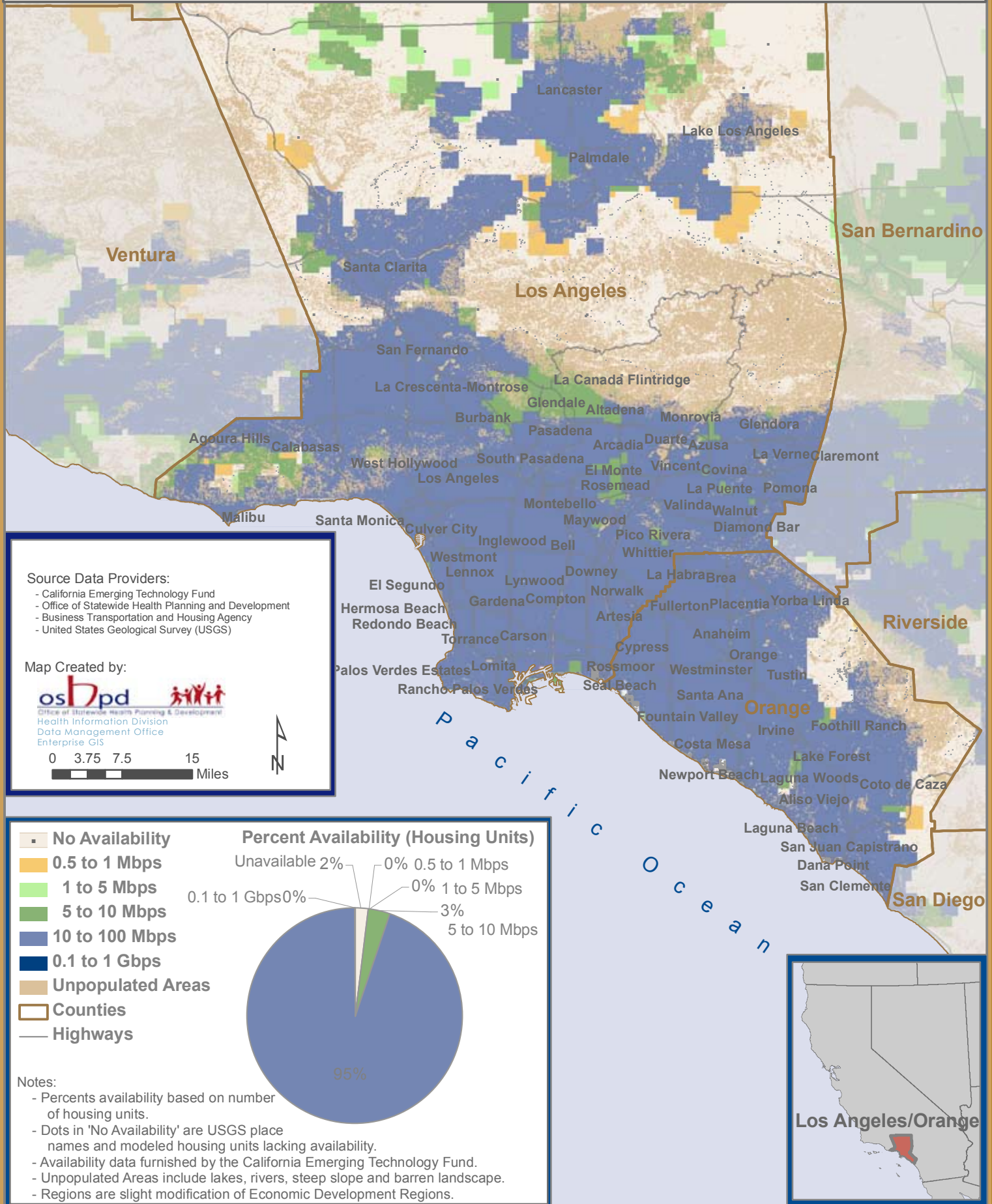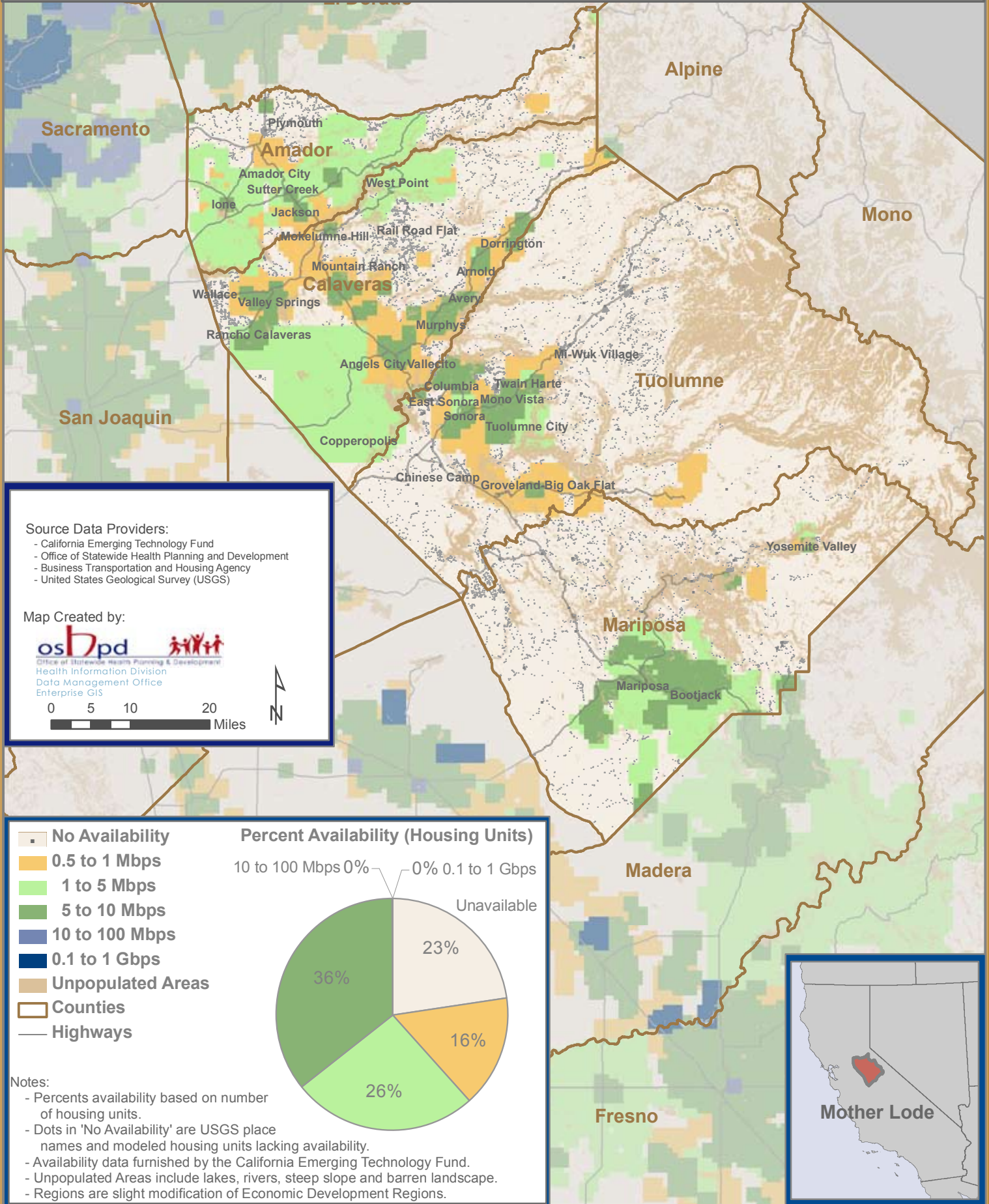0 5 10   20
                    Miles

Wireline Broadband Availability: Los Angeles / Orange

Lancaster
Lake Los Angeles
Palmdale
San Bernardino
Ventura
Santa Clarita
Los Angeles
San Fernando
La Canada Flintridge
La Crescenta-Montrose
Glendale Altadena Monrovia
Burbank Glendora
Pasadena Arcadia Duarte Azusa
Agoura Hills South Pasadena Vincent Covina La Verne Claremont
Calabasas El Monte Rosemead La Puente Pomona
West Hollywood Montebello Valinda Walnut
Los Angeles Maywood Diamond Bar
Malibu Pico Rivera
Santa Monica Culver City Inglewood Bell Whittier
Westmont La Habra Brea
El Segundo Lennox Lynwood Downey Fullerton Placentia Yorba Linda
Gardena Compton Norwalk Artesia Riverside
Hermosa Beach Anaheim
Redondo Beach Cypress Orange
Torrance Carson Westminster Tustin
Palos Verdes Estates Lomita Rossmoor Santa Ana
Rancho Palos Verdes Seal Beach Fountain Valley Orange Foothill Ranch
Irvine Lake Forest
Costa Mesa Coto de Caza
Newport Beach Laguna Woods
Aliso Viejo
Laguna Beach
San Juan Capistrano
Dana Point
San Clemente San Diego

Pacific Ocean

0   3.75   7.5   15
Miles

N

Legend

- **No Availability**
- **0.5 to 1 Mbps**
- **1 to 5 Mbps**
- **5 to 10 Mbps**
- **10 to 100 Mbps**
- **0.1 to 1 Gbps**
- **Unpopulated Areas**
- **Counties**
- **Highways**

Percent Availability (Housing Units)

Unavailable 2%   0% 0.5 to 1 Mbps
0.1 to 1 Gbps 0%   0% 1 to 5 Mbps
                       3%
                       5 to 10 Mbps

95%

Notes:
- Percents availability based on number of housing units.
- Dots in 'No Availability' are USGS place names and modeled housing units lacking availability.
- Availability data furnished by the California Emerging Technology Fund.
- Unpopulated Areas include lakes, rivers, steep slope and barren landscape.
- Regions are slight modification of Economic Development Regions.

Los Angeles/Orange

Wireline Broadband Availability: Mother Lode

Alpine

Sacramento

Plymouth

Amador

Amador City
Sutter Creek
Ione
Jackson
Mokelumne Hill
West Point
Rail Road Flat
Dorrington
Mountain Ranch
Arnold
Calaveras
Avery
Wallace
Valley Springs
Murphys
Rancho Calaveras
Angels City Vallecito
Mi-Wuk Village
Columbia
Twain Harte
Tuolumne
East Sonora
Mono Vista
Sonora
Copperopolis
Tuolumne City
Chinese Camp
Groveland-Big Oak Flat

Mono

San Joaquin

Yosemite Valley

Mariposa

Mariposa
Bootjack

Madera

Fresno

Source Data Providers:
- California Emerging Technology Fund
- Office of Statewide Health Planning and Development
- Business Transportation and Housing Agency
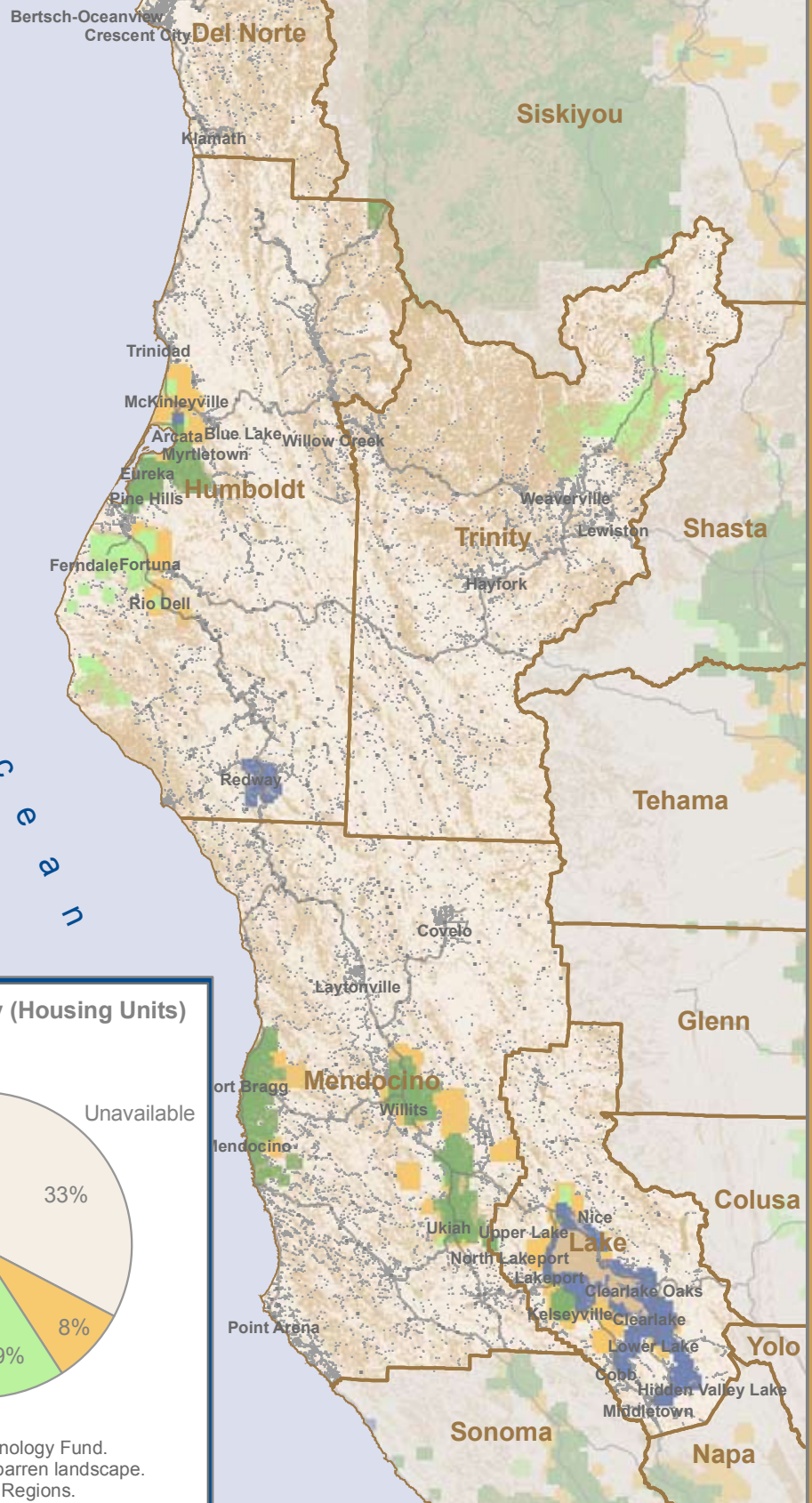- United States Geological Survey (USGS)

Map Created by:

oshpd
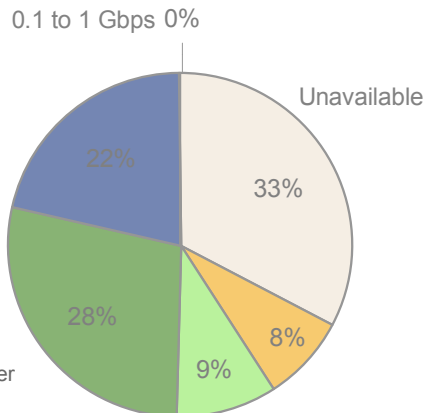Health Information Division
Data Management Office
Enterprise GIS

0   10   20
Miles

N

Legend
- No Availability
- 0.5 to 1 Mbps
- 1 to 5 Mbps
- 5 to 10 Mbps
- 10 to 100 Mbps
- 0.1 to 1 Gbps
- Unpopulated Areas
- Counties
- Highways

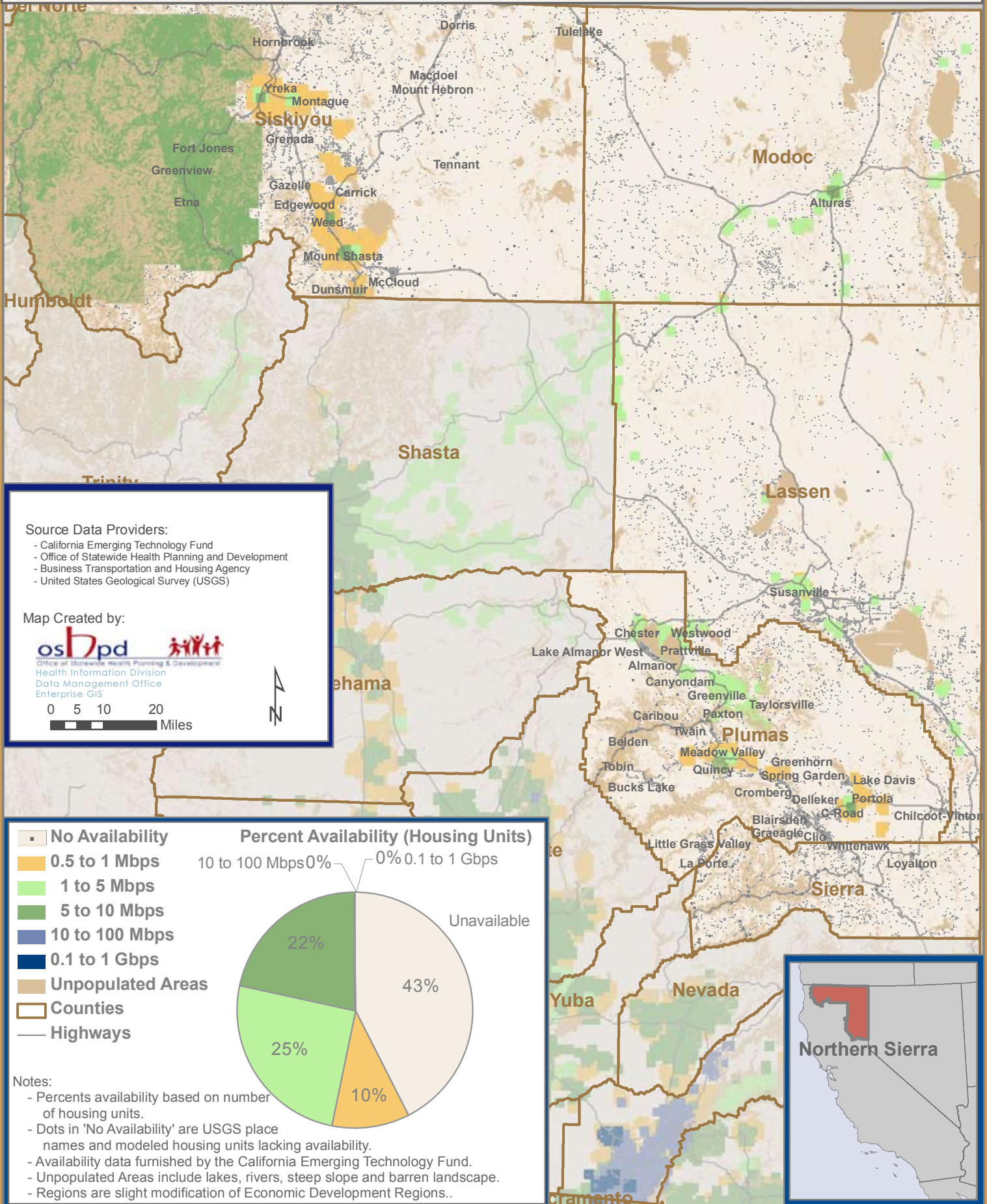### Percent Availability (Housing Units)

10 to 100 Mbps 0%   0% 0.1 to 1 Gbps

Unavailable

23%

36%

16%

26%

Mother Lode

Notes:
- Percents availability based on number of housing units.
- Dots in 'No Availability' are USGS place names and modeled housing units lacking availability.
- Availability data furnished by the California Emerging Technology Fund.
- Unpopulated Areas include lakes, rivers, steep slope and barren landscape.
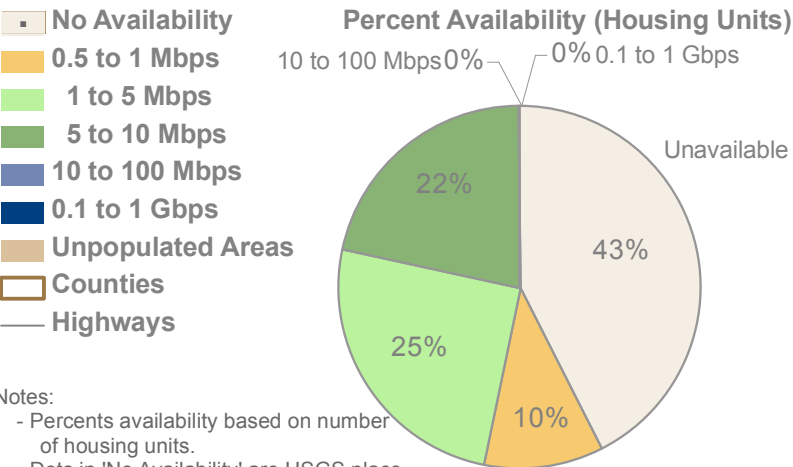- Regions are slight modification of Economic Development Regions.

Wireline Broadband Availability: North Coast

0 5 10   20
Miles

N

North Coast

Pacific Ocean

Bertsch-Oceanview
Crescent City
Del Norte

Siskiyou

Klamath

Trinidad

McKinleyville

Arcata Blue Lake Willow Creek
Myrtletown
Eureka
Pine Hills **Humboldt**

Ferndale Fortuna

Rio Dell

Weaverville
Trinity Lewiston

Shasta

Hayfork

Redway

Tehama

Covelo

Laytonville

Glenn

Port Bragg **Mendocino**
Willits

Mendocino

Ukiah Upper Lake Nice
North Lakeport **Lake**
Lakeport

Colusa

Clearlake Oaks
Kelseyville Clearlake
Point Arena
Lower Lake

Yolo

Cobb Hidden Valley Lake
Middletown

Sonoma **Napa**

Legend

- No Availability
- 0.5 to 1 Mbps
- 1 to 5 Mbps
- 5 to 10 Mbps
- 10 to 100 Mbps
- 0.1 to 1 Gbps
- Unpopulated Areas
- Counties
- Highways

Percent Availability (Housing Units)
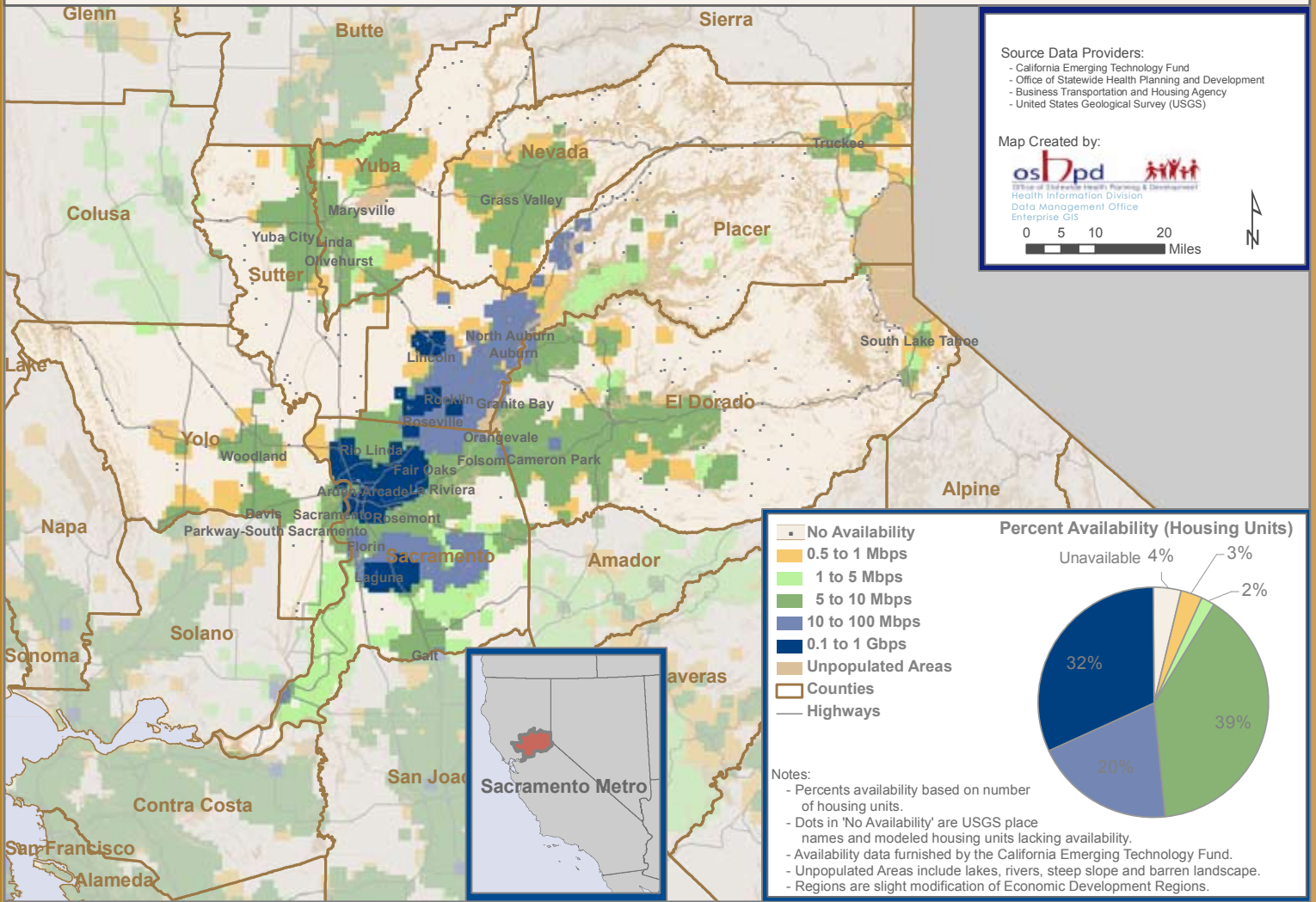
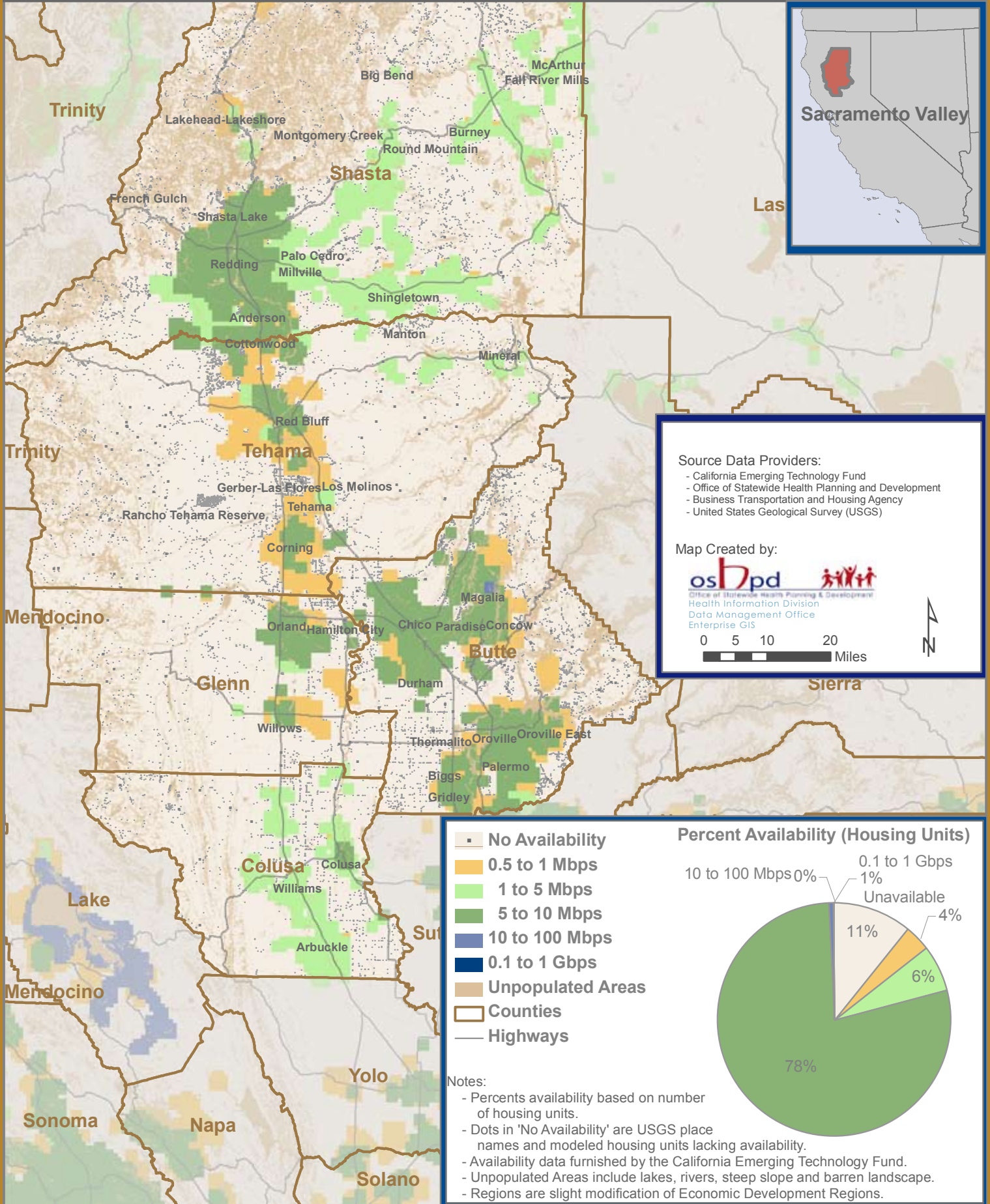0.1 to 1 Gbps 0%

Unavailable

33%

22%

28%

9%

8%

Notes:
- Percents availability based on number of housing units.
- Dots in 'No Availability' are USGS place names and modeled housing units lacking availability.
- Availability data furnished by the California Emerging Technology Fund.
- Unpopulated Areas include lakes, rivers, steep slope and barren landscape.
- Regions are slight modification of Economic Development Regions.

Wireline Broadband Availability: Northern Sierra

Del Norte

Hornbrook
Yreka
Montague
Siskiyou
Grenada
Fort Jones
Greenview
Gazelle
Etna
Edgewood Carrick
Weed
Mount Shasta
Dunsmuir McCloud

Dorris
Tulelake
Macdoel
Mount Hebron
Tennant

Modoc
Alturas

Humboldt

Trinity

Shasta

Lassen

Susanville

Chester Westwood
Lake Almanor West Prattville
Almanor
Canyondam
Greenville
Caribou Paxton Taylorsville
Plumas
Belden Twain
Meadow Valley
Tobin Quincy Greenhorn
Bucks Lake Spring Garden Lake Davis
Cromberg Portola
Delleker C-Road
Blairsden Chilcoot-Vinton
Graeagle Clio
Little Grass Valley Whitehawk
La Porte Loyalton

Tehama

Sierra

Nevada

Yuba

Sacramento

Legend

- No Availability
- 0.5 to 1 Mbps
- 1 to 5 Mbps
- 5 to 10 Mbps
- 10 to 100 Mbps
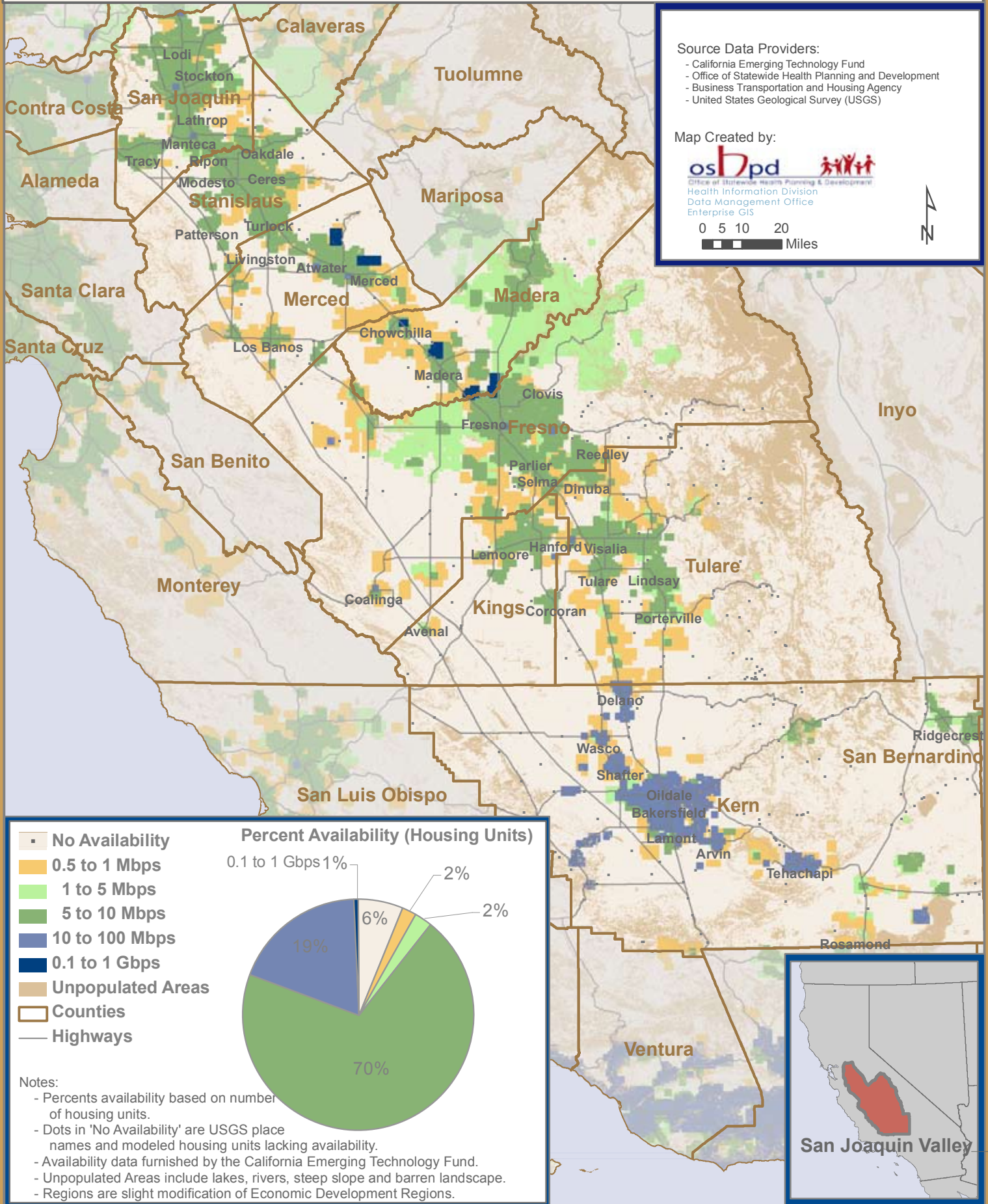- 0.1 to 1 Gbps
- Unpopulated Areas
- Counties
- Highways

Percent Availability (Housing Units)

10 to 100 Mbps 0%   0% 0.1 to 1 Gbps

Unavailable

43%
22%
25%
10%

Notes:
- Percents availability based on number of housing units.
- Dots in 'No Availability' are USGS place names and modeled housing units lacking availability.
- Availability data furnished by the California Emerging Technology Fund.
- Unpopulated Areas include lakes, rivers, steep slope and barren landscape.
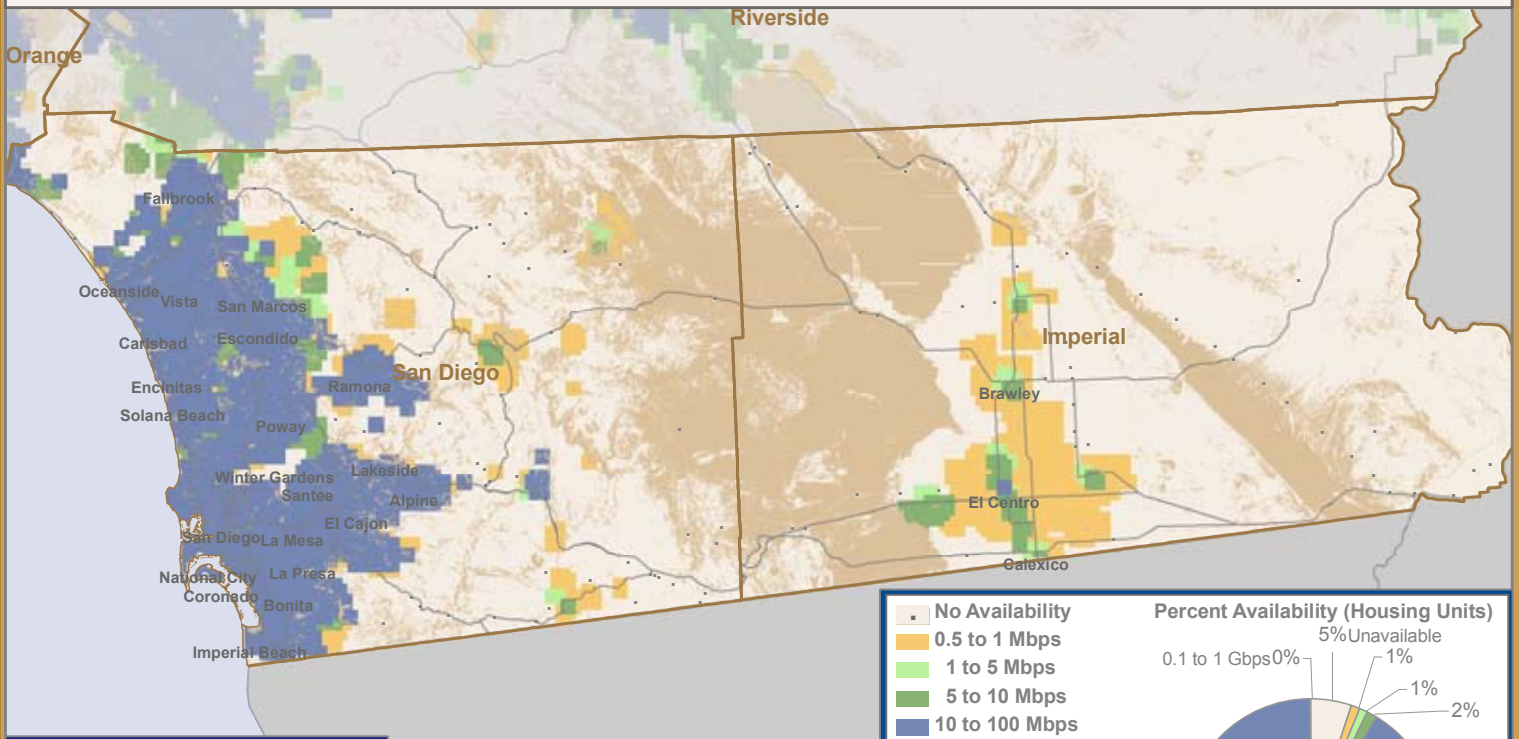- Regions are slight modification of Economic Development Regions..

Northern Sierra

Wireline Broadband Availability: Sacramento Metro
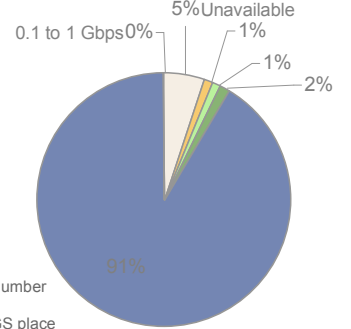

Source Data Providers:
- California Emerging Technology Fund
- Office of Statewide Health Planning and Development
- Business Transportation and Housing Agency
- United States Geological Survey (USGS)

Map Created by:

oshpd
Office of Statewide Health Planning & Development
Health Information Division
Data Management Office
Enterprise GIS

0   5   10   20
                    Miles

Legend:
- No Availability
- 0.5 to 1 Mbps
- 1 to 5 Mbps
- 5 to 10 Mbps
- 10 to 100 Mbps
- 0.1 to 1 Gbps
- Unpopulated Areas
- Counties
- Highways

Percent Availability (Housing Units)

Unavailable 4%   3%
2%
32%
39%
20%

Notes:
- Percents availability based on number of housing units.
- Dots in 'No Availability' are USGS place names and modeled housing units lacking availability.
- Availability data furnished by the California Emerging Technology Fund.
- Unpopulated Areas include lakes, rivers, steep slope and barren landscape.
- Regions are slight modification of Economic Development Regions.

Wireline Broadband Availability: Sacramento Valley

Sacramento Valley

Trinity

Big Bend

McArthur
Fall River Mills

Lakehead-Lakeshore

Montgomery Creek
Burney

French Gulch
Round Mountain

Shasta

Shasta Lake

Las

Palo Cedro
Millville
Redding

Shingletown

Anderson

Cottonwood
Manton

Mineral

Red Bluff

Tehama

Gerber-Las Flores Los Molinos

Rancho Tehama Reserve
Tehama

Corning

Magalia

Chico Paradise Concow
Orland Hamilton City

Butte

Glenn
Durham

Willows

Oroville East
Thermalito Oroville
Palermo
Biggs
Gridley

Sierra

Colusa
Colusa

Lake
Williams

Sut

Arbuckle

Mendocino

Yolo

Sonoma
Napa

Solano

Legend:
- No Availability
- 0.5 to 1 Mbps
- 1 to 5 Mbps
- 5 to 10 Mbps
- 10 to 100 Mbps
- 0.1 to 1 Gbps
- Unpopulated Areas
- Counties
- Highways

Percent Availability (Housing Units)

10 to 100 Mbps 0%

0.1 to 1 Gbps 1%

Unavailable 4%

11%

6%

78%

Notes:
- Percents availability based on number of housing units.
- Dots in 'No Availability' are USGS place names sand modeled housing units lacking availability.
- Availability data furnished by the California Emerging Technology Fund.
- Unpopulated Areas include lakes, rivers, steep slope and barren landscape.
- Regions are slight modification of Economic Development Regions.

Wireline Broadband Availability: San Joaquin

Source Data Providers:
- California Emerging Technology Fund
- Office of Statewide Health Planning and Development
- Business Transportation and Housing Agency
- United States Geological Survey (USGS)

Map Created by:

osbpd
Office of Statewide Health Planning & Development
Health Information Division
Data Management Office
Enterprise GIS

0 5 10   20
Miles

Calaveras
Lodi
Stockton
San Joaquin
Lathrop
Manteca
Tracy   Ripon
Oakdale
Modesto   Ceres
Stanislaus
Patterson
Turlock
Livingston   Atwater
Merced
Merced
Chowchilla
Los Banos
Madera
Clovis
Fresno   Fresno
Parlier   Reedley
Selma
Dinuba
Hanford   Visalia
Lemoore
Tulare   Lindsay
Coalinga
Kings   Corcoran
Avenal   Porterville
Delano
Wasco
Shafter
Oildale
Bakersfield   Kern
Lamont
Arvin
Tehachapi
Rosamond

Contra Costa
Alameda
Santa Clara
Santa Cruz
San Benito
Monterey
Tuolumne
Mariposa
Madera
Inyo
San Bernardino
Ridgecrest
Tulare
San Luis Obispo
Ventura

Percent Availability (Housing Units)

0.1 to 1 Gbps 1%
6%
2%
2%
19%
70%

Legend

- **No Availability**
- **0.5 to 1 Mbps**
- **1 to 5 Mbps**
- **5 to 10 Mbps**
- **10 to 100 Mbps**
- **0.1 to 1 Gbps**
- **Unpopulated Areas**
- **Counties**
- **Highways**

Notes:
- Percents availability based on number of housing units.
- Dots in 'No Availability' are USGS place names and modeled housing units lacking availability.
- Availability data furnished by the California Emerging Technology Fund.
- Unpopulated Areas include lakes, rivers, steep slope and barren landscape.
- Regions are slight modification of Economic Development Regions.

San Joaquin Valley

Wireline Broadband Availability: Southern Border

Riverside

Orange

Fallbrook

Oceanside
Vista
San Marcos
Carlsbad
Escondido
Encinitas
Ramona
San Diego
Solana Beach
Poway
Winter Gardens
Lakeside
Santee
Alpine
El Cajon
San Diego
La Mesa
National City
La Presa
Coronado
Bonita
Imperial Beach

Imperial
Brawley
El Centro
Calexico

Legend

- No Availability
- 0.5 to 1 Mbps
- 1 to 5 Mbps
- 5 to 10 Mbps
- 10 to 100 Mbps
- 0.1 to 1 Gbps
- Unpopulated Areas
- Counties
- Highways

Percent Availability (Housing Units)

- 5% Unavailable
- 0.1 to 1 Gbps 0%
- 1%
- 1%
- 2%
- 91%

Notes:
- Percents availability based on number of housing units.
- Dots in 'No Availability' are USGS place names and modeled housing units lacking availability.
- Availability data furnished by the California Emerging Technology Fund.
- Unpopulated Areas include lakes, rivers, steep slope and barren landscape.
- Regions are slight modification of Economic Development Regions.

0   5   10   20
Miles

N

Southern Border

Ambitious Goals Are Required to Create World-Class Broadband Networks

Achieving the benefits that broadband will produce requires California to adopt aggressive goals. The charts below detail goals for both availability and adoption between 2008 and 2015. Current-generation technologies include services that offer combined speeds between approximately 1 and 10 Mbps. Next-generation infrastructure is defined as that which is capable of providing services around 50 Mbps total or better.
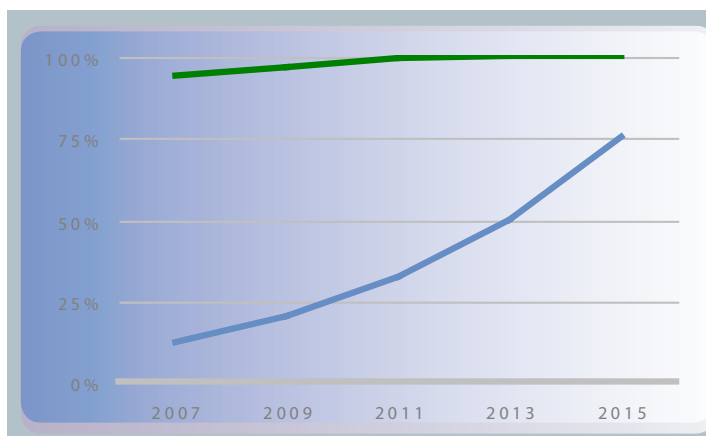
Broadband Availability

- Current Generation
- Next Generation
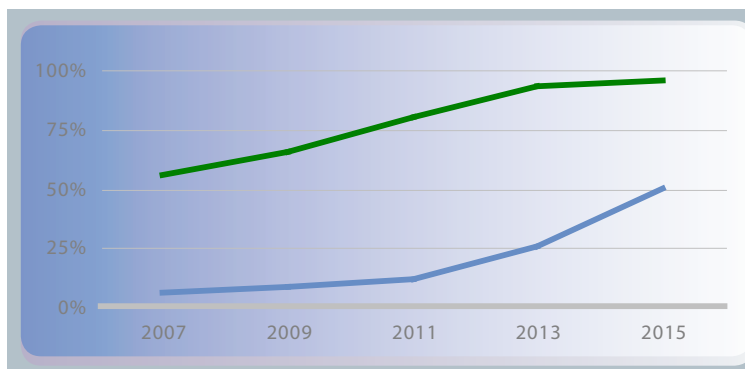
Broadband Adoption

- Current Generation
- Next Generation

To meet the availability and adoption goals indicated in the preceding charts, the CBTF believes that California's stakeholders will need to achieve the following objectives:

- **Ensure ubiquitous and affordable broadband infrastructure, made available through a variety of technologies, across all of California;**
- **Drive the creation and use of applications that**

produce the greatest economic, educational health and other benefits for California's economy and communities; and

- **Deploy next-generation broadband infrastructure and position California as the global economic leader in a knowledge-based economy.**

To meet these objectives, public and private-sector stakeholders should undertake a comprehensive plan, comprised of seven recommendations, which will strengthen the foundation for a 21st century economy in the Golden State. While each recommendation is itself an action, the following pages contain detailed descriptions and multiple specific actions that will enable each element of the plan to be implemented and accomplished. Maintaining California's global leadership is a task that will be shared by government, entrepreneurs, philanthropists, industry, educators, researchers and community institutions. Together, stakeholders should implement these seven recommendations, which form a comprehensive plan to build a 21st century economy:

1. **Build out high-speed broadband infrastructure to all Californians**
2. **Develop model permitting standards and encourage collaboration among providers**
3. **Increase the use and adoption of broadband and computer technology**
4. **Engage and reward broadband innovation and research**
5. **Create a statewide e-health network**
6. **Leverage educational opportunities to increase broadband use**
7. **Continue state-level and statewide leadership**

Principles to Guide Recommendation Implementation

- **Current-generation infrastructure will only suffice for a limited period of time.**
- **Digital literacy and computer access are necessary prerequisites to any meaningful experience with broadband-based technologies.**
- **Youth and young adults typically act as early adopters who are critical to the creation and adaptation of new technologies.**
- **Different requirements drive the supply of and demand for broadband.**
- **Flexibility in technology is critical if the marketplace is to accommodate and support innovation.**
- **Technology and competitively neutral policies promote competition.**
- **Broadband usage will increase by facilitating the shortest period between innovation and adoption by all.**
- **Increased broadband usage brings remarkable environmental and economic benefits to California.**
- **Certain populations, particularly the elderly and the disabled community, will gain tremendous opportunities from access to broadband-based technologies.**
- **Empirically based metrics ensure that only policies that achieve measurable outcomes are continued.**
- **Global competitiveness is dependent on a world-class broadband infrastructure.**

Recommendations

Build Out High-Speed Broadband Infrastructure to All Californians

An advanced communications infrastructure is critical to California's future as a 21st century economy. Ubiquitous broadband availability, built with the capacity to meet the increasing bandwidth needs of California's businesses and residents, provides the foundation for this advanced economy. With ubiquitous availability, every California community will be connected to high-capacity broadband. However, in some of California's rural communities, the fixed cost of deploying or upgrading broadband simply exceeds a provider's potential revenue. The CBTF has identified several opportunities to ensure deployment throughout all of California. To quickly and effectively bring scalable broadband access to communities across the state, policymakers should consider the following opportunities:

- Invest financially in California's economic future
- Leverage existing resources within California

Invest Financially in California's Economic Future

Government has long supported critical infrastructure deployment in the United States. Rural electrification and the universal service programs for telephones are only two important examples of this leadership. Investing in broadband expansion will not only bring the benefits of the technology to all communities, it could help create immediate jobs: equipment manufacturers will expand their production capabilities to meet increased demand, and broadband providers will hire additional employees to build this new infrastructure.

Overall, market forces are working to incent carriers to build broadband to most urban and suburban areas of California. Therefore, the emphasis of any state investment should be only on those areas where build-out of new and upgraded systems is uneconomic. To accomplish this, the CBTF recommends that the state should provide only the lowest subsidy necessary to encourage build-out of new and upgraded systems and that precautions must be taken to ensure that investment is not made for any project that would have been

undertaken regardless of a subsidy. Additionally, it is important to have clear definitions of and be able to distinguish clearly between unserved and underserved areas because the problems and solutions may be different. For example, an unserved area could refer to a census tract, or other reasonable designation, with no broadband service today.

When reviewing actions to increase broadband availability, an underserved area might refer to a census tract, or other reasonable designation, exhibiting high rates of poverty, and not located in a saturated market. A saturated market for current-generation technologies is one in which these technologies are available to a significant percent of the total potential of residential subscribers. For next-generation infrastructure, a saturated market is one in which next-generation infrastructure has been physically deployed. Current-generation technologies include services that offer combined speeds between approximately 1-10 Mbps. Next-generation infrastructure includes that which is capable of providing services around 50 Mbps total or better. For recommendations that seek to increase broadband use, an underserved area could refer to a census tract, or other reasonable designation, exhibiting high rates of poverty and low levels of broadband adoption.

The CBTF believes that using these criteria will produce the appropriate incentives to ensure that all communities have access to the bandwidth they need to truly harness the opportunities provided by the Internet.

State-Issued Broadband Bonds: The state should issue infrastructure bonds, the proceeds of which will be used—in partnership with investment from the private sector—to finance components of high-speed capable infrastructure in unserved and underserved markets. The state itself will not provide service. Instead it will partner with private entities to ensure that all California communities have the infrastructure in place that will allow them to effectively compete. State-financed facilities (e.g., conduit, towers, etc.) should either be made available to all broadband providers where technically

feasible at reasonable cost or the state should enter into revenue share agreements for state-financed facilities.

Supporting broadband infrastructure using funds made available through a bond issuance makes sense. The infrastructure will remain useful for decades, often past the repayment of the bond. Broadband is a capital improvement, and the technology has a long, useful life and, therefore, it is appropriate to pay for it over time, like other state investments. A sizeable investment, allocated judiciously, could generate five times that amount in commercial investment. In fact, other states have considered this same policy. Vermont recently approved $40 million in bonds for this purpose, and Massachusetts is considering $25 million in bonds.

California Advanced Services Fund (CASF): An important goal of universal service policy is to ensure that all citizens have access to critical communications technologies. In California, the limited deployment of broadband in certain areas of the state during this decade, the importance of broadband services to the financial health of the state, and the

represents a suitable, competitively neutral, and broad-based program targeted toward broadband infrastructure. If adopted, CASF will provide important incentives to help—from a timing perspective—high-cost areas obtain advanced telecommunications faster than if market forces alone were to deliver such services. Funds that will be used by the CASF have already been collected and appropriated in compliance with Public Utilities Code **§** 270.

Tax Incentives for Rural, Unserved California: The state should identify those communities without broadband availability or those which require significant upgrades to reach current- or next-generation services, and provide broadband providers with a two-tiered tax incentive to stimulate new investment. Providers should receive a 10 percent tax credit on capital expenditures for investment in current-generation broadband infrastructure and a 20 percent credit for next-generation broadband investment. By providing targeted tax incentives for the provision of broadband services in currently unserved and underserved areas, it may allow these areas to be served profitably through private investment.

direction of the legislature "to encourage the development of new technologies" should prompt the California Public Utilities Commission (CPUC) to act now and provide one-time funding under Public Utilities Code **§** 739.3 for deployment of broadband facilities in unserved and underserved high-cost areas of California.[54] The California Advanced Services Fund (CASF), a proposed program not yet voted on by the CPUC,

This incentive is technology neutral, making delivery of service—not the delivery medium—the factor for determining eligibility. Any broadband provider meeting the determined speed of service would be eligible, regardless of whether the service is provided over a telephone wire, cable modem, optical fiber, wireless device, satellite service, or some other form of technology.

Leverage Existing Resources

California Teleconnect Fund: The state can achieve the purpose and potential of the California Teleconnect Fund (CTF) by first increasing participation by eligible institutions and, second, expanding the CTF to other entities that can help accomplish the program's mission. The California Public Utilities Commission established the California Teleconnect Fund in 1996 and today provides a 50 percent discount on selected telecommunications services to schools and libraries, qualifying hospitals and health clinics, and nonprofit community-based organizations (CBOs) offering health care, job training, job placement, educational instruction, and community technology services. Annual CTF costs remain at approximately $33 million, though statute allows the program to utilize as much as $55 million annually. CTF participation has differed among eligible entities; 1,907 schools and/or school districts and 286 library branches and/or library systems participate in the program. Currently, 94 health organizations and 756 CBOs are enrolled in the program.

Though DSL is listed as an eligible service, few broadband providers offer the discount, and the CPUC lacks the authority to compel providers to offer the service at a discount. As a result, some entities accepted into the program have not received discounts, and this experience has likely decreased demand for the program by entities like CBOs that often use commercial DSL service in their organizations.

Accordingly, the CBTF recommends the following actions to increase the effectiveness of the CTF. First, the CPUC should determine and eliminate the barriers encountered by eligible entities that (i) have not yet applied or (ii) have been approved, but have been unable to utilize the CTF discount. Second, the commission should work with the designated 2-1-1 provider in each community to reach out to all eligible CBO organizations in each county as well as ensure that all rural health care facilities that apply to the FCC's Rural Health Care Program are participating in CTF. Third, the commission should estab-lish a mentor program to guide eligible entities through the application process.

The CPUC must effectively serve currently eligible entities, but it should also consider alternative uses for the fund that support the program's mission to reward the economic and societal impacts of certain institutions by providing discounted telecommunications services.

The CBTF recommends that the CPUC explore the following opportunities:
- Expand CTF payments to cover some of the uncovered telecommunications service costs from the FCC Rural Health Pilot program;
- Determine the legal and cost impacts of allowing California Community Colleges (CCCs) to participate in the CTF, especially considering the rural location of many CCCs; and
- Prorate the CTF discount when eligible entities share facilities with non-qualified organizations, including the necessary controls required to avoid fraud, waste, and abuse.

California Rural Telecommunications Infrastructure Grant Program: The Rural Telecommunications Infrastructure Grant Program [AB 140 (Ch. 903, Stats. 2001)] is administered by the CPUC and offers grants of up to $2.5 million per project to construct telecommunications infrastructure in communities without telephone service. The program cannot exceed $10 million per year and the CPUC may only award one grant per community.

The legislature should reauthorize the program, which expires this year, and lift the grant cap of $2.5 million so that entire projects costing more than that amount can be funded in a single grant. This limitation has delayed the construction of some projects, since the unserved community must structure its application for a multi-year implementation that does not exceed the annual grant cap. The grant ceiling was originally instituted to ensure that funds were spread broadly and not consumed by a few large investments. However, some com-

munities have been forced to extend projects over multiple years, even though the projects could have been funded in a single year without exceeding the $10 million cap. This has resulted in unnecessary delays in bringing broadband to unserved California communities.

AB 855/ Digital Divide Fund: AB 855 is a pioneering California law with a great deal of potential to help unserved and underserved communities participate in the digital revolution. But it has not reached its potential because it has not been fully implemented. A series of administrative actions can help make this policy the powerful tool it was intended to be. AB 855 (Chapter 820, Statutes of 2003) required the Department of General Services (DGS) to develop an inventory of state-owned real property that wireless telecommunications providers could lease for "wireless telecommunications facilities."[55] Under AB 855, the director of DGS "may negotiate and enter into an agreement to lease department-managed and state-owned real property to any provider of wireless telecommunications services for location of its facilities."[56] AB 855 also created the Digital Divide Grant Program, which requires that 15 percent of the revenues from these leases be used for a competitive grant program funding Digital Divide pilot projects. Lease agreements for Department of Transportation land or "lease agreement[s] existing prior to the operative date of the section" were exempted from participation in the Digital Divide Grant Program.

The CBTF recommends the following:
- Require DGS to report to the Office of the Governor the current status of the AB 855 inventory; the extent to which DGS has sought compliance by other agencies to meet the spirit and requirements of AB 855; the number of wireless communication lease negotiations entered into since January 1, 2004; and the number of those leases that were negotiated by the director of DGS. DGS should also describe its efforts to educate stakeholders about AB 855.
- Remind all eligible departments that they must comply

with current law and immediately list property that may be leased and used for wireless telecommunications facilities.
- Develop standards for compliance. For example, require all agencies and departments to notify potential wireless telecommunications lessees as to the availability of specific property within 30 days of initial contact.
- To incentivize compliance with AB 855, allow departments and agencies to use the fees collected through this program to be partially credited against lease payments to DGS.
- Ensure that the designated percentage of revenues from renewed wireless telecommunications leases, as well as new leases, are included in the Digital Divide Grant Program.
- Review the legal basis for any existing departmental/agency exemptions to Digital Divide Fund participation.

In addition, DGS should revise and publicize its fee schedule for access to state property for wireless broadband services. Over the last year, a number of wireless broadband providers attempting to extend access into unserved communities have noted that they believe DGS's application process and fee schedule have created a barrier to broadband deployment.

Community Service Districts: The state should expand the authority of Community Service Districts (CSDs) and allow them to provide broadband service, either directly or through a contractor, if a provider is unable or unwilling to deploy service to that community. A CSD's authority to provide broadband service, either directly or through a contractor, should remain in effect until such time that a private provider is ready, willing and able to acquire, construct, improve, maintain and operate the broadband service for a comparable cost and quality of service as is provided by the CSD. At such time, title would be diligently transferred or operations leased at fair market value.

California Government Code §6110 grants CSDs 31 powers, including such fundamental activity as supplying water, managing sewage, and ensuring police protection. By law, a CSD may undertake only those powers that are expressly

permitted in statute. Further, Government Code §61105 grants certain communities special powers not available to other districts. In the past, the legislature has expanded CSD powers when private providers were unable or unwilling to provide a critical service to the community. For example, CSD authority has been extended to operate a gas station and an underground gas distribution system. In these cases, the expansion of the law allowed the CSD to fill a vital need in the community until such time that the private sector was able to do so.

Most residents within California's 318 CSDs have access to at least one broadband provider. Nonetheless, residents living in some CSDs remain unserved by any provider. In these cases where the economic model often cannot justify build-out by a private provider, CSDs could play an integral role in increasing broadband availability through developing backhaul/middle mile, and last-mile broadband connectivity. CSDs also can improve a community's existing broadband service resiliency by developing or funding a redundant connectivity option for existing providers.

Anchor Tenancy: The state should assess anchor tenancy opportunities as a part of every state agency's process to nego-tiate or renegotiate a telecommunications lease. In combination with other strategies used to strengthen the financial support needed to deploy a robust broadband infrastructure, anchor tenancy can act as a catalyst, drawing providers to locations that have little or no access to broadband. The state owns or leases numerous facilities throughout California, nearly all of which require broadband access. If the state can increase its anchor tenant capacity, its presence—with little or no change in the cost of service—has the potential to increase broadband access for consumers and upgrade facilities in a region.

State policy should ensure through Executive Order that agencies assess whether anchor tenancy could (i) draw private providers to a surrounding unserved community or (ii) upgrade existing network infrastructure, if no other plans exist to do so. If an agency determines that anchor tenancy would draw private providers to the area (for either construction or network upgrades), it should perform a cost-benefit analysis and, if feasible, the agency should require as a condition of the lease that providers extend broadband access to a specified portion of the surrounding community. For facilities located in unserved communities, agencies should seek a lease agreement that requires build-out to the rest of the community. In addition, the state should annually report on the progress of this initiative.

Expedite Wireless Broadband Deployment:

- *Encourage Deployment to Unserved Areas:* The state should better align its Rights-of-Way (ROW) policies and provide access to its ROW at cost for wireless infrastructure deployment to unserved communities. Executive Order S-23-06 aligned rate structures for conventional and controlled-access highway ROW in California. Until 2000, the California Department of Transportation (Caltrans) disallowed any placement of communications lines along controlled-access highways unless a reasonable or feasible physical alternative was unavailable. In 2000, Caltrans changed its policy to allow telecommunication lines, specifically fiber optic cables, entry to such facilities upon payment of a lease-type fee, in addition to the cost-recovery fee. As a result of the EO, Caltrans abolished the lease fee and now only charges broadband providers in controlled-access highways for permit review, issuance, and inspections.

While fiber-optic capacity is critical to next-generation broadband infrastructure, wireless broadband can provide an affordable solution for many of California's communities and access to state ROW should, therefore, be provided in a similar manner. Accordingly, the CBTF recommends that Governor Schwarzenegger provide access to state ROW on a cost-recovery basis for wireless providers that create systems to bring broadband to presently unserved areas.

- *Public-Private Partnerships:* The state should create public-private partnerships across California with providers that are willing to upgrade state infrastructure (e.g., towers and vaults) and provide wireless broadband services in unserved and underserved areas in return for no-cost leases.

The state owns hundreds of radio towers throughout California; however, they need to be upgraded to ensure a robust public safety communications system. The state could reduce permit processing and deployment costs substantially if it allowed vendors to co-locate their wireless broadband facilities on these towers. A public-private partnership between the state and broadband providers would provide broadband vendors with an easy location for the installation of wireless broadband equipment and, at the same time, aid the state in the maintenance of its public safety communications system.

During the next few years, fixed and mobile wireless broadband will see increasing deployment. It can be costly for providers to construct their own towers. The state, however, leases such facilities for use by providers when space is available. The Department of General Services' Real Estate Division assesses such space at fair market value and determines an appropriate lease rate for the provider, paid on a monthly basis. Such lease rates vary greatly, but are often in the range of $1,000 per month. DGS's Telecommunications Division should (i) assess its current public safety communications infrastructure to determine the cost of upgrading equipment and (ii) identify all available sites for wireless broadband providers to co-locate their equipment.

Embarking on these public-private partnerships will simultaneously upgrade state infrastructure while providing an incentive for greater broadband deployment.

Collocation Facilities: Broadband infrastructure consists not only of conduit and fiber but also of buildings with sufficient power and cooling equipment to house networking equipments. Such buildings, sometimes referred to as collocation facilities, serve as physical points of interconnection among networks.

To address the cost of infrastructure in unserved areas and encourage network upgrades in other areas, the state should offer, at cost, small spaces on state-owned properties on which collocation facilities can be constructed. This will both reduce one of the cost barriers and also create "carrier neutral" facilities into which companies can connect with both regional networks and other networks that connect to major Internet connection points in metropolitan areas.

Recommendation #1: Build Out High-Speed Broadband Infrastructure to All Californians

- Issue broadband bonds to aid infrastructure deployment
- Create the California Advanced Services Fund to fund infrastructure
- Provide tax credits to extend broadband to communities without sufficient broadband
- Increase participation in and consider expanding the California Teleconnect Fund
- Reauthorize and lift the $2.5 million per project cap on the Rural Telecommunications Infrastructure Grant Program
- Fully implement the state facility inventory database for wireless infrastructure
- Use wireless facility lease revenues in the Digital Divide Fund
- Allow Community Service Districts to provide broadband services if the private sector does not deploy service in that location
- Assess anchor tenancy opportunities as a part of every state agency's process to negotiate leases
- Provide access to state rights-of-way on a cost-recovery basis for wireless providers in unserved areas
- Create public/private partnerships across California to upgrade state infrastructure and provide wireless broadband to unserved and underserved areas in return for no-cost leases
- Offer small spaces on state-owned properties for collocation facilities

Develop Model Permitting Standards and Encourage Collaboration Among Providers

California broadband permitting requirements and processes differ from city to city, and may also differ for various projects and applicants. Broadband deployment projects, however, often require providers to place equipment and cabling across multiple boundaries. Since there are no standard application forms or policies that communities can adopt, requirements and expectations vary widely. This process increases the costs and timing of broadband deployments for both municipalities and providers. As more providers upgrade current equipment and bring next-generation infrastructure to California's communities, addressing this issue becomes critical. To develop consensus across currently disparate policies, it is vital to convene a statewide group of stakeholders from both local governments and providers. This group should develop standard application forms, policies, and timelines that governments can adopt voluntarily. Additionally, the group may develop a mechanism to allow local governments and providers to communicate and develop feedback processes for new technologies before they are introduced to the larger marketplace. Once standards have been completed, the group should continue meeting to monitor outcomes and changes. This statewide group should develop the following:

Standard Municipal Application Process: A standardized municipal application process will protect public ROW while promoting broadband deployment. The application process should contain the following elements:

• *Standard Application:* A standard permit application will allow broadband providers to use a single application to perform work across multiple jurisdictions. The application and procedures should specify the information that providers will be required to submit as part of a complete application.

• *Permit Conditions:* Standard permit conditions will ensure compliance with existing federal, state, and city laws, statutes and ordinances. All providers and utilities should have fair and equal access to public ROW.

• *Above-Ground Equipment Standards:* There are technical, practical and economic reasons for placing above-ground cabinets. In many cases, above-ground cabinets are necessary to provide broadband services. By jointly agreeing to cabinet standards, both providers and municipalities will spend less time addressing this issue during the permit-review phase.

• *CEQA:* Municipalities across California implement the requirements of the California Environmental Quality Act (CEQA) differently for similar broadband permits. The application process could result in increased efficiencies if municipalities agreed upon a standard mechanism to process broadband permits, relative to CEQA guidelines.

• *Dispute Resolution Process:* A model dispute-resolution process should be developed so that municipalities and providers can efficiently resolve disputes. Creating this process will save time for both parties, ensuring that there are efficient mechanisms in place to approve or reject applications. The state should also consider offering a state-level mediation process to solve conflicts between municipalities and providers before they result in legal action.

E-Permits: Develop an e-permit application for state agencies and local governments. E-permitting will allow providers to apply online, reducing trips to the permitting office and saving the time of staff, who will no longer need to re-type permit requests.

Permitting Timelines: While jurisdictions vary greatly in terms of both size and available resources, the standard process should suggest reasonable timeframes for processing applications of varying standard types. Standard timelines will allow applicants to plan projects accordingly. The process should include the following elements:

• *Response Time*—Response times for similar permits vary greatly among municipalities. All permit applications should be approved or rejected within 60 days, as required by the California Permit Streamlining Act. As improvements in the

An Example of Permit Improvements

In Performance is the Best Politics, author Graham Richard, mayor of Fort Wayne, Indiana, explains how Fort Wayne improved the permitting process for site development: "Large developers kept telling [us] that Fort Wayne's processes were too convoluted…'The permit process takes too long, there are too many restrictions, and I'm not going to go in there and be treated that way.' Initial benchmarking against other communities revealed that nearby cities could turn around site plan improvement applications in just five to 10 days. Fort Wayne took nearly two months on average, with a large percentage dragging on much longer."

Fort Wayne responded quickly, organizing a team from all departments involved in permitting. They conducted focus groups and determined the standard steps and hours required to process a basic permit. They used this information to streamline the process, flag difficult permits immediately, and benchmarked themselves against metrics that they collected. As a result, 95 percent of all new permits are now processed in less than 10 days. This decreased the city's and the applicant's costs.

process take hold, however, the permitting process should set a goal of 30 days to process permit applications.

• *Restrictions*—Permit restrictions should be available for review when the provider begins the permit process and should be provided in writing at the time the permit application is approved. This will result in fewer amended applications because applicants will clearly understand the restrictions prior to the application.

• *Rejected Permits*—Rejected permits should include a written list detailing the reasons why the permit was rejected. This should also result in fewer amended applications because the applicant will know exactly what it must change for the application to be approved.

• For amended applications to the same permit, the permit should be granted within 30 days of adequately addressing all the written reasons for initial rejection.

Metrics: The public-private partnership of local governments and utilities should establish a set of metrics to measure the efficiency of the permitting process and compliance to issued permits. The metrics should address the timeframe to process permits, number of rejected permits, the number of resubmissions, broadband provider violation of issued permits, and the conflict resolution time frames. These metrics will provide a basis for setting benchmarks for continued improvement.

Potential Use Of Blanket Permits: The partnership should evaluate the use of "blanket permits" for large, long-term infrastructure placements. Blanket permits allow a provider to use a single permit for tasks that are common or repetitive at multiple locations over a specified period of time. For example, a municipality could grant a blanket permit when a provider is building small, buried terminals in the public ROW. Blanket permits save resources during long-term projects since the provider and government do not have to constantly renegotiate terms for tasks that are undertaken on a daily or weekly basis. The use of blanket permits could be expanded to providers that have an established record of respectfully following the permitting rules. A local government

could determine success in this area by using the metrics derived from the permitting performance review recommended here.

Moratoria: In many cities and municipalities there is an undergrounding policy which aims to beautify a community by placing moratoriums on most or all above-ground facilities. This can create a barrier to entry for providers and also delay needed broadband upgrades to existing service. The CBTF recommends the development of provisions for providers to build above-ground facilities if underground infrastructure (e.g., conduit, duct work) is not complete or ready within a specific number of months. These guidelines should address issues such as time limits for moratoria; incentives for local jurisdictions to place excess conduit in anticipation of future needs; a waiver process for cases in which these provisions do not allow access to the ROW; and systematic notice for providers of joint trenching opportunities prior to establishing a moratorium. To ensure providers receive systematic notice of joint trenching opportunities, the state should maintain and expand the Fiber Collaboration Database (www.dot.ca.gov/broadband), created through Executive Order S-23-06, to include information from local governments.

Conduit Standard: Adopt the conduit standards that are described in the CBTF preliminary report, which is available online at www.calink.ca.gov.

New Developments: One of the biggest costs to deploying broadband is cutting or trenching roadways. Developers can ensure that capacity is available in the future by placing standard spare conduit and innerduct in the ROW at the time of construction. By proactively placing this infrastructure in the ground when the subdivision or businesses development is built, providers, consumers and businesses will have greater broadband availability in the future.

Recommendation #2: Develop Model Permitting Standards and Encourage Collaboration Among Providers

- **Convene a statewide group of stakeholders from local governments and the provider community.**

This group should develop:
- **A voluntary municipal application process**
- **E-permits**
- **A permitting timeline for standard types of permits**
- **Metrics to measure efficiency of the permitting process and compliance to issued permits**
- **Guidelines for the use of blanket permits for large, long-term infrastructure placements**
- **Guidelines for moratoria on above-ground facility construction**
- **Conduit standards**
- **Commitments for placing standard spare conduit in the Rights-of- Way at times of construction**

Increase the Use and Adoption of Broadband and Computer Technology

Critical to a robust broadband infrastructure is information about the technology's value and access to the tools that are necessary for a meaningful online experience. The CBTF recommends a multi-faceted approach to increase consumer and business knowledge about the benefits associated with broadband technology and to ensure that communities have the tools they need to engage in meaningful online experiences.

California Kids—100 Percent Up to Speed: California should establish a public-private partnership charged with moving our state toward the goal of "California Kids—100 Percent Up to Speed," where every household with a child is able to have a computer with high-speed Internet in the home and the ability to use it. The public-private partnership should identify opportunities for streamlined refurbishing efforts, computer loan/grant programs, and technology training opportunities.

Common sense dictates that residents in a household without a computer at home will not adopt broadband even if available. Approximately 17-27 percent of California households still do not have a computer at home depending on geographic region. Certainly some families choose not to purchase a computer. But a disproportionate percentage of low-income families do not have a computer at home, suggesting that affordability is a barrier: 42 percent of families with incomes of less than $25,000 annually do not have a computer at home compared to less than 9 percent of families with incomes of $70,000 or more. This gap in computer ownership along income lines needs to be addressed in order to open up this large market to broadband use and to ensure that the opportunities enabled by broadband can reach all California residents.

As California takes steps to increase home-computer ownership and subsequently the adoption of broadband, it makes sense for children and their families to be the focus of its efforts. By concentrating on youth, California can ensure that its future workforce is technologically literate and prepared for the new economy. In addition, youth are often early adopters of technology, bringing their families, neighbors and friends along when they have access to the tools and training to use them.

The 100 Percent Up to Speed Partnership should involve industry, community-based leaders and organizations, state and local government, libraries, parents, philanthropy and other stakeholders. As California moves toward this 100 percent goal, the state will build a market for broadband adoption, increase actual use of broadband, and help ensure that all young people and their families receive the opportunities offered by broadband access and applications.

Key stakeholders should convene over a three-year period to develop and implement a plan that moves efficiently toward the goal of "California Kids—100 Percent Up to Speed." The Partnership will set targets against which to measure progress over the three-year period.

In addition, the Partnership will explore a range of options to determine which approach or combination of approaches works best in California, including making computer bulk purchase rates available to low-income families, low-to-no-interest computer loan programs, and/or refurbishing/recycling computer programs. It should also engage community institutions to provide local outreach, refurbishing, technical support, and computer literacy and advanced technology training.

- *Refurbishing:* The partnership, in collaboration with the California Integrated Waste Management Board and DGS, should (i) study how various incentives can increase computer donations from the private sector, (ii) determine how the state can increase the availability of computers for refurbishing efforts from state agencies, and (iii) identify the minimum hardware requirements for computers that will be redistributed.

DGS should report the number of computers that state agencies refurbish during their upgrade cycles and the disposal methods. It should propose a plan to maximize the number of state computers donated to reuse-and-refurbishing programs, at the lowest cost to taxpayers. Californians currently have a greater incentive to recycle unwanted computers than to donate them to reuse-and-refurbishing programs. For example, a tax deduction does not exist for fully depreciated but working computers. This may inadvertently incentivize businesses and individuals to send their computers to a landfill rather than to a refurbishing program. Nonetheless, the act of refurbishing a computer, even if it increases its use by only one extra year, can result in significant carbon offsets and other environmental benefits.[57]

Public Awareness: Research that has explored the demand-side of broadband has noted that "a lack of knowledge about broadband benefits" among consumers is a primary reason for not adopting the technology.[58] In an effort to increase adoption rates, some governments, such as South Korea, have promoted broadband by linking its benefits to "cultural expectations" (in South Korea's case, a cultural "emphasis on education").[59] In California, Governor Schwarzenegger has an opportunity to highlight the importance of broadband—using the very communications technologies already in use.

The use of interactive technology on the governor's website is more advanced than that of any other state, and even that of the White House.[60] The governor can leverage his pioneering efforts to educate Californians about the opportunities broadband brings to individuals and to the state. Many of the applications on the governor's website are virtually inaccessible to Californians without broadband access, so for those who visit the website and are unable to access all of its features, it is a perfect opportunity to explain that these applications—and many education and entertainment-based applications—require high-speed access.

To adopt this idea, the CBTF recommends the governor develop a campaign to promote broadband and its importance to California's economy and its residents. New technologies and applications, and their capabilities and benefits, are often a mystery to the population at large for a number of years after their introduction. For example, DVDs were introduced to consumers in 1997, and although it was one of the most rapidly adopted consumer technologies in history, nearly 10 years passed before the use and acceptance of the technology could be considered ubiquitous.

The website should include an overview of the technology and associated applications, frequently asked questions, a technology fact sheet, consumer alerts, and links to forums, conferences, and grant opportunities. In addition, it should also include a community technology-resources map that provides a database of community technology access points, technology training programs, technical support organizations, and low-cost and refurbished computer resources.

Technology Training: The state should promote technology training by directing existing resources toward programs that enhance technology literacy, 21st century job skills, and access to technology. To accomplish this goal, the state can take the following steps:
• Empower California Community Colleges (CCCs) to expand digital literacy programs, including hardware refurbishing activities. The California Community College system contains 109 campuses that serve more than 2.5 million students. It is critical that these young people and adults have the opportunity to develop skill sets that will serve them in today's global economy. All students should be encouraged to participate in at least one online course that uses web-based collaboration tools similar to those that students will encounter in the workforce. Students should also have access to technology literacy programs available through campus libraries.

Finally, CCCs should be encouraged to expand computer refurbishing instruction in order to address the growing need for individuals with such skills.

• Instruct the State Workforce Investment Board (WIB) to develop an explicit technology literacy component for its five-year Strategic State Plan. While the current priorities identified in the 2007-2009 strategic two-year plan tangentially support technology training, raising the level of digital literacy in California requires a strategic effort to incorporate technology training into workforce development activities. State and local WIA dollars should be directed toward teaching these marketable skills. The CBTF recommends a 10 percent increase over the next two years in WIA funds devoted to technology skills training.

• Expand Career Technical Education (CTE) opportunities in Secure Community Re-Entry Facilities. Secure Community Re-Entry facilities, the centerpiece of Governor Schwarzenegger's comprehensive prison-reform package, are designed to improve public safety by reducing recidivism. They provide intensive rehabilitation, and offer every offender job training, mental health and substance-abuse counseling, housing placement, educational assistance, and other services in the critical few months just prior to release. The training provided in these facilities should include Career Technical Education (CTE) courses related to technology literacy, broadband installation, and hardware repair.

• Make effective use of the growing number of community institutions that provide technology access and training throughout California. Around the state, community technology programs provide training and access to youth, adults, and seniors in non-profit organizations, libraries, and other hubs of community activity. The programs offer many participants their first opportunities to learn about the benefits of broadband.

• Provide tax incentives to technology-based businesses offering technology training and technical support to at-risk communities, particularly disabled and low-literacy populations. Companies that depend on a highly skilled workforce are well positioned to offer not-for-profit technology training opportunities to at-risk populations, particularly if undertaken in conjunction with trusted community institutions.

Recommendation #3: Increase the Use and Adoption of Broadband and Computer Technology

- **Establish a public-private partnership to ensure that every household with a child is able to have a computer with high-speed Internet in the home and the ability to use it**
- **Use incentives to increase computer donations from the private sector and the government to under-served families and non-profit organizations**
- **Develop an education campaign to promote broadband and its importance to California**
- **Create a community technology resources map that provides a database of community technology access points, technology training programs, technical support organizations, and low-cost and refurbished computer resources**
- **Empower community colleges to expanding digital literacy programs**
- **Include a technology literacy component in the Workforce Investment Board strategic plan and increase funding by 10 percent**
- **Expand Career Technical Education opportunities in Secure Community Re-Entry Facilities**
- **Make effective use of community institutions that provide technology access and training**
- **Provide tax incentives to technology-based businesses offering training and technical support to at-risk communities, particularly disabled and low-literacy populations**

Engage and Reward Broadband Innovation and Research

California's success as a hub of technological development is a result of many factors. One important feature has been the state's longstanding commitment to innovation, research, and development. Many Internet applications have historically been produced in California, which has provided a significant benefit to the state's economy. Maintaining a robust broadband infrastructure and research and development (R&D) community for new broadband applications is crucial to California maintaining its leadership in the technology industry. The state should now take the following actions to remind the world's entrepreneurs that California has a unique innovation economy, unrivaled anywhere else in the world.

Broadband Innovation Program

The state should create a Governor's Broadband Innovation Program to encourage broadband and Internet-based innovation among California's research community.

Four parts compose the Broadband Innovation Program:

Research and Development Incentives: Encourage the California Research & Development credit to focus on long-term broadband research and development activities. This extension must focus on the application development and the user interfaces that will be needed for the ultra-high-speed broadband access technologies that are likely to be deployed, available and in common use in the next five to 10 years.

Current market conditions reward short-term research and development efforts for which results can be seen in a sales cycle of 12 to 18 months. As a result, advancements in research and development advancements have historically resulted in only incremental advancements. To remain competitive with the rest of the world, the state of California must encourage public-private R&D partnerships that harness the expertise in industry, academia, and the public sector to focus their efforts on the technologies and applications that will be available to the state's citizens five to ten years into the future. While this research is already eligible under the general federal R&D tax credit program that was renewed in December 2006, the state of Califor-

nia should focus additional attention on long-term broadband R&D activities to ensure that the state (and the nation) remains a leader in the next decade in this vital technological area.

Universities also have a special role to play as "living laboratories of the future," where experimentation with new infrastructure and applications can occur and be evaluated. Industry, the public sector, and university leadership should be encouraged to view the "mini-cities" of campuses as rich test beds for experimentation on both new broadband technologies and the emerging novel applications of those technologies. Accordingly, the University of California (UC) Discovery program, which supports research partnerships with UC, industry, and the state, should be expanded to support the type of private-public partnerships that will be essential in moving broadband research from our universities into industry. Additionally, state funds should be made available or reallocated to public-private partnerships to experiment with new applications—such as smart infrastructure, telecommuting, digital cinema, telemedicine, and e-government—on the advanced infrastructure of CENIC's CalREN, the state's ultra-broadband network (currently 1-10 Gbps).

Community Innovation: Create a Community Innovation and Research Initiative to promote the development of broadband-based technology to solve social issues and problems at a community level. The Initiative should provide funding and incentives for research institutions and the private sector to collaborate with community-based organizations in designing and incubating new broadband-based applications that address social and economic issues at the community level.

Though broadband applications have the potential to address a number of social problems in California's underserved communities, broadband use in these communities is low. A recent study by The Pat Brown Institute of Public Affairs at California State University, Los Angeles, "Technology and the Geography of Inequality in Los Angeles," found that a clear relationship exists between socioeconomic status and level

of access to technology. In addition, neighborhoods in Los Angeles that were largely African-American or Latino experienced lower levels of ability to access technology. This is, in part, a result of a dearth of relevant content and applications. This recommendation is designed to increase the demand for broadband in these underserved markets through the development of new applications that have direct impact on addressing social and economic problems in these communities.

Development of technology applications for social use is not new. In fact, the state and private industry have invested in the development of such technologies in specific areas, such as telemedicine, emergency services, and security issues. However, there is no concerted effort to develop applications to address issues at a community-based level. In many cases this would not require public and/or private research institutions to create completely new applications, but instead simply collaborate with community-based organizations to apply newly developed technologies to a specific social problem. For example, a social networking application for mobile technologies could be used by homeless youth to share information on shelters and other resources. A new video technology application could provide new opportunities for communities in the deaf and hearing-impaired community. The Community Innovation Research and Development Initiative, combined with the increasing interest in social entrepreneurship in California, will result in many more relevant applications that will increase the impact of broadband technology in underserved communities.

Innovation in State Programs: Support a new Teen Innovation Project that encourages California's youth to examine the state and local government activities that impact them and then submit ideas and prototypes that use technology to improve the programs. Youth interact with the government, whether through the DMV or CalWorks or when voting. And just as they have innovated technology applications in other arenas, they have the same ability to do so in their interactions with government. Technology-savvy teens can deliver

a new perspective to state and local governments. If the government were to implement the creative ideas submitted by youth and then develop prototypes, it could save the state money, increase the efficiency of service delivery, and provide a meaningful opportunity for teens to contribute to California's success.

This idea would echo a program developed by the Scottish government, The Young Person's Challenge Fund. The Fund was based on a belief that it was important for the government to develop a way in which Scotland's youth could use their talents and the power of technology to help make government services more accessible and useful.

Publicize Successes: Annually grant Governor's Broadband Innovation awards to those youth and adult researchers who have developed technology solutions with the potential for the greatest impact on California. Supporting innovation through an annual awards process is an inexpensive method by which the state can support and drive the creation of new technologies. Government leaders should use their influence to encourage broadband innovation.

E-Government Access and Efficiency Program

Create an E-Government Access & Efficiency Program to spur Internet use among existing as well as new technology users; enhance efficiency in government operations; meet the needs of low-income residents in innovative and efficient ways; increase telecommuting by California's residents in recognition of its positive impact on quality of life and the environment; and establish California as a leader in the world in the use of broadband. In a time of limited state funds, increased e-government services offer a way to help Californians interact with their government in a more convenient way and at substantial savings to the state.

Building on California's already rich state government portal (www.ca.gov), this program will motivate more residents to do business with the government online by increasing the online services available, marketing the effort, and designat-

ing neighborhood venues where residents can more easily and conveniently conduct government transactions. Some examples include testifying remotely via video conference, obtaining and renewing professional licenses, registering to vote, watching government hearings, obtaining information about loans to first-time homebuyers or applying for social benefits programs. Creating a suite of e-government services most relevant to low-income populations will also encourage broadband use by these populations and enable social service agencies and outreach workers to better serve these communities.

The E-Government Program contains the following components:

• Continue expansion of the state portal by increasing the types of available services, groupings of services, and the number of languages in which services are available. For example, the state should assess the feasibility and cost of implementing statewide online transactional services that would enable people to assess their eligibility and apply for programs such as Food Stamps, Medi-Cal/Healthy Families, CalWorks, WIC, and reduced school lunch programs. These online services could be used both by low-income individuals themselves and by social service agencies to extend education about these opportunities.

• Launch a public education and communications campaign to market this new way of doing business with the government, and steer the public to use public broadband in public access sites, like community technology centers and libraries, or in the home.

• Partner with existing nonprofit and government providers that primarily serve low-income communities, so this information can be presented on their websites.

• Work with community institutions in rural and urban areas to serve as sites where residents can access e-government services and receive coaching and technical assistance. Each site should have a trained "e-government efficiency" staff person trained to show residents what they can accomplish online and to assist them. The state should collaborate with corporate and philanthropic partners to support these training and public-outreach efforts.

• Catalog best practices from local governments that have created successful Web portals. The final product will provide all background information on how projects were started, funded, developed, and on their sustainability models.

• Identify California Virtual Office success stories and the common attributes that should be promoted and replicated by other stakeholders in the state. This data should be utilized to create a best practices guide to implement and run a Virtual Office within California, including information on the best technologies available for different applications and services; broadband speeds required for remote services; and the extent to which security, privacy, and other concerns are addressed. As discussed in the first CBTF report, research and data should be collected that would quantify the benefits of telecommuting for California workers who telecommute and the positive impacts on issues like global warming, road congestion, etc. To increase telecommuting practices among employees, including those of the state, employers should consider ways to implement affordable computer-purchase programs for employees. The state should also sponsor an official statewide telecommute day, as suggested in the CBTF's preliminary report.

Innovative E-Government Applications

California should adopt innovative e-government applications such as:

People Finder Interchange XML data standard: As was evidenced by the Hurricane Katrina disaster in New Orleans, broadband connectivity is an extremely valuable resource for providing disaster-relief services and information. Specifically, through the use of broadband, people who were lost or separated from their loved ones were able to find each other. The People Finder Interchange Format (PFIF) was created as way for each of the many websites that sprung up after Katrina to be able to publish their data in such a way that it could be aggregated and then explicitly queried for names or locations. A critical characteristic of this approach is that it enables citizen volunteers to help during emergencies.

While systems can and should be set up before a disaster to facilitate the effective use of this data standard, this is not a centralized approach that requires the Office of Emergency Services to significantly increase its workload. Training, education, and tools to facilitate the process of publishing and digesting data in the PFIF standard can be provided by the community.

Adopting the PFIF standard would not only provide a simple and effective mechanism to facilitate locating missing persons in a disaster. It would also signal that the state of California is supportive of open data formats as a way to facilitate government transparency and accountability. The PFIF standard has the support of an impressive consortium of organizations including Yahoo!, Microsoft, Google, The American Red Cross, Salesforce.com, and others.

Online Jury: Establish an online jury selection system (e-jury) that will streamline jury selection, saving time and money for citizens and for the courts. Participation in the online program would be voluntary. In general, it is not unusual for jury selection to require a full day, and sometimes additional days, depending on the size and complexity of the court case. By instituting an e-jury system, those participating online could be sworn-in online with multi-language support. Citizens would have the ability to complete an Affidavit for Disqualification, an Affidavit to Request a Postponement, an Affidavit to Request an

Excuse, and the Juror Questionnaire in advance of their appearance in the courtroom. The court can notify those jurors excused for hardships or availability reasons online. Jurors responding to the survey questions can be called into the courtroom later in the day so that they avoid the morning's "offline" processes.

E-Voting: California should demonstrate and utilize its technology leadership by developing an online voting system that meets the legal and security requirements necessary to implement secure, democratic elections. Electronic voting machines today are on par with the original automated teller machines (ATMs) banks rolled out in the 1980s. Most of the concerns that have previously been submitted by opponents to online voting revolve around the potential for voter fraud, verification of voter identities, secrecy of the voting process, guarantee of the one-person, one-vote principle, as well as concerns that voters with less money may not have Internet access. There is also concern that hackers could sabotage the virtual polls, resulting in voter confusion similar to the events surrounding poor polling data in Florida in the 2000 presidential elections. However, the technology to implement secure, certified elections processes over the Internet exists today. The state of California should champion the use of online voting as a vital part of the democratic process in the 21st century.

Recommendation #4: Engage and Reward Broadband Innovation and Research

Create a Governor's Broadband Innovation Program:

· **Refocus the California Research & Development credit**

· **Create the Community Innovation and Research Initiative**

· **Develop a Teen Innovation Project**

· **Grant Governor's Broadband Innovation awards**

· **Expand the UC Discovery Program**

Create the California E-Government Access and Efficiency Program to drive use of broadband technology by:

· **Expanding the state portal, www.ca.gov, and cataloging best practices in local government portals**

· **Publicizing information through partnerships with non-profit organizations**

· **Supporting trained "e-government efficiency" staff in community centers**

· **Supporting telecommuting and Virtual Office**

· **Adopting innovative applications**

Create a Statewide E-Health Network

Ubiquitous deployment of broadband services is an integral part of improving the overall health of Californians and driving down costs of care. Providing Californians with electronic access to health services and health-related information will assist in preventing disease, promoting health and wellness, simplifying access to health coverage, and reducing healthcare costs.

E-health is an overarching term that includes the provision of health services through the use of technologies such as real-time videoconferencing, store-and-forward applications, electronic health records, remote disease monitoring, online education, and many other modalities that support access to health services and health information.

What is an E-Health Network? An e-health network is a secure telecommunications environment linking multiple organizations and individuals to enable the provision of electronically delivered health services, research, and education.

This recommendation builds upon the California Telehealth Network Proposal to the FCC, broadening the scope beyond telemedicine to include e-health services. It also proposes expanding the network footprint to include additional sites and provider networks, establishing a ubiquitous e-health network that is an integral part of improving the overall health of Californians.

Implement a Shared Vision, Strategic Plan, and Sustainable Business Model for the Network
The state should establish a process to create consensus and identify the appropriate role for government and stakeholders. This will establish appropriate leadership, governance, and coordination to promote and implement the shared vision of an e-health network and provide accountability to build the technical and organizational infrastructure for a secure, ubiquitous, statewide e-health network that is accessible to all providers and consumers in California.

Specifically, the state should: (1) establish an accountable entity within state government to coordinate activities across agencies and (2) convene a public-private advisory body composed of representatives of major stakeholder groups representative of the diversity of California (e.g., providers, consumers, payers, technology experts). The accountable entity within state government and the advisory body should develop and implement a strategic plan and sustainable business model for an e-health network.

A vision for an e-health network must be shared between the public and private sector. At the state level, it is not clear where leadership, governance, coordination, and accountability exist to address this need. Nonetheless, participants at the 2006 E-Health Forum—convened by the Secretary of Health and Human Services, the Secretary of Business, Transportation and Housing Agency, and the Chief Information Officer of the State—identified leadership as the most important role for state government to play to advance adoption of health information technology.

Ensure Sustainability for the Network
It is critical to ensure development of a financially sustainable e-health network through reimbursement policies and practices that support its appropriate use, and encourage the alignment of strategic investments. Existing telehealth networks and e-health pilot projects within California have been developed largely as a result of grant funding. Sustainability, however, is dependent upon both payers and providers finding a value proposition to support widespread adoption. The leadership of the e-health network should convene principals from the major investors/payers to discuss priorities for telehealth and e-health funding. This group should consider creating a more formal process for project development and joint priority-setting, resulting in the alignment of strategic investments in sustainable e-health over at least a 10-year period.

Currently, inadequate reimbursement by health plans, insurance companies, and other payers, as well as a lack of clarity

about existing payment policies, discourages greater use of telehealth applications and services. The state should examine existing policies and remove barriers for healthcare services that can be provided by more efficient and cost-effective means. For example, the state should clarify requirements under California's Telemedicine Development Act to specify that all payers must provide a payment mechanism for telemedicine and specify their reimbursement policies in writing.

One significant reimbursement challenge is that policies governing Medicare and Medi-Cal currently limit its use for e-health, as the reimbursement policies are based on rules that were put in place many years ago when telemedicine was a pilot program. For example, geographic designations based on the census disallow use in rural areas with higher populations; and regardless of location, there are restrictions on specific medical specialties as well as the type of telehealth services that can be provided.

Increase the Availability and Use of E-Health Applications

Applications and information that provide real value to consumers and providers will drive development of the e-health network and assist in overcoming geographic, financial, and cultural barriers to improving and maintaining health. These value-added applications will drive adoption and utilization of an e-health network. Examples include: Web-based messaging and appointment services, e-prescriptions, and telemedicine. An e-health network will also facilitate disaster planning by creating the capacity for the provision of healthcare services across communities. Access to continuing education for healthcare professionals will also be expanded by an e-health network. Additionally, this network will also expand the locations and sites where healthcare services can be provided; for example, the number of school-based clinics can be markedly increased.

These value-added applications are being created through the interaction of the technology companies that create them and users in the medical community and patients. As demand for services grow, development of such applications will expand. The leadership of an e-health network can accelerate the development and deployment of these applications by convening forums with stakeholders.

The medical teaching community can ensure that coursework and continuing education include instruction in the use of telemedicine application. The e-health network leadership should also inventory and evaluate existing initiatives that provide health information and content to meet the needs of low-income, underserved, underinsured, and low health-literacy populations.

Improve the Capacity to Provide E-Health

Many rural and underserved communities lack access to specialty care, which necessitates lengthy travel for patients and/or providers. To optimize the benefit of an e-health network, an adequate number and diversity of providers must support the possible healthcare services and education enabled by telehealth. To ensure a pool of providers, California must (1) work with the providers of Continuing Medical Education to increase telehealth training opportunities throughout the state, (2) conduct outreach to professional medical associations to accelerate their participation in the e-health network, (3) connect providers throughout the state with those who want to access the providers' medical services, and (4) encourage payers to study new reimbursement models that incentivize innovative delivery of telehealth services.

Recommendation #5: Create a Statewide E-Health Network

- **Implement a shared vision, strategic plan, and sustainable business model for the network.**
  - Establish an accountable entity within state government to coordinate activities across state agencies
  - Convene a public-private advisory board composed of major stakeholder representatives

- **Ensure sustainability for the e-health network**

- **Increase the availability and use of e-health applications**

- **Remove barriers for appropriate reimbursement by health plans**

- **Improve the capacity to provide e-health**
  - Increase telehealth training opportunities
  - Conduct outreach to professional medical associations to accelerate participation in the e-health network
  - Connect providers throughout the state with those who want to access medical services

Leverage Educational Opportunities to Increase Broadband Use

Technology in general, and in particular broadband, is "an enabling force behind globalization, knowledge work, and entrepreneurship, and thus students must understand the role it plays in transforming political, social, cultural, civic, and economic systems around the world."[61] While technology alone will not enable students to learn these lessons, broadband technologies can play a major role in supporting efforts to enhance teaching and learning. Key efforts that must be addressed in order to realize the benefits that broadband networks and technology resources can provide include the following:

Connecting Unconnected Schools: Although some areas of California still lack access to broadband services, the state is fortunate to have the most robust K-20 research and education network infrastructure of any state in the nation. The network was built and is maintained by the Corporation for Education Network Initiatives in California (CENIC). Participation by K-12 in the network is facilitated by the California K-12 High Speed Network (K12HSN) program, and the Imperial County Office of Education serves as the lead agency under the auspices of the California Department of Education. The K-20 network, known as the California Research and Education Network (CalREN), serves the state's public and private institutions of higher education and the vast majority of the K-12 education community. These entities connect to each other and to educators across the United States via similar research and education networks in other states.

The work to date provides an excellent foundation for accelerating broadband deployment and usage within the K-20 community. However, an estimated 14 percent of school district offices and 22 percent of schools (representing 1.2 million of California's 6.3 million K-12 students) are not yet connected to the K-20 network. To fully leverage the benefits of the K12HSN, it is critical to identify and seek solutions for schools and district offices that remain unconnected because

of either availability or cost. The CBTF recommends that the K12HSN and CENIC continue their efforts to engage rural communications companies in the development of connectivity solutions. For example, of the non-connected districts, 44 have a relatively small number of students, and it will cost between approximately $3 and $5 million to connect each district.

Additionally, the governor's office, the California Public Utilities Commission, the California Department of Education, and other stakeholders should work together to advocate a simplification of the rules and claims process for the federal E-Rate program, in particular a simplified application for districts with telecommunications costs of $20,000 or less. Small schools do not typically possess the expertise necessary to complete the required paperwork and/or would not obtain enough funding to warrant the time and energy associated with the E-Rate application. The E-Rate program is administered through the Schools and Libraries Division of the Universal Service Administrative Company, a not-for-profit corporation appointed by the Federal Communications Commission, and provides affordable access to telecommunications services for all eligible schools and libraries in the United States. Funded at up to $2.25 billion annually, the E-Rate Program gives discounts on telecommunications services, Internet access, and internal connections.

As an interim measure, either (1) the California Public Utilities Commission should fund an entity that would provide support to small school and library districts that need assistance completing their applications; or (2) the state can provide incentives to larger districts to provide assistance to small school districts located in the surrounding region.

Enable a Technology Support System for Broadband in Schools: Broadband access alone is not enough to ensure students will succeed in tomorrow's economy. Students must

have access to computers capable of utilizing the bandwidth as well as instructors and administrators who know how to use and integrate technology tools into instruction. Each year, *Education Week* publishes an annual report known as "Technology Counts," which compares states' efforts in this regard for K-12 schools. The review primarily focuses on policy considerations. In the most recent report, California received an overall score of C- compared to a C+ average for the fifty states.[62] The 2006 results were as follows:

Indicator	California	Average State
Access to technology (computers)	D-	C
Use of technology (technology standards, and access to online assessments and online classes)	D+	C+
Capacity to use technology (teacher & administrator requirements)	B-	C
Overall grade	C-	C+

A recent publication by the Center for Literacy and Inquiry in Networking Communities at the University of California, Santa Barbara, based on their research involving videoconferencing activities with K-12 schools, suggests that teachers do not have support for or access to innovative approaches to applying broadband-based technologies and resources as part of their teaching methods. Such approaches require new configurations of support personnel and professional learning opportunities to enable successful use of broadband (e.g., videoconferencing, podcasting, among other new technologies). They also note that local schools do not have the resources to invest in connectivity, equipment, and personnel required for broadband or wireless use. Their publication cites a lack of technological support and equipment (such as videoconferencing equipment, ways of penetrating firewalls, etc.), a lack of professional development

opportunities, and outdated models for distance learning as factors that contribute to the complexity of K-20 collaborative efforts to develop innovative teaching/learning methods.[63] Together, the reports indicate that the existing support for teachers, faculty, students, and parents is insufficient. Similar challenges plague informal educators at community institutions like libraries and community technology programs. If these issues are not addressed, the full value of the network infrastructure as a tool to enhance teaching and learning may never be realized.

To resolve this issue, California should evaluate the bandwidth, technology and support needs of teachers, faculty, students, and parents as they relate to the educational needs of California's K-20 community. For example, the current minimum speed that a school must have in order to be deemed connected within the context of the K12HSN is 1.5 Mbps. As education-related applications require increasing amounts of bandwidth, the state should raise this speed periodically to reflect the evolving needs of educational institutions. Understanding the needs of the educational community, and developing benchmarks to gauge success, will allow stakeholders to develop a comprehensive approach to a new educational technology support system. A portion of this work is already underway through collaboration between the California Education Technology Consortium, located within the California Community Colleges, and the K12HSN.

Once this process is complete, it is vital to ensure that the technology training opportunities for teachers, faculty, students and parents are sufficient. Doing so will ensure that California's students finish school with the technology skills required to be successful in the workforce. Additionally, support should be considered for higher-education institutions to develop wireless broadband solutions for students and faculty living in communities where access is either unavailable or costs are prohibitive, given the level of poverty.

Creating Curricula Relevant to the Educational Needs of the Students: The state should adopt an aggressive plan to create and disseminate technology-enabled curricula relevant to the educational needs of students. In

particular, the curricula should emphasize the skills that are needed to ensure youth are prepared for jobs in California's world-class industries. Funds should additionally be competitively awarded to teams of K-20 experts to document, improve, and scale "best in class" online teaching and/or professional development efforts. These groups must consist of experts who can comprehensively represent efforts underway in formal and informal institutions. Additionally, curricula should be created using internationally recognized grade-level standards like those developed by, for example, the International Society for Technology in Education (ISTE). These efforts should be undertaken as a part of a larger vision to ensure that all youth are digitally literate and graduate California's schools proficient in 21st century skills.

Encourage partnerships between on- and off-campus educators: Approximately 30 percent of K-12 students' time during the school year is spent at school. Out-of-school time can be used to provide students with access to innovative learning opportunities enabled by technology, as well as access to programs that teach students how to use technology. In many instances, the providers of educational opportunities in informal education settings like YMCAs, Boys and Girls Clubs, libraries, and community centers have little communication with students' teachers. Strengthening ties between schools and communities through the use of technology would create a comprehensive learning environment for California's students. Additionally, as Prop 49 (The After School Education and Safety Program Act) funding dramatically increases the number of after school programs in California, it is critical to develop high-quality programs. Technology literacy should be developed in all programs, and technology assistance and curriculum development supported through the Prop 49 effort.

To encourage programs that enhance access for students by allowing participation from community sites either via videoconferencing or Web-based collaboration tools, the state should revise grant rules, funding formulas, and scoring criteria. Concerted efforts should also be made to develop partnerships with community institutions that specialize in providing technology access and transition services to students with disabilities and foster youth.

Recommendation #6: Leverage Educational Opportunities to Increase Broadband Use

- Connect schools that are unconnected to the K12 High-Speed Network
- Provide assistance to small school and library districts in completing applications for E-rate funds
- Evaluate the bandwidth, technology, and support needs of educational stakeholders to create a support system
- Consider wireless broadband solutions for students and faculty living in limited-access communities
- Create and disseminate technology-enabled curricula to the education community
- Develop technology literacy programs in Prop 49 supported programs
- Support policies to ensure that all youth graduate schools proficient in 21st century skills
- Foster partnerships with community institutions that provide technology access and transition services to students with disabilities and foster youth
- Revise grant rules to encourage participation in educational events from remote sites

Continue State-Level and Statewide Leadership

Continued leadership is required to implement the preceding recommendations and ensure that California's broadband availability and use lead the world, making it the premier location to innovate, thrive, learn, work, and create. Just as rural electrification programs brought electricity to a nation, the CBTF's recommendations will foster a digitally included California where all communities and businesses, large and small, are poised to leverage broadband's economic, educational, environmental, healthcare, public safety, accountable governance, and smart planning benefits.

State Leadership: To continue the momentum created over the last year, the governor should continue the California Broadband Initiative within state government and periodically convene the California Broadband Task Force. The CBTF should monitor and provide feedback on both the recommendations contained in this report and other broadband initiatives underway in the state. It is imperative that the governor and the leaders of the legislature prioritize broadband for the social and economic well-being of the state.

Community Broadband Leadership Councils: It is vital to spur local leadership that increases demand for broadband in unserved and undeserved communities. Currently no organized forum exists for these communities to develop a business case for broadband; however, a statewide-public-private partnership could create this mechanism and facilitate both the creation of Community Broadband Leadership Councils (CBLCs) and the sharing of information across CBLCs. Individual CBLCs located in unserved and under-served communities and comprised of local residents who are passionate about broadband can articulate that the level of demand is substantial enough to warrant investment by providers and develop the business case for broadband deployment. CBLCs can identify potential anchor tenants, critical infrastructure, state or local infrastructure, partnerships with surrounding communities, and residents and businesses who will commit to purchasing broadband. The CBLC model will be strengthened if representatives from

each Council meet regularly, under the auspices of a formal network, to share best practices and strengthen one another's work. In fact, a similar model, pioneered in Kentucky, has a proven track record of success.[64]

A typical CBLC, staffed by passionate, committed local champions will publish a business case for the local community and a set of lessons learned that other communities may use to develop financial models supporting broadband deployment. Examples of CBLC activities include: convening public discussions to assess infrastructure needs and explore broadband opportunities; holding farm demonstration projects for on-farm voice, data and telemetry applications; and developing presentations that examining water-management systems, on-farm mesh networks, and community public safety projects.

- **Continue the California Broadband Initiative within state government**
- **Periodically convene the California Broadband Task Force**
- **Support a public-private partnership to create Community Broadband Leadership Councils to increase demand in unserved and underserved communities**

Conclusion

Broadband is California's future, underpinning the state's economic, social, and educational systems. No aspect of our lives has been untouched by the new applications and efficiencies provided through broadband infrastructure. Over the past decade, Californians and California companies have led the broadband revolution, providing technologies and applications that have fundamentally changed the way the world communicates, transacts, and learns. It is not an exaggeration to state that without California, the world would not have the broadband economy that it has today.

Yet California is at a crossroads. Despite leadership in developing world-class broadband technologies, California's broadband infrastructure is not world-class. Only parts of the state have access to the fastest new broadband access services. Some Californians have to contend with slower broadband access—or none at all. The state's broadband adoption rates, while high compared to other states in the nation, are lower by international standards and falling relatively. The question

infrastructure. Achieving these goals will not be easy and will require the combined efforts of state and local government, academia, industry, and the non-profit sector.

The Task Force has laid out in detail seven actions that will lead to a world-class broadband experience in California:

- Build out high-speed broadband infrastructure to all Californians
- Develop model permitting standards and encourage collaboration among providers
- Increase the use and adoption of broadband and computer technology
- Engage and reward broadband innovation and research
- Create a statewide e-health network
- Leverage educational opportunities to increase broadband use
- Continue state-level and statewide leadership

facing California is whether it should take action to deploy broadband infrastructure, applications, and services that are as good as or better than any other on the face of the earth.

The members of this Task Force believe that the answer to this question is a resounding "Yes!" This Task Force believes that California must make available ubiquitous and affordable broadband infrastructure, create and adopt broadband applications that produce economic, educational, and social benefits, and continually deploy the best-generation broadband

The Task Force believes that this program must be acted on expeditiously and urges the governor and the legislature to implement the recommendations. Under the leadership of the state government, both the public and the private sectors have important roles in this quest to make California the best in the world in broadband. The members of this Task Force remain available to assist in any way possible.

Endnotes

[1] See: http://www.ruralhealth.ca.gov/

[2] "Just the Facts: Poverty in California," Public Policy Institute of California, (November 2006) at: http://www.ppic.org/content/pubs/jtf/JTF_PovertyJTF.pdf.

[3] Starr, Kevin, "California: A History," Random House, Modern Library Chronicles, (2005): xx.

[4] Baker, Betty, "California's Tech Exports Total $52 Billion in 2006," AeA, (17 July 2007) at http://www.aeanet.org/pressroom/prac_TCS_2007_california_sv.asp

[5] Robert W. Crandall and Charles. L. Jackson, "The $500 Billion Opportunity: The Potential Economic Benefit of Widespread Diffusion of Broadband Internet Access," Criterion Economics, L.L.C.,(July 2001).

[6] Pociask, S., "Building a Nationwide Broadband Network: Speeding Job Growth," White Paper for New Millenium Research Council, TeleNomic Research, (2002) at http://www.newmillenniumresearch.org/event-02-25-2002/jobspaper.pdf.

[7] Crandall, Robert, William Lehr and Robert Litan, "The Effects of Broadband Deployment on Output and Employment: A Cross-Sectional Analysis of U.S. Data," Issues in Economic Policy, (July 2007), at http://www3.brookings.edu/views/papers/crandall/200706litan.pdf.

[8] Sharon E. Gillet et al., "Measuring Broadband's Economic Impact," Prepared for the U.S. Department of Commerce, Economic Development Administration, (February 2006): 3-4 at http://www.eda.gov/PDF/MITCMUBBImpactReport.pdf.

[9] "Call Centers in the Rec Room," Business Week, (23 Jan 2006) at http://www.businessweek.com/magazine/content/06_04/b3968103.htm.

[10] "Helping our Children With Disabilities Succeed: What's Broadband Got To Do With It?" The Children's Partnership, Digital Opportunity for Youth Issue Brief: Number 2: (July 2007): 8.

[11] Id at 1.

[12] Fuhr, Joseph, P. Jr. and Stephen B. Pociask, "Broadband Services: Economic and Environmental Benefits," American Consumer Institute (31 Oct 2007): 8.

[13] "Cyberinfrastructure Vision for 21st Century Discovery," National Science Foundation, (March 2007): 4 at http://www.nsf.gov/od/oci/CI_Vision_March07.pdf.

[14] Consumer Electronics Association, "National Study Finds Electronics Significantly Reduce Energy," Consumer Electronics Association, (19 September 2007). at http://www.ce.org/Press/CurrentNews/press_release_detail.asp?id=11350. Note that telecommuters have commutes to work that are almost twice as long as those of typical automobile-based commuters.

[15] "Study Shows Telecommuting Requires Significant Participation If It Is to Have Big Environmental Impact," Resources for the Future, (11 March 2005), http://www.rff.org/rff/News/Releases/2005Releases/Study-Shows-Telecommuting-Requires-Significant-Participation-If-It-Is-to-Have-Big-Environmental-Impact.cfm.

[16] Consumer Electronics Association, "National Study Finds Electronics Significantly Reduce Energy," Consumer Electronics Association, (19 September 2007). at http://www.ce.org/Press/CurrentNews/press_release_detail.asp?id=11350.

[17] Fuhr, Joseph, P. Jr. and Stephen B. Pociask, "Broadband Services: Economic and Environmental Benefits," American Consumer Institute (31 Oct 2007): 1.

[18] Jon M. Peha, "A Secondary Broadband Provider for Public Safety," (19 Jul 2007): 3 at www.ece.cmu.edu/~peha/Secondary_Broadband_Provider_for_Public_Safety.pdf.

[19] "Deploying Ubiquitous Broadband in Rural California to Enhance Economic Development, Education and Healthcare: A Strategy to Develop a a Statewide eHealth Network," California Telemedicine and eHealth Center, (September 2005) at http://www.ctectonline.org/documents/broadband_report.pdf.

[20] James P. Marcin, et al., "Using Telemedicine to Provide Pediatric Subspeciality Care to Children With Special Health Care Needs in an Underserved Rural Community," Pediatrics, Vol. 113, No1 (2004): 1-6 (As cited in The Children's Partnership's, "Meeting the Health Care Needs of California's Children: The Role of Telemedicine.")

[21] "Health Information Technology: Can HIT Lower Costs and Improve Quality," Rand Health, (2005).

Endnotes

22 "Meeting the Health Care Needs of California's Children: The Role of Telemedicine," The Children's Partnership, (2007): 9.

23 Smith, Rebecca, "New Ways to Monitor Your Energy Use," The Wall Street Journal Online, (19 June 2007), http://online.wsj.com/article_print/SB118221899305839988.html.

24 See: http://www.calchannel.com/ for more information.

25 See OECD broadband adoption data from 2001-June 2007. Available at http://www.oecd.org/sti/ict/broadband.

26 "OECD Broadband Statistics (to December 2006)," Organisation for Economic Co-operation and Development, (December 2006) at http://www.oecd.org/sti/ict/broadband and staff calculations from historical Federal Communications Commission (up to 12/31/06) at http://www.fcc.gov/wcb/iatd/comp.html. In order to standardize data to the greatest extent possible, June 2007 OECD data was not included since the latest available FCC data was from December 2006.

27 "Average broadband monthly price per advertised Mbit/s, by country, USD PPP" Organisation for Economic Development (October 2007) at http://www.oecd.org/sti/ict/broadband.

28 "Average advertised download speeds, by country" Organisation for Economic Development (October 2007) at http://www.oecd.org/sti/ict/broadband.

29 Harden, Blaine, "Japan's Warp-Speed Ride to the Internet Future," Washington Post, (29 August 2007): A1, http://www.washingtonpost.com/wp-dyn/content/article/2007/08/28/AR2007082801990.html.

30 Kolko, Jed, "Broadband for All? Gaps in California's Broadband Adoption and Availability," Public Policy Institute of California, (July 2007): 12.

31 Yolanda Edwards paraphrasing Anthony Wilhelm in: Yolanda D Edwards. "Looking Beyond the Digital Divide: Review of "Looking Beyond the Digital Divide". Federal Communications Law Journal 57, 5 (May 2005): 590.

32 Horrigan, John, B. and Aaron Smith, "Home Broadband Adoption 2007," Pew Internet & American Life Project, (3 July 2007): 3 at http://www.pewinternet.org/PPF/r/217/report_display.asp.

33 Id.

34 "Fact Sheet: United States Maintains Information and communication Technology (ICT) Leadership and Economic Strength," National Telecommunications and Infrastructure Administration, (24 April 2007) at http://www.ntia.doc.gov/ntiahome/press/2007/ICTleader_042407.html.

35 See OECD adoption data, available at: http://www.oecd.org/sti/ict/broadband.

36 "Just the Facts: Poverty in California," Public Policy Institute of California, (November 2006) at: http://www.ppic.org/content/pubs/jtf/JTF_PovertyJTF.pdf.

37 See October 2007 FCC wireline competition data: http://www.fcc.gov/wcb/iatd/comp.html.

38 "OECD Broadband Statistics to December 2006," Organisation for Economic Co-operation and Development, (December 2006) at http://www.oecd.org/sti/ict/broadband and staff calculations from historical Federal Communications Commission (up to 12/31/06) at http://www.fcc.gov/wcb/iatd/comp.html. In order to standardize data to the greatest extent possible, June 2007 OECD data was not included since the latest available FCC data was from December 2006.

39 "Broadband Deployment Is Extensive throughout the United States, but It Is Difficult to Assess the Extent of Deployment Gaps in Rural Areas," United States General Accountability Office, (5 may 2006): 30 at: http://www.gao.gov/new.items/d06426.pdf.

40 Horrigan, John, b. and Aaron Smith, "Home Broadband Adoption 2007," Pew Internet & American Life Project, (3 July 2007): 4 at http://www.pewinternet.org/PPF/r/217/report_display.asp.

41 "Broadband Deployment Is Extensive throughout the United States, but It Is Difficult to Assess the Extent of Deployment Gaps in Rural Areas," United States General Accountability Office, (5 may 2006): 30 at: http://www.gao.gov/docssearch/repandtest.html.

42 "Just the Facts: Poverty in California," Public Policy Institute of California, (November 2006) at: http://www.ppic.org/content/pubs/jtf/JTF_PovertyJTF.pdf.

Endnotes

[43] Id.

[44] Kolko, Jed, "Broadband for All? Gaps in California's Broadband Adoption and Availability," Public Policy Institute of California (July 2007): 13.

[45] "Internet & Broadband Use in Kentucky: Statewide Results from the 2005 ConnectKentucky Technology Assessment," Connect Kentucky, (2005). See also: Jennifer Cheeseman, Alex Janus, & Jessica Davis, "Computer and Internet Use in the United States: 2003," US Census Bureau, (Oct. 2005): 3 at: http://www.census.gov/population/www/socdemo/computer.html.

[46] Jennifer Cheeseman, Alex Janus, & Jessica Davis, "Computer and Internet Use in the United States: 2003," US Census Bureau, (Oct. 2005): 11 available at: http://www.census.gov/population/www/socdemo/computer.html.

[47] Kolko, Jed, "Broadband for All? Gaps in California's Broadband Adoption and Availability," Public Policy Institute of California, (July 2007): 13.

[48] "High-Speed Internet Subscribers are Less Loyal to Their Providers Than are Dial-Up Subscribers, Depsite Steady Growth in high-Speed Internet Market Share," J.D. Power and Associates, (19 September 2007): 1 at http://www.jdpower.com/corporate/news/releases/pdf/2007210.pdf.

[49] "Range of broadband prices for a monthly subscription (October 2007), Organisation for Economic Development at http://www.oecd.org/sti/ict/broadband.

[50] Center for Economic Development and California State University, Chico Research Foundation, "Siskiyou County 2007 Economic and Demographic Profile," Northeastern California Small Business Development Center (2006).

[51] "U.S. Census Bureau: State and County Quick Facts, Alpine County" US Census Bureau at http://quickfacts.census.gov/qfd/states/06/06003.html. Accessed: 18 November 2007.

[52] Center for Economic Development and California State University, Chico Research Foundation, "Del Norte County 2007 Economic and Demographic Profile," Northeastern California Small Business Development Center, (2007).

[53] Robert Crandall, Robert Hahn, Robert Litan, Scott Wallsten, "Bandwidth for the People," Policy Review, (127) (2004): 69.

[54] Cal. Pub. Util. Code § 709(c).

[55] State-owned real property "excludes property owned or managed by the Department of Transportation and property subject to Section 7901 of the Public Utilities Code." Cal. Govt. Code § 14666.8(a).

[56] Id. at § 14666.8(c).

[57] Lynch, Jim, "Islands in the Wastestream: Baseline Study of Noncommercial Computer Reuse in the United States," CompuMentor (2004): 7 at http://www.compumentor.org/recycle/RRreport.pdf.

[58] Choudrie, Jyoti and Yogesh K Dwivedi, "Investigating Factors Influencing Adoption of Broadband in the Household," The Journal of Computer Information Systems, 46(4), (2006): 25-34.

[59] Id.

[60] Marinucci, Carla, "Governor Sets Pace for Politics on the Net," San Francisco Chronicle, (14 January, 2007), at http://www.sfgate.com/cgi-bin/article.cgi?file=/c/a/2007/01/14/MNGBHNIHQO1.DTL.

[61] Fadel, Charles and Cheryl Lemke, "Technology in Schools, What the Research Says." Cisco and Metiri Group (2006): 3.

[62] "Technology Counts 2007: A digital decade.:" (29 Mar 2007). Editorial Projects in Education Research Center, Education Week. (17 Oct 2007) at http://www.edweek.org/ew/toc/2007/03/29/index.html.

[63] Ho, H., Yeager B., Green J., Dixon C., Tomlinson H., "Archeology of a Virtual Tour: Uncovering the Layers of Student Engagement with Complex Issues of Race in Digital Space." Screening Noire (in Press).

[64] For more information, see: http://www.connectkentucky.org.

Acknowledgements:

Working Groups

Build-Out

Chair
Russ Gyurek
Cisco

Members
Michael Byrne
State of California, Office of Statewide Health Planning and Development

Jeff Luong
AT&T

Milo Medin
M2Z Networks

Tina Nerat
Humboldt State University

Esther Northrup
Cox Communications

Davis Park
Little Tokyo Service Center

Brian Roberts
City and County of San Francisco

Community Development

Chair
Laura Efurd
Community Technology Foundation

Members
Gwyneth J. Borden
IBM Corporation

April KirkHart
The Children's Partnership

Elva Lima
Verizon

Julia Lave Johnson
State of California, Office of Planning and Research

Ana Montes
Latino Issues Forum

Kathleen KG Ouye
Professional Librarian
Ouye-Mingram Consulting Partners

Karen Wade
FSS Project T.E.C.H.

Micheline Wilcoxen
Community Technology Organizing Consortium

Nick Young
Intel

Economic Development

Chair
Jim Kirkland
Spinvox Ltd.

Members
Joaquín Alvarado
Institute for Next Generation Internet (SFSU)

Ellis Berns
City of Mountain View

Supervisor David Finigan
Del Norte County

Steve Monaghan
Nevada County

Peter Pardee
Hughes Network Systems

Jose R. Rodriguez
El Concilio

Education

Chair
Stephanie Couch
Corporation for Education Network Initiatives in California

Members
Bob Campbell
AT&T

Robert Gravina
Poway Unified School District

Ken Ikeda
Bay Area Video Coalition

Arlene Krebs
Wireless Education & Technology Center at CSU Monterey Bay

Emerging Technology & New Applications

Chair
Bryan Martin
8x8, Inc.

Members
Joaquín Alvarado
Institute for Next Generation Internet (SFSU)

Dennis McSweeney
Sprint Nextel

Milo Medin
M2Z Networks

Bill Reed
Sempra Energy

Larry Smarr
Calit2 (UCSD)

Prof. Jonathan Taplin
Annenberg School for Communication (USC)

Steve Wright
Salesforce.com Foundation

Healthcare

Chair
Jeff Newman
State of California, Business, Transportation & Housing Agency

Members
Ed Babakanian
UCSD Healthcare

Ellen Badley
State of California, Department of Managed Health Care

Commissioner Rachelle Chong
California Public Utilities Commission

Diana Dooley
California Children's Hospital Association

Denice Helwig
Humboldt State University

Barbara Johnston
California Medical Board

Christine Schmoeckel
California Health and Human Services Agency

Margaret Laws
California Health Care Foundation

Cathryn Nation
University of California

Peter Pardee
Hughes Network Systems

Tom Riley
Cal Capital Group

Terri Shaw
The Children's Partnership

Peter Yellowlees, M.D.
UC Davis Information and Educational Technology

Judi Manis
AT&T

California Broadband Initiative
www.calink.ca.gov