December 3, 2019

The Honorable Martha Guzman Aceves
Commissioner
California Public Utilities Commission
505 Van Ness Ave., San Francisco

Re: Summary of fiber policy convening at the Electronic Frontier Foundation

Dear Commissioner Guzman:

The Electronic Frontier Foundation (EFF) is the leading nonprofit organization defending civil liberties in the digital world. Founded in 1990, EFF champions user privacy, free expression, competition, and innovation. With over 30,000 dues-paying members and well over 1 million followers on social networks, we focus on promoting policies that benefit both creators and users of technology. We submit the following summary report of the convening on fiber policy EFF hosted with relevant stakeholders across the state of California in order to inform relevant state officials of the potential and opportunity for universal fiber deployment in California.

EFF believes it is critical that policymakers begin the process of transitioning broadband infrastructure into a ubiquitous fiber to all network. EFF's research has found that fiber as a medium to transmit data is superior to all the alternatives in wireless and coaxial cable due to its extremely high potential capacity and exceptionally low latency. EFF estimates that fiber has orders of magnitude more data capacity than the alternatives. Given the unique and extraordinary benefits dense fiber networks providers for 21st century communications, EFF requested a variety of policy experts to share their expertise with the state of California in hopes of educating the government on ways it can advance high-speed broadband access to all Californians.

Joining EFF in providing their findings from research and field experience were Greenlining Institute, Institute for Local Self-Reliance, Magellan Advisors, SiFi Networks, Praxis Associates/Inyo Networks, Monkeybrains, Common Networks, Crown Castle, and Diffraction Analysis. Each organization, company, and expert analyst provided their insights in the challenges and opportunities as private operators, municipal broadband experts, and advocates for communities that traditionally have lacked access. The challenge California faces to achieve universal fiber access to the Internet is significant, but it is the only means to ensure California will keep pace with our international competitors in the EU, South Korea, Japan, and China.

Please find below a summary of the presentations with recommendations for policy. Additional materials, including slides presented, are attached as appendices.

Electronic Frontier Foundation (EFF) Summary - (Slides on Appendix A)

Representing the EFF was its Senior Legislative Counsel, Ernesto Falcon, and its Staff Technologist, Bennett Cyphers.

The EFF supports California adopted a universal fiber plan with clear metrics and goals set towards achieving universality. EFF's own internal technical research[1] has found that fiber as a data transmission medium has orders of magnitude more data capacity than any alternative wireless or cable broadband options. Moreover, it has exceptionally low latency now, which is key to enabling the next generation of real-time internet applications. As a result, government policy should be exclusively focused on expanding the reach of fiber networks with the express goal of connecting all people. No other transmission medium is even coming close to what fiber can and will be able to do in the future.

EFF also highlighted the past failures of telecom policy—namely in the areas of universality and competition—where federal and California state government data indicate most people have one or no choice for gigabit services, that fiber to the home is nearly non-existent, and that the upper half of the median income scale have been the primary recipients of broadband competition. Rural markets and low income neighborhoods have been ignored by incumbents, which makes it a priority for policymakers to ask how to bring alternatives to those unserved and underserved markets given the intentional neglect by incumbents.

Recommendations: EFF wants the state government to adopt a universal fiber plan in order to keep pace with China, the EU, South Korea, and Japan. EFF believes any government investment in broadband infrastructure must be in fiber networks given the technical superiority of fiber over all other alternatives. Policy focused on building out fiber should engage both private and public models that have been proven to be successful across the nation and the world in order to achieve universal, affordable, and competitive networks.

[1] Bennett Cyphers, *The Case for Fiber to the Home, Today: Why Fiber is a Superior Medium for 21st Century Broadband*, Deeplinks Blog (Oct. 16, 2019), https://www.eff.org/wp/case-fiber-home-today-why-fiber-superior-medium-21st-century-broadband.

Greenlining Institute Summary - (Slides on Appendix B)

The Greenlining Institute was represented by its Technology Equity Director Paul Goodman

Founded in 1993, the Greenlining Institute performs policy analysis and research on issues involving racial and economic justice. Mr. Goodman's research has focused on broadband access. He presented to the group data demonstrating the lack of equity in broadband deployment

in today's market. Greenlining has studied extensively the deployment of ISPs and compared that data with other proxies for racial discrmination in housing, financial redlining, pollution, and found near identical overlaps with where broadband is deployed. In other words, the same racially discriminatory patterns that exist in the economic and health sectors also exist for broadband access in the state of California.

Recommandations: Greenlining supports a universal and affordable broadband access policy that seeks to rectify the racial inequality that persists in broadband markets today.

Institute for Local Self-Reliance Summary (Full presentation on Appendix C)

The Institute for Local Self-Reliance (ILSR) was represented by its Senior Researcher, Communication Broadband Networks Initiative, Lisa Gonzalez.

ILSR supports local community ownership that fosters creation of high-quality, locally accountable broadband networks. ILSR has identified more than 500 communities[2] across the country served by publicly owned broadband networks. Every year, there are more and more examples of local ownership. Examples the ILSR highlighted included Wilson, North Carolina, where the municipal electric utility invested in fiber more than a decade ago and still benefit from the infrastructure with low cost high-speed Internet, improved electric service, and economic development.

ILSR noted that communities served by publicly owned broadband appreciate the local control, affordability, and accountability that accompany these networks. In recent years, a string of Colorado elections have allowed communities to reclaim local telecommunications authority. Voters have expressed the desire to regain the ability to invest in these publicly owned networks to expand competition, especially in communities where large incumbent cable and DSL Internet

[2] Institute for Local Self-Reliance, *Community Network Map*, *available at* https://muninetworks.org/communitymap.

providers overcharge for poor services. Around 145 counties and municipalities in Colorado have reclaimed the right to invest in their telecommunications infrastructure.

Publicly owned fiber optic networks are also allowing local communities to shrink the digital divide[3] in their cities, towns, and counties. In Wilson, the Greenlight Community Broadband

Network developed a program to provide 50 Mbps symmetrical Internet access to public housing units for $10 per month. They also developed a "pay ahead" option to help local residents who may have difficulty obtaining service from incumbents due to poor credit history. In addition to getting them online, the service helps these residents restore their credit history.

Recommendations: ILSR supports the state empowering its local governments to build their own broadband networks. Government policy should be focused on building fiber infrastructure and many local and small communities have proven they can build their own fiber to the home networks and that such projects are financially feasible. State funding should be robust and should always allow (and encourage) municipalities, local governments, and tribal governments to be eligible. The concept of "overbuilding" should be redefined as a positive method of encouraging competition, rather than a waste of resources. The state should promote local communities to expand fiber infrastructure deployment as a way to expand high-quality Internet access, 5G technology, smart city applications, and future innovations.

Magellan Advisors Summary - (Slides on Appendix D)

Magellan Advisors was represented by its Vice President of Digital Innovation, Jory Wolf.

Magellan consults with public and private organizations on their broadband and telecommunications planning efforts with an emphasis on creating smart gigabit cities. The organization has partnered and consulted with dozens of cities[4] across California and emphasized that they possess a strong desire to build fiber networks. Strategic planning by local governments can yield solutions for many needs beyond broadband access. Areas such as transportation, parking, and economic development can be further enhanced by smart city planning. The utilization of strategic partnerships with private providers and regional cooperation among municipalities have yielded progress.

[3] Katie Kienbaum, *Municipal Fiber Networks Power Digital Inclusion Programs*, Institute for Local Self-Reliance (Oct. 10, 2019), *available at* https://muninetworks.org/content/municipal-fiber-networks-power-digital-inclusion-programs.

[4] See Appendix D page 2-3.

Recommendations: Magellan believes any successful universal fiber plan must rely on local governments as reliance on the private sector alone has not proven sufficient. State policy should encourage and empower local governments in their efforts to upgrade their local networks to fiber. Local ownership of critical infrastructure will promote competition, universality, and affordability.

SiFi Networks Summary - (Slides on Appendix E)

SiFi Networks was represented by its Chief Executive Officer, Ben Bawtree.

SiFi is in the process of building out an open access fiber network in Fullerton, California. When complete, it will be the largest open-access network in the country that ensures competition with the added benefit of being smart city ready. The network will be fully privately funded connecting over 55,000 homes and businesses and will also connect nearly 50 municipal facilities to support the local government's growing needs. SiFi asserts that network construction of this nature is more than broadband service, because it will improve the quality of life for local school districts, colleges, hospitals, and non-profit organizations that provide an infrastructure ready for the next generation.

Recommendations: Open access fiber networks can prevent the cherry picking that has occured with incumbent broadband providers that only serve the most lucrative segments of the community. SiFi recommends the government improve its permitting process to allow more rapid deployment of open access fiber networks. The state can extend the reach of open access fiber to unserved and underserved markets with financial support as low as 10% of the total cost.

Praxis Associates/Inyo Networks Summary (Slides on Appendix F)

Praxis Associates and Inyo Networks was presented by its Chief Executive Officer, Micharl Ort, Ph.D.

Mr. Ort noted that transformative infrastructure projects are the hallmark of major economic advancements. The economy of the future will be driven by Big Data, Cognitive Computing (artificial intelligence), Internet of Things (IoT), and the Cloud. Each of these will rely on the network infrastructure in place to provide the data transmission. Praxis Associates and Inyo Networks has built the infrastructure ready for these future developments and supports the state focusing policy on building it out to everyone. From their past projects, they have improved

regional broadband speeds, with their middle mile fiber network, several hundred times over previously available speeds.

Dense open access fiber networks can also be utilized for other critical services. For example, earthquake detection and analysis has been made possible by installing sensors along the fiber network able to detect disruptions underground.

Recommendations: The state should broaden funding for a more aggressive buildout and to update its California Advanced Services Fund with an emphasis on more middle mile fiber networks capable of handling high-speed transport far above what is currently eligible for funding. Middle mile, open access fiber networks allow for a network construction model that is based on cooperation among various players that need access to data and foster a robust ecosystem. Aggressive state efforts need to happen now as any major fiber project will take years before bearing fruit. Further, the state needs to more readily make transportation rights of way more accessible and streamline the permitting process.

Monkeybrains ISP Summary (Slides on Appendix G)

Monkeybrains was represented by its Director of Engineering, Policy Program, Preston Rhea.

Monkeybrains is a wireless and fiber ISP in the San Francisco region. They offer both point-to-point and point-to-multi-point wireless services as well as fiber to the premises services for homes and businesses. The ISP explained the major success story behind the city of San Francisco's Article 52 "Communications Choice" ordinance[5] that opened up apartment buildings to broadband competition. Prior to its passage, landlords and REITs decided what their tenants would receive for broadband service and regularly defaulted to a cable monopoly in exchange for cash payments from cable companies.[6] San Francisco ended the landlord-brokered monopolization of broadband for renters and competitive ISPs have been able to expand and provide choice throughout the city at a breakneck pace.

[5] San Francisco Police Code - Choice of Communications Services Providers in Multiple Occupancy Buildings. available at https://sfgov.legistar.com/LegislationDetail.aspx?ID=2863893&GUID=E010FDC6-4024-4BA7-B282-C0F9DE32D9F4.

[6] Preston Rhea, "RE: Improving Competitive Broadband Access to Multiple Tenant Environments, GN Docket No. 17-142; Petition for Preemption of Article 52 of the San Francisco Police Code Filed by the Multifamily Broadband Council, MB Docket No. 17-91, Draft Notice of Proposed Rulemaking and Declaratory Ruling, FCCCIRC 1907-04 (June 19, 2019)," https://ecfsapi.fcc.gov/file/107031073124557/Monkeybrains%20Article%2052%20Letter.pdf

Monkeybrains also stated that tax dollars funding construction of broadband networks must go towards high-speed networks powered by fiber. The state's metric of 6 Mbps is at best more than a decade behind the current standard technology. The city of San Francisco is currently undergoing an ambitious fiber to affordable housing project that will ensure that low-income residents are connected to future-proof fiber owned by the public.[7] The city's forward-thinking

dark fiber construction work, including wiring standards for renovations and new construction, ensure broadband is deployed equitably and with cost effectiveness in mind.[8] To that end, Monkeybrains supports the state converting PG&E into a public utility for purposes of facilitating the deployment of publicly-owned fiber on a statewide universal basis. Public takeover of the power grid would eliminate the largest barrier to affordable fiber deployment in California - the cost of deployment over private pole and conduit ownership by PG&E and other monopolies.[9]

Recommendations: Monkeybrains recommends that the state adopt the San Francisco Article 52 ordinance as state law, and add a ban on landlord-ISP revenue sharing arrangements. The state should also ensure that any new housing built has an open fiber connection at the start to ensure cost-effective digital equity. Lastly, Monkeybrains supports efforts to convert PG&E into a public utility in order to dramatically bring down the cost of deploying public fiber.

Common Networks ISP (Slides on Appendix H)

Common Networks was represented by its Senior Director of New Markets & Growth Initiatives, Heba Gamal.

Common Networks is a wireless ISP that serves customers throughout the Bay Area in Alameda, San Leandro, San Jose, Santa Clara and Sunnyvale with high-speed wireless services. Common noted that Internet access is a necessity for people, where 7 in 10 teachers assign homework that requires a broadband connection. Common has pioneered a new decentralized graph based

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[7] "San Francisco 'Fiber to Housing' Program Provides Internet for Low-Income Families." City and County of San Francisco's Mayor's Office of Housing and Community Development. 23 Aug. 2019 https://sfmohcd.org/article/san-francisco-fiber-housing-program-provides-internet-low-income-families Accessed 21 Nov. 2019.

[8] City and County of San Francisco. (2019). Digital Equity Strategic Plan 2019-2024. Retrieved from https://sfmohcd.org/sites/default/files/SF_Digital_Equity_Strategic_Plan_2019.pdf

[9] Preston Rhea. "Buying PG&E's Distribution Network Could Also Make Municipal Broadband Possible." San Francisco Examiner. 11 Sep. 2019 https://www.sfexaminer.com/opinion/buying-pgs-distribution-network-could-also-make-municipal-broadband-possible/ Accessed 21 Nov. 2019.

networking using wireless rooftop hardware in the unlicensed spectrum, while leveraging existing fiber networks for backhaul. Common's strategy requires minimal construction and is very fast to deploy allowing for true alternative to FTTH.

Recommendations:

- Over the Air Reception Device (OTARD) rules need to be modernized to enable the streamlined deployment of next-generation high-speed networks that wireless ISPs can

  deploy. Removing ambiguity and streamlining the permitting of wireless equipment at a state level would decrease market entry barriers and accelerate the time to be able to service new neighborhoods.
- Secondly, California should adopt a statewide policy to prohibit any exclusive marketing agreements as well as all revenue sharing agreements in Multi-Tenant Environments (MTE), which stifle and delay, if not eliminate, competition and deployment of broadband services.
- Lastly, Common Networks would support state efforts to promote affordable access to broadband and ensuring wireless ISPs have access to capacity will add competitive pressures on prices throughout the state.

Crown Castle (Slides on Appendix I)

Crown Castle was represented by its Vice President of Fiber, Engineering, & Operations, West Region, John Toccalino.

Crown Castle has more than 9,100 route miles of fiber in the state of California and serves the Bay Area, Central Valley, and the southern California region from Ventura down to the U.S. border with fiber networks. Crown Castle is focused on building fiber networks to service small cell tower deployments that are necessary for wireless services, including 5G.

In his presentation, Mr. Toccalino emphasized that the construction methods to deploy networks have been slow to innovate and, when they do innovate, they are difficult to implement. New advancements, such as micro-trenching, can change the economics, speed and community impact to network deployment. However, it is necessary to convince each local jurisdiction of the benefits of micro-trenching and the actual impact of the technique. The effort to prove the benefits jurisdiction by jurisdiction impedes the rapid deployment of this advancement despite the increasing history of proven success. For the Bay Area alone, Crown Castle would have to contend with 29 different jurisdictions to build a comprehensive dense fiber network.

This is an example of the effort to implement a project in most areas of the state. Every jurisdiction has its own permit process, utilities, and barriers to rapid deployment. In addition, the costs to deploy are often encumbered by ancillary requirements unrelated to the network build. We have experienced requirements to create ramps at all four corners of an intersection when we work in any area of the intersection. Although we appreciate the benefit of ramps, placing the onus to install ramps at every corner when our work does not disturb every corner feels like more than our fair share of the cost.

Recommendations:
State policies that reduce the time required for permitting and addresses the multiple jurisdictional barriers to deployment would create an environment for rapid deployment while reducing overhead costs. By reducing the time to prepare to deploy, the environment for conceiving and deploying broadband networks is greatly enhanced.

A means to successfully prove new innovations, such as micro-trenching, in one jurisdiction should be sufficient to satisfy all jurisdictions by a unified process. The state government has the opportunity and capability to coordinate across jurisdictions allowing for more efficient planning, reduced cost, improved speed to market, and significantly improving the state's ability to expand and build fiber optic networks.

Diffraction Analysis (Slides in Appendix J)

Diffraction Analysis was represented by its Chief Executive Officer, Benoit Felten.

Diffraction provides expert global analysis on business modeling, deployment strategies, commercial and marketing best-practices, policy, and economic opportunities for Online Service Providers as well as Network Operators. Mr. Felten noted that telecom markets have never organically developed into universal systems and that infrastructure competition does not happen naturally. Examples in Spain, Portugal, and Lithuania demonstrate how infrastructure policy involving polesharing and ducts yielded competition in broadband access. Notably, Spain has 98 percent coverage with fiber after implementing infrastructure policies.

Diffraction Analysis explained that the need for deep fiber backhaul for 5G small cell technology through 5G will blur the differences between wireline and wireless networks. It is doubtful that the fiber investment required for this second stage 5G deployment will be affordable by all market players, raising questions as to the viability of the current 3/4 player mobile competition

model. Challenging 5G networks is the fact that so far their deployments have not demonstrated a revenue upswing that would justify the investment.

These realities are forcing policy makers to recognize the role of regulation in promoting competition in advanced telecom markets. Notably, New Zealand is experimenting with structural separation policy to rationalize the market costs for difficult to serve areas. South Korea required their ISPs to share infrastructure on fiber to ensure quick ubiquitous deployment of 5G services.

Recommendations: Regulatory policy should take into account different markets that exist for telecom, namely dense urban, low-density urban, and low-density suburban or rural. Each can sustain different network approaches, for example, dense urban markets can be mostly unregulated, while lower density markets require greater government involvement in regulation to ensure healthy competitive markets. The value of a hybrid approach is that it is flexible for different market needs and recognizes different levels of intervention are needed to achieve universal deployment of fiber.

APPENDIX A

Electronic Frontier Foundation Slides

- Funded by more than 30,000 dues paying members (Annual financial report on website)

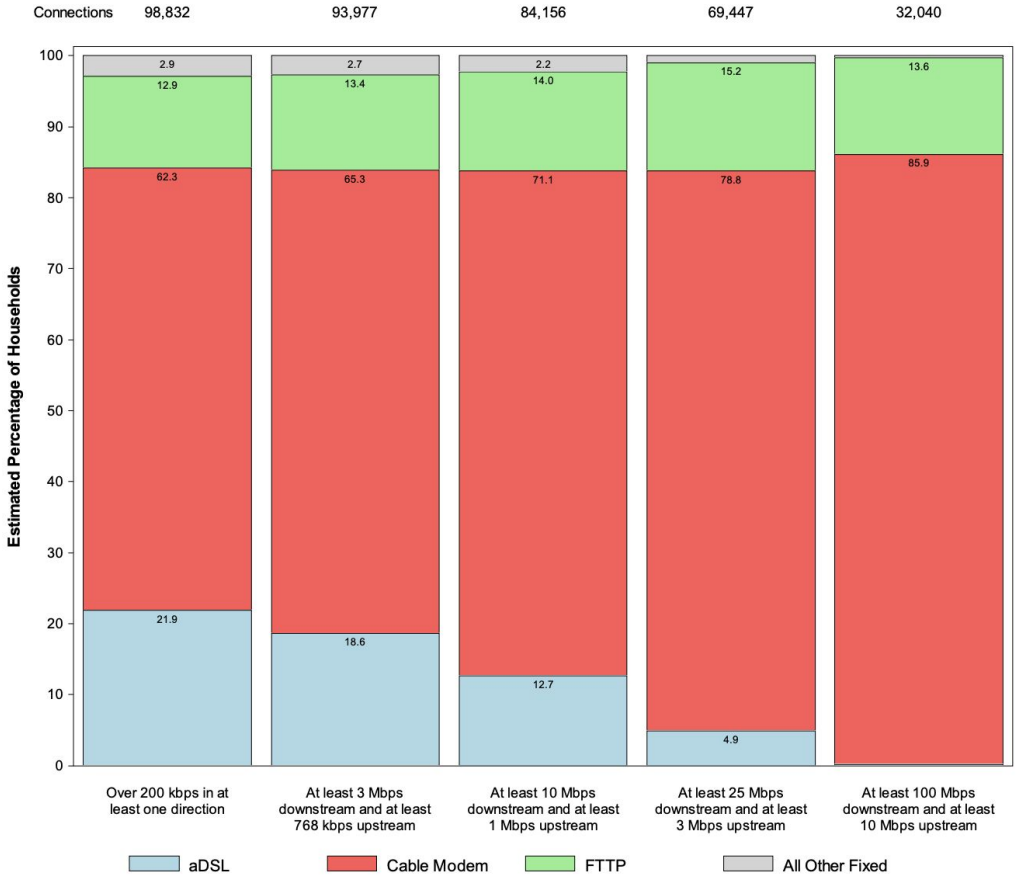
- Focused on connecting all Americans to fiber (research, advocacy, and public education)

- Supportive of public, private, and public/private efforts towards universal, affordable, competitive access to 21st century ready broadband.

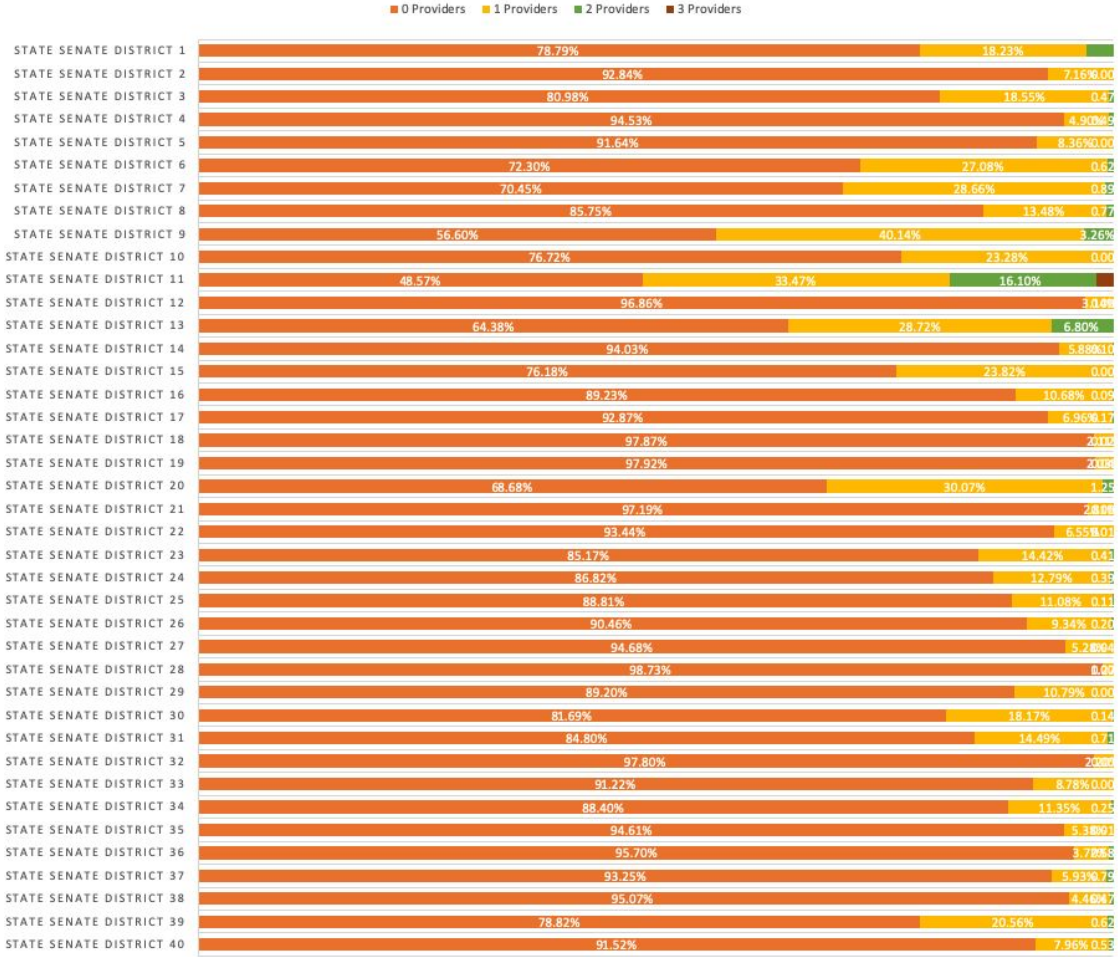
Average Percentage of Population with Multiple Provider Options for 250 Mbps/25 Mbps by Census Block Group Demographic Variable (As of December 31, 2017)

	Zero	One	Two	More Than Two
Population Density				
First Quartile (Lowest Pop. Density)	61.3%	30.0%	7.5%	1.2%
Second Quartile	37.2%	40.4%	16.2%	6.2%
Third Quartile	29.3%	44.1%	17.7%	8.9%
Fourth Quartile (Highest Pop. Density)	22.4%	36.4%	18.7%	22.6%
Median Household Income($2016)				
First Quartile (Lowest Median Household Income)	45.1%	37.7%	11.3%	5.8%
Second Quartile	44.1%	37.4%	12.5%	6.0%
Third Quartile	37.3%	38.4%	15.4%	8.9%
Fourth Quartile (Highest Median Household Income)	23.5%	37.5%	21.0%	18.0%

Figure 27
Residential Fixed Connections by Technology as of December 31, 2017
(Shares of selected technologies for selected speeds, connections in thousands)



CALIFORNIA GIGABIT ACCESS MARKET PER SENATE DISTRICT



Fiber vs. the world: looking to the future

DOCSIS (Cable)

- Extreme upstream/downstream discrepancy due to legacy hardware
- Relatively high latency (tens of milliseconds), not suitable for real-time cloud computing
- DOCSIS 3.1 deployments are hybrid-fiber, and upgrades will need to go “fiber-deep” (nearly to the home)

5G Wireless

Two general types of tech:

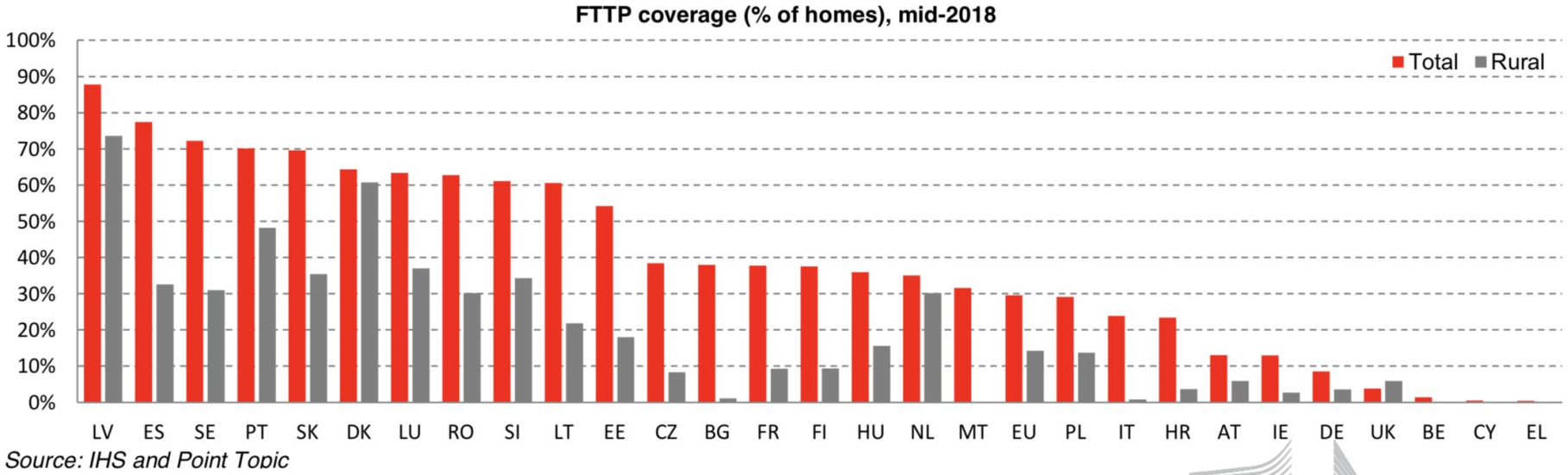
1. Short-range, high-band
    a. capable of gigabit+ and extremely low latency
    b. only available in dense areas, disrupted by weather, walls, and foliage
    c. will require fiber deployment to each service station
2. Long-range, mid/low-band
    a. Similar to existing 4g technology
    b. More of an evolution than a revolution

Great step forward for wireless, not competitive with fiber to the home

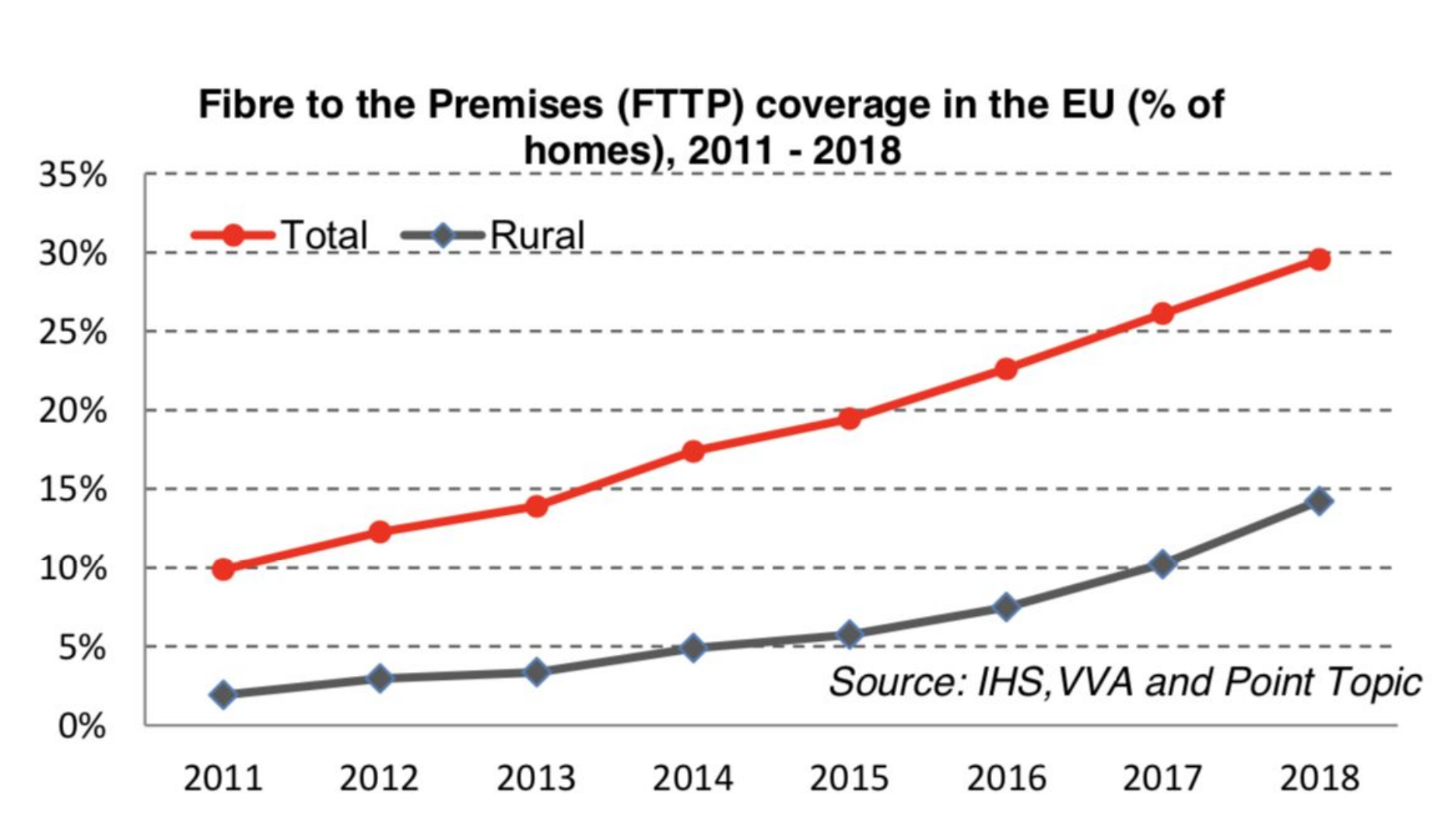
Fiber to the home

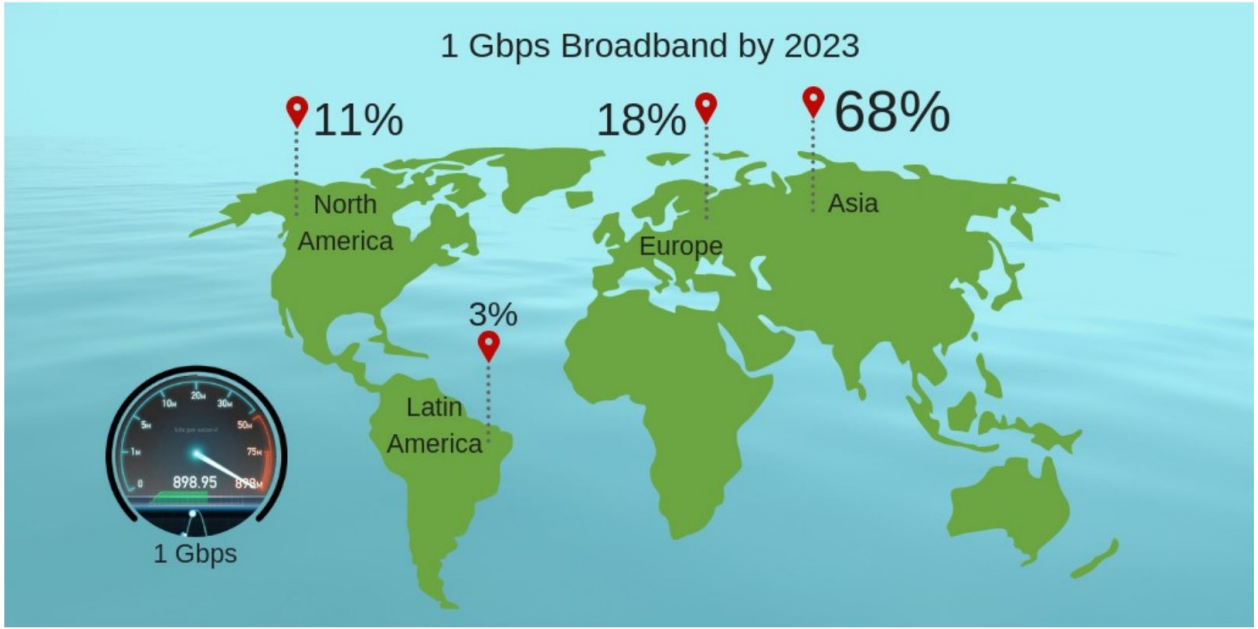
- Already capable of symmetrical 10 GB service
- Extremely low latency (order of 1-2 ms)
- Existing fiber connections can be upgraded without any digging
- Dense fiber enables the most exciting parts of next-gen wireless

EU Member nations Fiber to the Home deployment (red = urban, grey = rural).



Source: IHS and Point Topic


Fibre to the Premises (FTTP) coverage in the EU (% of homes), 2011 - 2018
35%
30%
25%
20%
15%
10%
5%
0%
Total
Rural
Source: IHS, VVA and Point Topic
2011
2012
2013
2014
2015
2016
2017
2018



Companies mentioned in this report: Alcatel, Altice, AT&T, Bell Canada, Broadcom, CenturyLink, Charter, China Mobile, China TieTong, China Telecom, China Unicom, and more

RETHINK TECHNOLOGY RESEARCH

By 2023, China predicted to have 193.5 million gigabit connections compared to U.S. 37.3 million (EU expected to reach 59.6 million).

APPENDIX B

Greenlining Institute Slides

Broadband Equity Mapping Project

Malena Leon Farrera

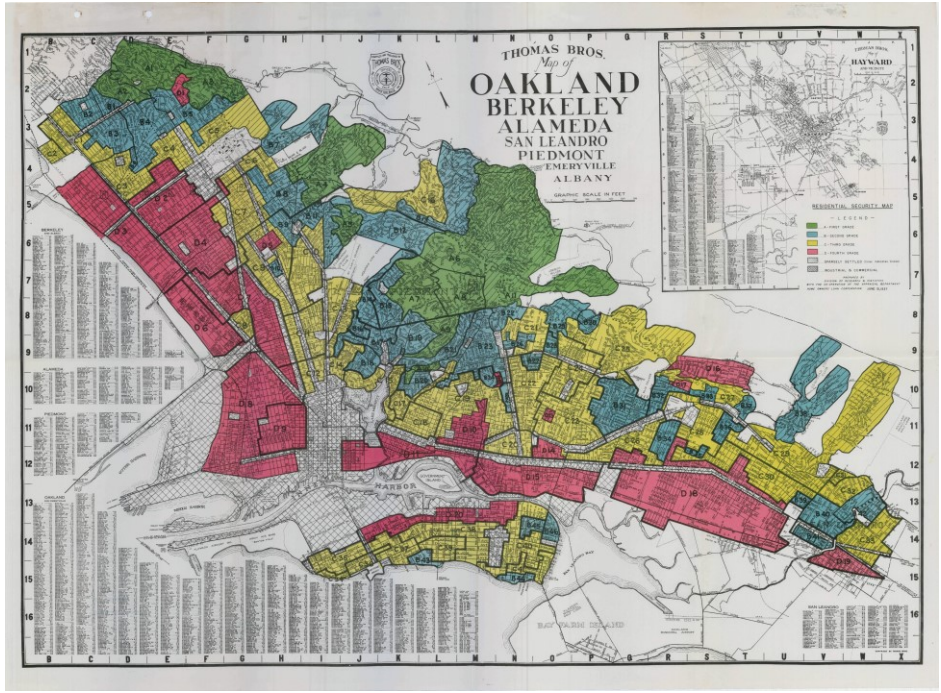
Haleema Bharoocha

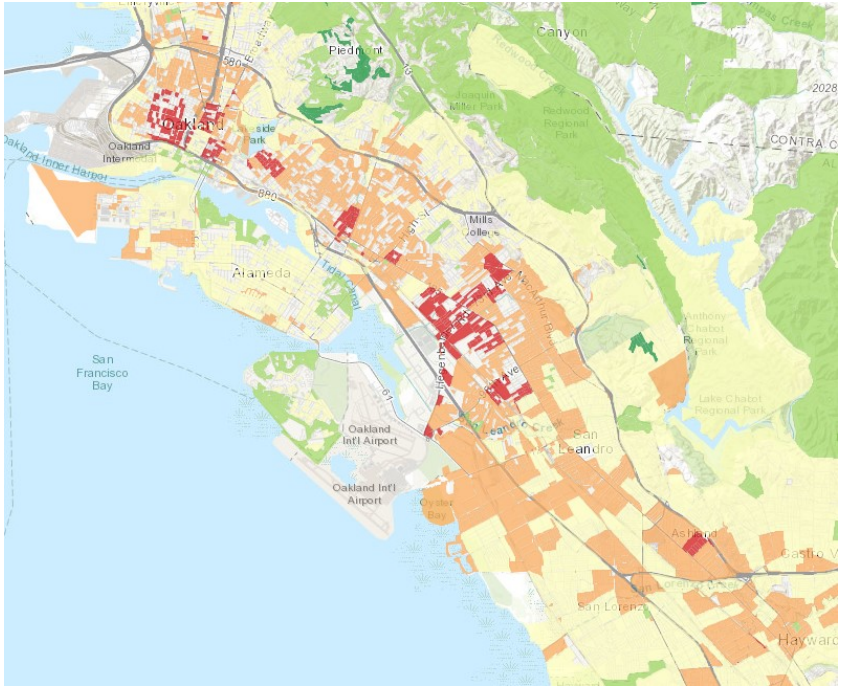
Vinhcent Le

Paul Goodman

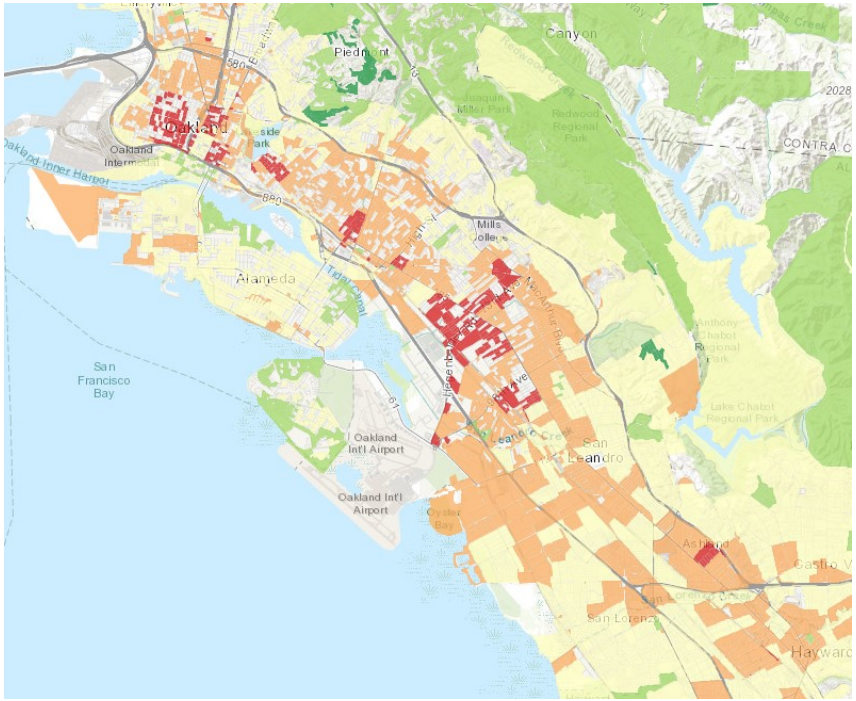
- 2017 ACS Census Data
- 2017 FCC Form 477 Data
- Created a broadband score—income, highest broadband speed, broadband adoption by census block.
- Actual map:
  - Searchable, state-wide coverage
  - Replicable

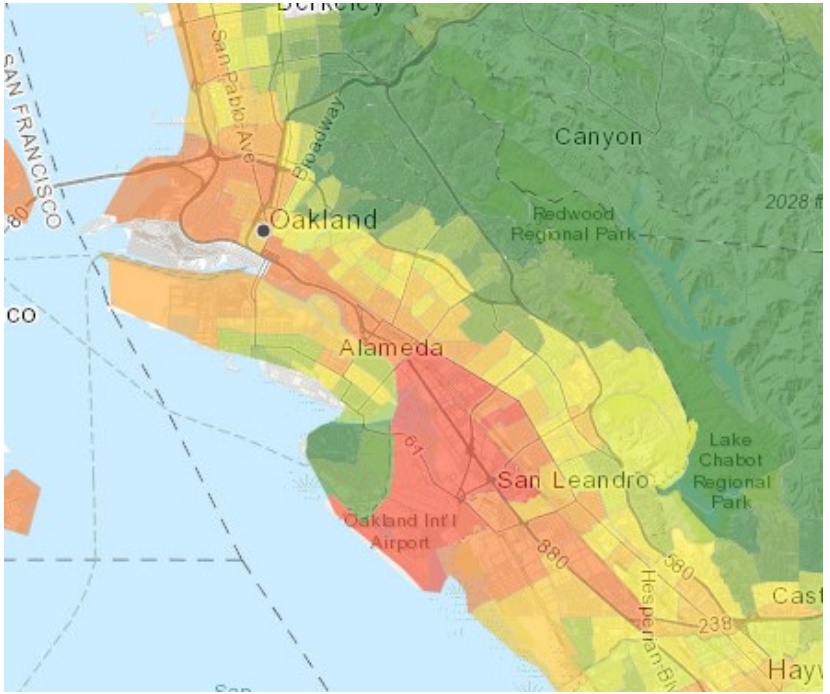
Oakland


THOMAS BROS.
Map of
OAKLAND
BERKELEY
ALAMEDA
SAN LEANDRO
PIEDMONT
EMERYVILLE
ALBANY
HAYWARD
RESIDENTIAL SECURITY MAP
HARBOR

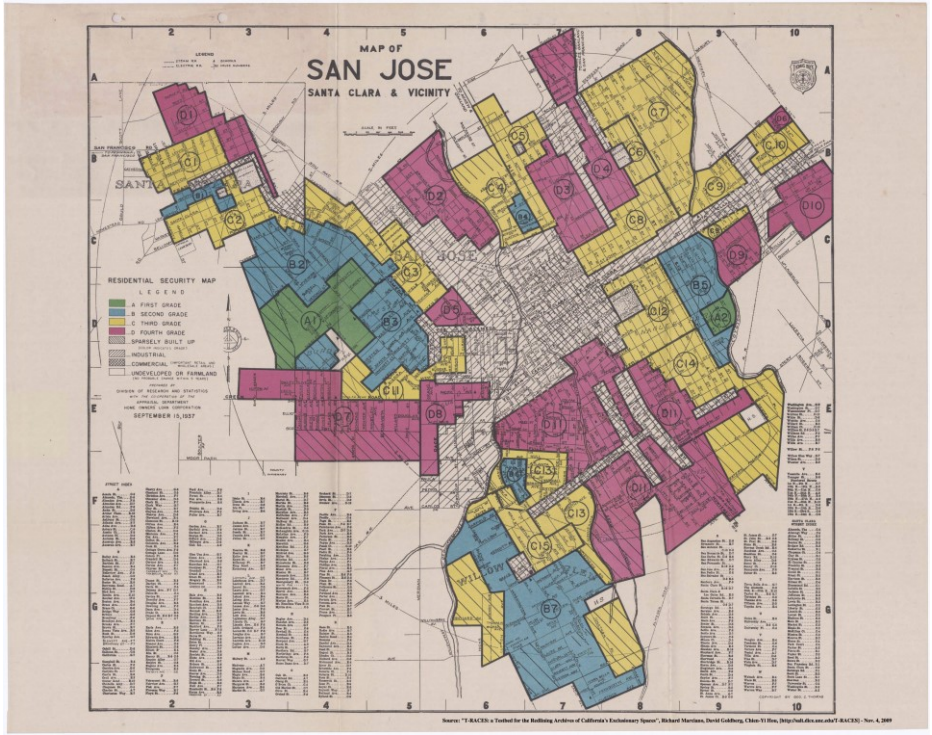

Piedmont
Oakland
Alameda
San Francisco Bay
Oakland Int'l Airport
Oakland Int'l Airport
San Leandro
Hayward
Ashland
Mills College
Lake Chabot Regional Park
Redwood Regional Park
CONTRA C

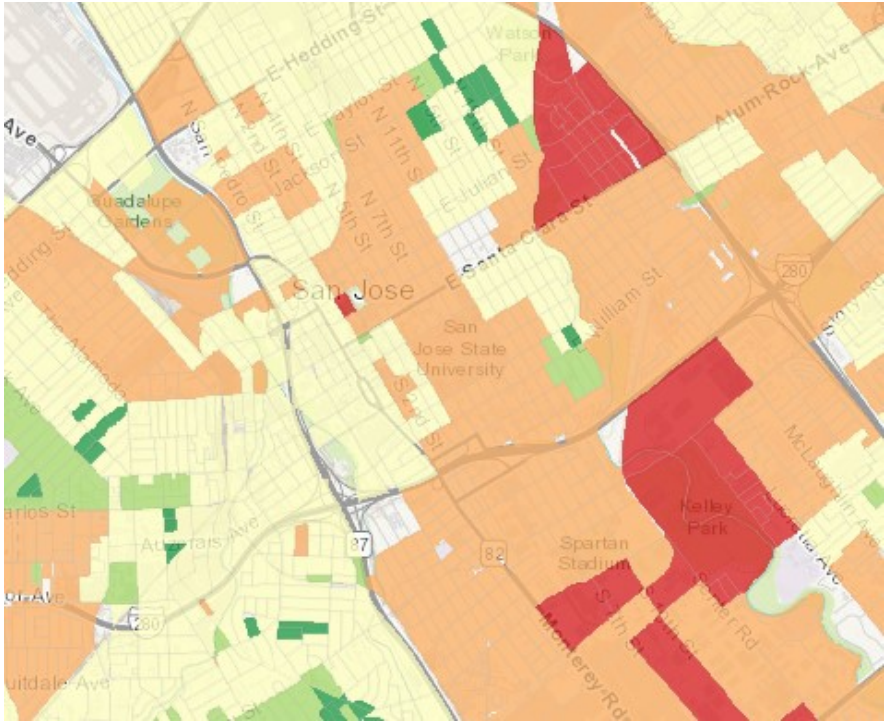
Oakland


Canyon
Piedmont
Oakland
Oakland Inner Harbor
Alameda
San Francisco Bay
Oakland Int'l Airport
Oakland Int'l Airport
San Leandro
Lake Chabot Regional Park
Ashland
San Lorenzo
Hayward

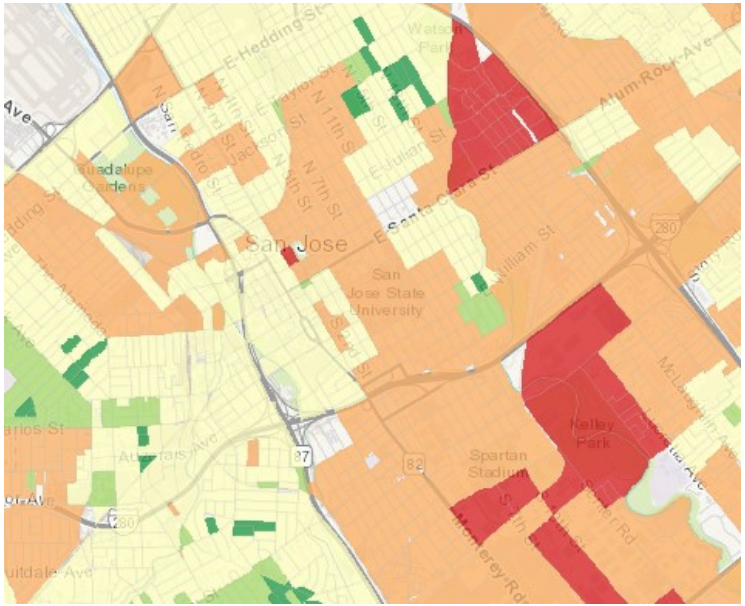

Berkeley
San Pablo Ave
Broadway
SAN FRANCISCO
Canyon
Oakland
Redwood Regional Park
2028 ft
Alameda
San Leandro
Lake Chabot Regional Park
Oakland Int'l Airport
880
580
238
Hesperian Blvd
Hayw

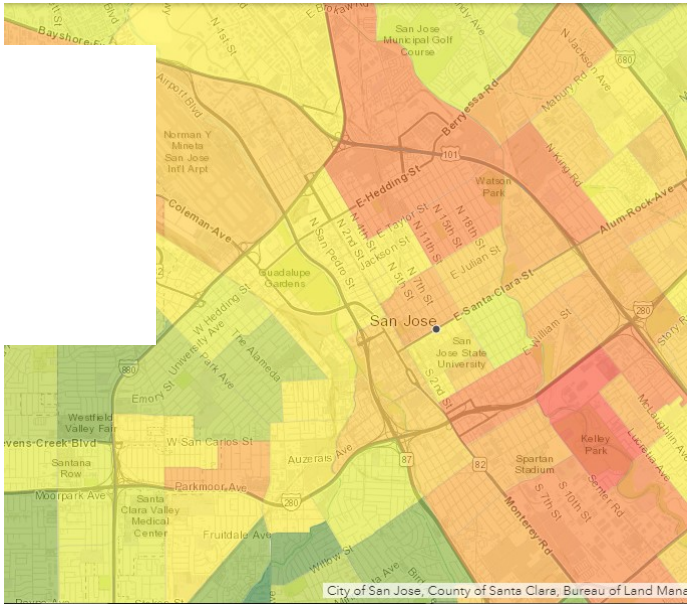
San Jose


MAP OF
SAN JOSE
SANTA CLARA & VICINITY
RESIDENTIAL SECURITY MAP
LEGEND
A FIRST GRADE
B SECOND GRADE
C THIRD GRADE
D FOURTH GRADE
SPARSELY BUILT UP
INDUSTRIAL
COMMERCIAL
UNDEVELOPED OR FARMLAND
SEPTEMBER 15, 1937

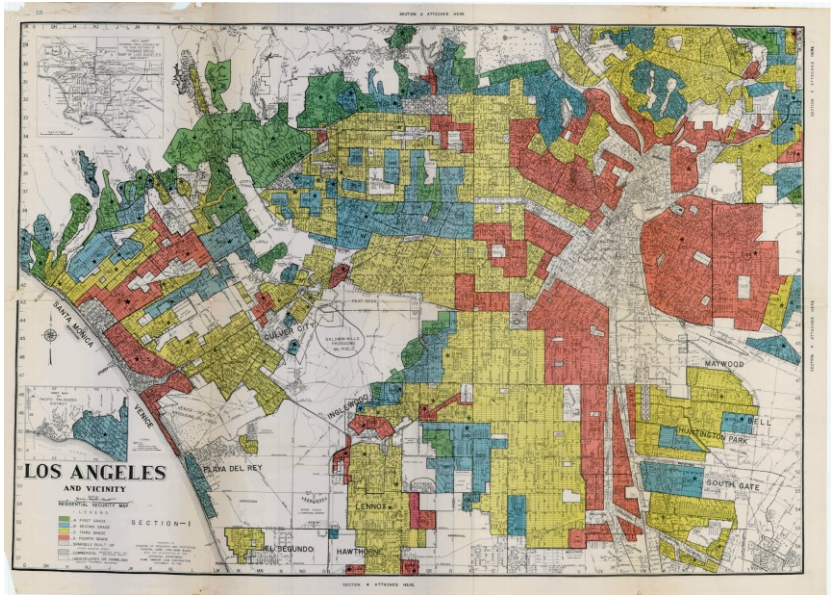

San Jose
San Jose State University
Spartan Stadium
Kelley Park
E Hedding St
N 11th St
N 7th St
E William St
Alum Rock Ave
Guadalupe Gardens
Watson Park
280
87
82

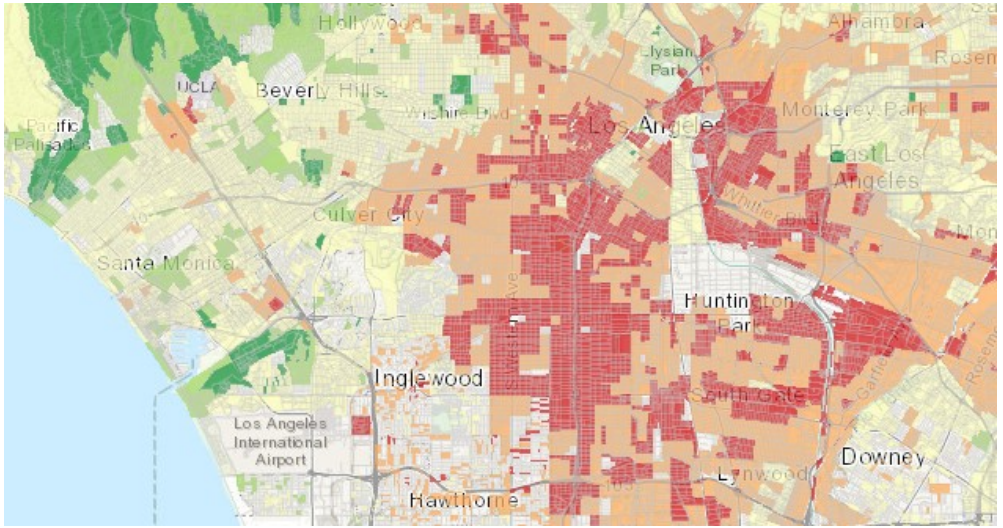
San Jose


San Jose
San Jose State University
Kelley Park
Spartan Stadium
E Hedding St
Alum Rock Ave
E Santa Clara St
N 11th St
N 7th St
Monterey Rd

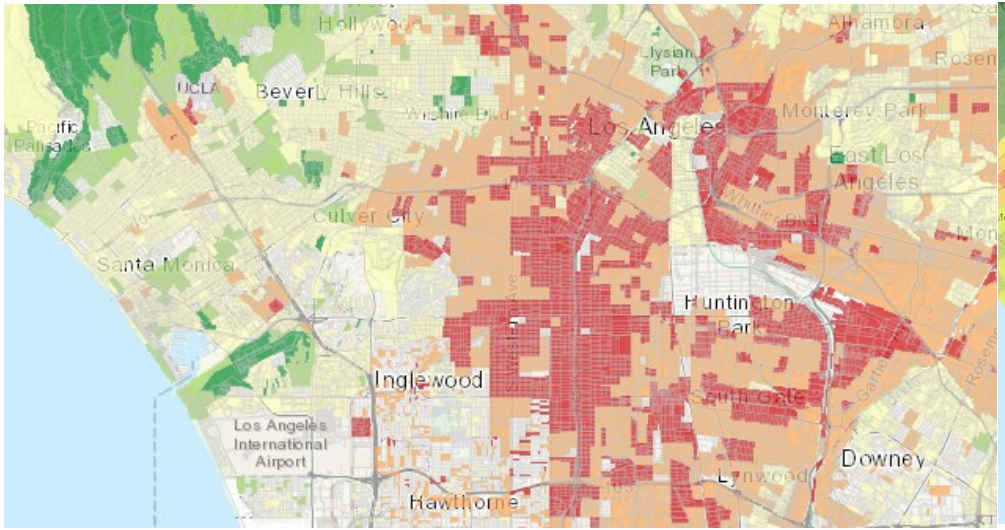

San Jose
San Jose Municipal Golf Course
Norman Y Mineta San Jose Intl Arpt
Watson Park
Guadalupe Gardens
San Jose State University
Kelley Park
Spartan Stadium
Westfield Valley Fair
Santana Row
Santa Clara Valley Medical Center
E Hedding St
Alum Rock Ave
E Santa Clara St
Coleman Ave
Bernal Rd
Monterey Rd
W San Carlos St
Auzerais Ave
Parkmoor Ave
Fruitdale Ave
The Alameda
City of San Jose, County of Santa Clara, Bureau of Land Mana

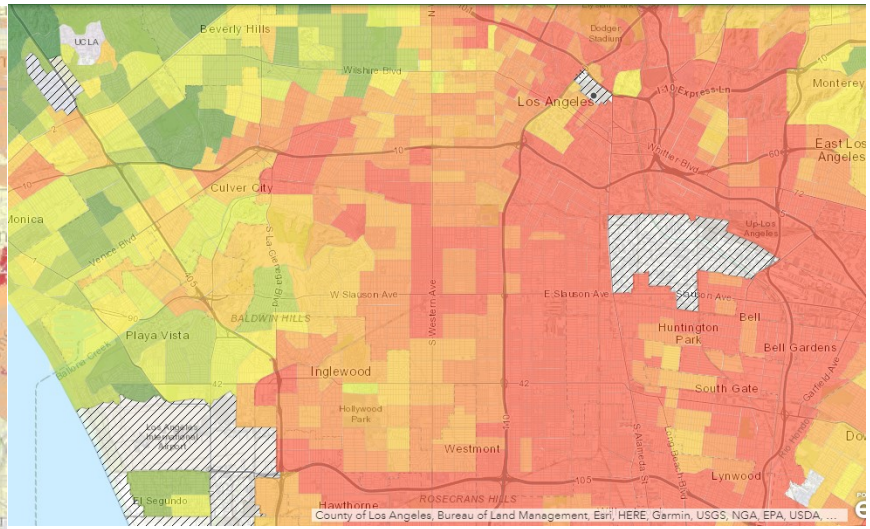
Los Angeles


LOS ANGELES
AND VICINITY
SECTION—I
SANTA MONICA
VENICE
PLAYA DEL REY
CULVER CITY
INGLEWOOD
EL SEGUNDO
HAWTHORNE
LENNOX
HUNTINGTON PARK
MAYWOOD
BELL
SOUTH GATE

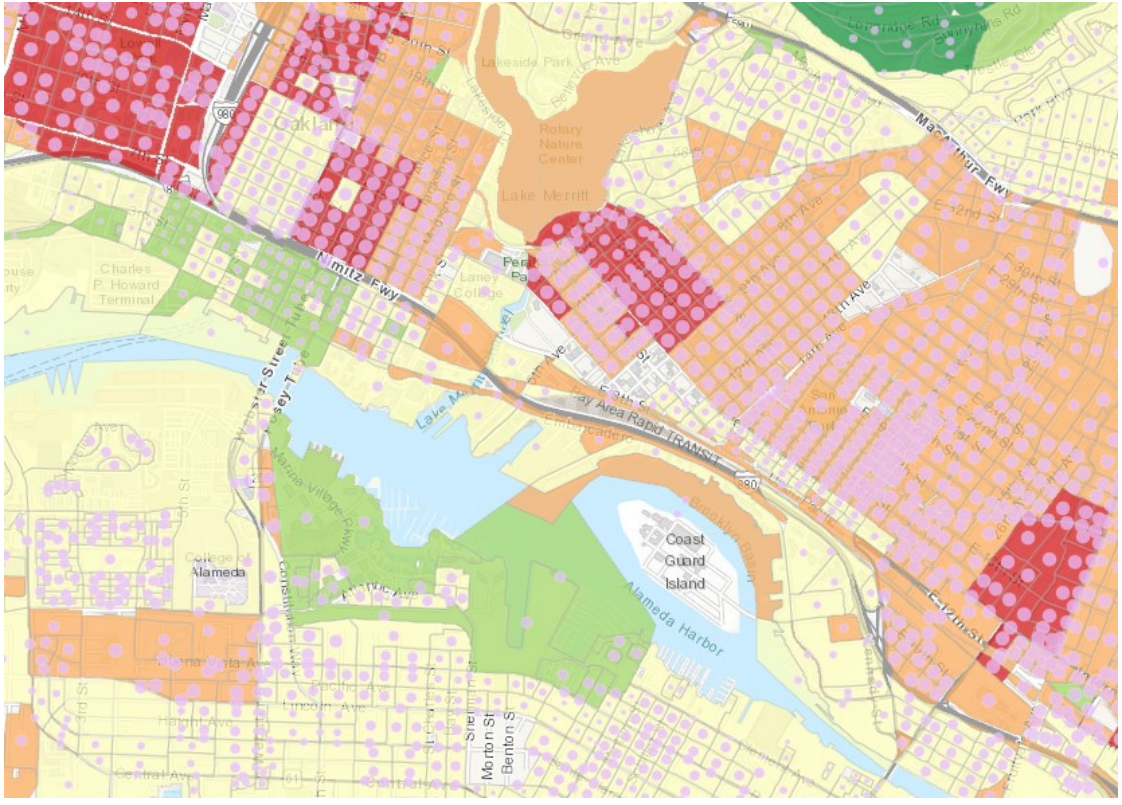

Hollywood
Beverly Hills
UCLA
Los Angeles
Monterey Park
East Los Angeles
Culver City
Santa Monica
Huntington Park
Inglewood
South Gate
Los Angeles International Airport
Downey
Hawthorne

Los Angeles

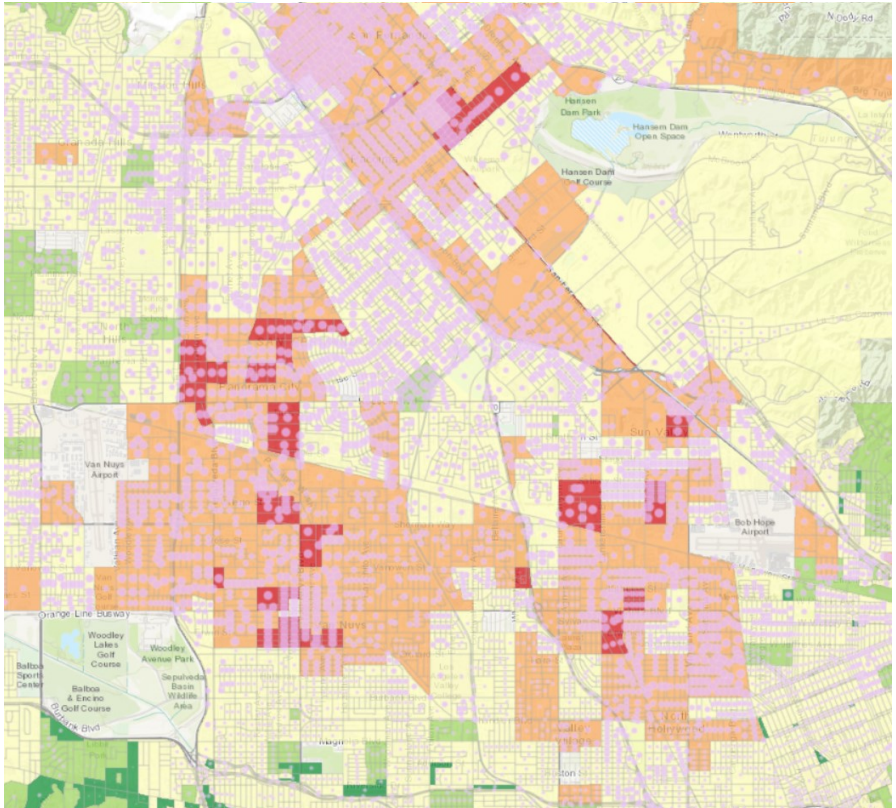

Hollywood
Alhambra
Elysian Park
UCLA
Beverly Hills
Wilshire Blvd
Los Angeles
Monterey Park
Pacific Palisades
East Los Angeles
Culver City
Santa Monica
Huntington Park
Inglewood
South Gate
Los Angeles International Airport
Downey
Lynwood
Hawthorne


Beverly Hills
UCLA
Dodger Stadium
Wilshire Blvd
Los Angeles
Monterey
East Los Angeles
Culver City
Monica
Venice Blvd
W Slauson Ave
E Slauson Ave
Playa Vista
BALDWIN HILLS
Huntington Park
Bell
Bell Gardens
Inglewood
South Gate
Hollywood Park
Los Angeles International Airport
Westmont
Lynwood
El Segundo
Hawthorne
ROSECRANS HILLS
County of Los Angeles, Bureau of Land Management, Esri, HERE, Garmin, USGS, NGA, EPA, USDA, ...

Oakland


Oakland
Lake Merritt
Rotary Nature Center
Lakeside Park
Laney College
Charles P. Howard Terminal
Nimitz Fwy
MacArthur Fwy
Bay Area Rapid Transit
Webster Street Tube
Posey Tube
Alameda
Coast Guard Island
Alameda Harbor
Morton St
Benton St
Sherman St

Senate District 18



Paul Goodman

The Greenlining Institute

paulg@greenlining.org

510 898 2053

APPENDIX C

Institute for Local Self-Reliance

Full Presentation

Institute for Local Self-Reliance Summary

The Institute for Local Self-Reliance (ILSR) was represented by its Senior Researcher, Communication Broadband Networks Initiative, Lisa Gonzalez.

ILSR supports local community ownership that fosters creation of high-quality, locally accountable broadband networks. ILSR has identified more than 500 communities across the country served by publicly owned broadband networks. Every year more and more examples come up of local ownership. Examples the ILSR highlighted included Wilson, North Carolina, where the municipal electric utility invested in fiber more than a decade ago and still benefit from the infrastructure with low cost high-speed Internet, improved electric service, and economic development.

Other major successful projects included Sandy, Oregon, a community where high-speed Internet is available at $60 per month from the local government. The city determined that they would need a 35 percent take rate to make SandyNet self-sufficient, but achieved a 60 percent take rate by the end of 2015 with households waiting to be connected. SandyNet was the city's response when the incumbent could not or would not offer the level of service the city's administration needed at City Hall or across the community. Sandy has built their network incrementally and strategically.

Ammon Fiber Optics, the open access software defined network developed by the community of Ammon, Idaho, allows the infrastructure to be used for specialized services that require high-capacity connectivity in addition to Internet access. The publicly owned asset has allowed the community to enhance public safety, as well as attract innovation entrepreneurs. Ammon uses a local improvement district approach to fund build outs.

ILSR noted that communities served by publicly owned broadband appreciate the local control, affordability, and accountability that accompany these networks. In recent years, a string of Colorado elections have allowed communities to reclaim local telecommunications authority. Voters have expressed the desire to regain the ability to invest in these publicly owned networks to expand competition, especially in communities where large incumbent cable and DSL Internet

providers overcharge for poor services. Around 145 counties and municipalities in Colorado have reclaimed the right to invest in their telecommunications infrastructure.

Fort Collins in Colorado brought the issue to the voters in 2017. In a contentious election, Comcast and CenturyLink in the guise of a special interest group, spent almost $1 million to defeat the measure to prevent competition. Voters, fed up with poor service and high rates, passed the measure anyway and the community has recently launched their publicly owned network, Connexion.

Publicly owned fiber optic networks are also allowing local communities to shrink the digital divide in their cities, towns, and counties. In Wilson, the Greenlight Community Broadband Network developed a program to provide 50 Mbps symmetrical Internet access to public housing units for $10 per month. They also developed a "pay ahead" option to help local residents who may have difficulty obtaining service from incumbents due to poor credit history. In addition to getting them online, the service helps these residents restore their credit history.

Fort Collins's Connexion plans to implement a low-cost, $20 per month, gigabit Internet access program for low-income households. Eligibility for the program will be based on the same criteria as other utility assistance programs, including LEAP and the Income Qualified Assistance Program (IQAP) and will be supplemented by Payment in lieu of Taxes (PILOT) from Connexion.

Hillsboro, Oregon, which is one of the many communities that has decided that investing in a publicly owned fiber optic network is a critical step, has also chosen to make a commitment to serving households with income challenges. The network, which is still in the early stages, will begin deploying people in two communities: one in a neighborhood where household income his higher and another where fewer people have access to the Internet due to economic challenges. Hillsboro's HiLight will provide $10 gigabit connectivity to households that qualify for SNAP, TANF, or free and reduced lunches. The city has decided to take a "pay as you build" incremental approach to avoid bonding or borrowing and expects to have the city completely connected in 10 years.

Publicly owned networks, which aren't required to maximize profits, have more opportunity to engage in digital inclusion programs, innovative economic development approaches, and connect with their owners, who are the people in the communities they serve. In rural areas, where large national providers aren't able to justify investment in high-quality Internet networks because population density is low, publicly owned networks, including cooperatives, are filling the gaps and providing connectivity on par with services in some of the most connected cities. Some of the fastest, most reliable, ultra-affordable Internet access can be found in rural communities that have invested in these networks when large, corporate Internet access providers shied away.

Local communities where municipal networks serve the community often appreciate:

- Local accountability and governance
- Economic development - businesses increasingly need high-capacity connectivity
- Municipalities, schools, libraries reduce communications costs
- Dollars stay in the community
- Better value dollar-for-dollar, speed, reliability, customer service
- Feel good about the investment

Recommendations: ILSR supports the state empowering its local governments to build their own broadband networks. Government policy should be focused on building fiber infrastructure and many local and small communities have proven they can build their own fiber to the home networks and that such projects are financially feasible. State funding should be robust and should always allow (and encourage) municipalities, local governments, and tribal governments to be eligible. The concept of "overbuilding" should be redefined as a positive method of encouraging competition, rather than a waste of resources. The state should promote local communities to expand fiber infrastructure deployment as a way to expand high-quality Internet access, 5G technology, smart city applications, and future innovations.

For more information, visit MuniNetworks.org and ILSR.org/broadband.

Feel free to contact Lisa Gonzalez: lgonzalez@ilsr.org
612.808.0690

Communities across the U.S. served by publicly owned Internet networks.
See https://muninetworks.org/communitymap for the interactive map.

APPENDIX D

Magellan Advisors Slides

California Fiber Policy Meeting
Electronic Frontier Foundation

Presented By:
Jory Wolf, VP Magellan Advisors
Wednesday, November 13, 2019

Client	Wireless Ordinance	Master License Agreement	Dig Once	Standards & Guidelines	Broadband Master Plan	Broadband Feasibility Study	Smart City Plan	P3 Partnership Negotiations	Fiber Cable Landing Evaluation
Alameda County, CA						•			
Carlsbad, CA		•			•			•	
Chula Vista, CA					•				
Culver City, CA							•		
Concord, CA	•	•	•		•		•	•	
Fairfield, CA	•	•	•	•	•		•		
Fountain Valley, CA	•	•		•					
Glendale Water & Power, CA		•		•					
Hayward, CA	•	•	•	•					
Hermosa Beach, CA									•
Huntington Beach, CA	•	•	•	•				•	
Inglewood, CA	•	•	•		•		•	•	
Jefferson PUD, WA					•				
La Mesa, CA								•	
Marion County, OR	•	•	•	•	•			•	
Manhattan Beach, CA	•	•	•		•		•		
Mission Viejo, CA						•			
Naperville, IL					•		•		
Oxnard, CA	•	•	•		•				
Paso Robles, CA								•	
Pierce County, WA					•				
Pima Assoc. of Gvts, AZ							•		
Sacramento, CA	•	•	•	•					
Salem, OR					•				
San Leandro, CA	•	•	•		•		•		
Santa Ana, CA	•	•	•	•	•				
Santa Clarita, CA	•	•	•		•			•	
South Bay Cities, CA					•	•		•	
Stockton, CA	•	•		•					
Sonoma County, CA					•				
Vallejo, CA						•			
Ventura, CA	•	•	•		•			•	
West Hollywood, CA	•	•	•	•	•	•		•	

West Coast Engagements 2017-2019

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West Coast Engagements 2017-2019

City of Carlsbad, CA
City of Chula Vista, CA
City of Concord, CA
City of Culver City, CA
City of El Segundo, CA
City of Fountain Valley, CA
City of Glendale, CA
City of Hayward, CA
City of Hermosa Beach, CA
City of Huntington Beach, CA
City of Inglewood, CA
City of La Mesa, CA
City of Manhattan Beach, CA
City of Mission Viejo, CA
City of Oxnard, CA
City of Paso Robles, CA
City of Rancho Cucamonga, CA

City of Riverside, CA
City of Sacramento, CA
City of San Leandro, CA
City of Salem, WA
City of Santa Ana, CA
City of Santa Clarita, CA
City of Stockton, CA
City of Vallejo, CA
City of Ventura, CA
City of West Hollywood, CA
15 South Bay Cities COG, CA
County of Marion, OR
County of Pierce, WA
Council of Govts. in Pima Co., AZ
County of Sonoma, CA
County of Sonoma, CA
Port of Walla Walla, WA

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Municipal Engagement

- Governance and Alignment
- Strategic Planning
- Wireless Policy
- Organizing Encroachment
- Leveraging Assets
- Regional Cooperation
- Shared Assets
- Public Private Partnerships
- Strategic Build
- Smart City
- Digital Inclusion and Literacy

Partnership Strategies

- Carlsbad, CA – Crown Castle (T-Mobile)
- Chula Vista, CA (Media 3)
- Concord, CA – (Verizon)
- Huntington Beach, CA – (Phillips, Crown Castle)
- Inglewood, CA – (Verizon)
- Paso Robles – (Digital West)
- Sacramento, CA – (Verizon, XG)
- San Leandro, CA – (Common Wireless)
- Santa Ana, CA – (Verizon, AT&T, T-Mobile, Crown Castle)
- South Bay Coalition of 15 Cities (Crown Castle, American Dark Fiber)

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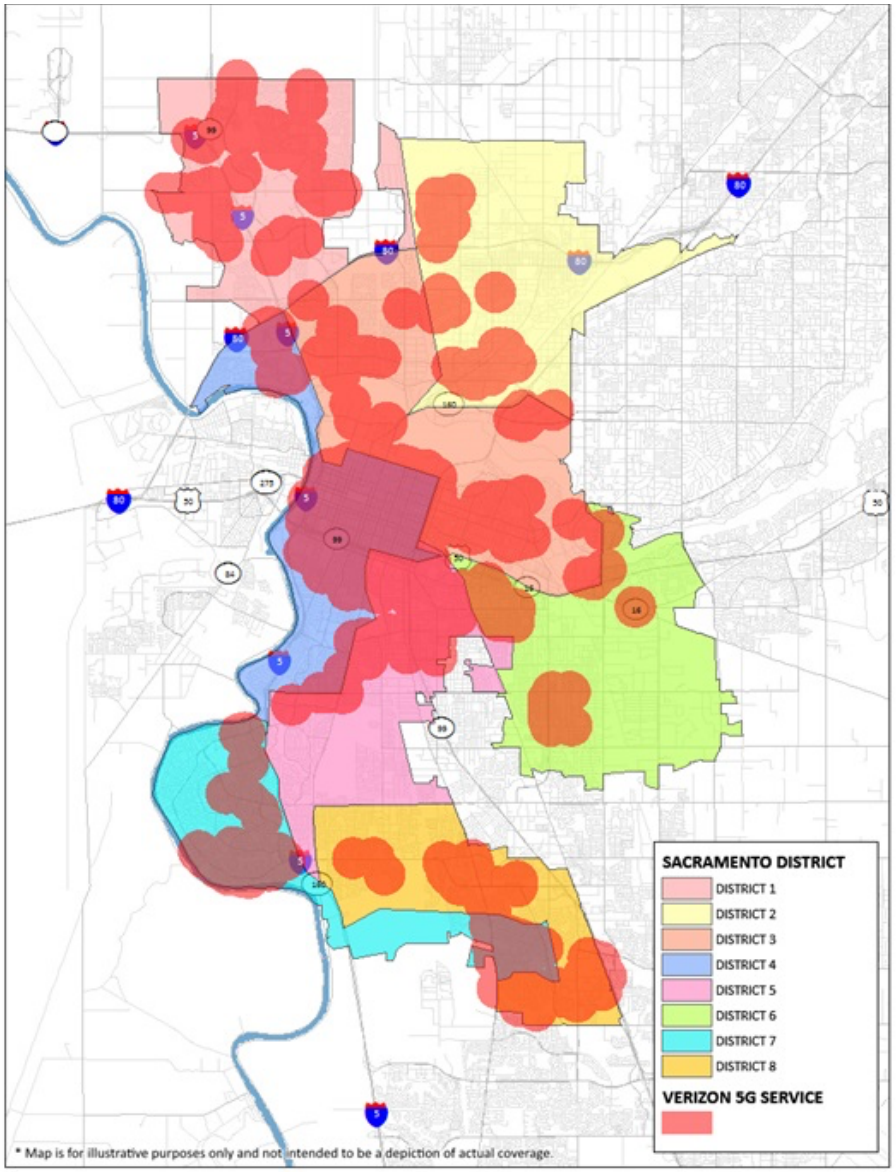
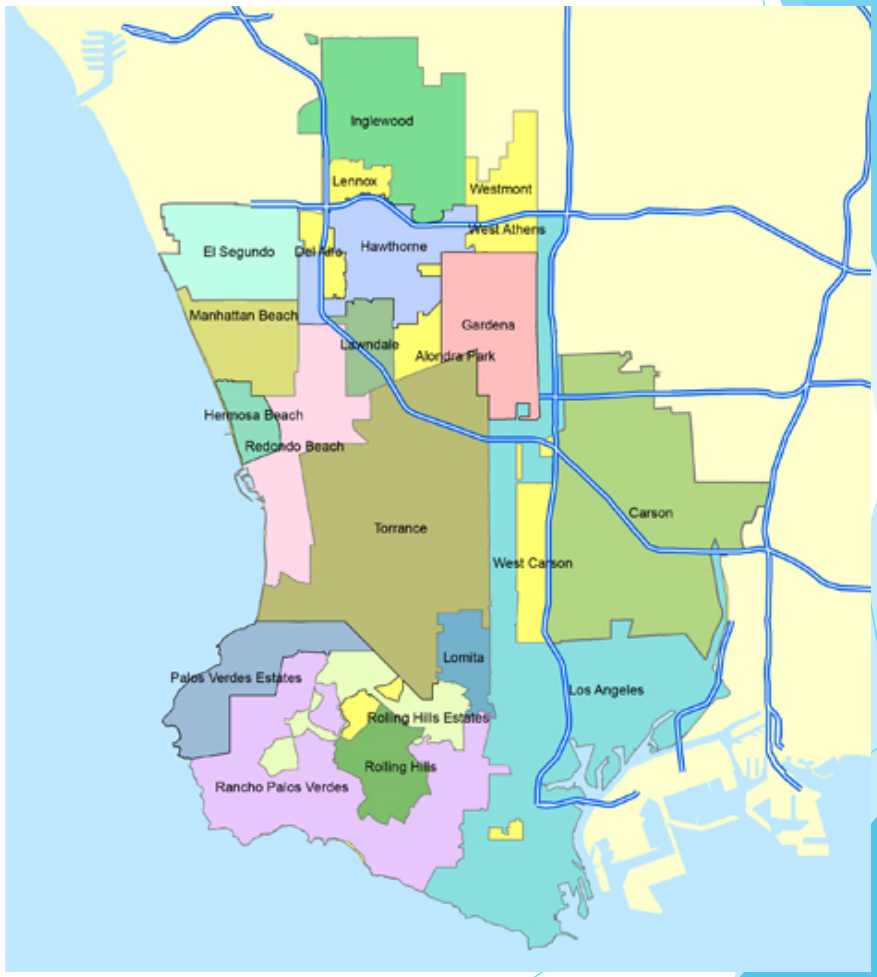


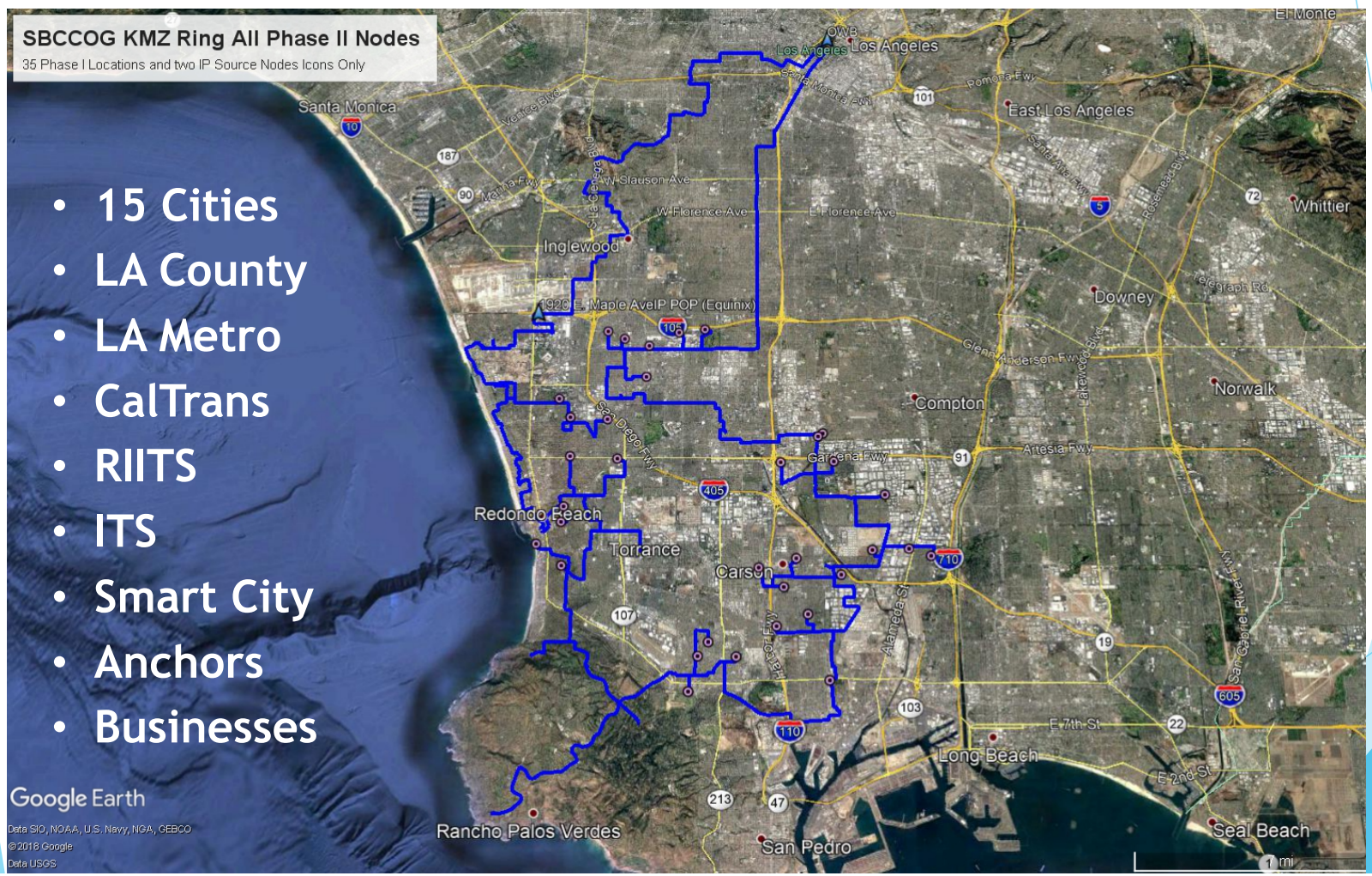
City of
SACRAMENTO

South Bay, CA

15 Cities
Population - 499,248
Square Miles – 105
3 Encumbents
Limited Investment
Economic Development
Jobs Retention
Tech Jobs
Limited Public Assets
No Political Will

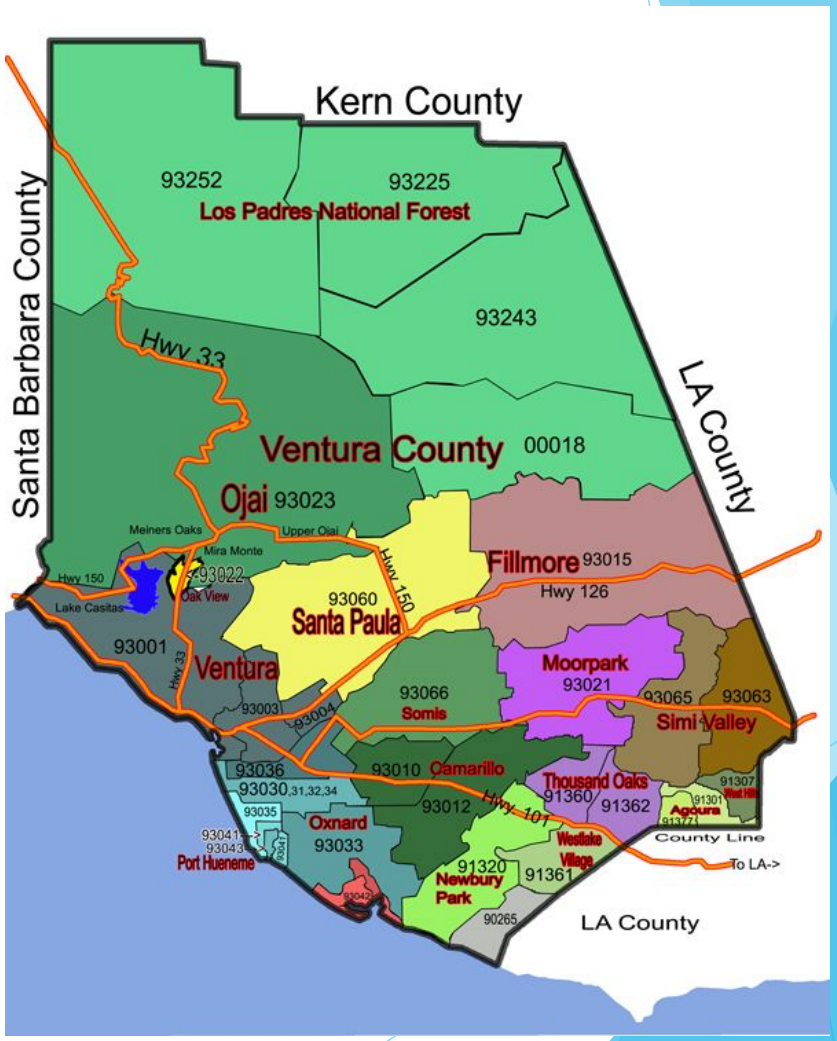


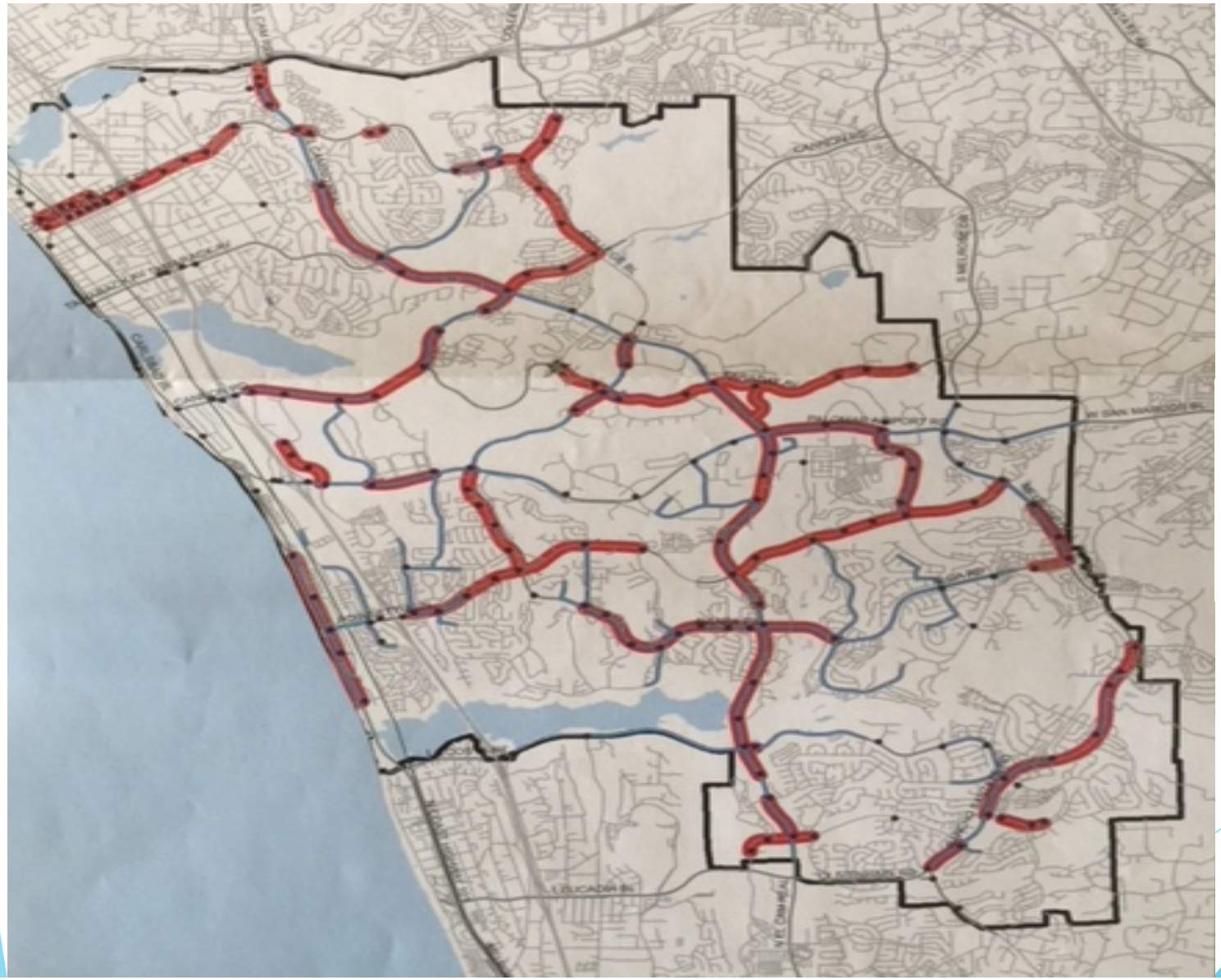
South Bay Regional Net



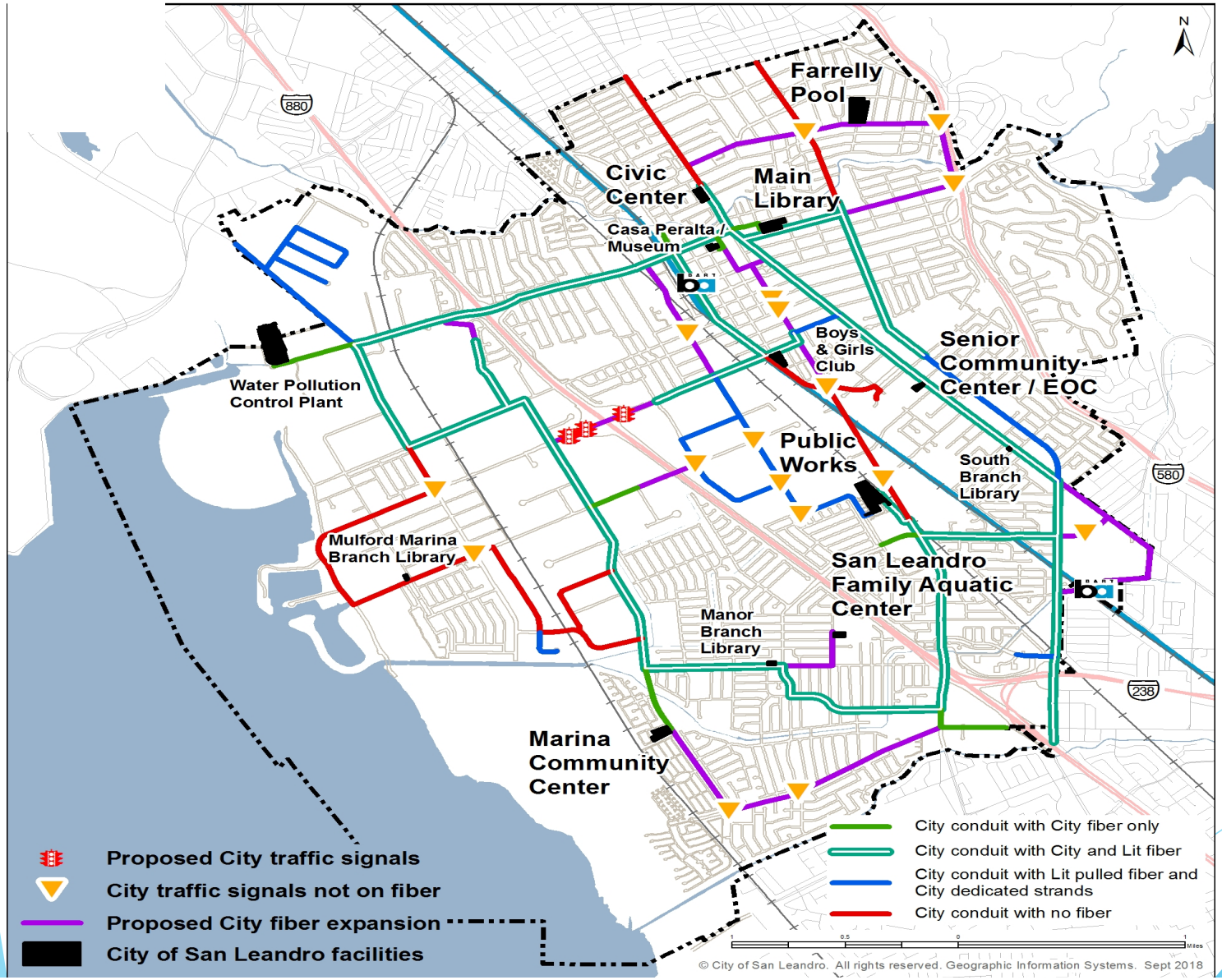
Ventura County, CA

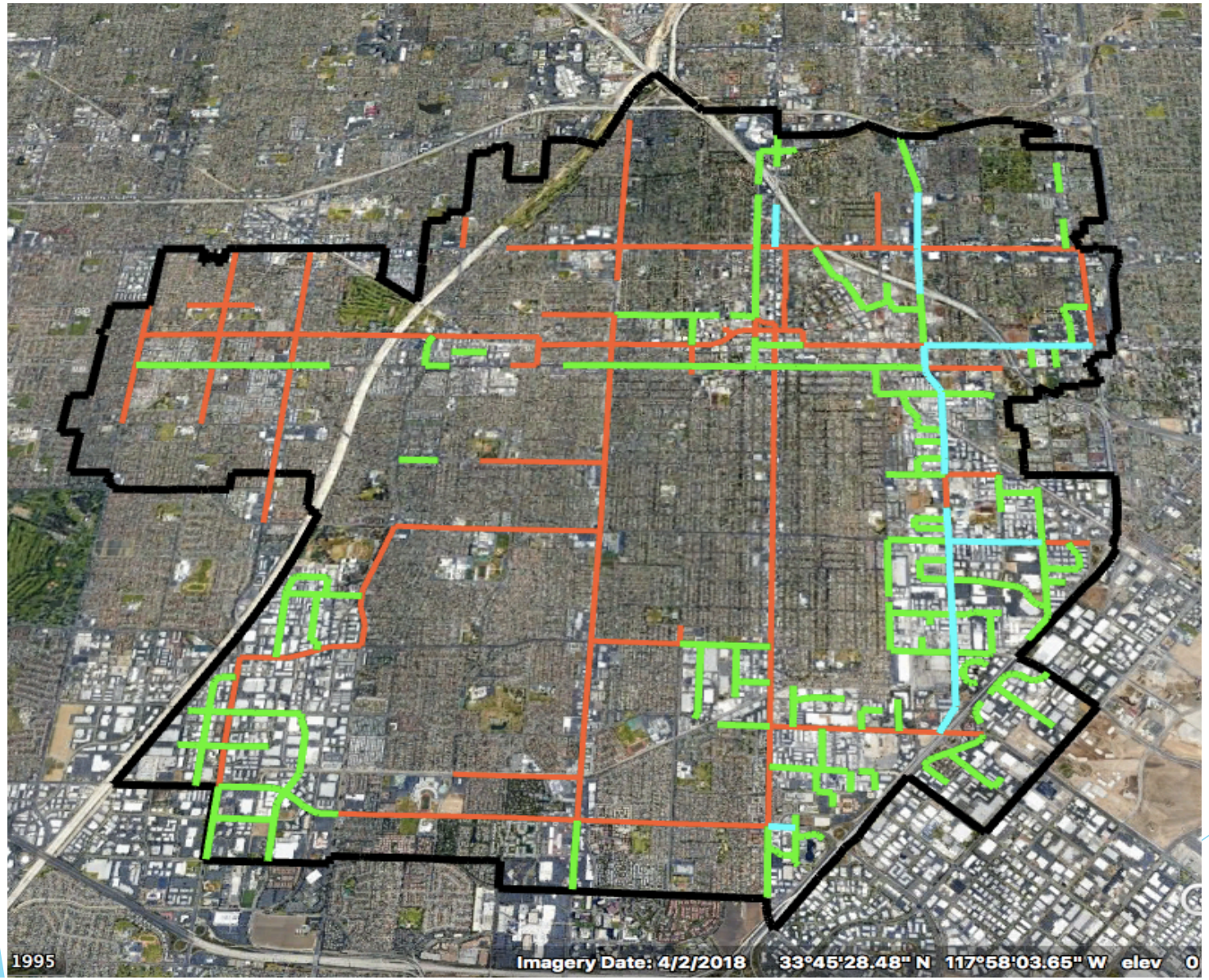
10 Cities
Population - 854,223
Square Miles - 2,208
Economic Development
Smart City
Public Private Partnerships
Anchors





City of Carlsbad
California


Farrelly Pool
Civic Center
Main Library
Casa Peralta / Museum
Boys & Girls Club
Senior Community Center / EOC
Water Pollution Control Plant
Public Works
South Branch Library
Mulford Marina Branch Library
San Leandro Family Aquatic Center
Manor Branch Library
Marina Community Center
880
580
238
N
Proposed City traffic signals
City traffic signals not on fiber
Proposed City fiber expansion
City of San Leandro facilities
City conduit with City fiber only
City conduit with City and Lit fiber
City conduit with Lit pulled fiber and City dedicated strands
City conduit with no fiber
© City of San Leandro. All rights reserved. Geographic Information Systems. Sept 2018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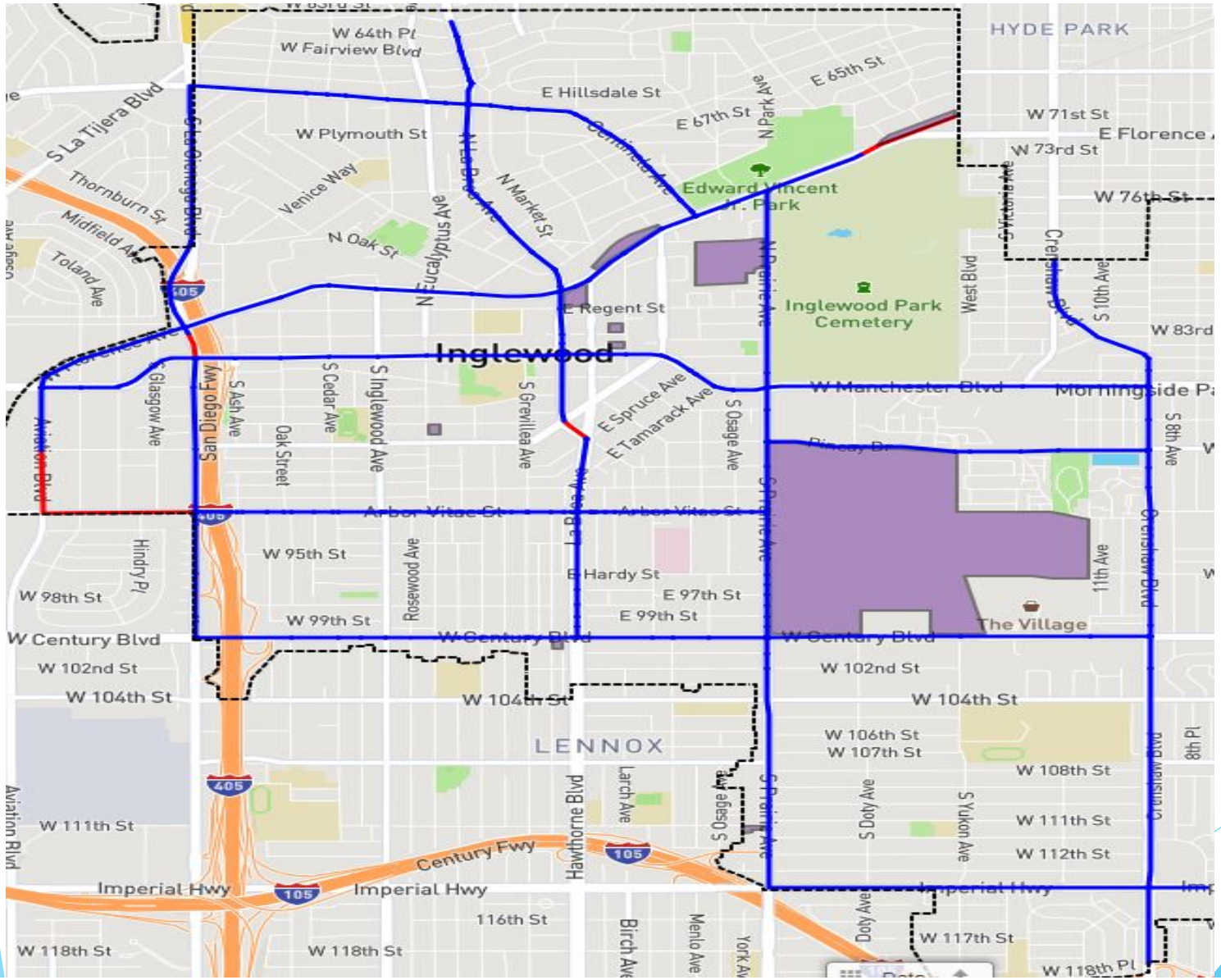
HYDE PARK
W 64th Pl
W Fairview Blvd
E Hillsdale St
E 65th St
E 67th St
N Park Ave
W 71st St
E Florence
W 73rd St
S La Tijera Blvd
W Plymouth St
Venice Way
N Oak St
N Eucalyptus Ave
N Market St
Edward Vincent Jr. Park
W 76th St
Thornburn St
Midfield Ave
Toland Ave
405
E Regent St
Inglewood Park Cemetery
West Blvd
S 10th Ave
W 83rd
Inglewood
W Manchester Blvd
Morningside Pa
S Glasgow Ave
San Diego Fwy
S Ash Ave
S Cedar Ave
S Inglewood Ave
S Grevillea Ave
E Spruce Ave
E Tamarack Ave
S Osage Ave
S 8th Ave
Aviation Blvd
Oak Street
Arbor Vitae St
W 95th St
Rosewood Ave
E Hardy St
E 97th St
E 99th St
11th Ave
W 98th St
Hindry Pl
W 99th St
The Village
W Century Blvd
W 102nd St
W 104th St
LENNOX
W 106th St
W 107th St
W 108th St
W 111th St
W 112th St
Aviation Blvd
Century Fwy
105
Hawthorne Blvd
Larch Ave
S Doty Ave
S Yukon Ave
Imperial Hwy
116th St
W 117th St
W 118th St
Birch Ave
Menlo Ave
York Ave
W 118th Pl

Thank You

Magellan
ADVISORS


Santa Monica
citynet
100 gigabits per second
Schools and College
Economic Development
Silicon Beach
300 Businesses and Anchors
Youth Technology Program
Annual Revenue: $2.5 million+
www.magellan-advisors.com
Magellan
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Ubiquitous City WiFi

10 Megabits Symetrical

500 Access Points

37 Hotzones

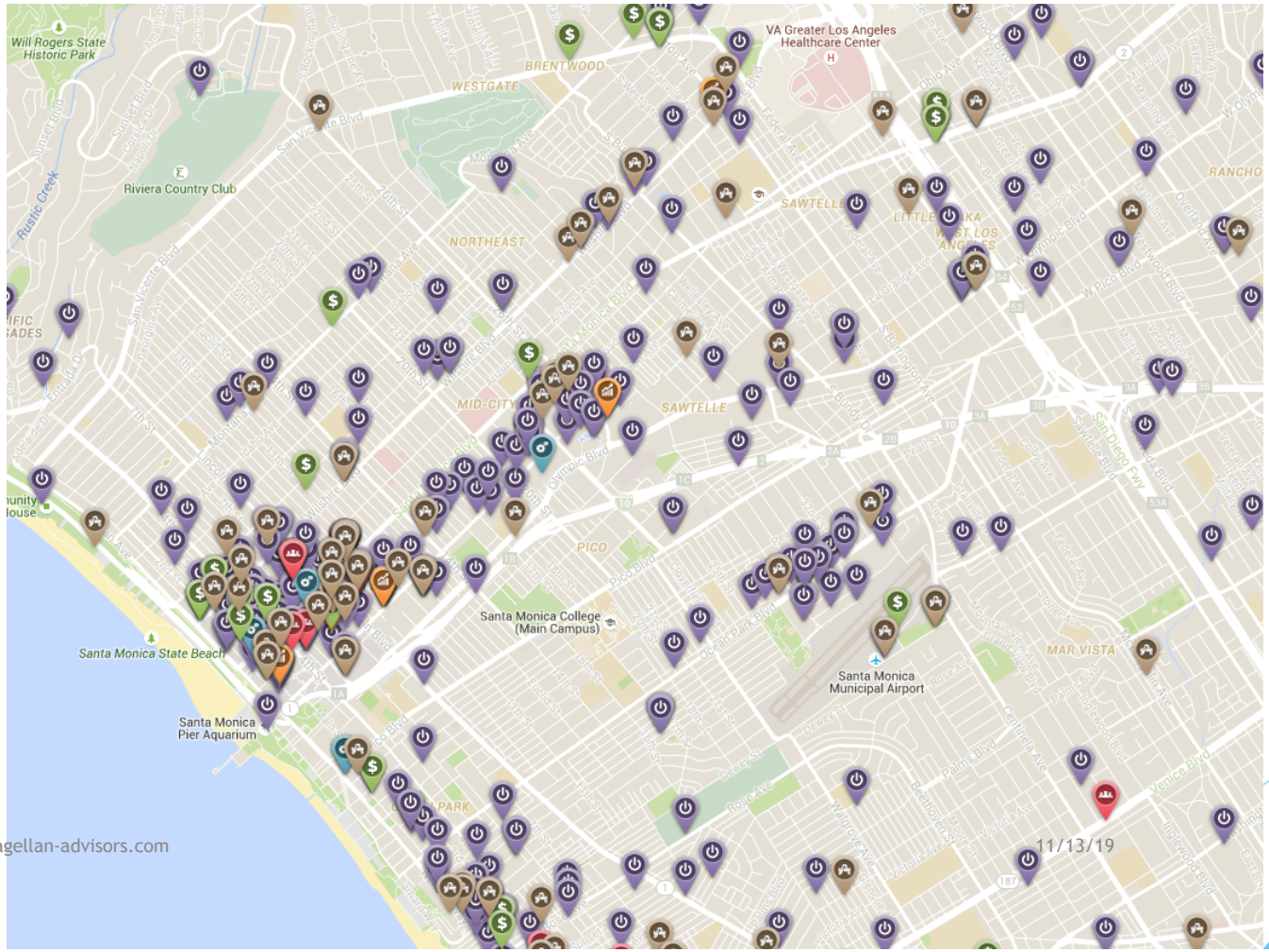
Transit Corridors

Commercial Corridors

15,500 + Users Per Day

Government Services

Silicon Beach



FIBER TO THE HOME & DIGITAL INCLUSION

Santa Monica citynet

100 Low Income Housing Bldgs

3,000 Low Income Families

Multi-Family Dwelling Units

FTTH 1 gig - $69 per mo

Low Income 1 gig - $48 per mo

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Smart Parking

- Wireless Meters
- Real-time Availability
- Pay-on-Foot Devices
- Parking Apps
- Parking Navigation
- Credit Cards
- Wireless Accounts

Economic Development

- Business Retention
- Business Attraction
- Silicon Beach
- Tech Start Ups
- Incubators
- Office Shares
- Youth Tech

Smart Transit

Traffic Signal Synch

Transit Priority

1600 HD Transit Cams

150 Signal Cams

TMC

Smart Bike Lanes

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Safety

4G & Wi-Fi Data

Mobile Streaming Video

750 HD Safety Cams

Addressing Community Needs

GREEN CITY
Green Infrastructure
Smart Energy and Utilities
Transport efficiency

ENERGY & UTILITIES
Power Generation Optimization
Grid Protection and Control
Intelligent Utility Network

E-GOVERNANCE
Online Records
Complaint Management
Payment Gateways

TRANSPORT
Urban Mobility Solutions
Airport / Railway Management
Fleet Optimization

PUBLIC SAFETY
Law Enforcement
Emergency Management
Security and Surveillance

EDUCATION
Analytics and research
School Solutions
Video conferencing

SMART BUILDING
Energy Optimization
Appliance Integration and control
Smart Metering

HEALTHCARE
Remote Monitoring
Asset Management
Telemedicine

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Enhancing Public Services

SMART CITY USE CASES

- SMART PARKING
- WEATHER SENSORS
- DIGITAL SIGNAGE
- ACOUSTIC SENSORS
- WATER & GAS METERING
- TRAFFIC LIGHTS & CONTROLS
- ELECTRIC VEHICLE CHARGING
- SOLAR INVERTERS
- SECURITY AND SURVEILLANCE
- WASTE MANAGEMENT

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Leveraging Local and Regional Assets

- Freeways, Highways, Roads & Sidewalks
- Conduit Infrastructure & Fiber
- Towers & Antenna
- Hilltops, Rooftops, Parks & Open Space
- Light Rail & Track Easements
- Utility, Street Light & Traffic Signal Poles
- Service Provider Assets

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Local & Regional Partners

- Regional RICS & Public Safety Agencies
- Public Transportation Districts
- Water and Wastewater Utilities
- Gas Utilities
- Electric Utilities and Co-ops
- Ports, Airports & State Hwys
- County EDC
- Universities, Colleges & Schools
- Telecommunications Providers

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Shared Policy & Governance

- Pole attachment & Encroachment Fees
- Telecommunications Permit Processes
- Wireless Ordinance
- Wireless Standards and Guidelines
- Public Right-of-Way Standards
- Master Licensing Agreements
- Dig Once / Joint Trench Policies
- Data Privacy, Security & Retention
- Digital Inclusion & Literacy

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Cooperative Procurement

- Broadband Transport Agreements
- ISP Agreements
- Fiber & Wireless Construction RFP's & Contracts
- Public Private Partnership Agreements (P3)
- Provider Services
- Marketing, Maintenance & Operations Contracts

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Regionalizing Local Funding

- Transportation Grants
- Public Safety Grants
- Economic Development Grants
- Reconnect Grants
- USDA Grants
- Leverage CIP & Public Works
- Leverage Development Agreements
- Leverage Small Cells for Revenue
- Service Provider Financing

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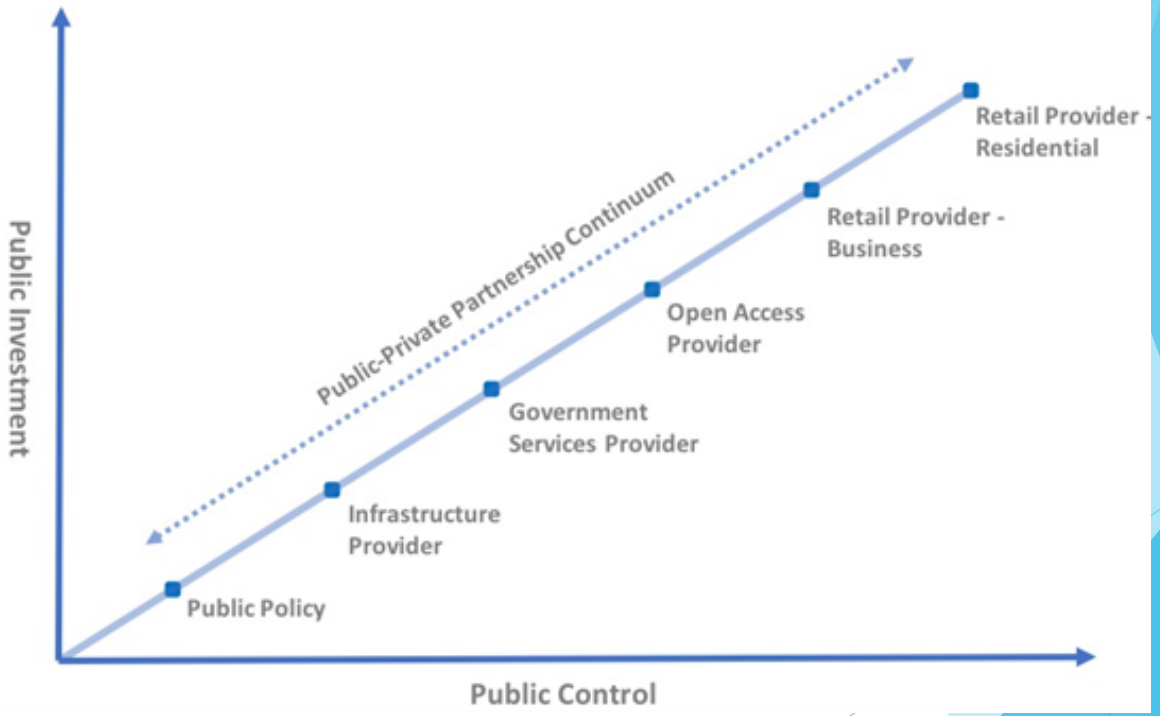
Reducing Risk: P3 Business Models

- Organize pole, conduit and fiber inventories
- Develop master plan including smart city initiatives
- Develop business model
- Develop governance model
- Develop RFP and select P3
- Negotiate terms and conditions with P3
- Coordinate P3 activities and monitor performance



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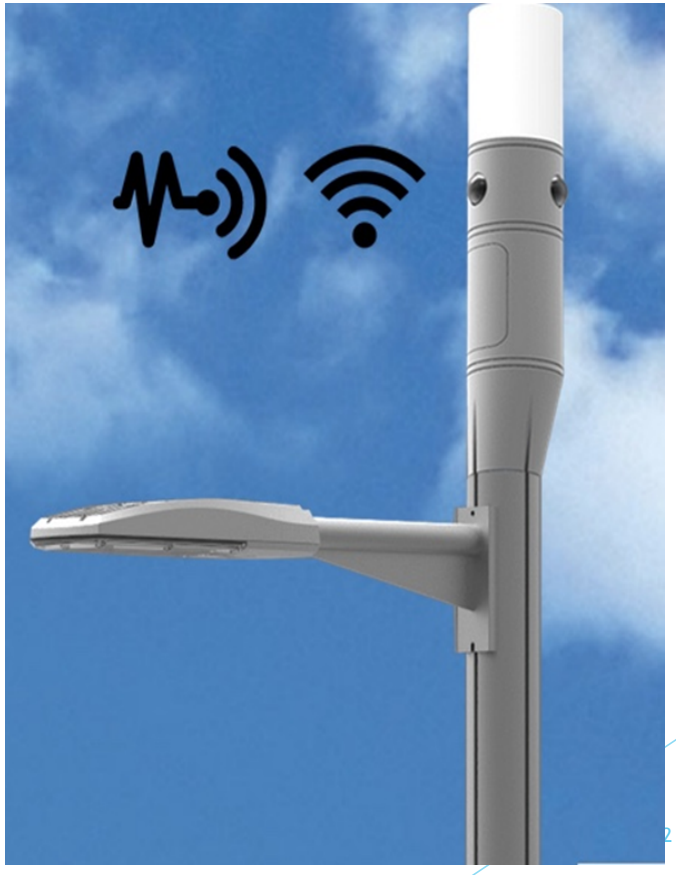
Site Licensing and Revenue Opportunities

- Attachment agreements (small cells, DCUs, DAS, smart poles)
- Purchase of Utility Poles
- License agreements vary from City to City
- Several potential partners exist
  - **Crown Castle** **AT&T**
  - **Extanet** **Verizon**
  - **Mobilitie** **T-Mobile**
  - **XG** **Sprint**
  - **Phillips/American Tower**
- Master License Agreement – Establish defined rates and terms
- In-kind considerations

MLA Key Terms

- Ten year initial term with automatic and optional five (5) year renewal terms;
- Must get business license, approvals, Encroachment Permit for each site;
- Co-terminus;
- Annual License Fee $XXX/pole per year w/ 3-4 % per year escalator;
- Includes Joint Build;
- Protection for Municipal Wireless Infrastructure (Wi-Fi, etc.) and
- Includes design guidelines and a public input process for residential neighborhoods and sensitive populations.



Policy & Governance

- Wireless Ordinance
- Wireless Standards and Guidelines
- Pubic Right-of-Way Standards
- Master Licensing Agreements
- Dig Once / Joint Trench Policies
- Development Review
- Development Agreements
- Capital Projects

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APPENDIX E

SiFi Networks Slides

California's Fiber Future

CA State Presentation

November 2019

Who are SiFi Networks

- Last Mile Fiber Optic Infrastructure Developer
- Funding, building and operating fiber to the premise and Smart City infrastructure
- Creators of FiberCities™
- 100% privately funded
- Environment to attract multiple Internet Service Providers (ISP) - **Competition**
- Three Layer Model

Fullerton FiberCity™

- Developers of the **USA's largest privately funded open access FiberCity™**
- One of the worlds most reliable network architectures
- Building past every single business and home in the city
- Ensuring competition with multiple ISPs on the network
- Connecting up 49 municipal facilities to support the cities growing needs
- Smart City application ready

Institutional Finance

Funding Partners

apg

Sifi Networks

WHITEHELM CAPITAL

Community

- Unlike those that have come before us FiberCity™ is a network tailored to the community
- Service Providers imbedded in the community
- Committed to top class service – no long term monopoly
- Not just about selling internet but creating a better quality of life for the city through:
  - The school district, college, hospital and non profit organisations including smart city

Government Intervention

- Cherry picking prevention
- Permitting process enhancement
- Smart city financial aid (e-rate model)- onboard the semi rural to viable private investment – 10% fund gap
- PPP models – enable rural California to be connected

APPENDIX F

Praxis Associates/Inyo Networks Slides

Fiber-Powered Regional Networks

EFF Fiber Policy Meeting

Michael Ort, Ph.D.

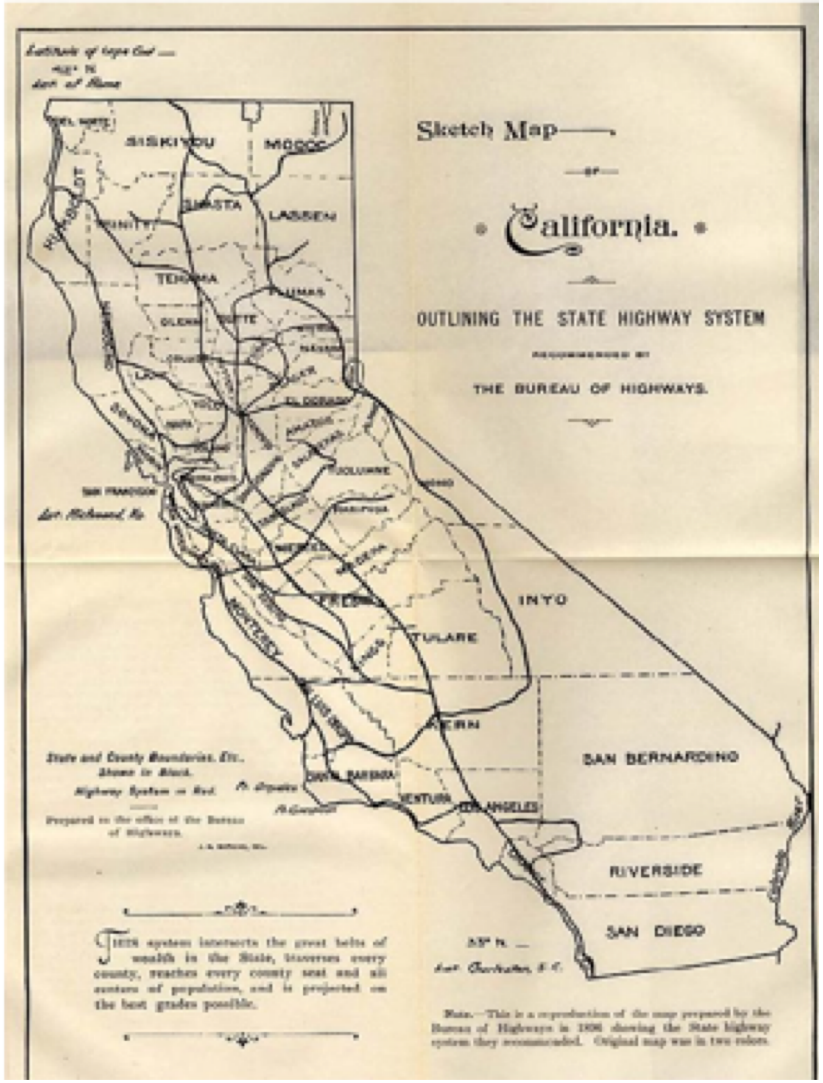
November 12 , 2019

Inyo Networks

Representative Customers




Transformative Infrastructure - 1895



Drivers of the Digital Economy

Internet of Things

Big Data

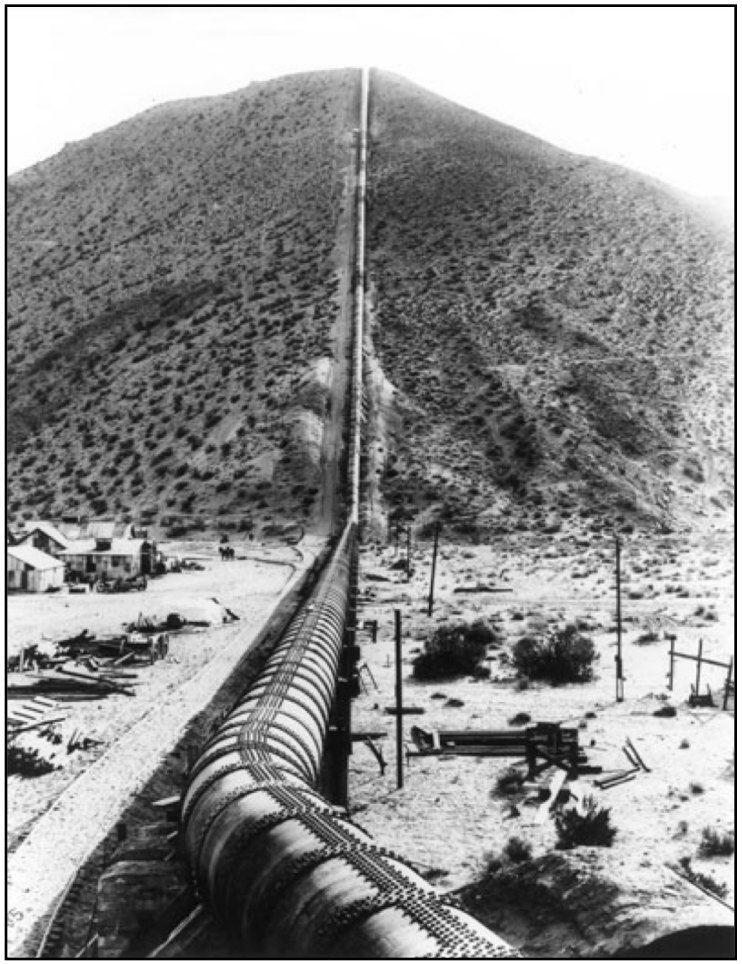
Cognitive Computing (AI)

The Cloud

Images: dreamstime

21st Fiber Infrastructure

Transformative Infrastructures

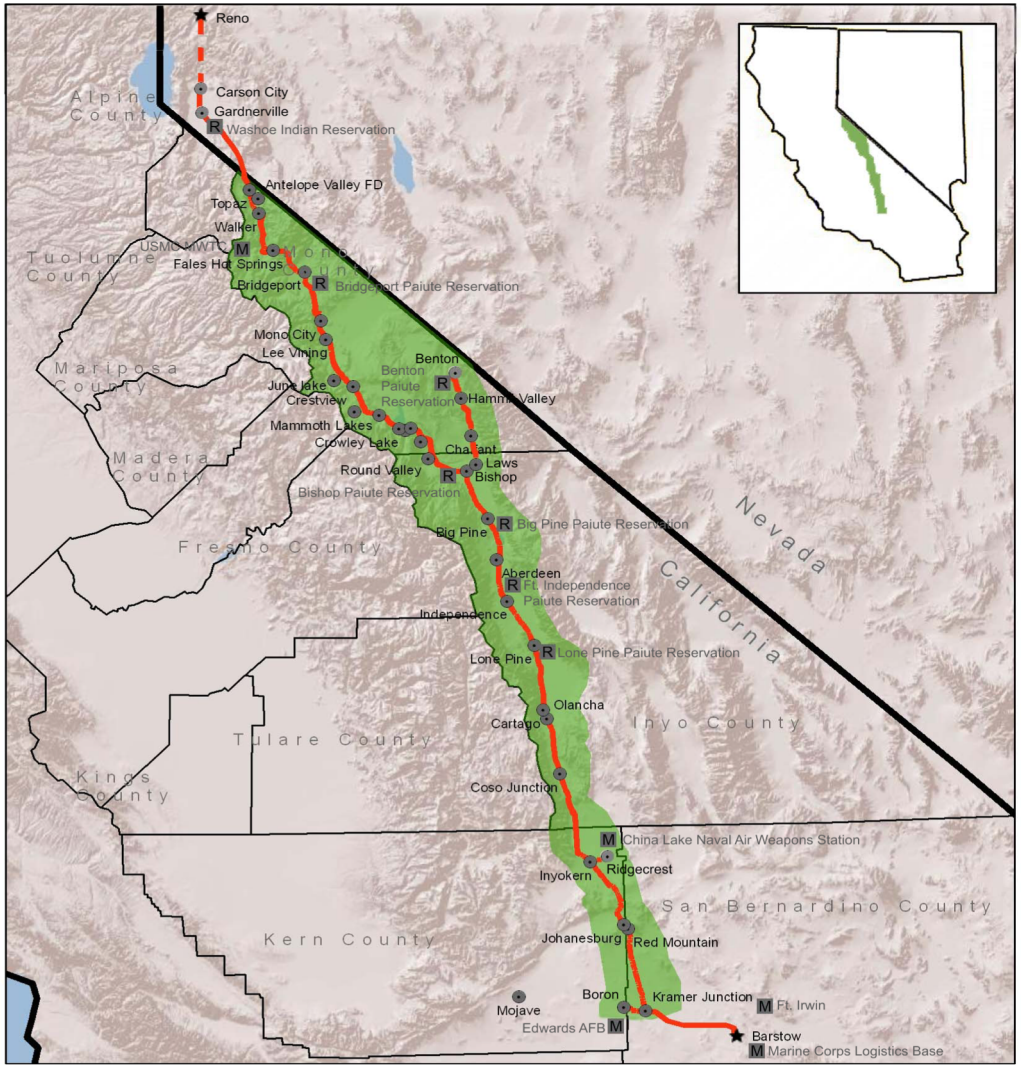


Los Angeles Aqueduct - 1913

US 395 – 1910 to 1940

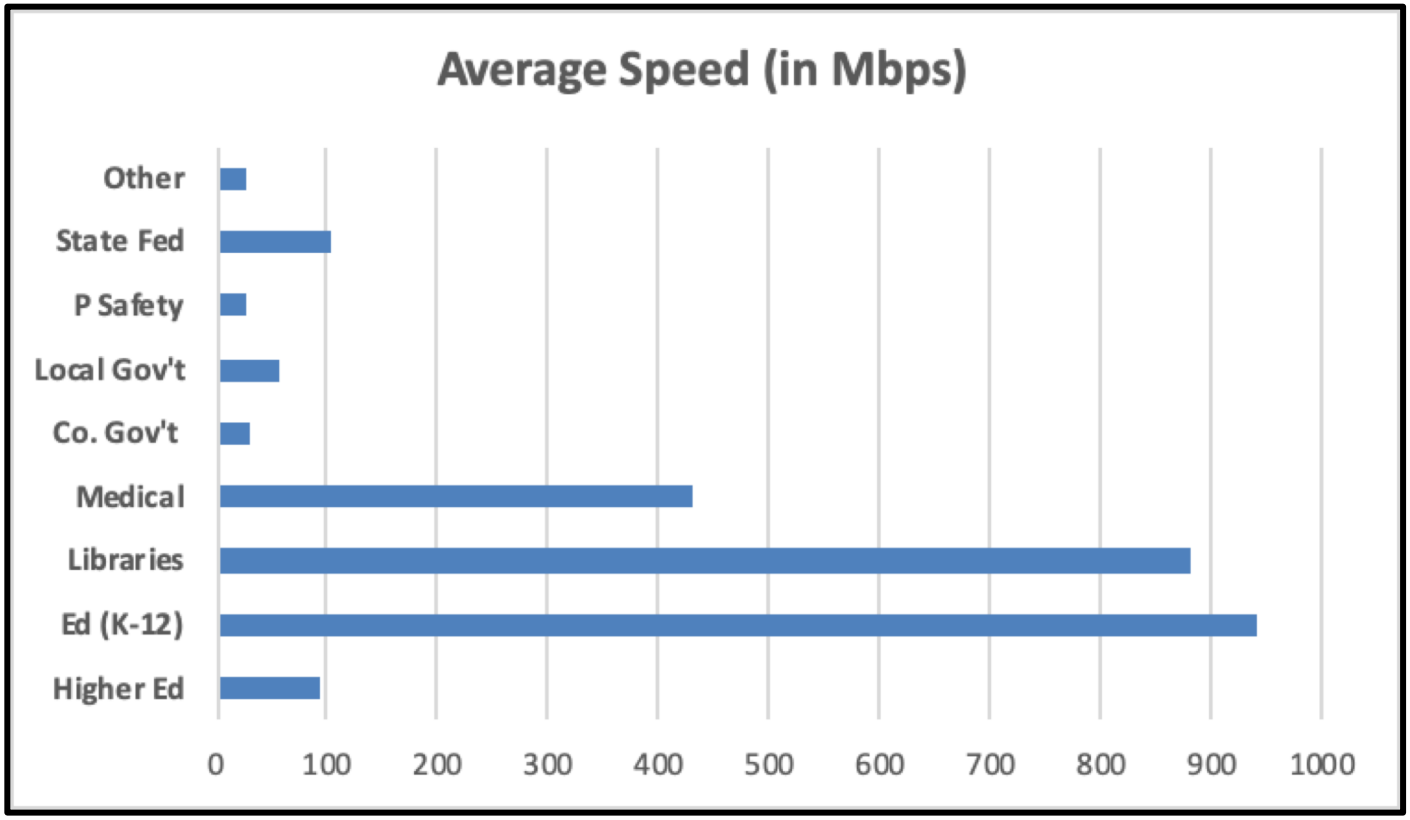
Digital 395- 2014

Digital 395


Reno
Carson City
Gardnerville
R Washoe Indian Reservation
Alpine County
Antelope Valley FD
Topaz
Walker
M
Fales Hot Springs
Bridgeport
R Bridgeport Paiute Reservation
Tuolumne County
Mono City
Lee Vining
Mariposa County
June Lake
Crestview
Benton
Benton Paiute Reservation
R
Hammil Valley
Mammoth Lakes
Crowley Lake
Chalfant
Laws
Round Valley
R
Bishop
Bishop Paiute Reservation
Madera County
Big Pine
R Big Pine Paiute Reservation
Fresno County
Aberdeen
R Ft. Independence Paiute Reservation
Independence
Nevada
California
Lone Pine
R Lone Pine Paiute Reservation
Olancha
Cartago
Inyo County
Tulare County
Kings County
Coso Junction
M China Lake Naval Air Weapons Station
Ridgecrest
Inyokern
San Bernardino County
Kern County
Johanesburg
Red Mountain
Boron
Kramer Junction
M Ft. Irwin
Mojave
Edwards AFB M
Barstow
M Marine Corps Logistics Base

Adoption: Broadband Speed

Digital 395 Anchor Speeds



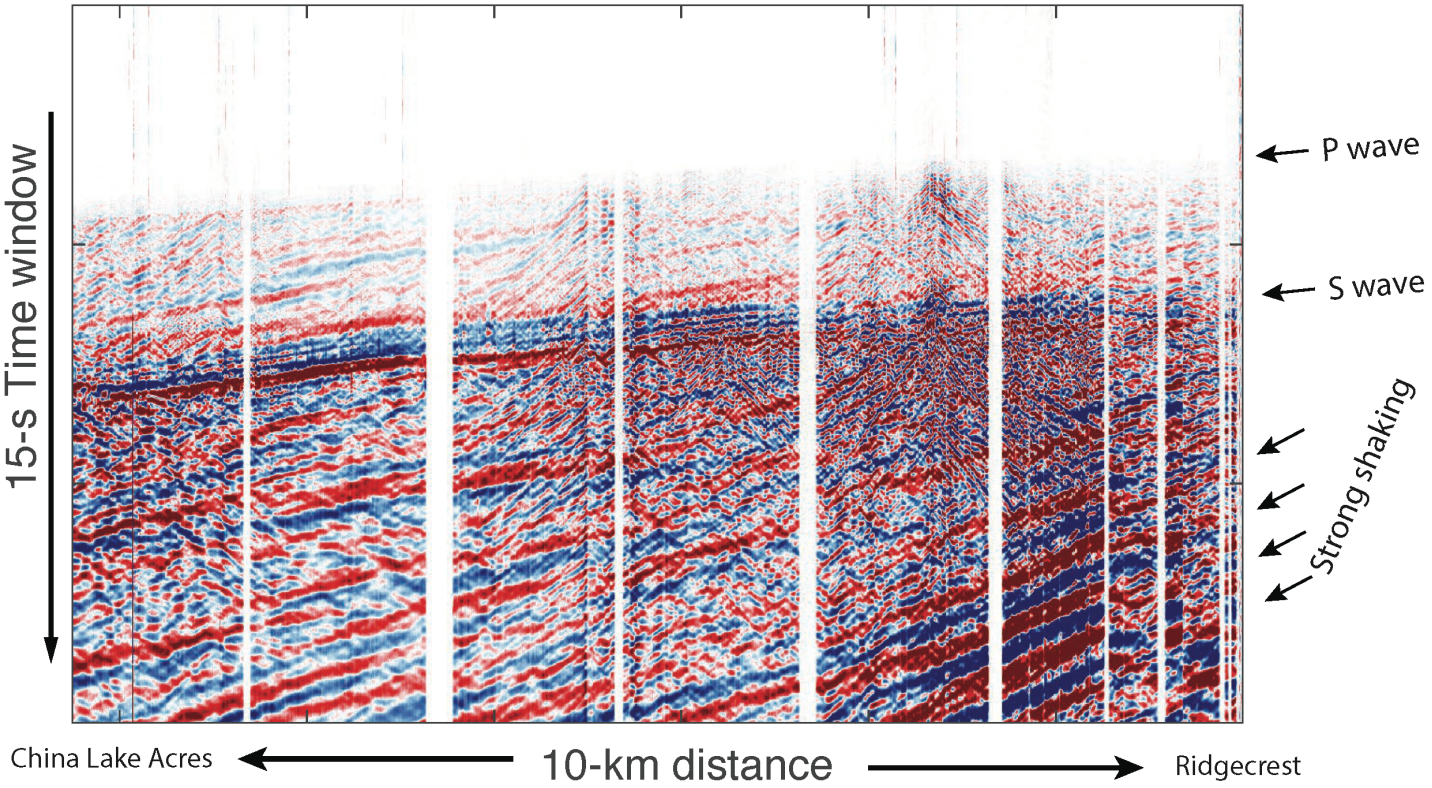
NOTE: As of October 31, 2019

Strategy: Infrastructure PLUS Policy

- *Market Strategy: Be Disruptive*
  - *Wholesale Model (GEM Anchors & Last Mile)*
  - *Flood the region with broadband to stimulate application use and development*
  - *Establish metro or better pricing and product offering*
  - *Many points of interconnection, shareable assets*
- *Foster Robust Ecosystem*
  - *Adopt model of "Cooperation, not Competition"*
  - *Symbiotic relationship – Mutual Benefit*
  - *Last Mile Providers will stimulate demand*
  - *Encouraged development of Applications*
- *Results*
  - *Regional Bandwidth Avg: 1.8Mbps to 600 Mbps*
  - *ISP Growth: 5 to 15*

Ridgecrest Earthquake

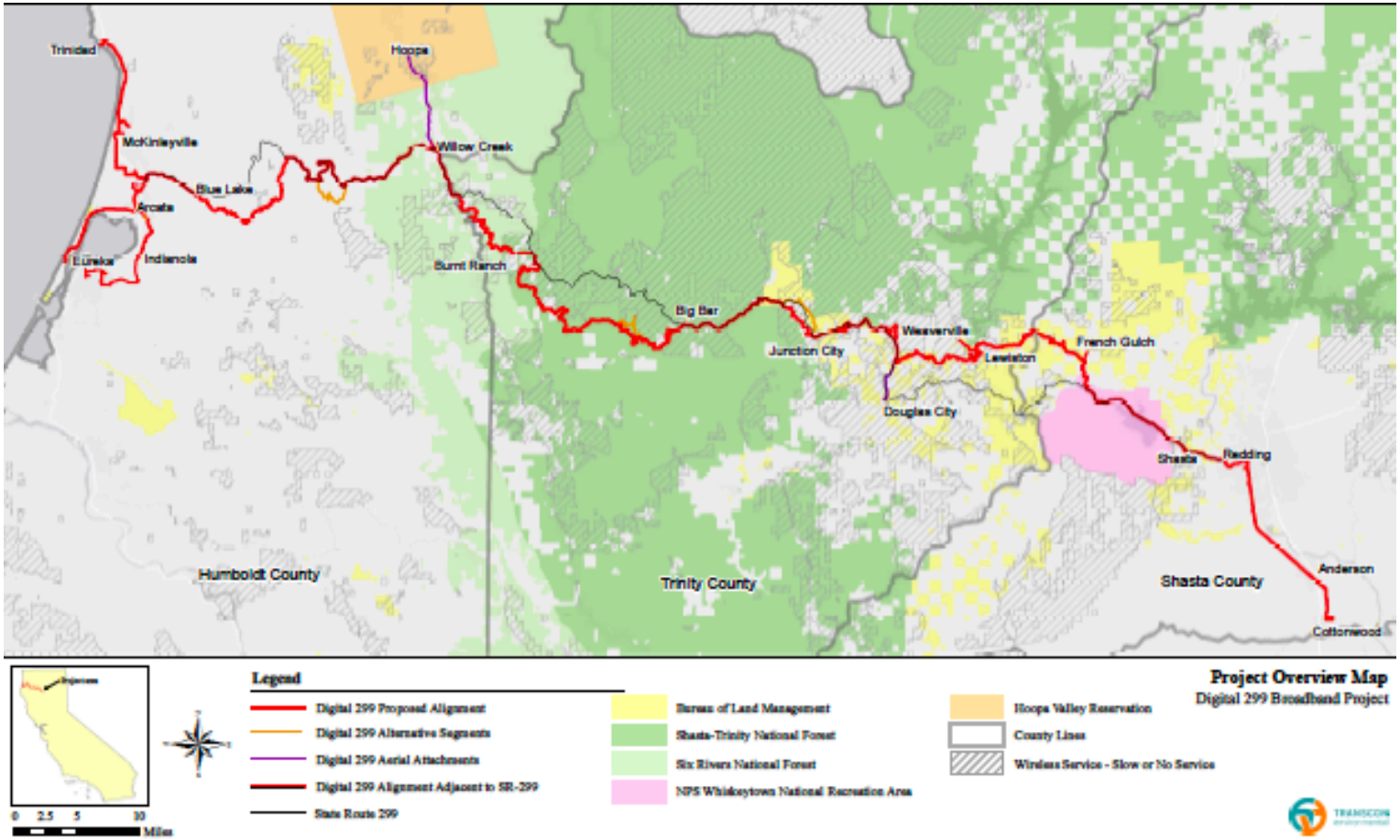
Ridgecrest Earthquake Fiber-Monitored (4.5 mag Aftershock (7/6/19)



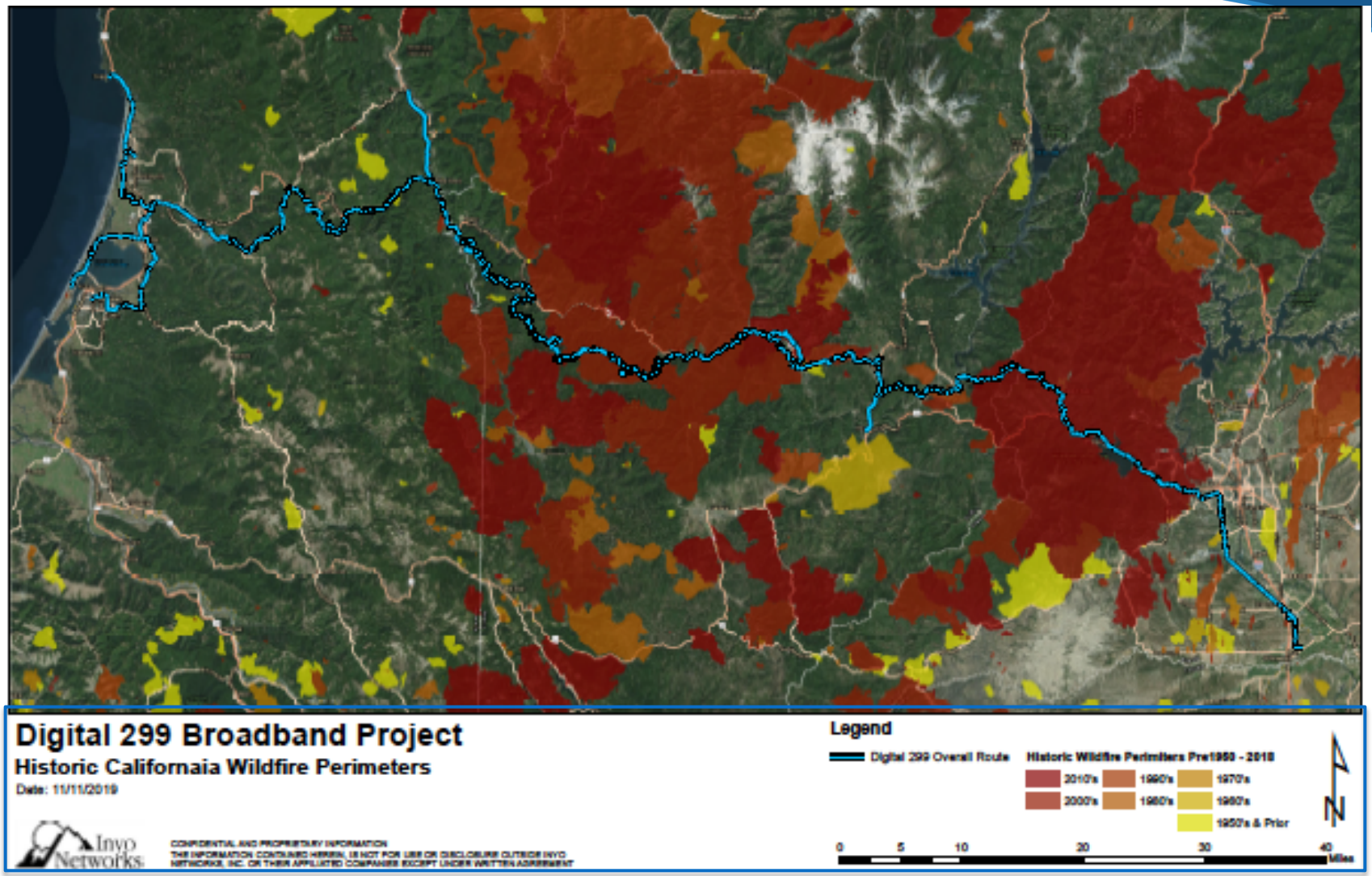
Source: Caltech Seismic Lab, 2019

Digital 299

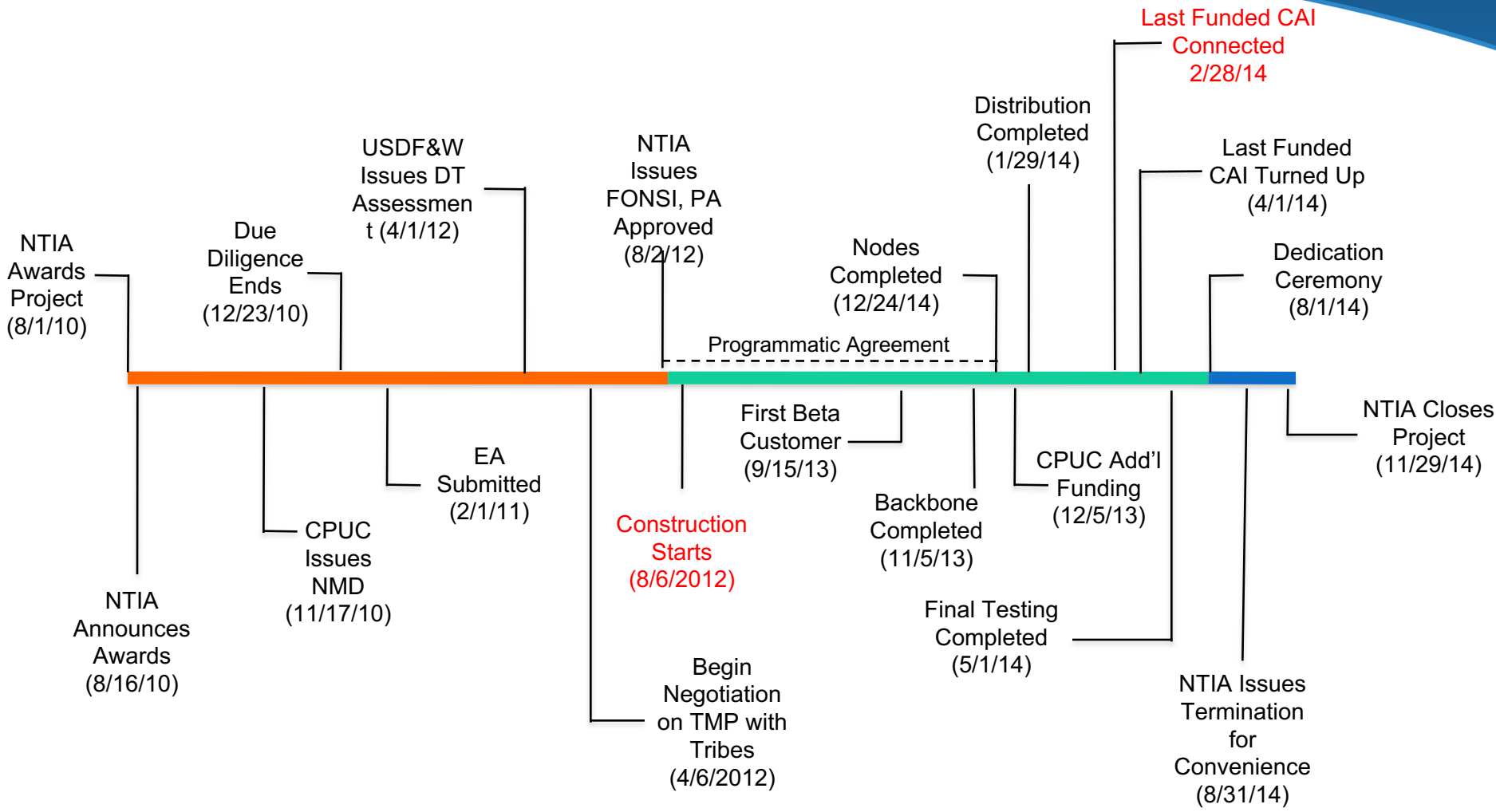
Digital 299 – Core Backbone



Regional Wildfire History



Planning to Completion – 5 to 8 Years



Thank You

Our Contact Information

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510-599-4062

mort@inyonetworks.com

Robert Volker

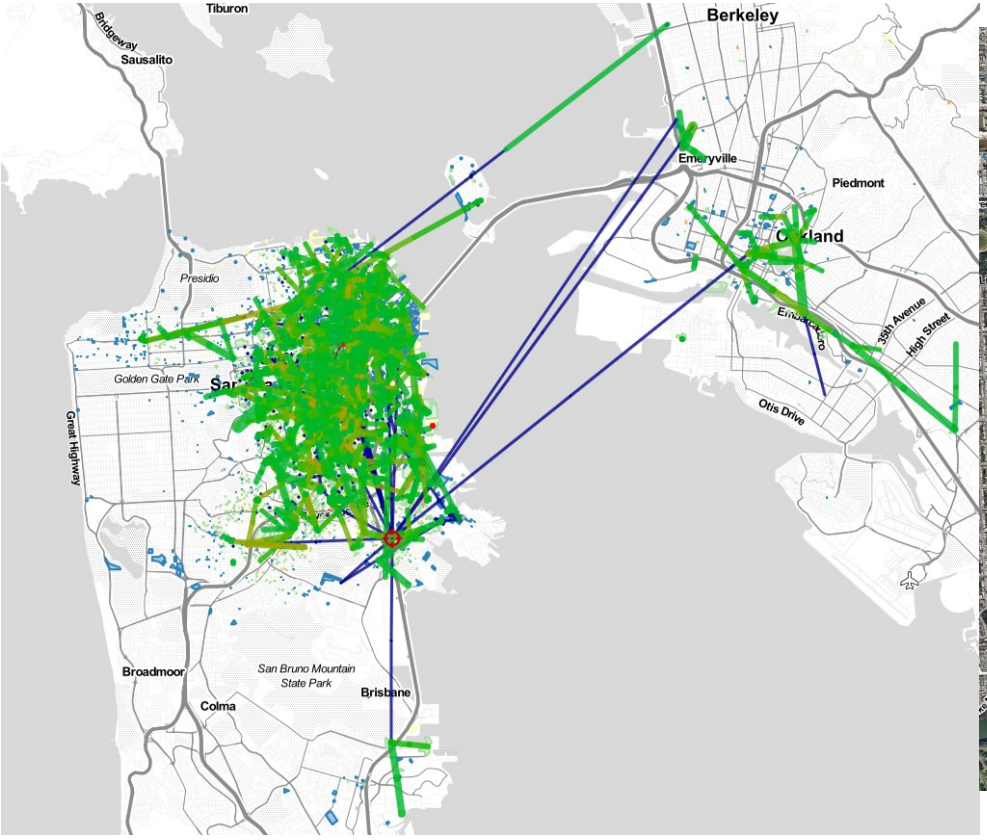
925-640-3600

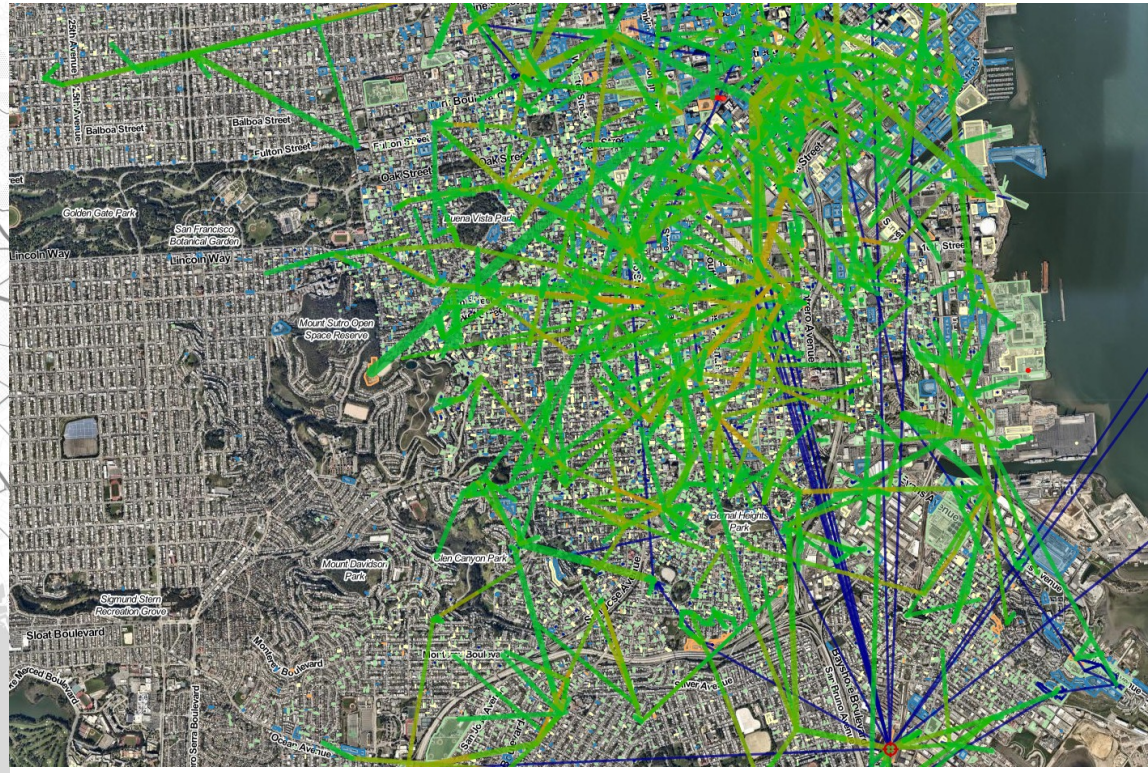
rvolker@praxisfiber.com

APPENDIX G

Monkeybrains ISP Slides

Three Programs for Public Fiber in California


Tiburon
Bridgeway
Sausalito
Berkeley
Emeryville
Piedmont
Oakland
Presidio
Golden Gate Park
Great Highway
Otis Drive
High Street
Broadmoor
San Bruno Mountain
State Park
Brisbane
Colma


Balboa Street
Fulton Street
Oak Street
Golden Gate Park
San Francisco
Botanical Garden
Lincoln Way
Mount Sutro Open
Space Reserve
Mount Davidson
Park
Sigmund Stern
Recreation Grove
Sloat Boulevard
Ocean Avenue

Three Programs

- **SF Article 52:** require fair and open access to multi-tenant environment (MTE) buildings
- **Fiber to Housing:** public dark fiber and wiring standards to support digital equity interventions
- **Nationalize the grid:** eliminate the main barrier to affordable public fiber deployment

Communications Choice Ordinance

- San Francisco passed **Article 52** in 2016. It has massively expanded customer access to smaller ISPs. This ordinance should be adopted statewide, and incorporate an anti-revenue sharing provision.
- Before Article 52, large landlords and REITs decided what broadband services their tenants could use.
- In addition to limiting competitive choice, landlords impose a revenue sharing provision which results in a secondary “rent” on their tenants who need broadband.

Monkeybrains and Article 52

- Monkeybrains has cited Article 52 to seven different organizations (owners and / or property management), with three resolutions - one resolution is a 100% below-market-rate building.
- Before Article 52 passed in 2016, we had a 0% rate of servicing 40+ unit MDUs with active revenue share agreements with Comcast and ATT. Since Article 52, we have a 60% rate of servicing 40+ unit MDUs with active revenue share agreements without invoking Article 52, and a 75% rate after invoking Article 52.
- In MDUs built 10+ years ago with 40+ units and long-standing revenue share agreements, we see very old technology deployed (coax DOCSIS 2.0/3.0 and Cat3 ADSL, with speeds of 20Mbps down – 3Mbps up) due to lack of competition. Building management blocks the entry of alternative ISPs due to existing revenue arrangement and tenants suffer.
- Article 52 is already keeping money in the pockets of working-class San Francisco families and will continue to do so as long as it is utilized.

- Let’s make the communications choice ordinance the law of the land in California.
- We must eliminate landlord + ISP revenue sharing as well to ease California’s housing affordability crisis.

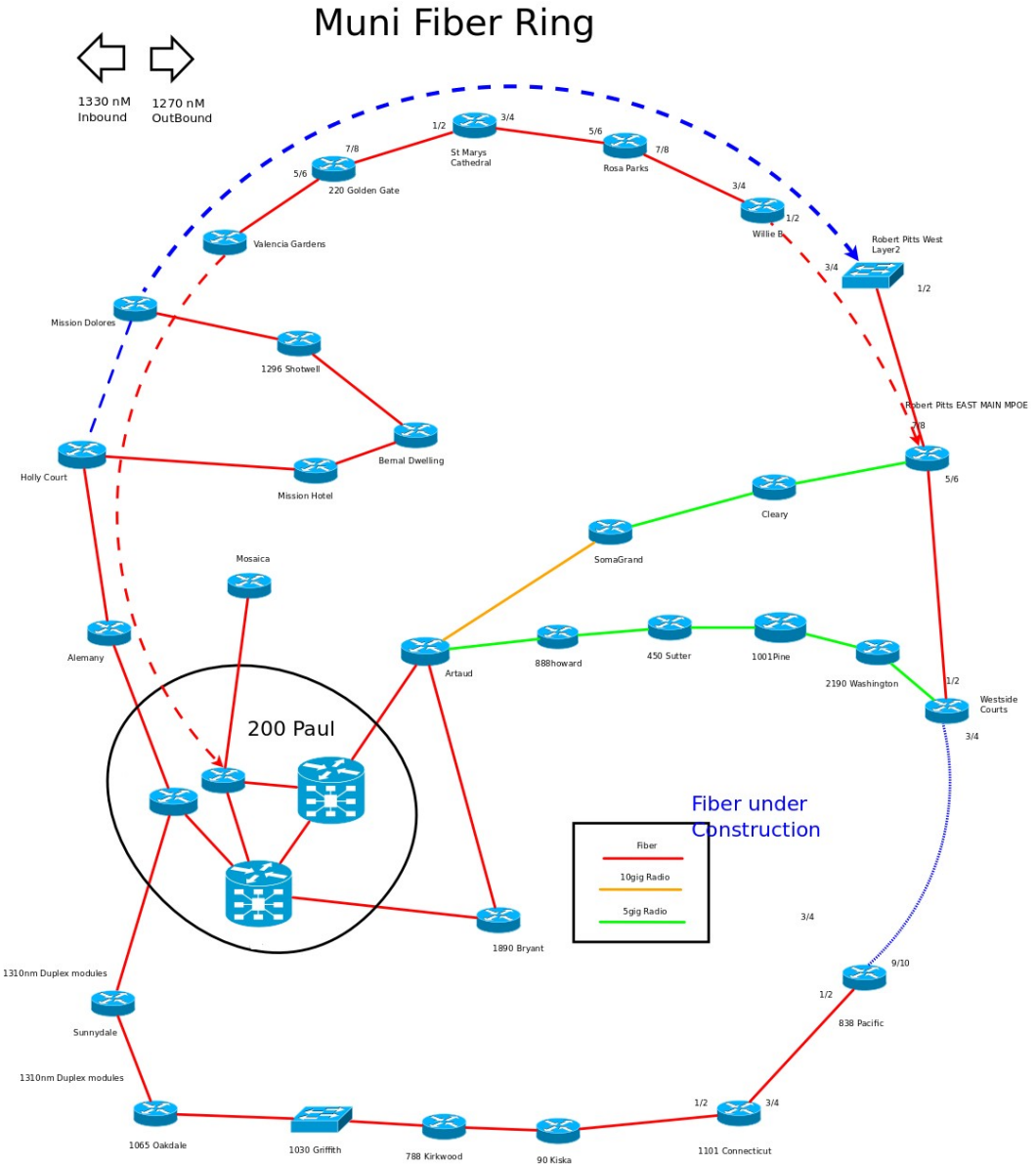
Fiber to Housing Program

- The City and County of San Francisco's Department of Technology (DT), the Mayor's Office of Housing and Community Development (MOHCD), and Monkeybrains in partnership with affordable housing providers and digital literacy organizations, have provided over 1,500 affordable housing units with free gigabit internet over public fiber – so far.

Building Public Fiber to Housing

- DT builds public dark fiber to “deed-restricted” buildings.
- MOHCD developed a wiring standard ensuring modern telecom service by default in renovated and new construction, supporting tenant choice.
- ISP (Monkeybrains) lights the fiber at 1 Gbps to each unit.
- Digital Equity Officer oversees programming for residents (router distribution, digital literacy classes, on-site support).

Muni Fiber Ring



MESSAGE FROM THE CITY AND COUNTY OF SAN FRANCISCO

In San Francisco, we believe that all residents should have the ability to access the Internet. We are committed to building a society that helps our most vulnerable residents connect to the wealth of opportunities and resources now available through technology. It is my great pleasure to share San Francisco's plan to accomplish this through the City's Digital Equity Strategic Plan.

The Internet has transformed our society in more ways than one. Digital tools are now standard in our workforce, schools, health care, and City services. Yet not everyone has the same ability to access or benefit from these advances. It has never been more important to bridge the divides in Internet access and digital literacy.

San Francisco's Digital Equity Strategic Plan is a starting point to change the status quo to a more connected community. From the beginning, our strategy has been built with our community. Through interviews and interactive workshops, hundreds of residents and dozens of stakeholder organizations have provided input on where services are needed most. Over the next five years, San Francisco's strategic efforts will focus on three main areas:

- **Expand affordable, high-quality Internet access through strategic partnerships.** This includes bringing free, high-speed Internet service to affordable housing residents throughout San Francisco.
- **Launch digital literacy innovation programs** to test novel new ways to provide technology training and support in high-need communities.
- **Establish central leadership and accountability for measurable change.** This should take the form of a Digital Equity Scorecard and an open coalition with resources to support community-based organizations and residents with technology needs.

Guiding all of this work will be our principles of equity, deep community engagement, agility, and inclusion.

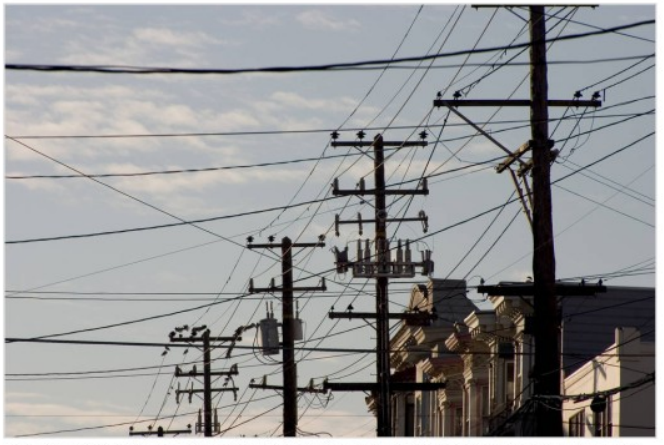
San Francisco's Digital Equity Plan is ambitious and builds on the progress we have already made in recent years. We look forward to working with all of our diverse communities and stakeholders to achieve digital equity in San Francisco.

London N. Breed
Mayor, City and County of San Francisco

- Adopt the Fiber to Housing program statewide.
- Build public dark fiber and set wiring standards so fiber will be directly useful to Californians in their homes and open for any provider to serve.

Take Public Ownership of PG&E

- The largest cost barrier by far to fiber deployment is ownership of distribution infrastructure (poles & conduits) by private power companies.
- San Francisco Mayor Farrell's stalled Fiber to the Premises program would have run into a wall with PG&E due to this problem.



Telephone poles and power lines over a San Francisco street. (Courtesy image)

Buying PG&E's distribution network could also make municipal broadband possible

COMMUNITY CONTRIBUTOR / Sep. 11, 2019 1:30 a.m. / OPINION

By Preston Rhea

The City of San Francisco is doubly harmed by its relationship with PG&E.

The for-profit utility neglected to invest in safety upgrades to its transmission lines, resulting in a series of deadly fires that killed dozens of people last year and choked Northern California with poisonous smoke. PG&E is using its bankruptcy to avoid liability for the disasters it caused.

Public Grid and Public Fiber

- State can pull fiber at any part of power pole, or in power conduits, if it owns the infrastructure.
- 5G deployment requires lots of fiber ~ three drops per city block. The public should own and control that asset, or the digital divide will be baked in by private “solutions.”
- Open fiber can be lit by any qualified provider.

- Governor Newsom should make good on his suggestion to have California own PG&E.
- PG&E’s monopoly over poles and conduits is a major barrier to equitable deployment of fiber and makes Broadband for All impossible.

APPENDIX H

Common Networks Slides

Common Networks

A new choice for home internet

EFF Forum: Programs for California Fiber

November 2019

common

FACT

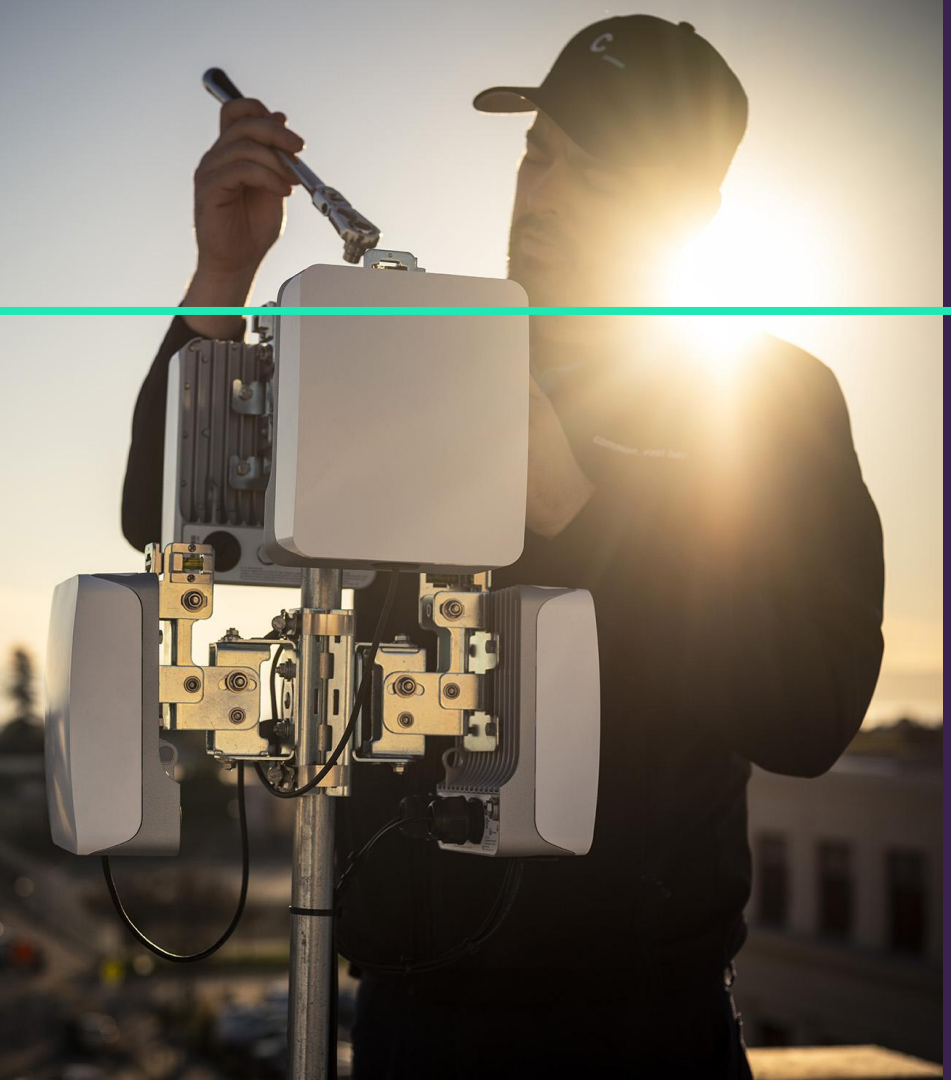
7 in 10 teachers assign homework that requires access to broadband internet

Source: "*The Homework Divide: 12 million schoolchildren lack internet*", Axios, Dec 2018.

FACT

8 in 10 people now search for online health information

Source: "More People Search for Health Online", NBC News, July 2018.



Common Networks

is a wireless internet provider offering fiber-class home internet service.

Our plan is to offer East Bay cities a new option for ultra high-speed internet.

common

Our Approach

common_

Basic

$34
per month

1-2 devices

Stream & download HD videos & music

Ideal for light usage activities

Faster

$39
per month

6+ devices

Stream HD & 4K videos on multiple devices

Perfect for most households

Fastest

$49
per month

20+ devices

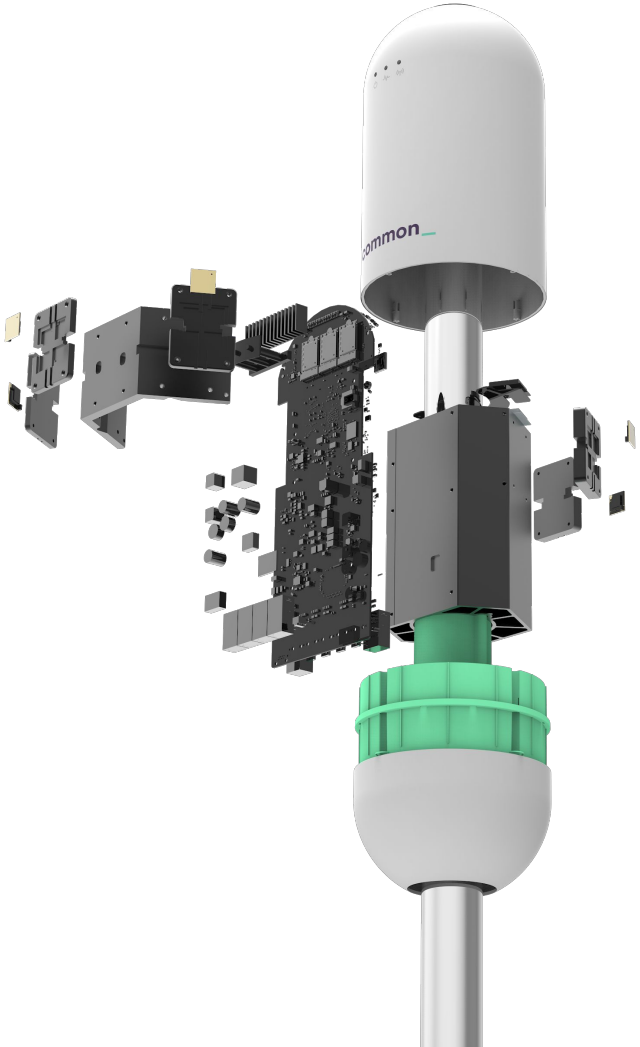
Download shows & movies in seconds

Extra speed for superusers

- Free installation
- Equipment and WiFi router included
- No taxes, no suprise fees
- No contracts, cancel any time

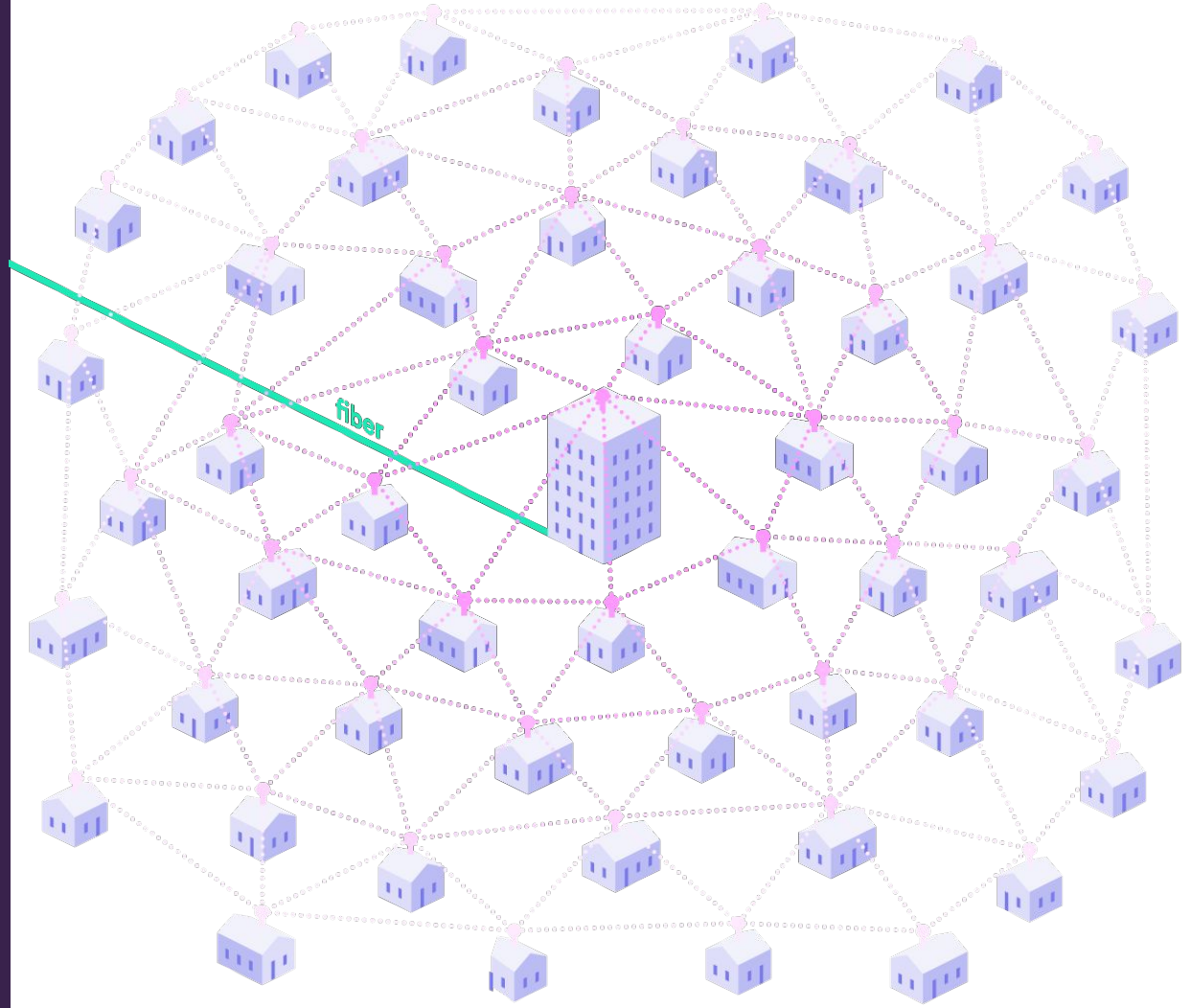
Building Next Generation Internet

We have deployed faster tiers of service to our customers and our next generation hardware is poised to deliver speeds of one gigabit per second

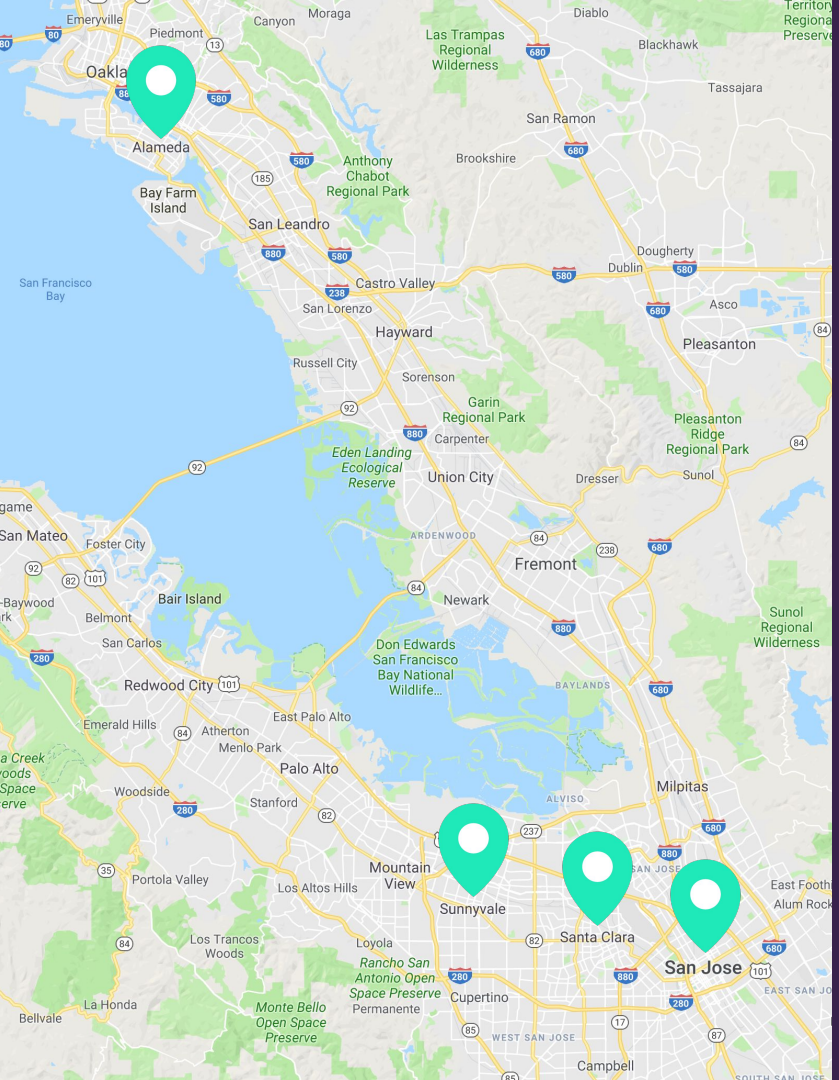


How Our Network Works

Using our patented graph approach, we can distribute bandwidth to hundreds of homes in a neighborhood.



U.S. Patent (US10172020B2) - *Systems and methods for networking and wirelessly routing communications*



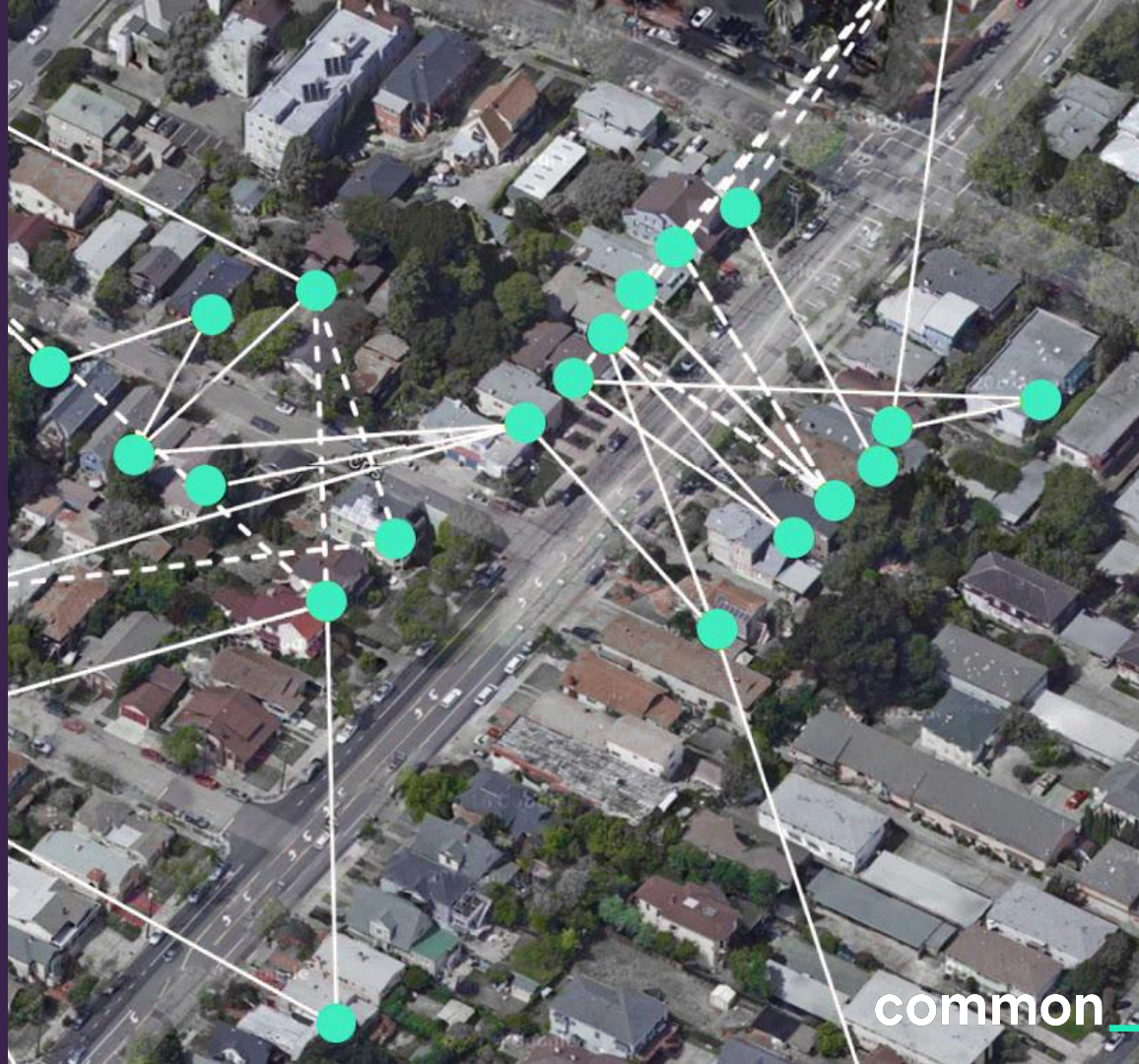
We currently are serving customers in Alameda, San Leandro, Oakland, Santa Clara, Sunnyvale, and San Jose

common_

Key Benefits of Our Model

Our model is a true alternative to fiber-to-the-home in that it:

- Leverages existing fiber infrastructure
- Requires minimal construction impact
- Has a lower overall cost
- Is faster to deploy - covered the majority of Alameda in ~18 months



A Partnership with the Community

Local Partners:

We also work with hundreds of local organizations including:

- Alameda South Shore Center, Alameda Theatre, Community Impact Lab, San Leandro Historical Society, Tech Exchange, and many many more
- And more than 350 buildings in Alameda

Partnership with City of San Leandro

- On June 17, 2019, we received unanimous approval by San Leandro City Council
- 2 Master License agreements allowing us to:
  - Lease rooftop space on city facilities
  - License city dark fiber

MASTER LICENSE AGREEMENT

This Master License Agreement ("**Agreement**") is entered into effective as of _____, 2019 ("**Effective Date**") by and between the City of San Leandro, a California charter city ("**City**") and Common Networks, Inc. ("**Company**"). City and Company are hereinafter referred to individually as a "**Party**" and collectively as the "**Parties**."

RECITALS

A. City is the owner of certain properties located within the City of San Leandro which may be well suited for communication equipment.

B. On a case-by-case basis, Company desires to install, operate, maintain, replace, modify and remove certain communications equipment, which may consist of, but is not necessarily limited to, antennas, radios, cabling and mounts (the "**Equipment**") on rooftop portions of City properties ("**Permitted Activities**"), and City is willing, on a case-by-case basis, to make certain properties available to Company for the Permitted Activities.

C. The Parties desire to enter into this Agreement to set forth the general terms and conditions, set forth herein for each specific property which Company may elect to use and City may elect to permit Company to use, as further set forth herein.

NOW THEREFORE, for good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the Parties agree as follows:

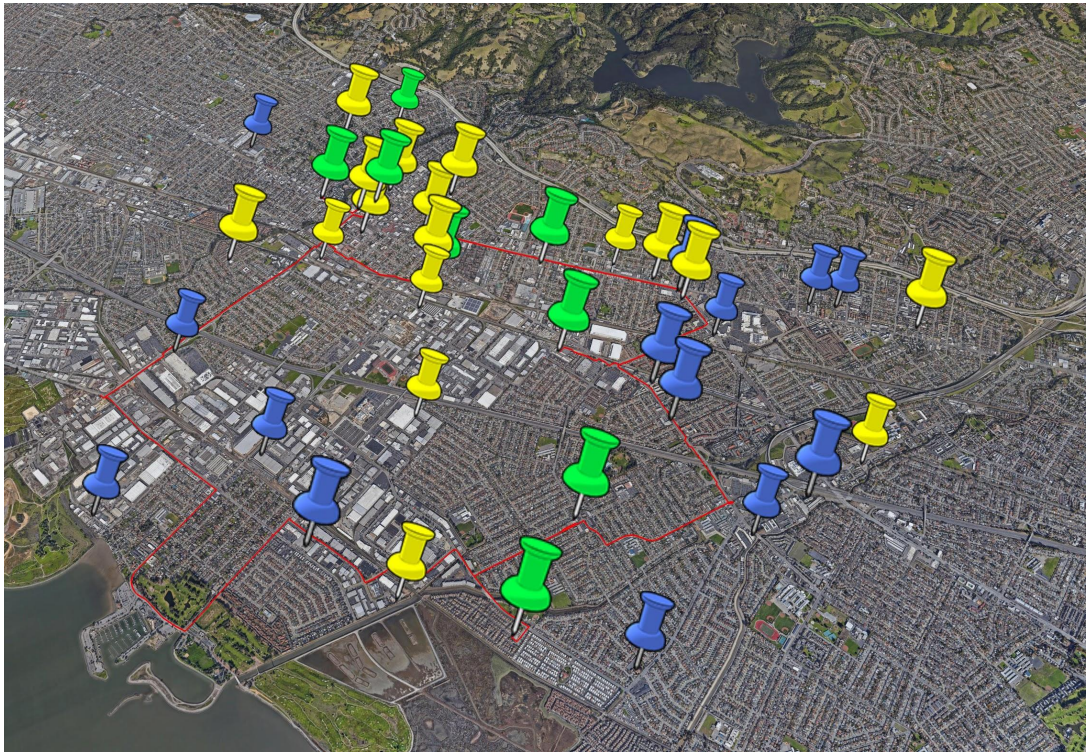
1. Master Agreement and Site Agreements. This Agreement sets forth the basic terms and conditions upon which each Site Agreement (defined below) is executed by City and Company. Upon agreement between the Parties with respect to the particular location and terms for use of a Permit Property (as defined below), the Parties shall execute a completed Site License Agreement ("**Site Agreement**") in the form attached hereto and incorporated herein by this reference. Each Site Agreement shall act as a separate and independent agreement for each Permit Property, the express intent of the parties being to use this Agreement to facilitate each of the independent transactions. The Site Agreement shall identify the specific property owned by the City ("**Permit Property**") together with the specific location of the roof of the Permit Property for Company's installation of the Equipment ("**Roof Space**") and such other terms as set forth therein. The Site Agreement may have special clauses specific to each individual Permit Property. In the event of a discrepancy or inconsistency between the terms and conditions of a particular Site Agreement and this Agreement, the terms and conditions of this Agreement shall govern and control. The City is not obligated to execute a Site Agreement for any particular Permit Property and the execution of any such Site Agreement shall be in the City's sole discretion.

2. Grant of License. Upon execution of a Site Agreement, City grants to Company, its contractors, subcontractors, employees and agents (collectively, the "**Company Parties**") a license to conduct the Permitted Activities on the Roof Space identified in the Site Agreement. Subject to the terms and conditions of this Agreement and the Site Agreement, the license granted under a Site Agreement includes the right of access for the Company Parties from the public right-of-way onto and through areas of the Permit Property as required to perform the Permitted

620\3185927.7 1

Working Collaboratively with San Leandro

We have been able to build significant coverage in San Leandro for our launch earlier this Fall



common

common_san leandro Timeline

SUMMER 2018

Decided on San Leandro as potential market

FALL 2018

Reached out to the Office of Information Technology

DECEMBER 2018

Began reaching out to local property owners for coverage partnerships

FEBRUARY 2019

Signed 10 partner buildings and have many more in negotiation

MAY 2019

San Leandro Facilities and Transportation Committee meeting

Begin installation of source and relay sites

JUNE 2019

San Leandro City Council Approval

AUGUST 2019

Early Access Launch

First customers connected

SEPTEMBER 2019

Press Launch

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Critical Asks

Understanding modern wireless networks & fostering competition

- OTARD Expansion: The most immediate impact of expanding OTARD protection for fixed wireless providers will be to remove the ambiguity around modern wireless networks, decreasing market entry barriers and reducing time to gain access to neighborhoods to serve new customers
- Multi-Tenant Environments: Revenue sharing agreements stifle and delay, if not eliminate, competition and deployment of broadband services
- Affordable Programs: Subsidized programs and innovative partnerships to allow smaller providers to support more accessible and affordable plans to disadvantaged communities

Get in Touch

Heba Gamal
HEAD of MARKET GROWTH

heba@common.net

common_

APPENDIX I

Crown Castle Slides

CROWN CASTLE | FIBER

State of California

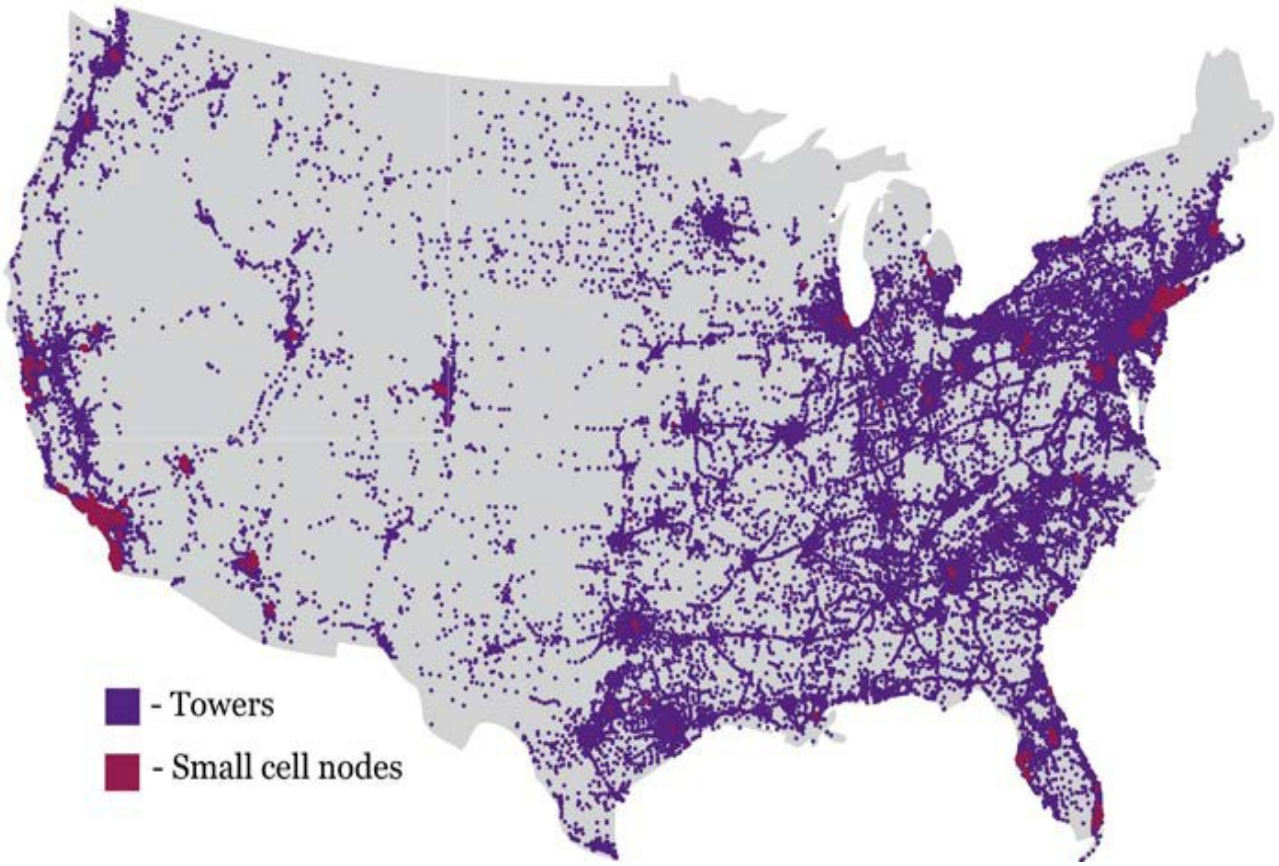
Providing High-speed Fiber Optic and Wireless Connectivity for the State of California

November
2019

The pathway to possible.

Crown Castle – Neutral Host Telecom Infrastructure Provider

National Footprint



25 Years of Experience
Nearly 100 offices
5,000 Employees

75K+
route miles of fiber

65K+
small cells on air or under contract

40K+
towers on air or under contract

CROWN CASTLE | FIBER

California Footprint

440 Resident Full-Time Employees
7 Offices

4,415 Towers
14,780 Small Cells
9,510 Fiber Miles

190 Government, School & Public Safety Customers

2,840 Buildings Connected by Fiber

We enable the services that make life more **convenient**, **enjoyable**—and **safe**.

50+%
of households rely exclusively on their mobile phones.

Video
is projected to be 77% of mobile data traffic by 2020.

80+%
of 911 calls are placed from wireless phones.

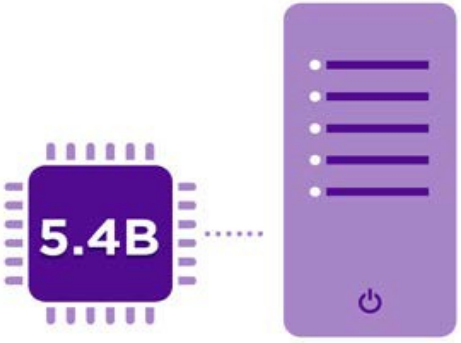
Mobile devices

From 2015 to 2020

Wearable devices

By 2020

Machine-to-machine connections



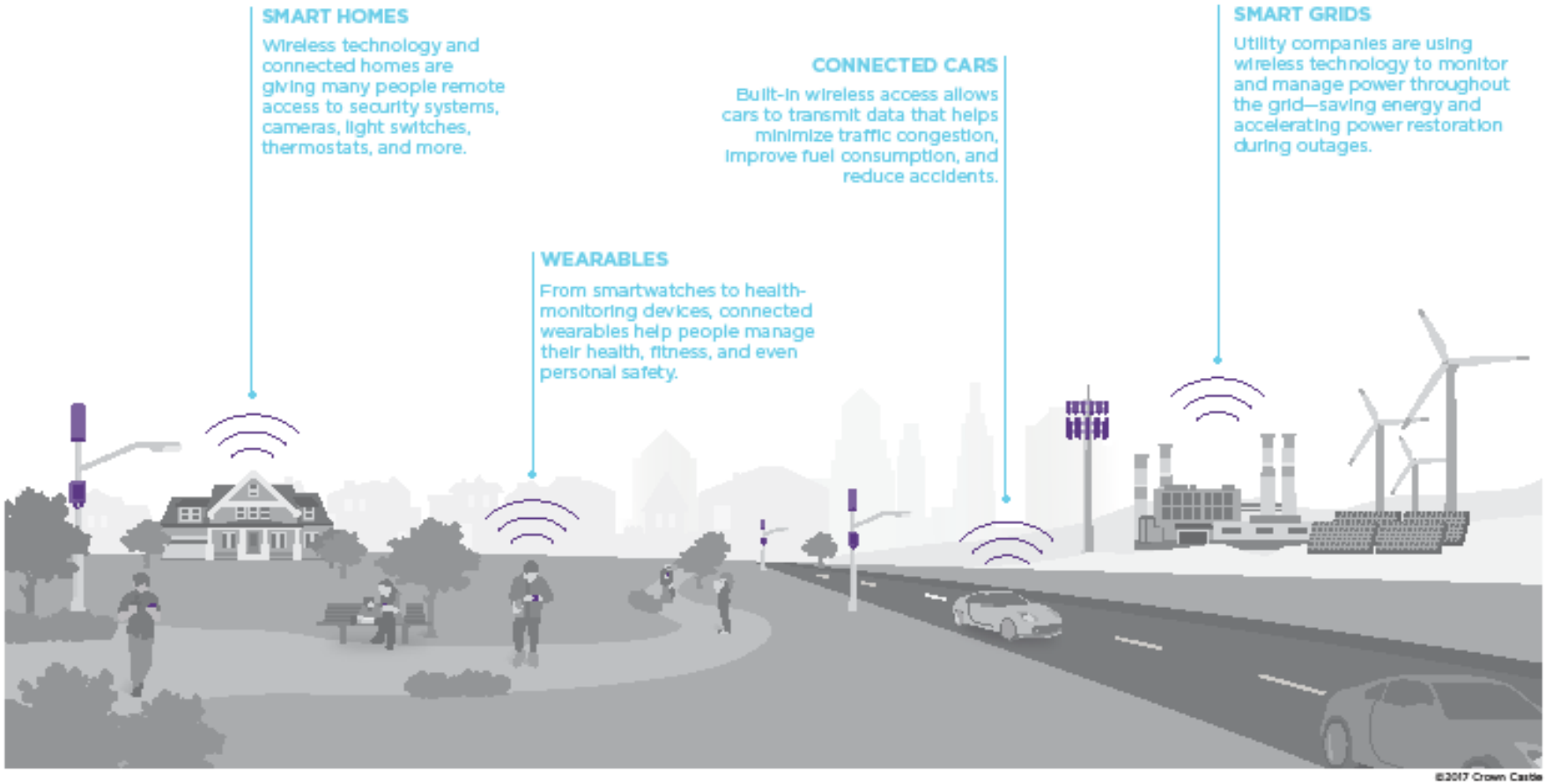
By 2024

CROWN CASTLE | FIBER

The "Internet of Things" and the infrastructure that enables it.

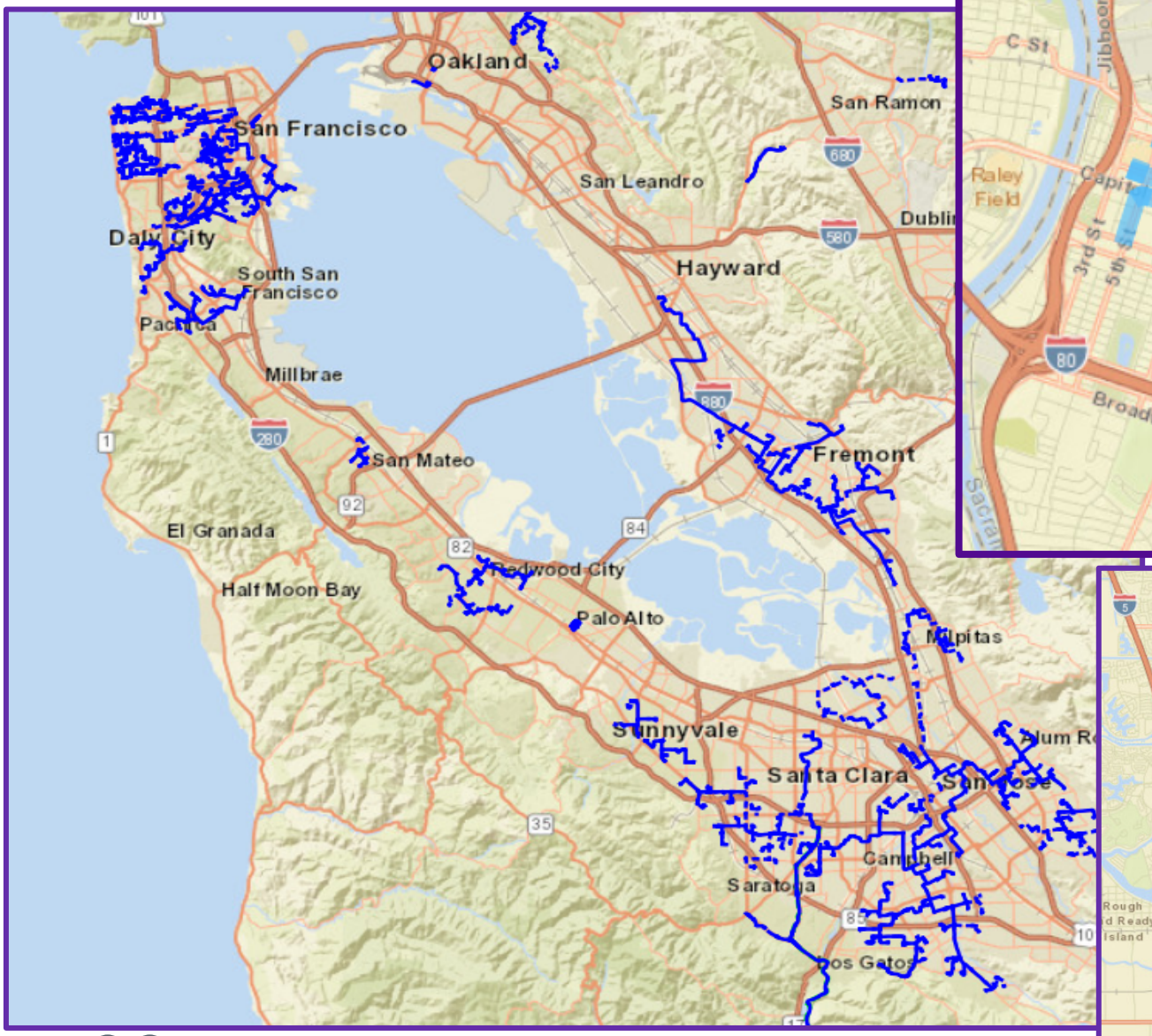
CROWN CASTLE

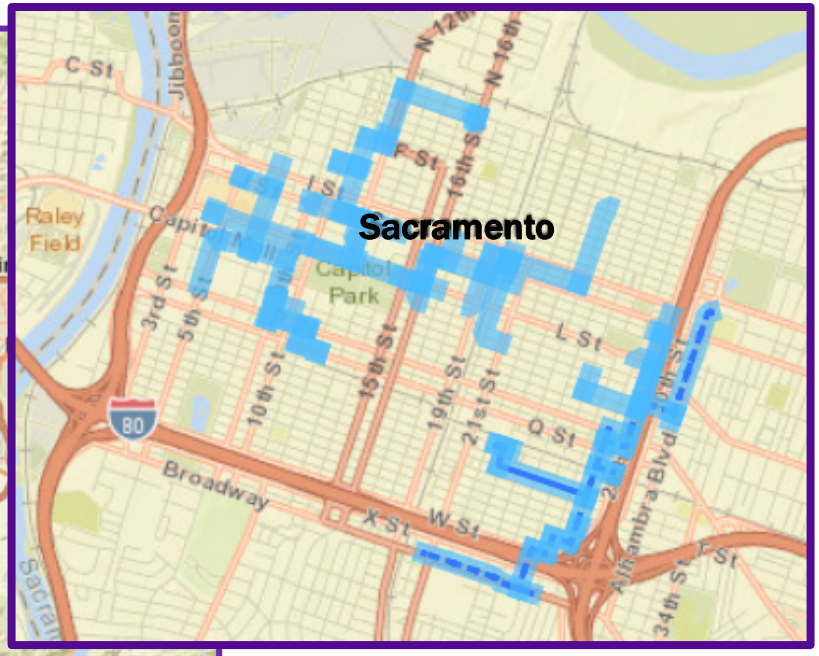
The internet revolution changed the way we use computers. Then wireless internet came along and made our phones smart and tablets possible. But that was just the beginning. Wireless data is changing the way we exercise, drive our cars, manage our homes, and even deliver power to our cities. It's called the "Internet of Things." And our infrastructure is enabling the wireless connections that make it possible.

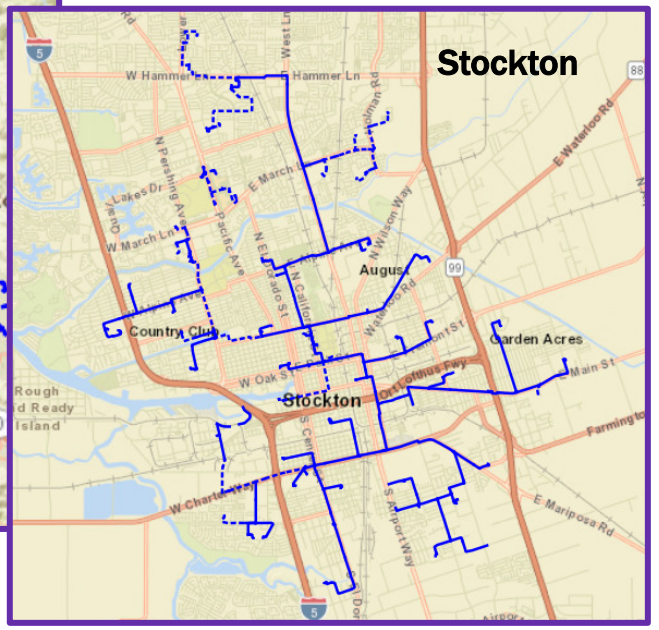


Our California Fiber Assets

Crown Castle Bay Area & Central Valley Fiber Networks

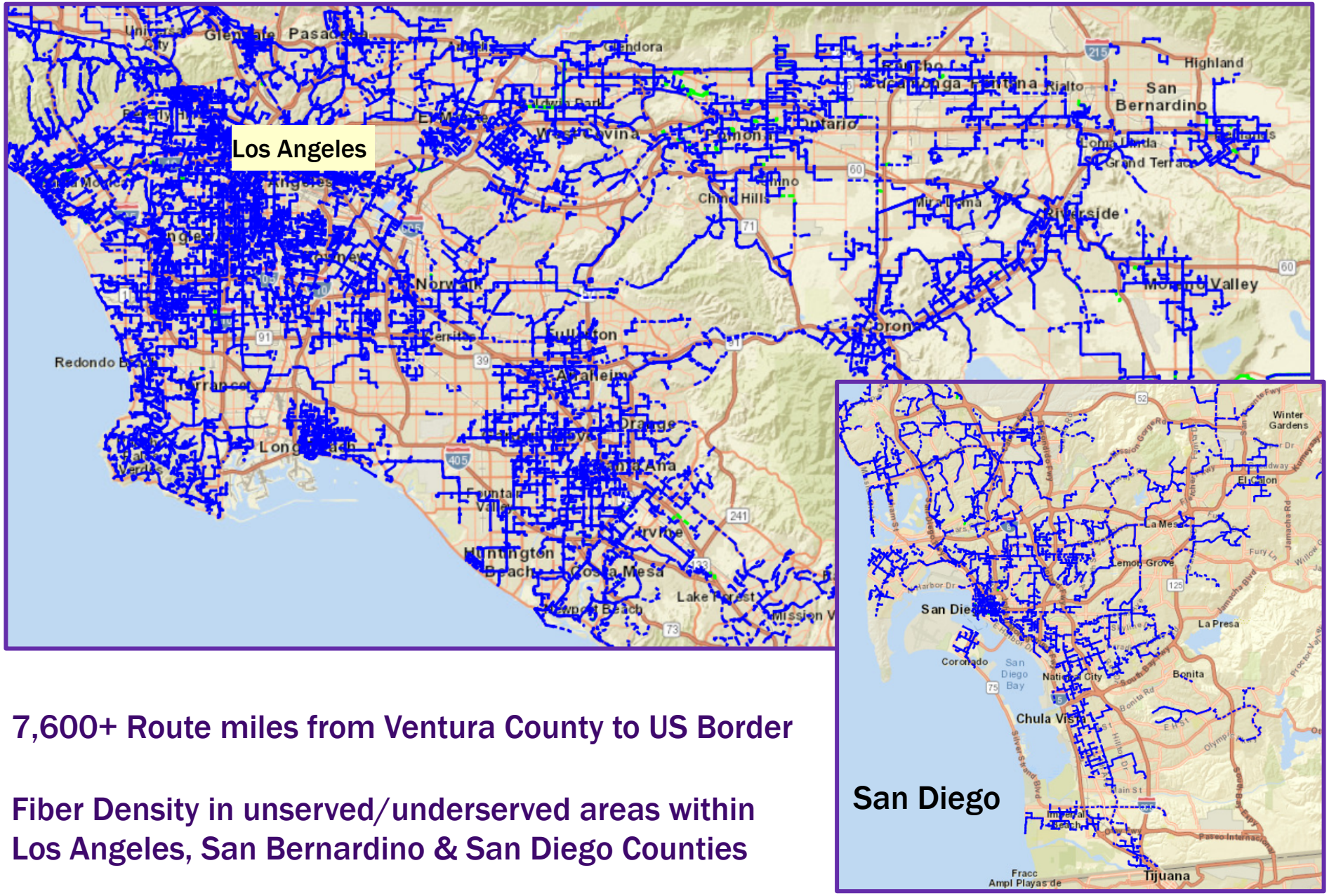






1,505 Route miles of fiber

Southern California Crown Castle Fiber Map



7,600+ Route miles from Ventura County to US Border

Fiber Density in unserved/underserved areas within Los Angeles, San Bernardino & San Diego Counties

Impediments to Deployment

Industry is Slow to Innovate .....

Traditional Open Trench

Open Trench Road Closures

But it is Happening .....

Vacuum Excavator & Trencher

Benefits of MicroTrenching

- Less invasive than traditional cut/fill trenching
  - 2” wide vs. 1’-2’ for open trench
- Less time
  - 1-2 days vs. 1-2 weeks
- Less waste
  - All debris is vacuumed during trenching
- Lower impact on streets
- Reinstatement material similar to concrete, mitigates possibility of vertical trench walls collapsing

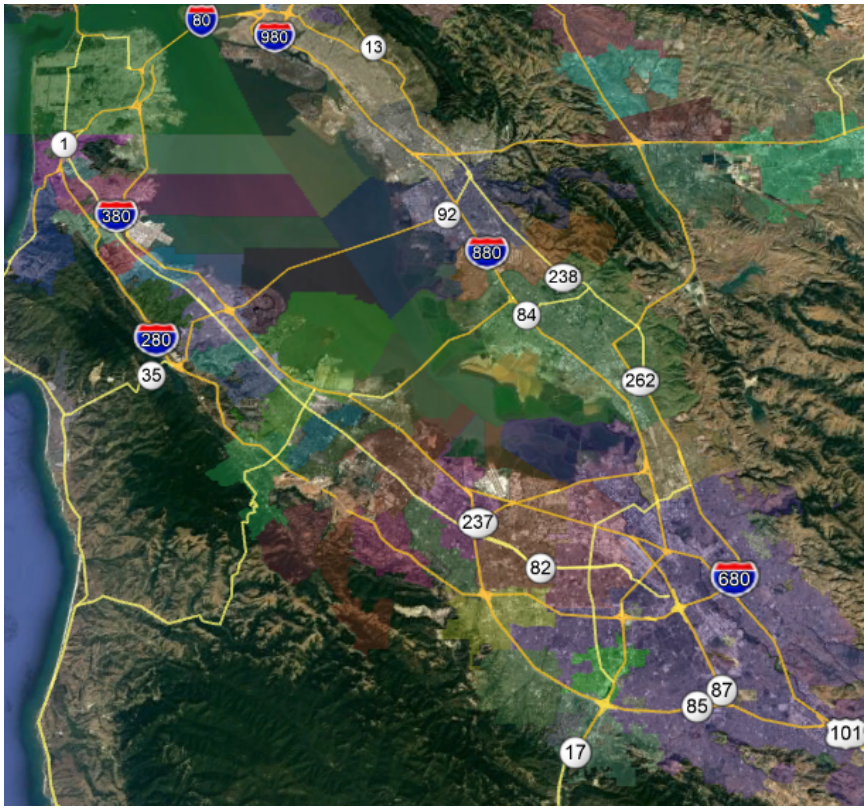
CROWN CASTLE

..... Jurisdictions are Slow to Adopt

Area	District	Priority Ranking within Area	Municipality	Target for Approval	In Discussion or Trial	Discussion or Trial (D, T, A)	Implemented
West	LA	1	Los Angeles			D	
West	RMR	2	Denver		•	D	
West	San Diego	3	San Diego				•
West	PNW	4	Seattle	•			
West	DSW	8	El Paso				•
West	Nor Cal	9	Sacramento		•	D	
West	RMR	10	Salt Lake City		•	D	
West	DSW	11	Abuquerque	•			
West	PNW	12	Mercer Island	•			
West	PNW	13	Portland	•			
West	DSW	14	Las Vegas	•			
West	Nor Cal	5	San Francisco		•	D	
West	LA	15	Hawaii		•	D	
West	Nor Cal	16	Palo Alto	•			
West	Nor Cal	17	Santa Claria		•	D	
West	DSW	18	Phoenix	•			
West	Nor Cal	19	Sunnyvale	•			
West	Nor Cal	20	Mountain View	•			
West	LA	6	Long Beach		•	D	
West	LA	7	Manhattan Beach		•		•
West	Nor Cal		Davis	•			
West	DSW		Tuscon	•			

..... So Many Jurisdictions

Bay Area - 29 Jurisdictions



- Permit Variants
- Public and Private Utilities
- Innovation Barriers
- Pole Attachment Requirements
- Small Cell Prohibition
- High and Random Fees
- Moratoriums

And We are Asked to Carry the Cost for Ancillary Infrastructure Improvements

ADA Ramp Replacements

Thank you

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APPENDIX J

Diffraction Analysis Slides

Effective FTTH Policy

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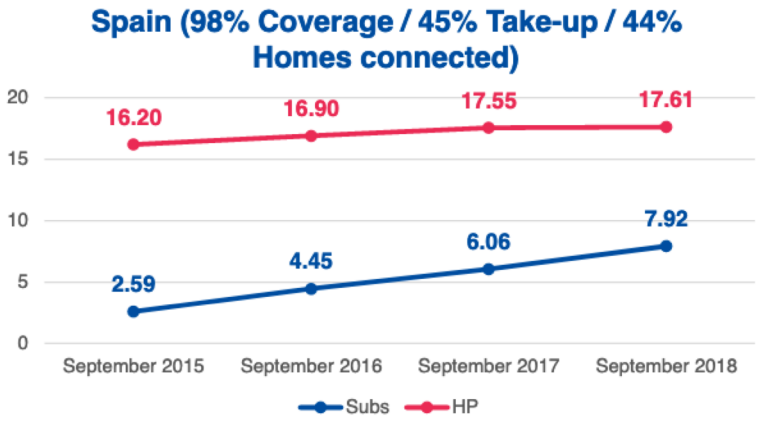
Infrastructure Competition (1)

- In FTTH we have no example of markets where infrastructure competition happened organically on vast portions of a national territory.
- The working examples of Infrastructure Competition were shaped by policy, essentially through Ducts and Pole Sharing regulation.
- Spain, Portugal and Lithuania are the main examples in Europe.
- Effective DPS regulation involves:
  - Aggressive regulated prices;
  - Information transparency from the incumbent;
  - Well designed and heavily monitored order and delivery processes.

Infrastructure Competition (2)

- Such infrastructure competition frameworks have resulted in healthy competition in dense urban areas, with often 3 and sometimes 4 market players serving the same customers.
- Lower density coverage however is not so successful, due essentially to two reasons:

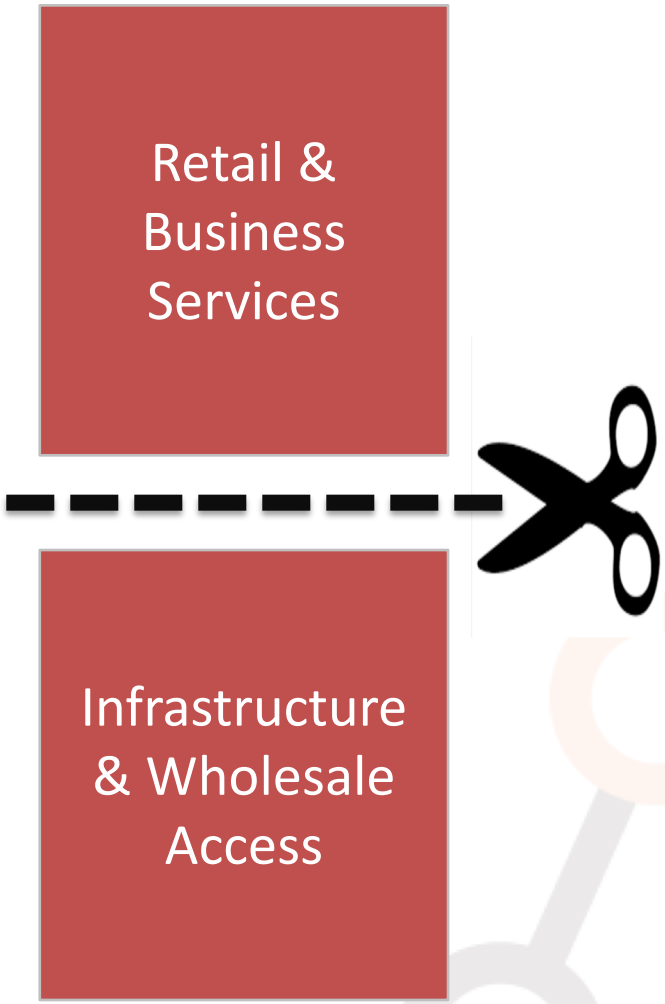
- Ducts are costly to install, but cheap to blow fiber through. Poles are costly to install but also costly to attach fiber to. As revenue density decreases, deployment costs increase;
- Poles are used for more than just telecoms, which means that multiple pole attachments for telecoms quickly push poles to their weight limits, needing more poles to be installed.



Source FTTH Council Europe

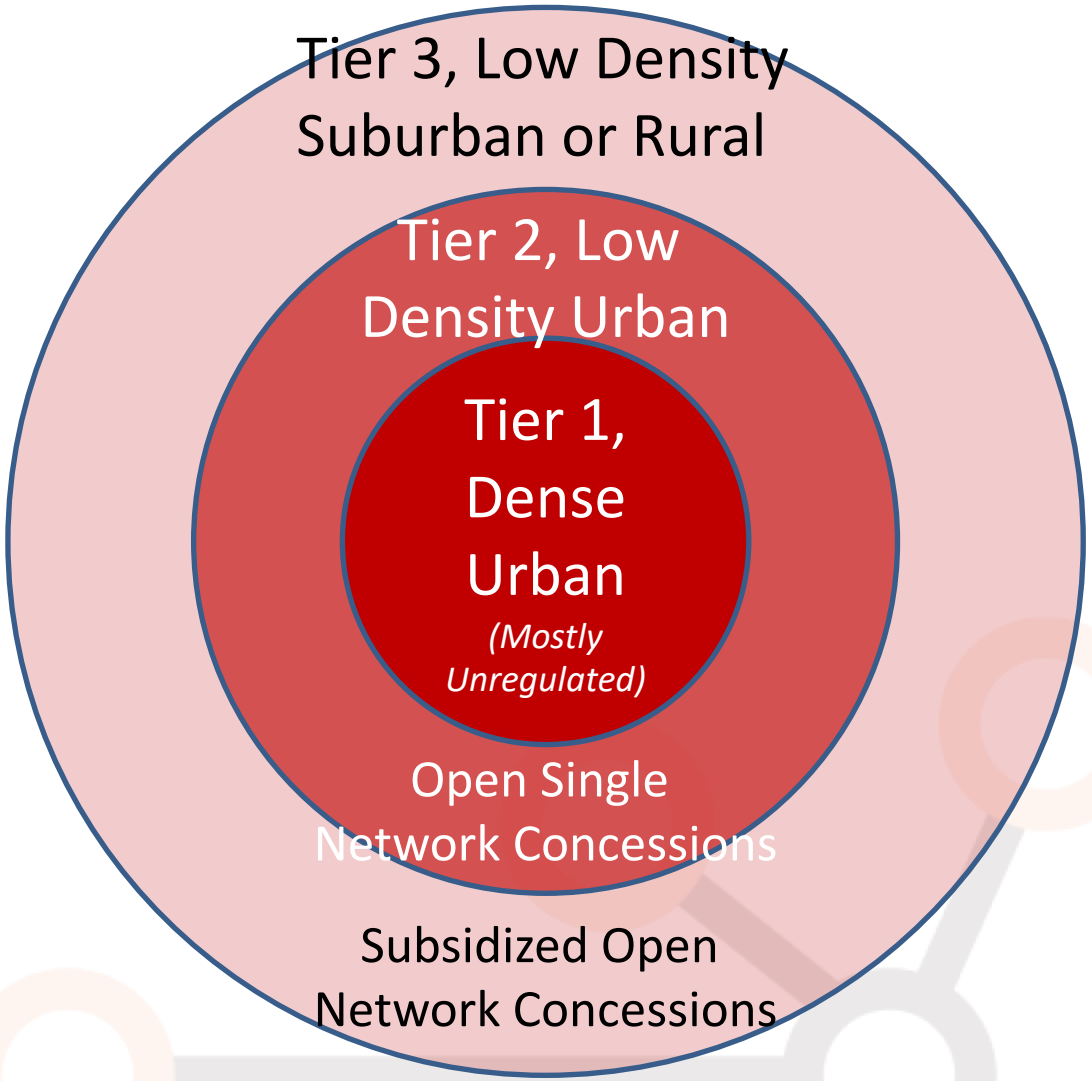
Structural Separation

- At the opposite end of the spectrum from Infrastructure Competition is a Structural Separation approach where a single national network or multiple regional networks are deployed by neutral parties not operating in the retail market.
- This is the path taken by New Zealand. The key benefits are in terms of coverage and asset utilisation. It does raise issues around service differentiation.



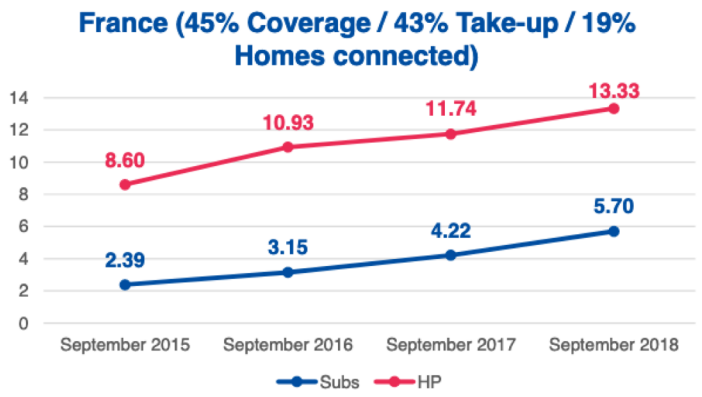
Hybrid Model (1)

- In between those two is a hybrid model that embraces network competition where viable and organizes and regulates network monopolies where they are the only way forward.
- France is one of the few countries to have formalized this, carving the country in three:



Hybrid Model (2)

- The virtues of a formalized hybrid model is to recognize that a single approach will not serve the entire population.
- It does make things more complex however with a higher regulatory burden on a larger number of players.
- The key limitation is the unspecified fourth ring: places where no one wants to invest even with subsidies (or where subsidies are not funnelled because of really low density).



Source FTTH Council Europe

Challenges and Opportunities of 5G

- **With the announced advent of 5G, the lines between fixed and wireless seem to be blurring a little.**
- **While the recurring « we only need wireless » trope is as wrong as ever, the underlying infrastructure will likely merge like never before when small cells go live.**
- **This raises two concerns about 5G deployment:**
  - Is there an existing small cell business case for all market players to deploy 5G ?
  - Even if there is, do wireline + wireless network operators have an unmatchable advantage when it comes to 5G deployment?
- **The key 5G challenge today is economics: with no significant revenue upswing in sight in the mass market but high CAPEX required to deploy, where is the business model for small cells?**
- **In South Korea, the government has forced a shared infrastructure deal on all parties to ensure that no one lags behind on deep 5G deployment.**