City of West Sacramento

Broadband Infrastructure Assessment and Action Plan

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1. Executive Summary

Access to broadband service – fast, reliable, high quality links to the Internet and internal networks – is a basic competitive requirement of twenty-first century economies. Broadband availability is one of the first criteria assessed when businesses consider relocating or expanding. It is considered to be a non-negotiable resource that is necessary for businesses to operate and to keep pace with global competitors.

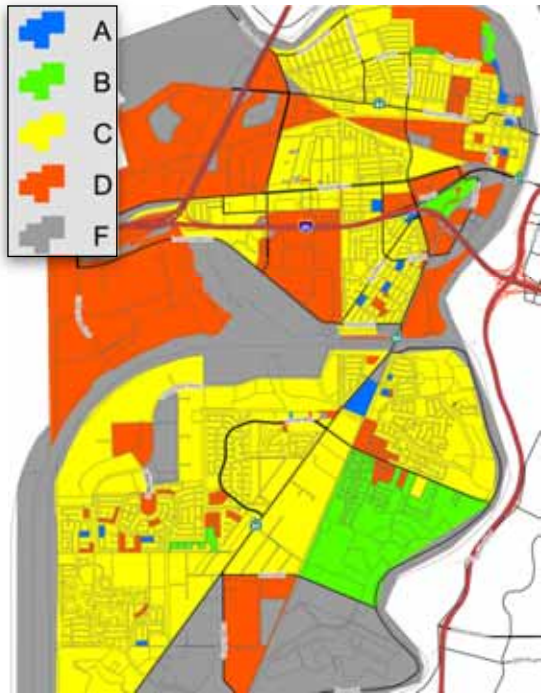


Figure 1.1 – West Sacramento broadband report card. Larger maps are in Appendix A.

Broadband is also a necessity for residents. Without it, people do not have access to jobs, education and services. The correlation between low income levels and low broadband adoption rates in West Sacramento points to a vicious cycle of cause – inability to subscribe to service due to availability or affordability – and effect – less access to the twenty-first century economy and a lower standard of living.

Demand for broadband connectivity continues to grow, by one estimate at the rate of 29% per year. Increased data traffic is only part of the equation. Expectations of service quality, reliability and availability are rising as well. As with roads, water systems and other utilities, broadband infrastructure planning needs to accommodate anticipated needs in the decades to come as well as current demand.

1.1. Conclusions

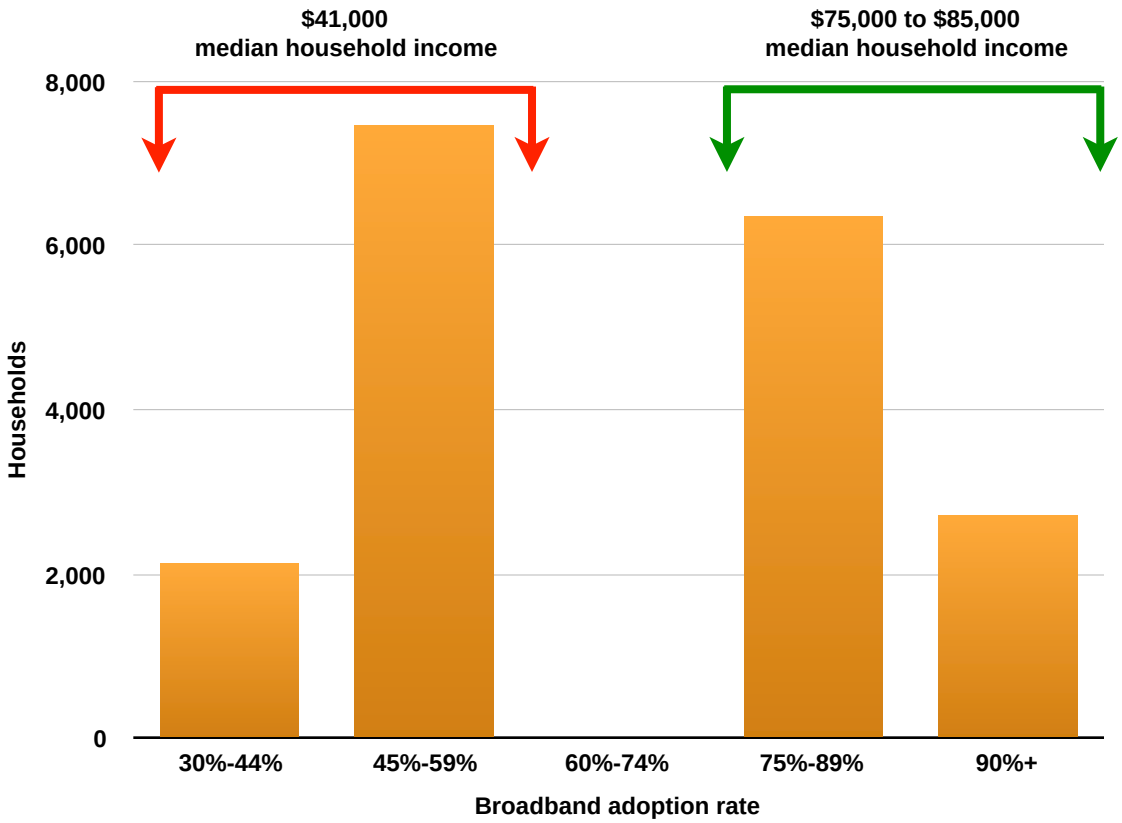
West Sacramento's broadband infrastructure generally ranges from average to excellent, although service availability and utilization of these resources vary greatly across the city. The assessment of broadband infrastructure, service and adoption conducted by Tellus Venture Associates in West Sacramento in 2016 reached five main conclusions:

- The primary broadband infrastructure owned by AT&T and Wave is near average when compared to California as a whole, receiving a "C-" grade (1.9 out of 4.0). This grade is at the top of the class for Yolo County communities, but it lags behind those in Sacramento County. Overall, a "C-" is an excellent result when compared to rural areas and on a par with suburban communities in major metropolitan areas, including Silicon Valley.
- Mobile broadband service varies by provider, with some offering citywide coverage and others showing significant gaps in availability and/or capacity.
- There is superior industrial class broadband infrastructure in West Sacramento, with several east-west and north-south transcontinental fiber routes crossing the city, two data centers and

metropolitan fiber networks capable of serving local businesses. The City of West Sacramento owns a significant amount of telecommunications conduit that could support expansion and greater utilization of these resources. The industrial class broadband infrastructure inWest Sacramento mirrors the extensive transportation infrastructure that has made it a major logistics hub.

- Business people in West Sacramento generally believe that the Internet service they receive is not fast enough or reliable enough for their needs. They perceive the customer service that businesses receive from Internet providers to be poor. Consumers expressed dissatisfaction with the level of service and prices offered by Internet providers in West Sacramento. Consumers also did not perceive Internet service to be sufficiently reliable, but were more pleased than not with the customer service and technical support they receive.

Chart 1.1 - West Sacramento's digital divide[1]



- A glaring digital divide exists in West Sacramento, with half of households in the city adopting broadband at a significantly lower rate and half at a significantly higher rate than Californians overall, and than typical residents in Yolo and Sacramento counties. This split correlates to economic status. Households with lower broadband adoption rates have an average income of about $41,000 per year, while those with higher rates average in the $75,000 to $85,000 range.

[1] See Section 5.1 and Tables 5.1 and 5.2 below for details regarding this data.

1.2. Recommendations

The City of West Sacramento can craft policy and deploy its assets in a way that can significantly improve broadband infrastructure and access for residents and businesses.

Although there is excellent basic broadband infrastructure in West Sacramento, it is underused and not easily accessed, particularly in commercial and industrial areas. This deficit reduces the value of the City's commercial real estate inventory by making it less attractive to relocating or expanding businesses. It is a common problem among Californian cities, particularly those with older industrial areas. High technology businesses will not locate or expand where broadband service is insufficient to their needs, leaving property owners with fewer options for tenants and cities with reduced revenue from jobs, sales and economic growth.

Figure 1.2 – Star Rating map showing full commercial/industrial potential of West Sacramento broadband infrastructure (larger maps available in Appendix A).

The broadband policy tools available to local jurisdictions in California are limited. Even so, there are effective policies the City of West Sacramento can adopt and implement:

- Work with AT&T, Wave and secondary and mobile telecommunications companies to improve broadband infrastructure, service and adoption, cooperatively if possible but in a competitive or adversarial posture if necessary. This effort would include reducing barriers to deployment, advocating for residents and businesses with state and federal regulators, and promoting access to low income broadband programs.

- Lease the conduit owned by the City to competitive and/or new telecommunications companies interested in upgrading service to industrial and commercial areas, and consider creating either a citywide project or smaller pilot network as a public/private partnership.

- Enact policies that promote telecommunications competition and development, and work with providers to identify policy barriers which could be removed or incentives that might be offered to encourage greater investment in their systems in West Sacramento.

1.3. Initiatives

Specific initiatives recommended for consideration include:

- Bridge the digital divide and increase broadband adoption in lower income areas of West Sacramento by encouraging and supporting greater use of AT&T's "Access" program which offers $10 per month broadband service to qualifying households.

- Establish an enquiry and complaint process for consumers and businesses that are seeking broadband services or are having problems with current providers. Although the City has limited authority in this regard, collecting this information, making it public and advocating on residents' behalf with state and federal regulators will create incentives for telecommunications companies to voluntarily cooperate. It will also expand public knowledge of existing resources and constraints, and build a record to support action by the appropriate regulatory bodies.

- Determine a preferred first step for making the City's telecommunications conduit available to telecommunications companies interested in building or expanding fiber optic networks in West Sacramento: a full, citywide project or a focused pilot project.

- Issue a request for proposals inviting telecommunications companies to participate in the chosen project.

- Adopt policies that reduce barriers and increase opportunities for telecommunications companies, incumbents and independent competitors alike, to build or upgrade broadband infrastructure. Examples include include permit process streamlining, "open trench" notification and "shadow conduit" installation policies, and establishment of standards for inclusion of broadband facilities and infrastructure in construction projects.

The City of West Sacramento has an opportunity to combine excellent, albeit uneven, basic infrastructure, city-owned assets, development policy and targeted programs that will develop equitable, affordable and accessible broadband service and infrastructure that is capable of supporting high tech businesses, encouraging economic growth and improving the quality of life for all members of the community.

2. Retail Broadband Infrastructure and Service

"Broadband" refers generally to any telecommunications service capable of supporting digital data transmission at high speeds. These services can include and/or support Internet, television, telephone, private data networks and various specialized uses. Broadband service can be delivered in a variety of ways, including telephone lines (e.g., DSL), coaxial cable (e.g., cable modem), fiber optic cable, wireless cellular/mobile service (e.g., cell phones, tablets, wireless modems), WiFi, point-to-point and point-to-multipoint fixed wireless service and hybrid networks. There are technical distinctions between the terms "broadband" and "Internet", but when discussing retail services offered to consumers and small businesses, the two can be used interchangeably.

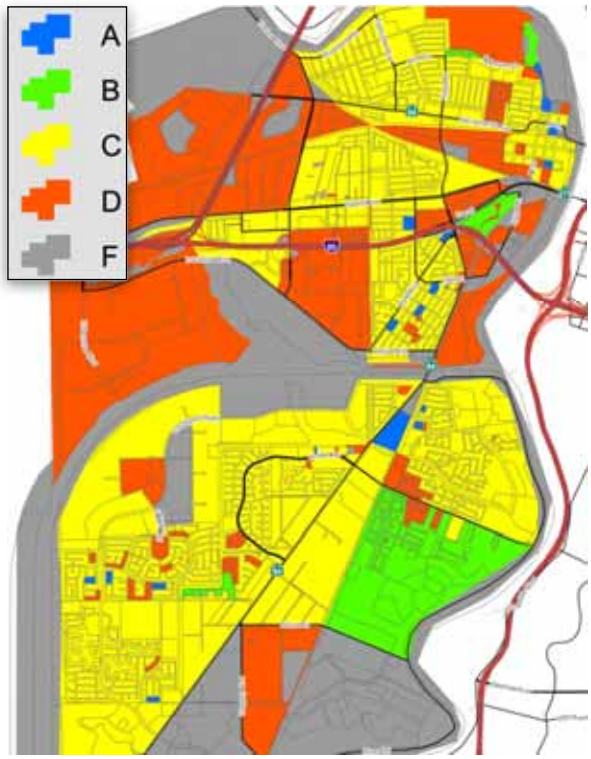


Figure 2.1 – West Sacramento broadband report card. Larger maps are in Appendix A.

2.1. Primary broadband infrastructure

Primary broadband infrastructure is designed to provide retail level service, and often supports telephone and television service as well. It is the type of service that consumers buy for consumer-class home use, and that small to medium-sized business use for routine, commercial-class Internet access. AT&T and Wave are the incumbent telephone and cable companies, respectively, in West Sacramento. Both companies have hybrid networks that use copper wires to connect directly to homes and businesses, and fiber optic lines that connect these local distribution lines to the Internet. AT&T also reports offering direct fiber connections in a few areas of West Sacramento.

Table 2.1 - Primary broadband availability in West Sacramento

	Census blocks	Housing units	Population
AT&T	536	18,289	47,815
Wave	507	18,141	47,188
Combined availability (both carriers)	559	18,478	48,235
West Sacramento total	707	18,681	48,744
AT&T	76%	98%	98%
Wave	72%	97%	97%
Combined availability (both carriers)	79%	99%	99%

Wave and AT&T, along with several secondary service providers in West Sacramento, file availability, technology and service level reports with the California Public Utilities Commission (CPUC) and the Federal Communications Commission. The most recent data that has been vetted by these agencies is current as of 31 December 2015. This data was refined and validated by the CPUC and published in September 2016 in tabular and interactive map formats. The analysis in this report is based on the data sets published by the CPUC and supplemented with standard census data, unless other indicated.

Broadband availability at one level or another is nearly ubiquitous in West Sacramento. Table 2.1 shows that 99% of homes in West Sacramento – 18,474 out of 18,681 – have broadband service available at some speed from at least one primary provider. Altogether, AT&T and Wave offer broadband service to 99% of housing units and 99% of the population in west Sacramento, according to their own reports. These numbers are likely overstated, because the providers are allowed to report partial coverage of a census block as full coverage. But on that basis, AT&T reports reaching 98% and Wave reports reaching 97% of both homes and people in West Sacramento.

Table 2.2 - Primary broadband service providers - West Sacramento

AT&T, service by census block

Download speed	**768 Kbps**	**1.5 Mbps**	**3 Mbps**	**6 Mbps**	**12 Mbps**	**18 Mbps**	**24 Mbps**	**45 Mbps**	**75 Mbps**
Legacy DSL[2]	109	5	292	79					
ADSL2	9	32	7	5	19	13			
VDSL					8	340	28	23	7
Fiber						6	21		4
Total	118	37	299	84	27	359	49	23	11

Upload speed	**384 Kbps**	**1 Mbps**	**1.5 Mbps**	**3 Mbps**	**6 Mbps**
Legacy DSL	114	371			
ADSL2	41	44			
VDSL		7	348	28	23
Fiber		4	6	21	
Total	155	426	354	49	23

Wave - cable modem (DOCSIS 3.0) speeds claimed throughout service area

Download	110 Mbps
Upload	10 Mbps

[2] "DSL" stands for digital subscriber line, and is a term that refers to technology developed by telephone companies to transmit data over the legacy copper telephone network. ADSL, ADSL-2 and VDSL are progressively more advanced versions of the technology. Older DSL technology is, for example, generally limited to 3 to 6 Mbps download speeds, ADSL-2 usually tops out in the 20 Mbps (or lower) download range and VDSL can support download speeds in excess of 40 Mbps.

During the course of the primary market research conducted for this study – one workshop and two online surveys (see Section 4 below) – several residents and business owners indicated that they were unable to obtain service from either Wave or AT&T. In particular, the Broderick, Bryte and Southport/southern West Sacramento neighborhoods were identified as particularly problematic.

When compared to the primary broadband infrastructure available to the average home or business in California, West Sacramento is near average, with a grade of "C-" (1.9 on a 4 point scale), using criteria originally developed for the East Bay and Central Coast Broadband Consortia.

The infrastructure grade of a census block is determined by the generally available level of service it supports. A "C" grade means a census block has the most common wireline service choices found in California, typical of the standard packages offered by AT&T and Wave: a minimum of two providers, one just meeting the minimum standard of broadband service set by the CPUC (6 Mbps download and 1.5 Mbps upload) and the other exceeding it. A "D" grade – below the Californian average – is given when wireline service meets but does not exceed this standard or where consumers only have access to one qualifying service provider. If no qualifying service is available, a failing grade – "F" – is given. "A" and "B" grades are given where superior service is offered. Details regarding the grading method are in Appendix B.

West Sacramento does well in terms of primary broadband infrastructure when it is compared to other communities in the region. It is the second highest ranked community in Yolo County, coming only a small fraction of a point behind Woodland, and falls into the upper mid-range of communities in Sacramento County.

Table 2.3 - Broadband infrastructure grades

	Grade	GPA
Arden-Arcade CDP	A-	3.7
Elk Grove	B+	3.3
Sacramento	C+	2.5
Sacramento County (all)	C+	2.3
Rancho Cordova	C	2.0
Woodland	C-	1.9
Folsom	C-	1.9
West Sacramento	C-	**1.9**
Davis	C-	1.8
Citrus Heights	C-	1.8
Galt	C-	1.7
Yolo County (all)	D+	1.3
Winters	D	1.0
Madison CDP	D-	0.7
Isleton	F	0.0
Clarksburg CDP	F	0.0
Knights Landing CDP	F	0.0

On the other hand, there is a clear difference between the primary broadband infrastructure that is found in West Sacramento and that which is found in the City of Sacramento and adjacent Sacramento County communities. The Arden-Arcade census designated place (CDP) rates an A- (3.7), the City of Elk Grove is a B+ (3.3), and the City of Sacramento and Sacramento County as a whole receive a C+ (2.5 and 2.3, respectively). The reason for this difference is the presence of a third major competitor, Consolidated Communications, which offers fiber-to-the-home service in competition with Comcast, AT&T and Frontier in many Sacramento County neighborhoods.

Silicon Valley offers another benchmark, where most incorporated cities are in the "C-" range. With a numerical grade of 1.9, West Sacramento is at the same level as Apple's hometown of Cupertino and slightly ahead of San Jose and Mountain View – Google's headquarters – which have a 1.8 grade.

The primary infrastructure "report card" grades for communities other than West Sacramento are based on the CPUC data collected as of 31 December 2014 because the grading analysis of the statewide data set, which is being done by the Central Coast Broadband Consortium, is not yet complete. However, the West Sacramento grade is based on the latest data available. It is essentially unchanged from the previous data set, and a rough comparison indicates that the same is true for other communities in Yolo and Sacramento Counties. For the purpose of the above comparison, which is the only use this report makes of the infrastructure grades in other communities, the 2014 data set is adequate.

The pattern of deployment, upgrading and maintenance of broadband infrastructure in West Sacramento follows a common pattern among Californian cities: more infrastructure investment tends to go into residential neighborhoods, where service providers can also sell video services, commercial districts receive less attention and industrial areas least of all. "D" and "F" grades are commonly found in commercial and industrial areas of West Sacramento. This problem is caused by a combination of lack of line extensions by Wave into commercial and industrial areas, and inconsistent upgrades of DSL infrastructure by AT&T.

Figure 2.2 – AT&T's high speed copper-based DSL service areas. Larger maps, by AT&T technology type, are in Appendix A.

AT&T

AT&T reports using four types of technology to provide service in West Sacramento: legacy DSL[3], interim ADSL2, modern VDSL and fiber-to-the-premise (FTTP) technology.

From a consumer standpoint, the difference between the three copper-based DSL technologies is readily apparent. If the service being received is branded as Uverse and television service is (or at least was, until recently) available, then it is VDSL-based. If it carries the Uverse brand and television service isn't available, it's ADSL2. If it doesn't carry the Uverse brand, it is legacy DSL service. AT&T has made a

[3] "DSL" stands for digital subscriber line, and is a term that refers to technology developed by telephone companies to transmit data over the legacy copper telephone network. ADSL, ADSL-2 and VDSL are progressively more advanced versions of the technology. Older DSL technology is, for example, generally limited to 3 to 6 Mbps download speeds, ADSL-2 usually tops out in the 20 Mbps (or lower) download range and VDSL can support download speeds in excess of 40 Mbps.

concerted effort over the past several years to transition customers from legacy service, which is subject to regulation by the California Public Utilities Commission, to unregulated Uverse branded service where it is available.

The 14 census blocks where AT&T only offers legacy DSL service (3% of AT&T's service area) are mostly in and around the Southport area, including 4 located in the same general area where AT&T reports offering FTTP service.

Census blocks where ADSL2-based service is offered instead of the more advanced VDSL technology (16% of AT&T's census blocks) tend to be located in predominantly commercial and industrial areas of central West Sacramento (see map in Appendix A). Overall, 406 West Sacramento census blocks have been upgraded to VDSL technology, which represents 76% of AT&T's service area and 57% of the City's total area.

There is an anomaly in the data: AT&T claims to provide FTTP service, and only FTTP service, in 31 West Sacramento census blocks, which represents 6% of AT&T's service area. These census blocks generally correspond to recently developed areas or areas that are targeted for future development. It is common practice to install FTTP technology in new developments, and AT&T usually provisions those FTTP systems with the same level of service as adjacent copper-based DSL systems. This disparity reflects choices made by AT&T, rather than a technological barrier. Unlike Frontier Communications, the other major telephone company in California, AT&T has not deployed the necessary infrastructure and business processes to consistently support the high service levels usually associated with fiber technology.

Table 2.4 - AT&T technology type, by census block

	Number of census blocks	Percent of City census blocks	Percent of AT&T census blocks
Legacy DSL only	14	2%	3%
VDSL only	20	3%	4%
Legacy DSL and ADSL2	85	12%	16%
Legacy DSL and VDSL	386	55%	72%
Fiber only	31	4%	6%
No service	171	24%	

The range of service speeds offered in those 31 census blocks are in the same range as VDSL service, i.e., 18 to 75 Mbps download and 1 Mbps to 3 Mbps upload speeds. Based on visual examination and discussions with City staff (see map in Appendix A), it appears that FTTP coverage in these blocks is partial at best, and many homes still receive service via copper wires. It appears that AT&T is inaccurately reporting that all 31 of these census blocks are completely served by fiber infrastructure, and is not reporting the other types of technologies present, as it does in census blocks where only copper-based service is available.

AT&T appears to be expanding its fiber infrastructure in West Sacramento. City staff have observed AT&T crews installing fiber lines in several areas, and it is possible that service to locations with FTTP infrastructure will be upgraded to higher levels. AT&T is also in the process of rebranding some of its high speed services from "GigaPower" to "AT&T Fiber", including some services that are delivered via copper wires. The rationale for this discrepancy appears to be that these high speed services are delivered via fiber to central locations within neighborhoods – often referred to as nodes[4] – with the final link accomplished using copper wires.

The data used in this analysis was submitted by AT&T to the CPUC several months before this new branding strategy was announced, so no connection can be drawn between it and the omission of copper technology-based service reports in the 31 census blocks where at least some FTTP service is available. The service reports that AT&T submits to the CPUC are supposed to reflect the technology present and the service available, rather than market positioning or branding decisions.

Wave

Wave is the cable company serving West Sacramento. It took over ownership of the system from Charter Communications in 2007. According to the service reports it files with the CPUC, Wave offers broadband service to 97% of homes and 97% of the population in West Sacramento. However, it only covers 72% of the City's census blocks. The major gaps are in industrial and commercial areas, and in the southernmost parts of the City.

Figure 2.3 – Wave's claimed cable modem service coverage in West Sacramento. Larger maps are in Appendix A.

Wave reports that it is using DOCSIS[5] 3.0 technology exclusively in West Sacramento and, consistent with common practice in the cable industry, claims to deliver up to 110 Mbps download and 10 Mbps upload speeds everywhere in its West Sacramento service area.

The key phrase is "up to". It is a term of art in the broadband industry that means, in effect, that the technology that's been deployed in an area is theoretically capable of supporting the indicated service level, but consumers should not expect to

[4] Although the term "node" can refer to many things, in this report it refers to a central box or vault in a neighborhood where high capacity fiber optic trunk lines connect to copper distribution lines that serve customers' homes or businesses.

[5] DOCSIS stands for "data over cable service interface specification", and is the set of standards used by cable companies in the U.S. to provide two-way Internet service over coaxial cable networks that were originally designed to deliver one-way television service.

experience that maximum service level consistently, if at all. Wave's ability to actually deliver promised speeds depends on the level of investment it has made in a particular neighborhood and the usage patterns of residents – the more people accessing the Internet in a given area, the lower the speeds each will receive. Consistent with common practice in the cable industry, Wave has not fully built out its cable system to marginal residential areas, or to commercial and industrial zones.

Table 2.5 - Major California cable company max upload speed, as a percentage of census blocks statewide

	1 Mbps	5 Mbps	10 Mbps	20 Mbps	25 Mbps	30 Mbps	1 Gbps
Charter Communications		100%					
Comcast				23%	77%		
Cox Communications						100%	
Time Warner Cable		14%		86%			
Wave	1%		99%				<1%

Table 2.6 - Major California cable company max download speed, as a percentage of census blocks statewide

	3 Mbps	50 Mbps	100 Mbps	110 Mbps	150 Mbps	250 Mbps	300 Mbps	1 Gbps
Charter Communications			100%					
Comcast					23%	77%		
Cox Communications							100%	
Time Warner Cable		14%					86%	
Wave	1%			99%				<1%

Wave's reported service speeds are below par for the California cable industry overall. By contrast, Comcast, which serves Sacramento, offers service at 150 Mbps download and 20 Mbps upload speeds, which is more typical of cable companies in California (see Table 2.6).

Although it does not report that it offers direct fiber-to-the-premise, Wave apparently does offer such services to commercial and/or industrial-class customers in West Sacramento, and is in the process of expanding its fiber network, according to permit applications filed with the City of West Sacramento and discussions with Wave personnel. However, since Wave does not disclose the location of its fiber optic infrastructure or the extent of its fiber-based service, it is not possible to factor it into a specific evaluation of commercial and industrial-class resources in West Sacramento.

2.2. Wireless broadband service

Mobile service

The capacity of mobile data networks – AT&T, Verizon, Sprint and T-Mobile – continues to increase, but the demand for mobile bandwidth is also increasing at what appears to be a significantly higher rate. There is no prospect for it to be a substitute for high capacity wired services. As with legacy copper networks, one of the primary means of increasing mobile capacity is to extend the reach of middle mile fiber in order to make the area covered by cell sites smaller and smaller. Cost is also an issue for mobile networks. Although typical monthly usage limits are adequate for smart phones and other hand held devices, in-home use can be an order or two of magnitude greater leading to bills ranging from several hundred dollars to more than a thousand dollars a month.

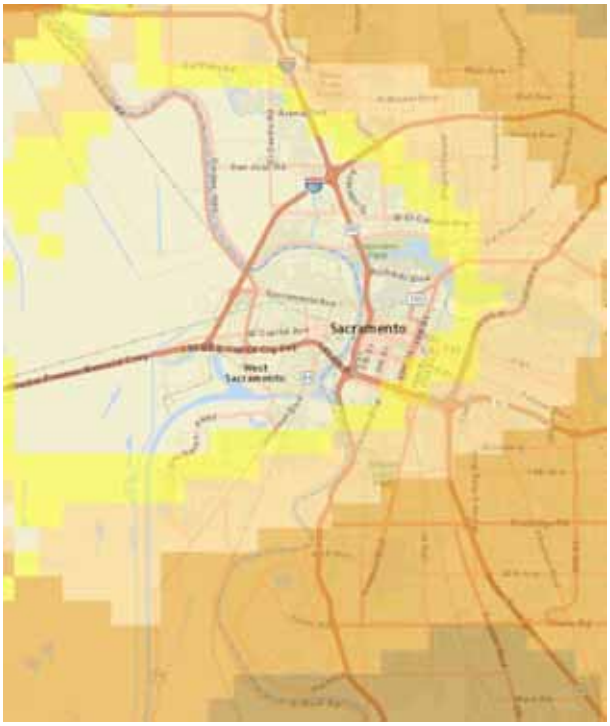


Figure 2.4 – Verizon's mobile broadband coverage. CPUC testing indicates service gap in northern half of West Sacramento. Larger maps are in Appendix A.

Four mobile carriers – AT&T, Sprint, T-Mobile and Verizon – have filed reports with the CPUC indicating that they provide broadband service in West Sacramento. The CPUC conducts regular, standardized tests of mobile broadband service throughout California, and has developed a model that shows the level of download speeds that an average consumer can reasonably expect to experience from each of these carriers. There is a significant difference between the claimed service levels and those measured and modelled by the CPUC. The CPUC's data is used for the purposes of this report. The availability maps published by the CPUC are in Appendix A (see page 58).

AT&T's mobile service is reliably available throughout West Sacramento. In the central area north of U.S. 50 and in neighborhoods to the north, customers can expect to experience download speeds in the 6 Mbps to 10 Mbps range. Elsewhere in the city, the predicted download speeds are in the 3 Mbps to 6 Mbps range, except for a small, undeveloped area in the southeast corner, where expected download speeds drop to the 1.5 Mbps to 3 Mbps range.

By contrast, the CPUC's modelling shows very poor mobile broadband service availability from Sprint. All of West Sacramento falls below the 768 Kbps download threshold. The likeliest explanation for this result is overloaded, older generation cell sites. Verizon's mobile broadband availability shows a similar pattern, but not as severe. Verizon's predicted availability falls below the 768 Kbps download threshold north of the ship channel and in the Southport area, then gradually increases from the 768 Kbps to 1.5

Mbps download range to the 3 Mbps to 6 Mbps download range as a user moves south of Southport Parkway. This pattern is repeated in downtown Sacramento as well. To a greater degree than Sprint, Verizon has invested in upgrading its cell sites to the current (fourth) generation of technology, which offers higher speeds and capacity. A possible explanation for this poor showing is network congestion. When a high number of users are trying to access the same cell sites – as might be expected in a busy urban center such as downtown Sacramento and/or adjacent areas in West Sacramento – the average service level experienced by users will drop.

Figure 2.5 – AT&T's mobile broadband coverage. CPUC testing indicates best service in downtown, decreasing further away. Larger maps can be found in Appendix A.

T-Mobile's broadband service levels fall midway between AT&T's at the high end and Sprint and Verizon at the low end. The CPUC's data indicates that subscribers can generally expect to consistently experience 3 Mbps to 6 Mbps download speeds in the southwest quadrant of West Sacramento, 1.5 Mbps to 3 Mbps download speeds in the northwest and southeast quadrants, and 768 Kbps to 1.5 Mbps in the northeast quadrant.

These poor results are not due to lack of sampling in West Sacramento. Four test sites are located in West Sacramento, two in the northern area of the City, to the east and west along the central corridor, and two in the southern area of the City.

Fixed wireless service

Three fixed wireless companies – DigitalPath, Ruralnet and Succeed.net – claim, in unvalidated reports filed with the CPUC, to provide service to West Sacramento, with download speeds ranging from the 3 Mbps to 6 Mbps tier all the way up to the 25 Mbps to 50 Mbps download tier. These reports appear to have been generated using unsophisticated modelling techniques that show uniform service levels from a small number of access points over a large, but sharply defined, circular area (see maps in Appendix A), and should not be taken at face value. All three companies appear to use unlicensed radio frequencies, which are subject to inference and may be preempted by other users. Any and all users have the same legal right to transmit on unlicensed frequencies, and must accept whatever interference or degradation results. Prospective customers are best advised to contact the companies to confirm availability and actual service levels, rather than rely on these service reports.

There is little evidence that any of these three companies have a significant customer base in West Sacramento. They were not mentioned during the broadband workshop or in the consumer survey that were conducted for this study (see Section 4 below). Participants in the business survey did not

mention any of the three either, however 4% of respondents indicated that they accessed the Internet using a wireless provider other than the mobile carriers. It appears that some businesses in West Sacramento make use of specialized fixed wireless Internet services, but the practice does not appear to be widespread.

Other fixed wireless Internet service providers are active in the Sacramento Valley, and might offer service in the West Sacramento area from time to time. The same caveats apply.

2.3. Eligibility for infrastructure subsidies

California Advanced Services Fund

An analysis of census data and broadband availability reports submitted by service providers to the California Public Utilities Commission indicates that only 1% of homes in West Sacramento are in census blocks that are arguably eligible for broadband infrastructure construction subsidies from the California Advanced Services Fund (CASF), based on an analysis of wireline service availability. CASF is a program administered by the CPUC that provides grants for the construction of broadband infrastructure, as well as other purposes. More information on CASF is in Appendix F below.

However, when deciding whether or not to approve CASF grants, the CPUC also takes mobile and fixed wireless service availability into account. As mentioned above, most of the mobile broadband service that is available in West Sacramento does not meet the CPUC's minimum standard, and is not likely to be an obstacle. Fixed wireless Internet service is spotty, but there are locations – particularly in areas not well served by wireline providers – where challenges from fixed wireless operators might be problematic.

Out of a total of 18,861 housing units in West Sacramento (2010 census), all but 229 are automatically excluded from CASF eligibility on the basis of wireline service. Most, if not all, of the 229 would probably be considered ineligible on the basis of fixed or mobile wireless service, although more testing would be required.

On the other hand, 38% of West Sacramento’s land area (not excluding submerged areas) is nominally eligible for CASF infrastructure funding on the basis of a lack of wireline service. As noted above, these under and unserved census blocks appear to be in either undeveloped or industrial areas. Although wireless service would likewise be taken into account in determining eligibility, the City should evaluate the feasibility of applying for CASF funds if broadband infrastructure projects are pursued in these areas.

Separate CASF accounts provide funding to public housing entities for broadband facilities in eligible properties and for programs that promote broadband adoption by residents of public housing. West Sacramento Housing received three grants for adoption programs totalling $148,845 and three grants for infrastructure projects totalling $72,088. The locations that received the grants are the Patio Apartments at 200 4th Street, 500-510 4th Street and 511-513 B Street, Washington Courtyards at 500 7th Street, and West Capitol Courtyards, 2455 West Capitol Avenue.

West Sacramento Housing submitted applications for one other adoption program ($7,420) and one other facilities project ($7,155), for Cummins Row, 685 Lighthouse Drive. Yolo County Housing has two grant applications for facilities project listed as pending, one for $11,822 at Riverbend Senior II, 665 Lighthouse Drive and one for $16,747 at Riverbend Senior I, 664 Cummins Way.

Connect America Fund

The Federal Communications Commission gives operating subsidies to telephone companies that provide broadband service in rural and/or remote areas, as a part of its universal service mandate. In the current round – Phase 2 – of the Connect America Fund (CAF-2) program, the FCC offered large telephone companies a right of first refusal to accept these funds or not, on a state by state basis. AT&T and Frontier Communications accepted CAF-2 subsidies for a total of 978 locations in Yolo County, however none of those locations are in West Sacramento.

3. Commercial and Industrial Broadband Infrastructure

West Sacramento's commercial/industrial broadband infrastructure mirrors its extensive transportation infrastructure. Major fiber lines generally follow existing rail and highway corridors and, like logistics facilities, local networks and major interconnection points are particularly dense where those routes intersect.

This excellent infrastructure, however, is not developed to its full potential, as the Star Rating analysis discussed below demonstrates. Although there are ample resources, the demand for broadband services in West Sacramento has not been sufficient to attract the necessary investment in local infrastructure by telecommunications companies. As an owner of a key broadband asset – conduit – the City of West Sacramento can solve this chicken-and-egg conundrum. Options for doing so are in Section 7 below.

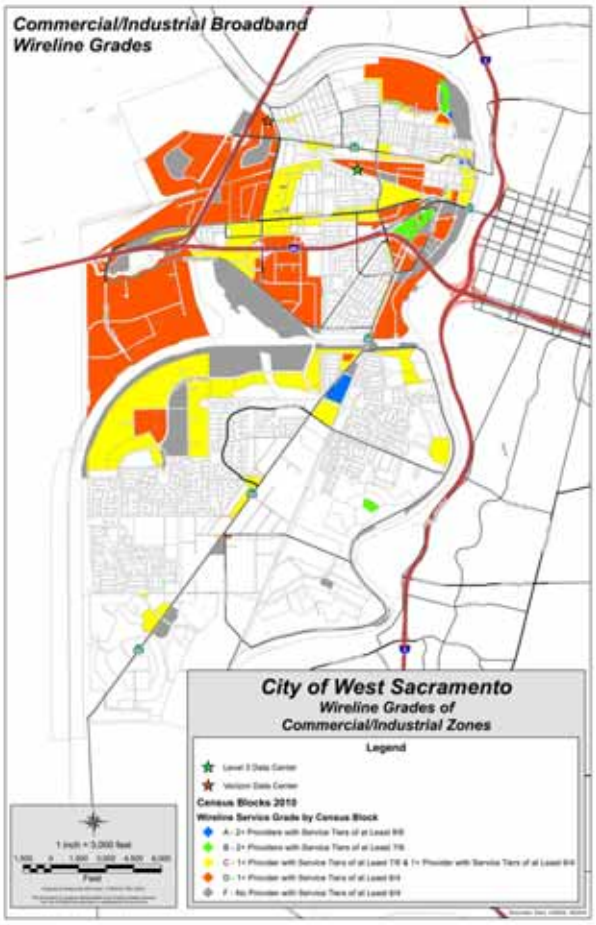


Figure 3.1 – Commercial/industrial zone report card shows pattern of neglect by incumbents. Larger maps are in Appendix A.

3.1. Commercial and industrial class defined

"Commercial class" service is defined as being similar to residential service in that the provider takes effectively all responsibility for installing, maintaining and supporting the service. Speeds are similar (6 to 150 Mbps), but service levels, reliability, consistency and pricing are higher.

"Industrial class" service refers to situations where the customer plays a much greater role in building and supporting the service, including buying different elements from different vendors and managing installation and support. Speeds would be higher – perhaps as high as a gigabit per second or more – and quality of service levels could be as high as found in top tier Internet exchanges. Large industrial customers frequently buy services directly from middle mile providers. T-1[6] circuits or wholesale fiber connections are examples of industrial class services that are available in West Sacramento.

Industrial and commercial customers are more diverse and less predictable than residential subscribers. One business might need gigabit speeds at the highest quality-of-service levels, while the one next door is content with a standard, relatively slow DSL connection. As a result, incumbent carriers tend to

[6] "T-1" is one of several standard types of data connections, originally developed for use by telephone companies. It refers to a dedicated copper wire-based circuit that can support speeds of approximately 1.5 Mbps.

approach commercial and industrial customers on a case by case basis or be extremely selective in choosing which neighborhoods and business districts to upgrade. They do not prospectively build high speed infrastructure. Businesses seeking higher grade service are frequently presented with installation estimates in the thousands and tens of thousands of dollars range.

3.2. Secondary broadband service providers

In addition to the primary, retail level of service provided by AT&T and Wave, six companies that focus on business customers provide commercial and industrial class service in West Sacramento, via infrastructure they own themselves and/or leased facilities.

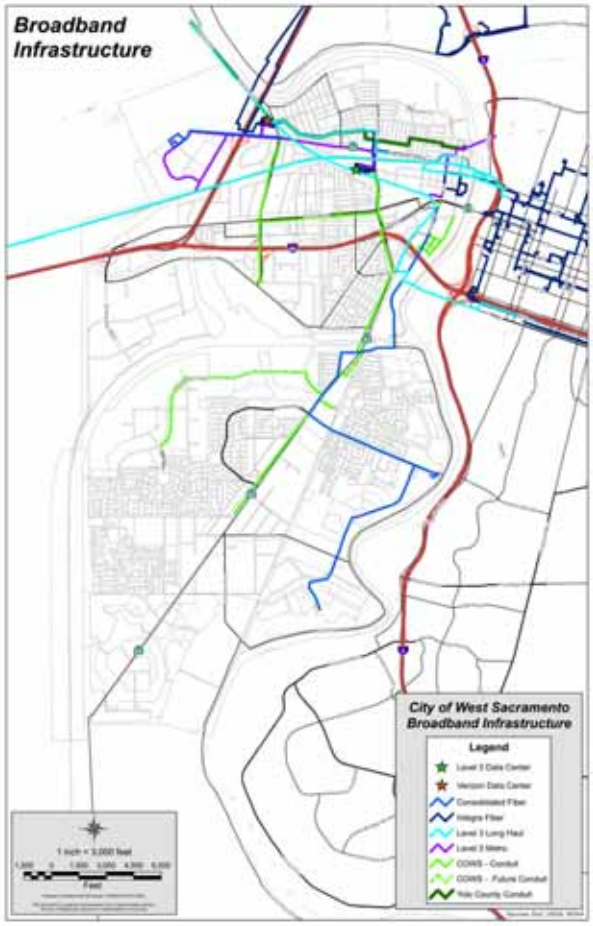


Figure 3.2 – Converging fiber routes mirror West Sacramento's excellent transportation infrastructure. Larger maps in Appendix A.

Two of the companies, Global Capacity and Sonic.net, have filed availability reports with the CPUC that indicate widespread coverage in West Sacramento. However, these reports have not been validated by the CPUC. The pattern of coverage and/or the undifferentiated technology claims (e.g., all technologies reported as present in all reported census blocks) indicates that these reports are based on marketing assumptions rather than hard data. In theory these reports should indicate census blocks where service is actually being provided. Given the expansive nature of these service claims, it is significant that none of the West Sacramento business or consumer survey respondents (see Section 4 below) reported receiving service from either company.

Many commercially-focused service providers do not install equipment or lease lines until a customer actually places an order. Instead of claiming they offer a particular level of service, some commercial and industrial grade providers are, in effect, saying "we believe we can deliver a certain speed in a general area, but we'll have to do a technical evaluation before we'll know for sure, and then we can figure out how much it will cost and how long it will take to do it". For the purpose of this evaluation, such service claims are interpreted to represent assumed and not actual capabilities.

The information filed by four other companies that report offering commercial/industrial-class service in West Sacramento is more specific in nature and more limited in the scope of coverage claimed. Although these reports have not been validated by the CPUC either, the locations and level of service claimed are credible.

Enhanced copper-based service, which is typically provided via lines leased from the incumbent telephone company, is generally reported to be present in census blocks of a commercial/industrial nature, where AT&T and Wave offer substandard broadband service, if they offer it at all. Level 3 Communications reports offering service that is consistent with legacy telephone-based technology (T-1 and DS-3 standards) in two census blocks, and XO Communications reports offering symmetrical speeds ranging from 1.5 Mbps (again, consistent with the T-1 standard) to 1 Gbps (which is consistent with ethernet-over-copper service).

Table 3.1 - Commercial/Industrial class service providers - West Sacramento

Fiber to the Premise service, by number of census blocks served

	1 Gbps	10 Gbps	100 Gbps
Consolidated Communications	2		
Level 3 Communications		2	5
Windstream (dba PAETEC Communications)	1		
Total	3	2	5

Note: all FTTP services are reported to be symmetrical, i.e. having the same download and upload speeds

Enhanced copper-based service, by number of census blocks served

	1.5 Mbps	2 Mbps	3 Mbps	10 Mbps	20 Mbps	45 Mbps	50 Mbps	1 Gbps
Level 3 Communications	1					1		
XO Communications	7	1	3	1	1		3	2
Total	8	1	3	1	1	1	3	2

Note: all enhanced copper-based services are reported to be symmetrical, i.e. having the same download and upload speeds

Fiber optic cables, though, can support the highest levels of service and provide the maximum degree of flexibility for sophisticated users, particularly businesses. Newly built networks, whether designed for business or residential customers, tend to be completely fiber based – fiber to the home (FTTH) or fiber to the premise (FTTP)[7] – because the cost of installing fiber is roughly the same as, and sometimes less than, traditional copper wire facilities. The labor involved in installing cables in conduit or on poles, and installing or upgrading conduit and poles, constitutes most of the cost in either case.

Fiber network enterprises are often categorized as “lit” or “dark” or “managed services” systems. A lit network is one where the operator installs both the fiber optic cable and the electronics that’s used to transmit information over it, and then sells a transportation service between two or more points to the

[7] FTTH and FTTP are two terms that can describe the same technology and service levels, and are often used interchangeably. The nominal difference is that FTTH refers to networks and services intended primarily for residential use, while FTTP is a broader term that can encompass networks of any user or service type, and including residential, commercial and industrial locations.

end user. Dark fiber comes without any electronics and only provides a physical connection between two or more points. The customer is responsible for installing, maintaining and operating all the required equipment.

"Managed service" is the type of service most commonly – often exclusively – offered by incumbent carriers such as AT&T and Wave. The carrier simply agrees to provide broadband service that meets particular, company-defined specifications for speed, availability and quality, and customers have a limited range of options from which to choose. The available options can be adequate for consumer and small business purposes, but often fail to meet the needs of larger and/or more sophisticated enterprises.

Figure 3.3 – AT&T fiber installation in Newport Estates. Photo credit: City of West Sacramento.

Three companies – Consolidated Communications, Level 3 Communications and Windstream (which reports under the PAETEC Communications name) report offering fiber-to-the-premise service to businesses in West Sacramento. The reports are specific as to census block and service speeds, which range from 1 Gbps to 100 Gbps, upload and download (i.e., symmetrical). The census blocks where FTTP service is reported correlate to known fiber optic routes and include the two major data centers located in West Sacramento (see Section 3.3 below). These reports indicate that the three companies are providing service at a significantly higher level than the service reported by AT&T and Wave.

Star Rating – current service

The City of West Sacramento provided map files showing the location of commercial and industrial areas. The current availability of commercial and industrial class broadband infrastructure – primary service as well as various levels of fiber-based connectivity – was compared to the mapping data and Star Ratings for these zones were calculated at the census block level. A full explanation of the method used to calculate Star Ratings for commercial and industrial areas in West Sacramento is in Appendix B, and maps of the results are in Appendix A.

Most commercial and industrial census blocks in West Sacramento rated 1 Star or less (out of a maximum score of 5), however there were 12 census blocks out of 136 that were rated at 2 Stars. No commercial or industrial areas rated 3 Stars or better. Overall, West Sacramento commercial and industrial broadband rating is one-half Star based on the service that is publicly reported as available.

Table 3.2 - Star Rating based on C/I centroids

	Stars
By current service reports	0.5
By current fiber routes	1.0
With utilization of city assets	2.0

Table 3.3 - Cross tab of C/I centroid Star Ratings by census block

	No Stars	1 Star	2 Star	3 Star	4 Star	5 Star
By current service reports	94	30	12	0	0	0
By current fiber routes	66	17	38	13	2	0
With utilization of city assets	44	2	20	46	22	2

3.3. Data centers

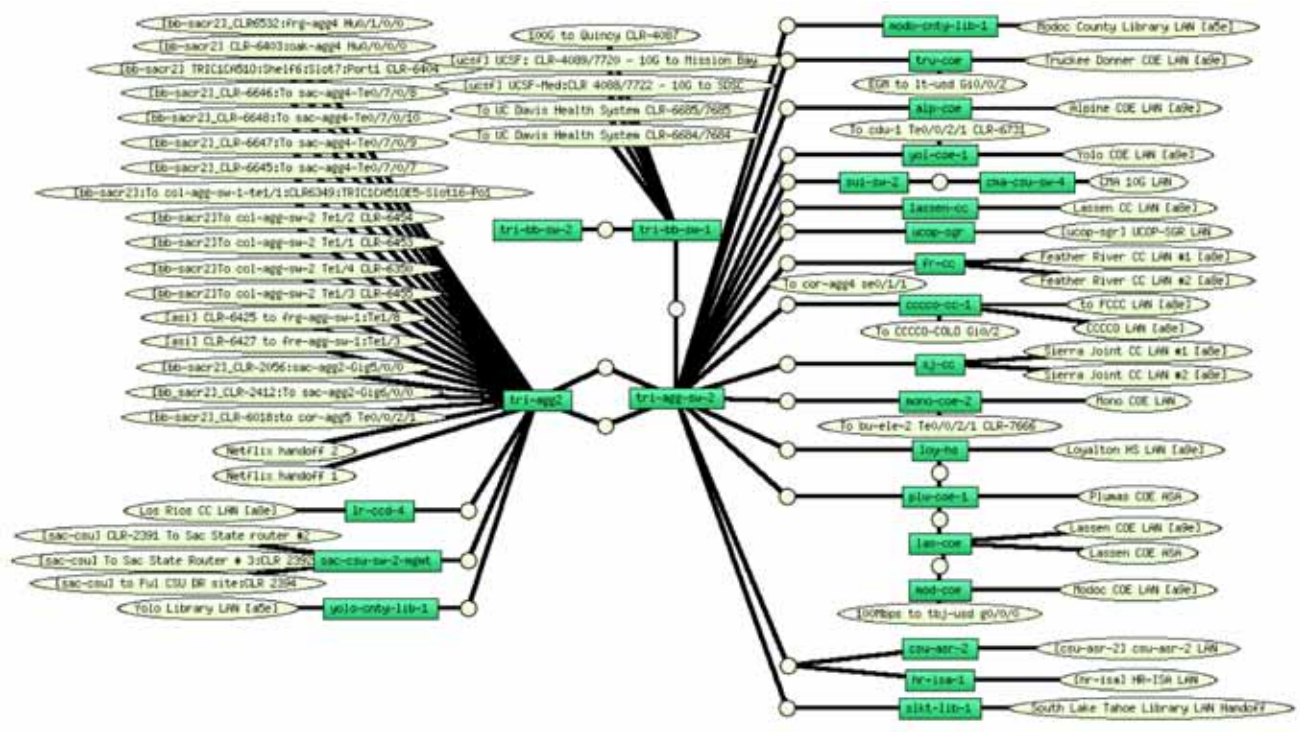


Figure 3.4 – Triangle Court data center educational network connections (source: CENIC).

Data centers and Internet exchanges are critical broadband resources. West Sacramento is fortunate to be the location of two such facilities. To use a water analogy, most Californian cities have to pipe in data from distant reservoirs. West Sacramento sits between the shores of two deepwater lakes.

Although the terms “broadband” and “Internet” are often used interchangeably, including in this report, there is an important distinction. “Broadband” is a more generic term. It simply refers to a high speed data connection above a certain speed threshold. That connection might be between an end user and an Internet exchange point, or it could be only for internal connections within a company.

Figure 3.5 – Verizon data center in West Sacramento.

Although definitions vary, 200 Kbps is generally accepted as the lowest practicable speed for a broadband connection – it’s the dividing line between the best that old style dial-up access can provide and the first generation of DSL service provided by telephone companies.

“Internet” service involves a connection, at whatever speed, to the vast, publicly accessible network of interconnected information technology (IT) resources that’s called the Internet. Internet service is usually obtained from a company that provides a connection between the end user and a major Internet exchange facility where data is handed back and forth between various networks: either a dedicated exchange facility or a data center where many companies install servers and other IT equipment.

Two such data centers are located in West Sacramento. One is owned by Level 3 Communications and is located at Triangle Court. It is a major exchange point that offers wholesale connections to multiple long distance networks. For example, as Figure 3.4 above shows, it serves as a major interconnection point for the statewide educational network operation by CENIC (Corporation for Education Networking in California). Level 3 classifies it as a “Premier Select” facility, which is its mid-range category.

The other West Sacramento data center is owned by Verizon, which obtained it when it acquired MCI’s assets. Its current status is less clear. It is not advertized as a colocation or exchange site and it is not on the list of publicly available data centers that Verizon is in the process of selling to Equinix, a major independent data center operator. Verizon retained ownership of its intercity fiber optic network when it sold its wireline telephone systems in California to Frontier Communications. It is likely that this data center is focused on supporting Verizon’s fiber network.

Both data centers are connected to multiple fiber optic networks, including those that serve the local West Sacramento/Sacramento market and major east-west and north-south transcontinental routes.

3.4. Fiber utilization potential

The commercial and industrial-grade broadband service currently offered in West Sacramento relies on an impressive base of fiber optic routes that are configured to serve local and intercity networking needs.

	Star Rating
Current service	0.5
Full fiber utilitization	1.0
With City conduit development	2.0

Table 3.4 – Star Rating by scenario.

One resource that does have a significant impact in West Sacramento is the excellent long distance fiber connections that are available. Several major east-west and north-south fiber routes pass through the city, generally along the I-80 and I-5 corridors. These routes, while not specifically factored into the analysis, do provide essential connectivity that significantly improve the resources available to the companies that were evaluated, and in that way could improve local commercial and industrial broadband availability ratings.

However, looked at on a city-wide basis, these commercial and industrial-class facilities and services are underutilized.

Star Rating – full fiber utilization scenario

A "what-if" Star Rating analysis was run using the assumption that the fiber networks that are configured for local service are fully accessible to industrial and commercial properties along those routes. In that scenario, West Sacramento's Star Rating doubles to 1 Star, with the number of 2 Star industrial and commercial census blocks more than tripling to 38, 13 census blocks improving to 3 Star ratings and two climbing all the way to a 4 Star rating (out of a possible 5).

3.5. City of West Sacramento conduit

The City of West Sacramento owns an extensive network of conduit that is suitable for telecommunications use. There is approximately 8.5

Figure 3.6 – City of West Sacramento conduit system. Larger maps are in Appendix A.

miles of traffic signal interconnect conduit and 4.5 miles of prospectively installed telecommunications conduit in the Bridge District. According to the City's map, the interconnect conduit routes appear to consist of up to four separate conduits or innerducts ranging from 3 inches to 5 inches in diameter, with many wires/cables installed and ranging from 25% occupied to fully occupied. A site survey generally confirmed the presence of traffic signal interconnect routes in the locations indicated on the map, but the visible handholes/vaults were not opened and inspected.

This interconnect conduit runs:

- Along West Capitol Ave., between Harbor Blvd. and Jefferson Blvd.
- Along Harbor Blvd., between Reed/Sacramento Ave. and Del Monte St. Original plans called for a City of West Sacramento manhole to be built on the Level 3 route at Harbor Blvd. just east of the center line.
- Along Jefferson Blvd., from Reed/Sacramento Ave. to Marshall Road, including short spurs along Industrial Blvd., to the east and west of Jefferson. Original plans called for two City of West Sacramento manholes to be built at the intersection of Sacramento and Jefferson, just west of Jefferson on the north and south sides of Sacramento.
- There is also an isolated interconnect segment on Southport Parkway, between Ramco St. and Promenade St.

The City also owns a 1.25-inch innerduct along a 3.5 mile conduit route built by Williams Communications and now owned by Level 3 Communications. This route connects to long haul, intercity routes at its western end on Stillwater Road, and dense metropolitan fiber networks and intercity routes in the City of Sacramento at its eastern end. The fact that it provides a pathway across the Sacramento River significantly adds to its value. It is designed to support long haul fiber routes, and consequently is buried deeper than conduit intended for local connections and is located in the middle of streets rather than near or under sidewalks.

Yolo County owns a conduit route that runs approximately 4 miles across the northern end of West Sacramento, and connects to routes in Sacramento and elsewhere to the west in Yolo County.

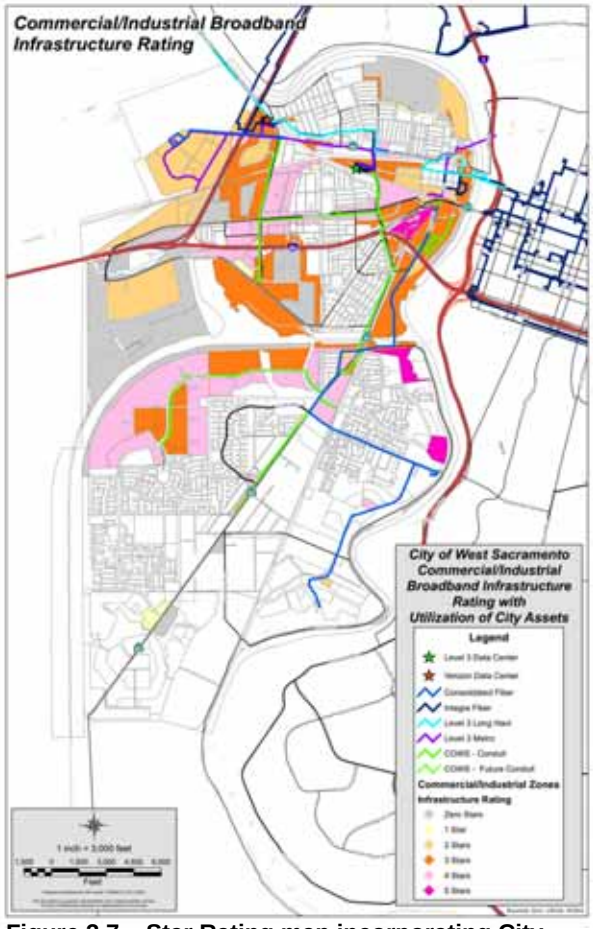


Figure 3.7 – Star Rating map incorporating City conduit (larger maps available in Appendix A).

Star Rating – conduit development potential

A second “what-if” analysis was done using two

assumptions: 1. existing fiber networks are fully accessible to properties along those routes and 2. additional, open access fiber is installed in City of West Sacramento conduit, with short connector segments built in order to create a single, contiguous system. Yolo County's conduit was not factored into this analysis because it duplicates existing routes. As a practical matter, though, it too should be considered as a potential, unused broadband asset.

If a strategy of fully developing and utilizing conduit and fiber routes in West Sacramento is assumed, the results are dramatic. The City's overall Star Rating jumps to 2 Stars, four times better than its Star Rating based on current service levels. The improvement for individual industrial and commercial census blocks is even more stark. Only a third (46 out of 136) of commercial/industrial census blocks rated 1 Star or less (see Table 3.3 above). The number of 2 Star census blocks dropped to 20, while another third (46 out of 136) rated 3 Stars, 22 earned 4 Stars and two reached the top 5 Star level.

4. Business and Consumer Perceptions

4.1. Primary market research

Tellus Venture Associates and Competitive Edge Intelligence conducted primary market research to ascertain how residents and business people perceive the broadband service that is available in West Sacramento. A workshop was held for local businesses on 20 September 2016, and online surveys were conducted: one for local businesses in September-October 2016 and one for residents in October-November 2016. Participant recruitment was done via City of West Sacramento email lists and social media.

Responses from the business survey tracked closely with the anecdotal information gathered during the workshop: business respondents generally believe that the Internet service they receive is not fast enough or reliable enough for their needs. They perceive the customer service businesses receive from Internet service providers to be poor, but on the other hand believe it meets the needs of residential users.

Consumers expressed dissatisfaction with the level of service and prices offered by Internet service providers in West Sacramento. As with business respondents, consumers did not perceive Internet access services to be sufficiently reliable. On the other hand, they were more pleased than not with the customer service and technical support they receive.

4.2. Business workshop

Seven West Sacramento business owners and residents participated in a 110-minute workshop, which was held on 20 September 2016 in a meeting room at City Hall. Mark Zollo from the City of West Sacramento and Steve Blum and Penny Butler from Tellus Venture Associates also attended. The workshop was conducted by Julia O'Daly from Competitive Edge Intelligence.

Participants identified approximately ten broadband providers in the area including Level 3, Wave, Hughes, AT&T, Verizon, Consolidated, DISH, DirecTv, Freedom Pop, and Wireless & Wi-Fi. In terms of reliability, all these systems were characterized as "okay", but outages and "blackouts" are not uncommon. Although participants have come to expect occasional outages, none had backup service in place.

Prices paid for service packages range from $29 per month for residential service (Freedom Pop) to $800 per month for commercial service (Wave).

The general consensus of participants was:

- The Internet service that is available to businesses in West Sacramento is not fast enough or reliable for their needs.

- Broadband is perceived as an essential utility and its availability is assessed by businesses when deciding whether or not to locate or expand in West Sacramento. Participants believe that better broadband infrastructure and service will attract more people and jobs to West Sacramento.
- Businesses and property developers frequently experience problems obtaining Internet service in newly developed areas.
- Residents with home-based businesses located in peripheral areas of West Sacramento have difficulty obtaining any Internet service at all.
- Cost is a barrier to obtaining speed and reliability levels above that of the basic service offered by major Internet companies. Participants generally believe that the pricing for this kind of service represents a good value, however the speeds delivered are perceived to be half or less of the speeds advertized by these providers.
- Overall, the customer service provided to businesses by major Internet companies is poor. However, Wave's customer service was described as improving, while AT&T's customer service was characterized as frustrating.
- All particpants want to see a citywide broadband vision and/or initiative developed that addresses the community as a whole.

These perceptions were mirrored by businesses that responded to a subsequent online survey. A fuller description of comments and perceptions expressed at the business workshop is in Appendix B.

4.3. Business survey

Table 4.1 - Business survey: type of business	
Agriculture	2%
Construction	4%
Environmental	2%
Finance, Insurance, Real Estate	21%
Food	4%
Health and Educational Services	14%
Hospitality	2%
Logistics	2%
Manufacturing	2%
Media	12%
Nonprofit	2%
Professional	14%
Retail	5%
Technology	16%

There were 57 valid survey respondents, representing a sample size of 13.5% of West Sacramento businesses, a statistically sound sample. Generally, any sample greater than 5% of total population is statistically relevant in analysis projections. A total of 84 responses were gathered during the course of the business survey, however 27 responses which did not indicate that the respondent had a business in West Sacramento were filtered out, and not used in the analysis.

Most of the responses were from small businesses, with 81% having two or fewer employees. Just over a fifth of the respondents were in the finance, insurance and real estate sector.

Nearly all used the Internet in the course of business:

- 98% of respondents currently purchase Internet for their business.
- 98% of the responding businesses have internet access.
- 82% of the businesses responding allow telecommuting.

More than three-quarters purchase cellular phone service (82%) and less than half have fixed line phone service (35%). There does not appear to be a dominant trend among the respondents with regards to how these services are purchased. Nearly half (48%) purchase these services as a bundled package, whereas 42% purchase all services through separate providers.

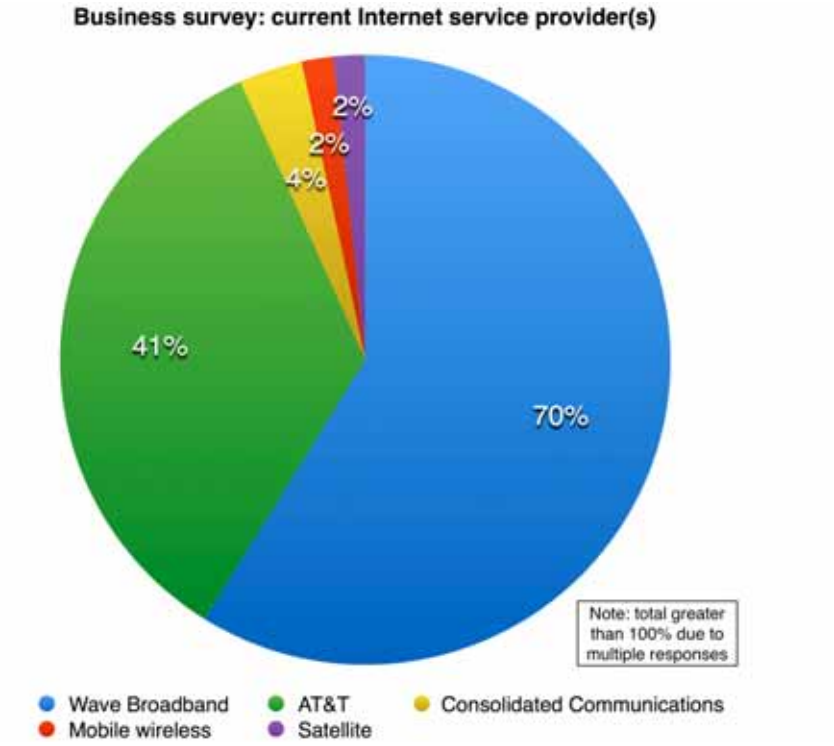


Chart 4.1 – West Sacramento business survey

More than two-thirds of the respondents (70%) currently contract with Wave for their broadband services, followed by AT&T (39%). Consolidated Communications is currently used by 2% of the respondents as a broadband carrier. The total is greater than 100% due to some respondents reporting that they purchase service from more than one carrier.

When only primary business Internet connections are considered, Wave's cable modem service captures 69% of the market share (Wave is the only company offering cable modem service in West Sacramento). DSL is primary Internet connection method for 19% of business respondents, 15% of respondents use mobile phone/mobile hot spot as their primary Internet connection, 7% use a satellite provider, 4% use a fixed wireless Internet service provider and 4% still use dial-up service.

An interesting corollary is that comments from business responders that are located outside of Wave's footprint indicate a desire for such service. One respondent noted:

> *Many of us in rural Southport rely on Internet for our business. I feel the city has let us down by giving Wave the contract without demanding it cover the entire city and by not demanding it to provide fast, reliable service to those who pay them top dollar for that. Others out here have to pay Verizon or similar hundreds of dollars a month for Internet access*[8].

When asked about the importance of Internet service, 86% of respondents said it is very or somewhat important in their ability to achieve strategic goals (80% very important). 84% said it was very or somewhat important in their ability to stay competitive (77% very important) and 63% stated that it is very or somewhat important when deciding where to locate existing or future facilities (55% very important). However, it is noteworthy that few purchase backup/redundancy service, with 45% reporting none and 41% identifying their mobile phone/mobile hotspot as their backup method.

Reliability of connections is highly valued among business users, with 96% of respondents stating that reliability is "very important" to their business. Only 12% of those businesses are "very satisfied" with the current level of reliability, whereas 34% are somewhat or not at all satisfied with the current reliability of their Internet service.

Table 4.2 - Business survey: minimum acceptable upload speed

1.5 Mbps or less:	0%
3 Mbps:	13%
6 Mbps:	21%
10 Mbps:	34%
25 Mbps or greater:	32%

[8] Cable franchises and the conditions that are attached to them are now managed at the state level, a change that was made by the California legislature in 2006. However, many consumers still believe that local government retains this authority.

Table 4.3 - Business survey: minimum acceptable download speed	
1.5 Mbps or less:	2%
3 Mbps:	4%
6 Mbps:	11%
10 Mbps:	23%
25 Mbps or greater:	60%

Internet connection speed was also rated highly by respondents, with 89% stating that the speed of connection was “very important”. However, only 11% responded that they are “very satisfied” with current Internet speed and 34% stated that they are “not at all” or only “somewhat satisfied” with current Internet speed. Technical support was identified as the third most important service attribute (70%). Only 13% were “very satisfied” with their current level of tech support.

In terms of value, 92% stated that the price of services were either “very” or “somewhat” important. Only 6% are currently very satisfied with the price of services and 46% are “not at all” or “somewhat” satisfied with the current prices for Internet service.

These key metrics indicate a real opportunity for incumbent providers to substantially improve current services and develop better pricing strategies. When only 6% of a customer base feels that they are getting good value for services, it is a key indicator that they would likely switch providers if any were available.

4.4. Consumer survey

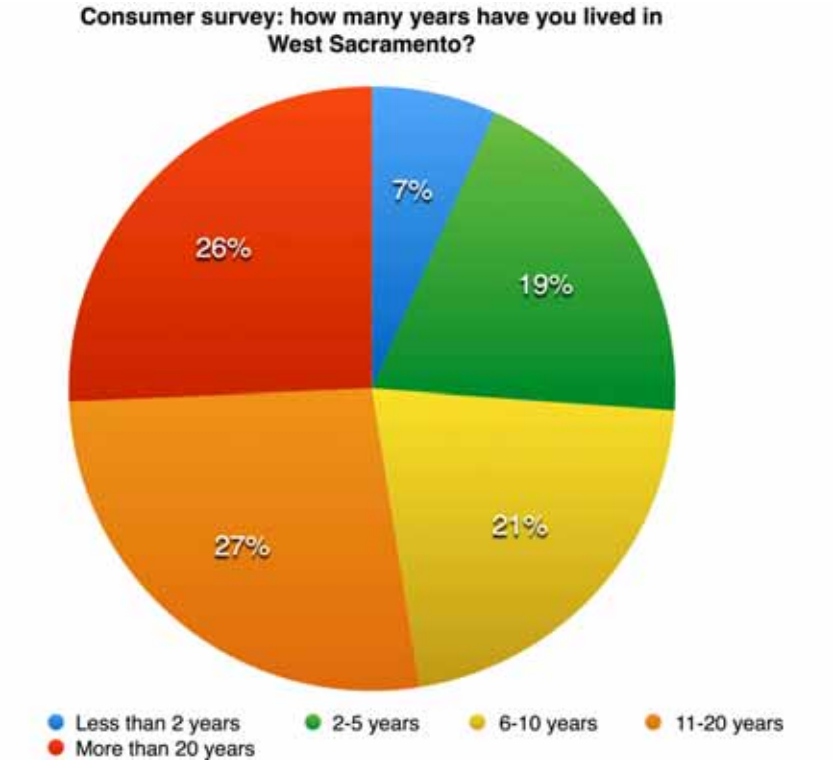


Chart 4.2 – West Sacramento consumer survey

There were 425 consumer survey respondents, representing a .85% sample size. More than half (53%) have lived in West Sacramento for more than 10 years, and a similar number (52%) work for employers who allow them to telecommute. On the whole, respondents were not very satisfied with their current service or the price they're paying for it.

- 98% of respondents have internet access at their home.
- 97% of respondents currently purchase Internet for their home.
- 89% of respondents purchase cellular/mobile telephone service.
- 70% of the responding households purchase either cable or satellite television.

The majority of the respondents (63%) purchased some or all of their services in a bundled package (47% some services, 16% all services), while 27% said they obtain all their services from separate providers.

Half of the respondents (51%) currently use cable as their primary Internet connection, followed by DSL (25%) and wireless (15%). However only 20% of respondents reported that they were "very satisfied" with the reliability of their current internet service. That figure contrasts to the 96% of respondents who rated reliability as "very important". It is significant – a "red flag" according to our analysis – that 32% of respondents reported being either "not at all" satisfied or only "somewhat satisfied" with their current Internet service provider's reliability.

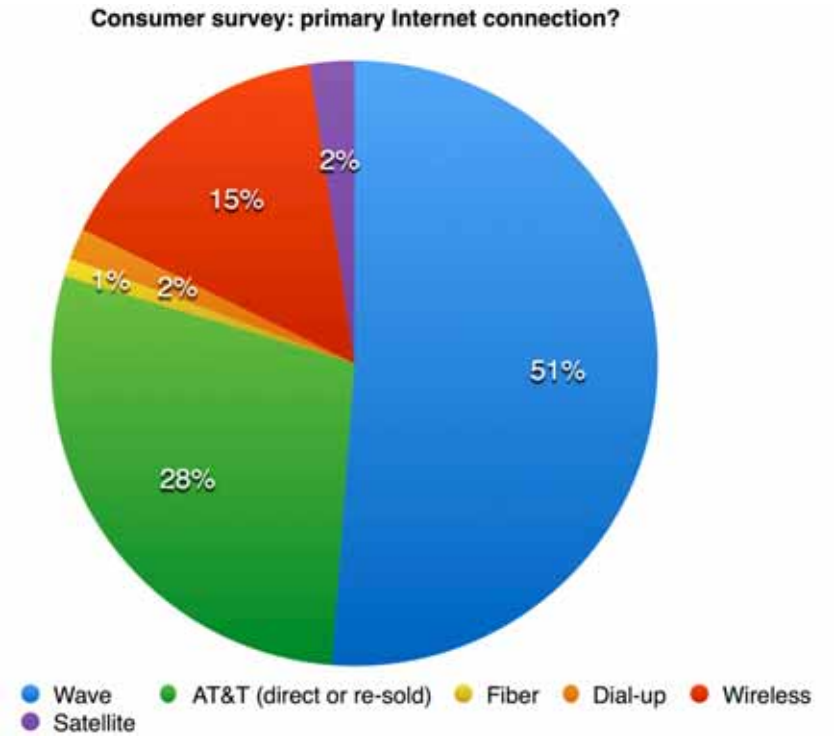


Chart 4.3 – West Sacramento consumer survey

The speed of Internet connections, including latency perceptions, was considered "very important" by 84% of respondents, however only 17% reported being "very satisfied" with the speed of their current

service. Dissatisfaction was significantly higher, with 31% of respondents reporting they were either "not at all" or "somewhat" satisfied.

The minimum acceptable upload speed for 84% of respondents was 6 Mbps or greater and the minimum acceptable download speed for half of respondents was 25 Mbps or greater.

Pricing is another service attribute with a disconnect between expectations and results: 72% of respondents said that price was "very important", but only 28% said they were "very" or "somewhat" satisfied by the prices on offer.

There is a closer match when it comes to customer service, though. More than half (60%) of the respondents said that the ability to contact their provider was "very important", with 55% reporting that they are either "very" or "somewhat" satisfied with their ability to contact their internet provider. Technical support was "very" important to 61% of respondents, while 52% said they were either "very" or "somewhat" satisfied with the the technical support offered by their current Internet service provider.

Table 4.4 - Consumer survey: minimum acceptable upload speed

1.5 Mbps or less:	4%
3 Mbps:	14%
6 Mbps:	23%
10 Mbps:	36%
25 Mbps or greater:	23%

Table 4.5 - Consumer survey: minimum acceptable download speed

1.5 Mbps or less:	2%
3 Mbps:	5%
6 Mbps:	13%
10 Mbps:	29%
25 Mbps or greater:	50%

In the comments section of the survey, consumers generally expressed negative perceptions of the Internet access services that are available in West Sacramento. Specific complaints included perceptions of low data caps, high prices and lack of competition. On the other hand, residents who live outside the service area of one or both of the primary ISPs (AT&T and Wave) expressed a strong desire for such service to be extended to them.

Typical comments included:

- *We have no internet options where we live. Our only option is using a cellular network which is not feasible because of the high cost of data.*

- *Wave is terrible and it is the only option in my neighborhood, the River's. Please bring in AT&T if at all possible.*

- *A reasonably-priced and reliable service other than AT&T would be wonderful. I live in Southport and have struggled with signals and reliability.*

- *Would love to have more options than ATT and Wave. Wave is incredibly spotty for speeds. Fluctuations all the time and ATT is a rip off. Comcast or Consolidated Communications would be amazing if offered/allowed in to our area.*

- *Data caps are also a very important consideration for an ISP. For example, Wave Broadband in West Sacramento has a 100GB data cap for their slower services, and just a 300GB data cap for their fastest service. That is simply unacceptable.*

It is not surprising that negative comments were submitted by consumers, since dissatisfied people tend to be more motivated to voluntarily respond to online surveys and take the time to write narrative responses. The sample should be considered skewed in that respect, and it should not be assumed that all consumers are dissatisfied with the Internet service they receive.

However, it is notable that no one offered a completely positive opinion about the incumbent providers that serve their neighborhoods (although many had positive views of providers that do not serve them, in what appears to be a “grass is greener on the other side of the fence” sort of response). The closest thing to a positive opinion came from a respondent who wrote “when Wave broadband is working I am totally satisfied with my Internet, however they have a reliability problem and their service is not very consistent”.

5. Broadband Adoption

5.1. Broadband adoption rate

The most recent data collected and published by the California Public Utilities Commission (circa June 2012) indicates that broadband adoption and penetration rates in West Sacramento are split nearly evenly between higher income areas that meet or exceed the statewide average and lower income areas that are significantly worse.

Table 5.1 - Adoption rate by census tract

Tract	Adoption rate	HUs	Population	Average income	Location
6113010101	45%-59%	2,736	6,645	$40,539	NE corner of West Sac
6113010102	45%-59%	2,515	7,534	$39,767	NW corner of West Sac
6113010201	75%-89%	1,210	2,538	$50,894	East - North & South of I-80
6113010203	30%-44%	2,142	5,397	$41,399	West - North & South of I-80
6113010204	45%-59%	2,197	4,922	$43,694	Center - North & South of I-80
6113010302	90%+	2,733	7,270	$84,779	Top middle and NE of Southport
6113010310	75%-89%	1,853	5,485	$76,937	NW corner of Southport
6113010312	75%-89%	1,942	5,130	$71,105	Center of Southport
6113010402	75%-89%	1,353	3,823	$101,323	Southernmost - south of Davis/Marshall

Table 5.2 - Adoption rate by demographics

Adoption rate	HUs	Population	% HUs	% Population	Average income
30%-44%	2,142	5,397	11%	11%	$41,399
45%-59%	7,448	19,101	40%	39%	$41,333
75%-89%	6,358	16,976	34%	35%	$75,064
90%+	2,733	7,270	15%	15%	$84,779
Total	18,681	48,744			

The two metrics – adoption and penetration – differ in that the adoption rate factors in broadband availability, while the penetration rate simply expresses broadband use as a percentage of overall population. Because broadband service of one kind or another is available to most households in West Sacramento, the two metrics are identical and this report will use the adoption figures for comparison.

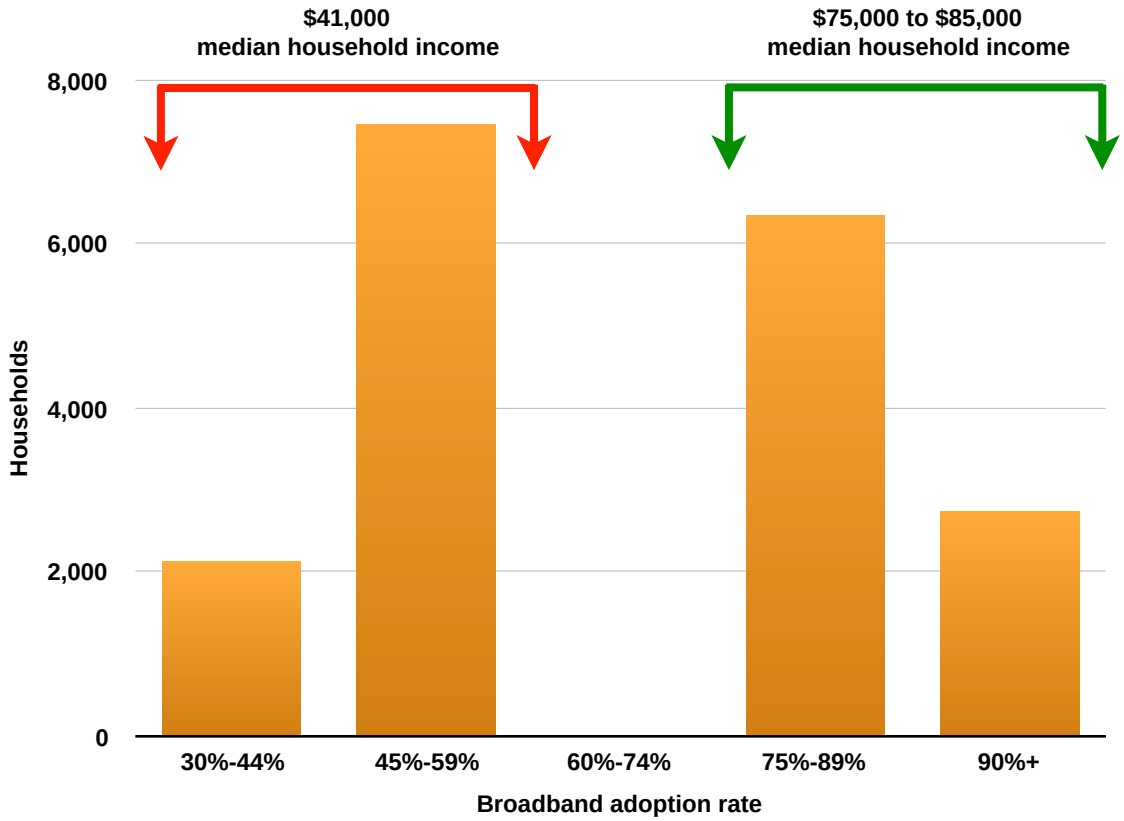
Service providers consider this kind of customer data to be proprietary, and as a result the FCC and CPUC treat it confidentially. Exact figures for cities, or census tracks or blocks are not released. Other

than state and county-level summaries, the only data published is an indication of which of six broad percentage ranges the adoption rate in any given census tract falls into. Even this scant information is suppressed when there are fewer than three service providers reporting customer data in a census tract, in order to preserve confidentiality.

The CPUC provided tabular adoption data for all ten West Sacramento census tracts (although some of this data is suppressed on the CPUC adoption map in Appendix A).

There are 18,681 housing units within the West Sacramento city limits and within the nine inhabited census tracts. Of those, 11% fall in the 30% to 44% range, 40% fall in the 45% to 59% range, 34% fall in the 75% to 89% range and 15% have an adoption rate of 90% or greater. None were less than 30% or fell in the 60% to 74% range.

Chart 5.1 - West Sacramento's digital divide[9]



By comparison, the California statewide adoption rate is 74%, Yolo County's is 69% and Sacramento County's is 72%. In other words, just about half (51%) of homes in West Sacramento fall below the statewide and countywide broadband adoption rates, and about half (49%) are above those figures.

[9] See Tables 5.1 and 5.2 for more detail.

There is also a clear difference in income levels. Average income for homes that fall below the statewide/countywide adoption rates is about $41,000 per year, while those above that level have average incomes in the $75,000 to 85,000 range.

5.2. Adoption programs

According to a Federal Communications Commission study[10], the price of broadband service is the most influential factor in determining broadband adoption rates. Although digital literacy and free or reduced price equipment programs play a role, the final decision to purchase broadband service – the true metric for measuring adoption rates – is based largely on the monthly cost of the service.

Several large broadband service providers have established Internet access plans for low income households, either voluntarily or as a result of regulatory conditions attached to a merger or acquisition. Wave Broadband does not offer such a program, but AT&T does.

Table 5.3 - AT&T Access program rate plans, by housing units

Download speed	Monthly data cap	Monthly price (plus tax)	Housing units
10 Mbps	1,000 GB	$10	16,978
5 Mbps	1,000 GB	$10	0
3 Mbps	1,000 GB	$5	29
1.5 Mbps	1,000 GB	$5	949
768 Kbps	1,000 GB	$5	128
768 Kbps	150 GB	$5	205
Unavailable	--	--	392
			18,681

Only one rate plan, determined by available speed & service, is offered to a household.

Wireless service, including mobile service, is not included in the program.

In 2015, the FCC approved AT&T's purchase of DirecTv, a satellite television company. Several conditions were attached to the approval, including a requirement that AT&T offer discounted Internet service to low income households. AT&T introduced the "Access" program in 2016. It is required to offer it until April 2020 and may phase it out completely a year after that. Californian households 1. "where at least one individual participates in the Supplemental Nutrition Assistance Program ("SNAP")" or receives Supplemental Security Income (SSI) benefits, 2. where AT&T's wireline Internet service is available and 3. that do not owe AT&T money for recent Internet service are eligible to receive a package of up to 10 Mbps download speeds for $10 per month plus tax, or less in some cases.

[10] *Wireline Competition Bureau Low-Income Broadband Pilot Program Staff Report*, Federal Communications Commission 22 May 2015.

The actual speed and, consequently, price depends on the level of service available to an eligible household. Consumers are not offered a choice, though. If, for example, 10 Mbps service is available to a home, then the only discounted plan that is offered is 10 Mbps for $10 per month. In that case, a consumer would not have an option of, say, buying a 3 Mbps plan for $5. That service level and price is only offered in locations where 3 Mbps is the maximum speed available.

In addition, AT&T imposes a monthly data cap of either 150 gigabytes or 1,000 gigabytes (1 terabyte), with a charge of $10 for every 50 gigabytes or fraction thereof used. AT&T does not explicitly disclose the method it uses to determine which data cap applies to which customer, saying only that it depends "on the type and speed of service" received. However, a link on the Access program webpage leads to a standard data cap table which indicates that homes that receive service via legacy DSL equipment have a 150 gigabyte cap and homes that receive ADSL2 or VDSL-based service (branded as Uverse or, more recently, simply as "Internet") are subject to the 1,000 gigabyte cap.

Based on that information, most homes in West Sacramento (91%) are in areas where the maximum $10 per month/10 Mbps/1 terabyte cap plan would be offered. Of the remainder, 6% of homes would be offered a $5 plan between 768 Kbps and 3 Mbps with a 1,000 gigabyte cap and 1% would be offered 768 Kbps with a 150 gigabyte cap for $5 per month. Homes in areas where AT&T Internet service is not available – 2% of the total – would not be eligible for anything under the Access program, including any wireless service which might be available.

Information about the program is available on the main AT&T website, but unless a person already knows it exists and knows that it is called "Access", it is difficult to find. Additionally, AT&T has a number of supplemental websites, some of which contain outdated information about the Access program. It would be impossible for an average consumer to know which one is accurate.

AT&T does not go to great lengths to publicize the program. Historically, this sort of program – discount Internet packages offered to low income households – has been used by service providers as an opportunity to up sell people who enquire about it into significantly more expensive plans, often including television and telephone service. Difficulty documenting eligibility and past debts – including money owed by people who might not live at a given address any longer – can also be barriers.

Additionally, the FCC has established a Lifeline program that provides telephone service subsidies for low income households. In California, this program is managed by the CPUC and supplemented with state funds. In some cases, for example when an eligible consumer chooses mobile service, broadband service might be included. The entire program is currently undergoing a redesign and, assuming the new administration does not make major changes, broadband service will be more widely included, with the goal of eventually replacing traditional telephone service.

6. Infrastructure Planning and Development

The trend at the state and federal level is toward less regulation of telecommunications companies. Local governments in California no longer manage franchises for video service and state regulation is minimal. Proposed legislation would transition landline telephone service away from its current regulatory regime, which is based on assumptions regarding legacy analog technology, and toward a less restrictive environment that might or might not be in keeping with current digital technology trends. Broadband and Internet service is not directly regulated at the state level, and federal agencies have adopted a "light touch" approach, where they have considered intervention at all.

The FCC's recent decision to bring "broadband Internet access service" under common carrier regulation (often referred to as the "network neutrality" decision) tries to draw a clear line between what kind of regulation does and does not apply to providers of those services. In particular, the FCC has ruled out regulation, by itself or states, of Internet service offerings, rates, or access to infrastructure by third parties, except to say that it will review complaints on an after-the-fact basis using a "just and reasonable" standard.

The decision specifically allows "any body politic, or municipal organization", as well as individuals and state utility commissions, to file complaints. It establishes formal and informal procedures for doing so, and creates an ombudsman's position to facilitate the process.

However, some aspects of Internet service and infrastructure are still open to regulation under common carrier rules, including pole attachments and conduit access and, to an unspecified extent, universal service policies, both of which are under the CPUC's jurisdiction. Other rules that will be enforced include those that relate to consumer protections and privacy, and accessibility provisions.

West Sacramento, like other California cities, has no direct role in regulating Internet service providers. However, the City can implement policies that help or hinder broadband infrastructure development and competition, and should consider its policy and program choices not just in terms of municipal authority, which is limited, but also in terms of opportunities to become a partner and an active participant in broadband infrastructure development initiatives.

Options include managing the use of city-owned facilities by Internet service providers, setting policy for shared use of public right of ways, becoming directly involved in developing broadband infrastructure and directly providing services, with or without private sector partners. Policy initiatives that encourage broadband infrastructure development can have a significant impact on the availability of service and facilities. Cities have attracted private, competitive broadband service providers by lowering barriers to entry and leveraging existing city infrastructure and budgets.

The experience of other cities shows that relatively small-scale efforts can result in significant improvements, particularly for commercial and industrial class broadband infrastructure, by reducing the risk for private telecommunications companies. These steps have included streamlining permitting procedures, directing public funds towards broadband projects and other measures.

6.1. Types of infrastructure

Broadband infrastructure generally breaks down into two categories – middle and last mile – and supports four different types of service: consumer, commercial and industrial classes, and mobile.

Last mile infrastructure is used to deliver broadband service directly to customers from a central office or other distribution point operated by telephone, cable, mobile and other telecommunications companies. It is the type of infrastructure most commonly seen in West Sacramento and, as described above, variations in its quality and capacity result in different service levels in different areas of the city.

Middle mile infrastructure connects the central offices and distribution points to major data centers and Internet exchanges, and provides the high capacity, wholesale bandwidth that is distributed on a retail basis via last mile infrastructure. As with other types of utilities, middle and last mile infrastructure is also sometimes referred to as transmission and distribution facilities, respectively. The terms can be used interchangeably.

In most of West Sacramento, consumer, commercial and industrial class service is delivered via wireline networks, although service is also available via fixed wireless technology on a more limited basis.

As discussed above, consumer-class Internet access is typically a shared resource, with many subscribers contending for the same bandwidth, and is subject to speed and volume limits as determined by the provider. This type of service often meets the needs of small and medium businesses, but not always. And it is generally inadequate for larger companies, which need commercial and industrial class broadband facilities.

Wireless infrastructure

Mobile broadband infrastructure supports yet another type of service. It is differentiated from fixed services and infrastructure – consumer, commercial or industrial – in that it is accessible over a wide area, rather than in a specific place. Because it relies on limited radio frequency spectrum, mobile service has less overall capacity than service based on modern wireline technology and is more expensive to purchase, on a cost per megabyte basis. Although carriers will often make claims to the contrary, mobile service is not an acceptable substitute for wireline service, either in terms of service levels or cost. However, it is regarded as equally essential. The Federal Communications Commission's *2016 Broadband Progress Report*[11] defined this distinction:

[11] *Broadband Progress Report 2016*, Federal Communications Commission 28 January 2016, In the Matter of Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, as Amended by the Broadband Data Improvement Act.

Consumers have advanced telecommunications capability only to the extent that they have access to both fixed and mobile broadband service. As they currently exist, fixed and mobile broadband services are not functional substitutes for one another, as some commenters suggest. Rather, as many commenters recognize, in today's society, fixed and mobile broadband are both critically important services that provide different and complementary capabilities, and are tailored to serve different consumer needs…

Figure 6.1 – Cell site in West Sacramento commercial/ industrial area.

It is true that, at a high level of generality, both services provide consumers with broadband Internet access service. As we have explained, however, significant differences in service capability and pricing prevent fixed and mobile broadband from being adequate substitutes for one another. Although fixed and mobile broadband sometimes provide overlapping functionality, this does not compel the conclusion that the two services are interchangeable for purposes of our Inquiry. Indeed, Americans with access to only one type of service are often unable to take advantage of the full range of functionality offered by advanced telecommunications capability.

Cellular wireless sites are last mile facilities and rely on the same middle mile fiber optic networks as wireline systems.

Service standards

Although different organizations use different criteria, the California Public Utilities Commission (CPUC) currently considers 6 Mbps download and 1.5 Mbps upload speeds to be the standard for adequate residential broadband service. The Federal Communications Commission, on the other hand, recently adopted 25 Mbps download/3 Mbps upload as the minimum acceptable level for advanced service, and efforts are under way in the legislature to raise the Californian standard to that level. It should be noted that, in either case, the standard refers to the capacity of the infrastructure installed by service providers. So long as the minimum level is available, consumers may also be offered the option of purchasing less expensive, lower speed service.

6.2. Broadband policy role of municipalities

The California Public Utilities Commission (CPUC) regulates “telephone corporations” and, to a lesser extent, “cable television corporations” and “video service providers”. These categories include AT&T and, to a restricted extent, Wave, which are the two primary retail broadband service providers in West Sacramento. Intercity carriers are also regulated as telephone corporations. Responsibility for regulating telephone corporations is shared between the CPUC and the Federal Communications Commission (FCC). Municipalities are allowed no authority in that regard.

Cable television regulation

Originally, regulation of cable television corporations was the responsibility of local government in California. The City of West Sacramento was actively involved in regulating franchisees to the extent allowed by federal and state law until the Digital Infrastructure and Video Competition Act of 2006 (DIVCA) was approved by the California legislature.

DIVCA established statewide franchises for video service providers, which now includes telephone companies such as AT&T. DIVCA severely limits the role cities and other local government entities may play in regulating or otherwise influencing video service providers. Cities still receive a 5% franchise fee from video franchise holders, and have a limited opportunity to inspect their books to ensure compliance. Requirements for public access channels, consumer protection rules and obligations to build out infrastructure are also subject to municipal review, but enforcement authority is severely limited, often to the point of being impractical.

Broadband provider access

The City and County of San Francisco passed an ordinance which prohibits owners (landlords and homeowner associations) of multiple dwelling units from denying access to competitive broadband providers that qualify under state law to do work in the public right of way. Single family homes are not included, however renters in those circumstances generally have sufficient control to allow access. The ordinance sets up procedures for broadband companies and building owners to follow, and establishes remedies for failing to do. State and federal regulations also restrict the ability of property owners to limit tenant’s ability to choose between competitive broadband providers. San Francisco’s ordinance is more specific and far reaching, and has not yet been tested in court.

Encroachment permits

The primary regulatory role remaining to cities is the ability to approve or deny applications for encroachment permits for the use of the public right of way on the basis of neutral “time, place and manner” standards.

Cities have greater flexibility when it comes to managing publicly-owned assets and providing services directly. Cities in California are free to decide whether or not to build and operate telecommunications facilities, establish Internet service utilities or manage assets that could be used for those purposes. The

FCC has reaffirmed that cities maintain wide discretion when negotiating with telecommunications companies over the use of city-owned facilities, as opposed to simply regulating access to the public right of way.

Management of street cuts

Cities retain the ability to establish reasonable conditions and procedures for utility companies, including telecommunications carriers, to do construction work in the public right of way. There are many different approaches, but in general most street cut policies intended to promote broadband fall into two categories: “open trench” and “shadow conduit”.

Open trench policies (also sometimes referred to as “dig once” policies) require some degree of advance notice of any digging that’s done in streets, sidewalks or other public places. This notice goes to other utilities that might be interested in installing facilities in that location or local agencies or both. If another utility wants to take advantage of the opportunity presented by the work, cost sharing arrangements can be negotiated or specified by policy. Some policies, such as one written for the City and County of San Francisco, go one step further and require a moratorium – five years is common – on any other utility work at that location.

Shadow conduit policies build on the opportunity presented by open trench notifications. Cities can make it a routine practice to install municipally-owned empty (i.e. “shadow”) conduit prospectively any time a suitable trench is available. Or requirements for installation of empty conduit can be imposed on new construction and major remodelling projects. Ownership of the conduit can be passed to the city, as in Brentwood, or remain with the property owner with the requirement it be connected to a municipal network, as in Loma Linda.

Figure 6.2 – West Sacramento fiber route.

An important adjunct to both open trench and shadow conduit policies is a requirement that all conduit installed by public agencies and, ideally, private utilities, be logged into the city’s GIS database. The City of Watsonville was able to build its own city-wide data network because it had taken care over the years to keep its records up to date. Cities that have failed to do so often lose track of where municipal conduit has been installed.

Finally, complicated permitting processes can serve as barriers to entry for broadband companies that want to bring competitive service into a city. Although care must be taken to protect the public’s interests and ensure community values are maintained, some jurisdictions are moving plan reviews for broadband facility construction out of planning departments and completely into the hands of public

works departments, which can use a relatively streamlined encroachment permit process to achieve the same ends.

6.3. Land use considerations

Single-Family Housing

If a residential project is in the thousands of homes range, it might be practical for a developer or home owners' association to bring in a competitive telecommunications company as a primary Internet (or cable or telephone) service provider. In a gated community, the threshold might drop to hundreds, or even dozens, of homes because rules for providing television service are different when the public right of way is not involved. If residents agree to buy services in bulk – i.e., all residents subscribe to a base level of service, which might or might not include Internet service – then a broadband provider will be able to amortize construction costs over fewer homes.

Figure 6.3 – Aerial fiber optic cable route in West Sacramento residential neighborhood.

Smaller last mile projects in residential developments will almost always rely on incumbents, which in West Sacramento are AT&T and Wave. It is becoming common practice for new homes to include pre-wired data networks, but there is no single, industry standard for doing so, or for providing open access to existing or potential competitive networks. The City can play a role in setting these standards for new construction (and for major remodelling projects). The greater the degree of standardization and open access, the easier it is for prospective last mile competitors to enter the market and offer residents additional choices.

Multi-Family Housing

The same considerations apply to multi-family housing as with single-family housing, with one major difference. Landlords and homeowner associations play a gatekeeper role and, up to a point, can control which broadband service providers can gain access to a property. In some cases, this control poses a barrier – e.g., landlords can prevent or refuse to pay for upgrades – but in other cases it can be an opportunity. Even a small multi-tenant property could be attractive to a competitive provider, due to the low cost per customer to build and maintain facilities, and the potential for bulk purchases of service, by landlords or homeowner/tenant groups. Google Fiber is following this model in San Francisco, although a recently enacted ordinance there all but eliminates the ability of multiple dwelling unit owners to block service from competitive providers.

Commercial

Office and retail properties—particularly those with a large number of tenants—are attractive to incumbent and competitive service providers alike, particularly when some or all of the construction costs for broadband facilities are borne by property owners. However, without access to core infrastructure, competitive providers operate at a severe disadvantage. Municipal conduit and dark fiber facilities, along with policies that require lateral connections to new construction, can level the playing field.

Industrial

Companies and institutions will often prefer to work directly with the raw materials of broadband: dark fiber, electronic equipment, and direct connections to major Internet exchanges. Although organizations with large-scale bandwidth needs are often willing to invest in on-site upgrades, site selectors will bypass locations that lack access to this core infrastructure.

6.4. Wireless policy

Development of wireless facilities, particularly those designed to support mobile broadband services, is necessary to meet increasing consumer demand and because construction of mobile infrastructure also requires additional investment in the fiber optic networks that support it. On the other hand, the City has a stewardship responsibility regarding environmental regulations, other community standards, and the use of the public right of way. Recent changes in state law and federal regulations has made exercising this responsibility problematic, and require adjustments to City policy and procedures in the near term.

The City of West Sacramento updated its land use policy regarding wireless telecommunications facilities in June 2016. It contains design and construction requirements for such facilities, sets application requirements, outlines a process for obtaining zoning administrator and planning commission approval, and provides for an appeals process. The policy generally appears to conform to state and federal requirements. However, as described in Appendix D, federal and state rules also place severe time limits on the review process, often referred to as “shot clocks”. Section 7.4 discusses additional policy steps that can be taken to ensure that applications are processed within those time frames and “deemed granted” or “deemed approved” situations are not encountered.

6.5. Municipal resources

City facilities that can support broadband development fall into two general categories: conduit and pole routes, and real estate.

Pole routes

Most California cities do not own pole routes. The exceptions are cities that also operate municipal electric utilities, such as Alameda, Santa Clara and Palo Alto. Not coincidentally, these three cities were the first in the San Francisco Bay Area to embark on large scale, municipal broadband projects.

Conduit

Most cities in California lack municipal conduit assets that are relevant to broadband planning. However many, including West Sacramento, do own significant conduit routes, particularly interconnect conduit used to manage traffic signal networks. Because traffic signals tend to be installed on busy streets in commercial areas, the conduit routes that serve them are usually well suited to support business-oriented broadband service and middle mile facilities. The City of San Leandro was the first in the Bay Area to make large scale use of traffic signal conduit for this purpose.

Figure 6.4 – City of West Sacramento conduit route along Reed Avenue.

Other types of municipal conduit include empty conduit installed on a prospective basis – the Cities of Brentwood and Watsonville are examples – as well as conduit specifically designed to support internal city data networks and street light systems. Conduit installed for IT network purposes can be useful, but is usually more limited in scope than traffic signal systems. Electrical conduit installed for street light purposes is usually not well suited for broadband systems because of differences in the way electrical distribution networks are designed and maintained. Using other city utility systems, such as sanitary and storm sewers, is likewise problematic.

Real estate

City-owned real estate – either vacant land or space inside buildings – can be used to house network electronics and data centers for fiber and other wireline projects. City buildings, street lights and other facilities can support public WiFi access points. Towers, tall structures and vacant land can be used for cellular sites and support facilities for wireline networks.

As discussed below, cities can use these resources to build municipally owned broadband infrastructure. Many different kinds of business arrangements can also be made with major incumbent providers and competitive independent companies, including swaps of service for access to facilities, partnerships and normal purchase agreements.

Agency IT budgets

Public agencies are usually among the biggest users of broadband service at the local level. Although there are restrictions on the use of services and facilities purchased with public funds, particularly those earmarked for educational purposes, public agencies can serve as anchor customers of new broadband

projects. Within limits, municipal information technology and telecommunications budgets can be directed in ways that support broadband development goals.

Although money allocated for educational networks cannot be used to subsidize municipal or public broadband service, it can be used to purchase service from competitive private or municipal service providers. For example, pre-purchase commitments made on behalf of U.C. Santa Cruz provided the critical initial revenue stream which made it possible for a private company, Sunesys LLC, to build a fiber line from Silicon Valley to Santa Cruz, and to successfully apply for state grant funds to build a second line from Santa Cruz to Soledad.

6.6. Municipal broadband enterprises

Several cities, including San Leandro, Palo Alto and Santa Clara in the Bay Area, either own and operate commercial and industrial grade fiber optic networks, or partner with private companies to make sure those resources are available to the community.

Dark fiber

Palo Alto and Santa Clara operate dark fiber networks which have proven very profitable. Once installed these systems require little upkeep other than fixing accidental breaks, and customer service is mostly limited to making the initial connections – for a fee – and sending periodic bills. San Leandro has given a local company non-exclusive access to its traffic signal network, a near-loop of approximately 11.5 miles in length, and to 7.5 miles of new conduit it built using a federal grant. In return, the city received ownership of approximately 10% of the fiber installed by the company and eventually will receive cash payments, as the business becomes profitable.

Direct service

The cost of building a full, fiber to the home system that serves every West Sacramento home and business would be in the tens of millions of dollars range[12], perhaps approaching the $100 million point. A feasibility study could be used to assess such a project, from the point of view of operating it as a municipal enterprise as well as an opportunity to present to potential private sector partners (see Appendix E below).

However, direct municipal involvement in providing consumer-grade service has a poor financial track record, particularly in communities such as West Sacramento which are served by two consumer-oriented, full service broadband providers. Wave and AT&T offer high speed residential Internet service, extensive television lineups, telephone service and other bundled services in West Sacramento. Although both companies are the target of complaints about service and prices, on most days they generally meet the broadband needs of most people in their service areas.

[12] Financial analysis of user-financed residential broadband service in Palo Alto, Tellus Venture Associates, June 2012.

AT&T has a national presence and millions of customers. It enjoys substantial operating economies of scale, including the ability to negotiate favorable terms with television programming and other video content providers, and can pick and choose which neighborhoods to upgrade on the basis of expected return on investment. Wave is a smaller company but, as indicated by the market research conducted for this study, has a commanding share of the market for broadband service in West Sacramento.

City-run systems do not have those economies of scale and cannot discriminate amongst residents on the basis of their economic potential. Consequently, it is usually impossible to compete with entrenched incumbents on the basis of lower prices, due to national-scale purchasing power, or lower costs incurred as a result of limiting the provision of advanced services to high potential customers.

Although a municipal FTTH system could theoretically offer more television programming options and greater broadband speeds at the same price as copper-based incumbent service providers, this competitive strategy usually results in lower net revenue and ongoing operating losses.

The only successful example of a municipally operated fiber to the home system in California is Loma Linda, which only provides Internet service – and not television service – to newly constructed or remodelled homes where the developer or property owner has installed empty conduit for the city's use. The City of Loma Linda – which is 4 square miles in size and largely suburban in character – has invested in a fiber backbone network to support this service, but much of the cost of building and operating it is borne by the several colleges and hospitals in town which act as anchor customers.

It is possible for cities in competitive markets to build and operate FTTH systems, but it is not reasonable to expect that operating costs and capital pay-back requirements – bond payments, for example – will be met by customer revenue in the near to mid term. Instead, a municipal FTTH operator must expect to subsidize operations for the foreseeable future, via the general fund, grant money, tax increment financing or assessments on property owners or utility ratepayers.

7. Policy and Program Recommendations

7.1. Recommendations

The broadband policy tools available to local jurisdictions in California are limited. Even so, there are effective policies the City of West Sacramento can adopt and implement. This report has three top level policy recommendations:

- Work with AT&T, Wave and secondary and mobile telecommunications companies to improve broadband infrastructure, service and adoption, cooperatively if possible but in a competitive or adversarial posture if necessary. This effort would include reducing barriers to deployment, advocating for residents and businesses with state and federal regulators, and promoting access to low income broadband programs.

- Lease the conduit owned by the City to competitive and/or new telecommunications companies interested in upgrading service to industrial and commercial areas, and consider creating either a citywide project or smaller pilot network as a public/private partnership.

- Enact policies that promote telecommunications competition and development, and work with providers to identify policy barriers which could be removed or incentives that might be offered to encourage greater investment in their systems in West Sacramento.

Specific initiatives recommended for consideration include:

- Bridge the digital divide and increase broadband adoption in lower income areas of West Sacramento by encouraging and supporting greater use of AT&T's "Access" program which offers $10 per month broadband service to qualifying households. The City should also consider engaging with lawmakers and regulators at the state and federal level, perhaps in cooperation with other local jurisdictions, to make this program permanent. At this point, AT&T is only required to offer this program until April, 2020.

- Establish an enquiry and complaint process for consumers and businesses that are seeking broadband services or are having problems with current providers. Although the City has limited authority in this regard, collecting this information, making it public and advocating on residents' behalf with state and federal regulators will create incentives for telecommunications companies to voluntarily cooperate. It will also expand public knowledge of existing resources and constraints, and build a record to support action by the appropriate regulatory bodies.

- Determine a preferred first step for making the City's telecommunications conduit available to telecommunications companies interested in building or expanding fiber optic networks in West Sacramento: a full, citywide project or a focused pilot project.

- Issue a request for proposals inviting telecommunications companies to participate in the chosen project.

- Adopt policies that reduce barriers and increase opportunities for telecommunications companies, incumbents and independent competitors alike, to build or upgrade broadband infrastructure.

7.2. Broadband adoption program

As described in Section 5.2 above, AT&T is offering a discounted "Access" service plan for the next three years to West Sacramento households where one resident receives SSI or SNAP assistance. Most West Sacramento households – 91% – live in areas where they would be able to receive a wireline broadband service plan with 10 Mbps download speeds and a 1,000 gigabyte monthly data cap for $10 per month, if they meet eligibility requirements. Other than the 2% of households that AT&T does not serve with wireline broadband service, the balance would be eligible for plans with lower speeds and/or lower data caps for $5 per month.

Figure 7.1 – AT&T Access program webpage with multistep eligibility and service enquiry process. Other AT&T webpages contain incorrect information and/or lack a sign up form.

AT&T is not proactively recruiting low income households for this program. Experience has also shown that when broadband providers are required to offer discounted service to low income customers, they will attempt to up sell eligible consumers into more costly, market rate plans during the sign up process. For example, the AT&T webpage containing the Access program sign up form has several links to market rate service packages – including television and telephone bundles – but does not inform consumers that they would be paying full price, rather than the discounted rate.

The City of West Sacramento can establish a program to assist both residents and, if willing, AT&T in increasing adoption of the Access plan. This program could be structured as follows:

- Contact AT&T's local government affairs staff and determine the extent of their interest in working with the City.

- If AT&T is interested in cooperating with the City, then establish dedicated phone and online portals for West Sacramento sign ups and eligibility verification and develop a joint marketing program.
- If AT&T is not interested in the City's assistance, then create a City run marketing program and identify the most efficient pathways for signing up and verifying eligibility.
- In either case, assign staff to implement the marketing program and, where appropriate, serve as an intermediary to ensure residents are able to sign up for the Access plan easily and without being subject to an up sell effort, and assist them with verifying eligibility.
- Establish a follow up process to ensure that residents successfully sign up for the Access plan, and connect them to local digital literacy and free or reduced price equipment resources.
- Work with Wave and other local broadband providers to offer similar plans.

As the FCC and CPUC expands current low income Lifeline programs for telephone service to include broadband, the City can likewise promote the availability of these subsidies and assist residents in accessing them.

The results of this process can be tracked, with key metrics being the number of households that sign up initially, the number that remain with the plan over time, and the extent of problems and obstacles encountered. Long term plans should be developed to ensure residents continue to have low cost broadband service available after the eventual expiration of the Access and/or other plans.

7.3. Broadband conduit project

Taken as a whole, the City's traffic signal conduit system would be expensive to duplicate. If it is assumed that the cost of installing new conduit in the public right of way is between $50 and $60 per foot, then the cost of building it would be in the $5 million range.

Two types of telecommunications companies would be interested in using the City's conduit. An existing provider, such as Wave or T-Mobile, or a fiber network company, such as Level 3, Integra or Zayo, would find segments of the City's conduit to be an effective way to solve connectivity problems in certain circumstances or to serve specific customers, including mobile carriers and mobile infrastructure companies. The City's conduit would, in that case, be used to extend or provide lateral connections to an existing network.

Figure 7.2 – Conduit in Bridge district joint trench. Photo credit: City of West Sacramento.

A new entrant in the market would be more interested in the City's system as a whole and in building a new fiber network. As an example, the City of San Leandro reached an agreement with a local company that used traffic signal conduit to build a completely new network that was specifically designed to serve local businesses.

There are number of issues to consider when deciding whether or not to use traffic signal conduit for telecommunications purposes. The City would have to maintain and operate its conduit in partnership with a private company, and establish clear lines of responsibility and operational roles and rules. A business model needs to be determined, and decisions made as to whether the conduit will be simply leased out at market rates or if a closer partnership should be created in order to pursue other City objectives and priorities. Creating a municipal conduit enterprise will require coordination between several different departments, as well as with private operators. Finally, the City will incur costs to implement a conduit business model and operational plan, and for ongoing development of the system to meet future needs.

Citywide network versus pilot project

The 16.5 mile city-owned conduit system runs through most of the commercial and industrial areas of West Sacramento. It includes conduit that was specifically designed to support telecommunications service, as well as for other purposes. The cost to a private sector parter to install fiber optic cable in the entire system would be in the $2 million range, not including the cost of bridging gaps in the system.

Some conduit segments would be more attractive to potential partners than others. For example, the conduit in the Bridge district is both empty and designed for telecommunications purposes. The cost of installing accessible fiber optic cables in this system would be much less than adding cables to already occupied traffic signal interconnect conduit or building lateral connections to deeply buried long haul conduit. A project with lower overall and per-foot costs that serves newly constructed buildings would be of greater interest to more companies than a complicated and expensive citywide initiative.

Figure 7.3 – City of West Sacramento conduit route in Southport.

On the other hand, less expensive and higher potential areas, such as the Southport and Bridge districts, can offset the costs and other drawbacks of building in areas with greater costs or lower usage potential. If the City takes an attractive area off the table by offering it

separately, it will decrease the chances of finding a partner willing to take on the remaining areas at a future date.

The advantage to a focused pilot project is that it would be built and operating sooner than a citywide project, and probably be less problematic. A citywide project has the advantage of maximizing the availability of industrial class broadband infrastructure in West Sacramento and increasing the development potential of existing properties.

The recommendation of this report is to pursue a citywide project, since it offers the greatest long term benefit. If a citywide project proves infeasible, then it would be possible to reset and target a smaller area. The reverse would not be true. Given the reduced attractiveness of a citywide project without the areas with the greatest short term potential, it would be difficult to interest a private sector partner in the remaining segments.

Request for proposals

Consistent with the choice of project made, a request for proposal (or similar) could be used to ask private sector companies to submit ideas for using the City's broadband facilities, and particularly its downtown, traffic signal and other conduit. The request could be structured around a public-private partnership, or a straight lease arrangement, or simply left open for responders to choose their preferred business model.

The scope of an RFP could depend on the type of program chosen by the City – e.g. a full buildout versus a pilot project – or it could leave the choice of project up to respondents. However, experience has shown that the more specific an RFP is in terms of goals, expectations and available resources, the likelier it is to receive responsive, high quality proposals.

The RFP would set out specific economic development goals for West Sacramento's commercial and industrial areas, describe existing and planned City assets and contain information that quantifies the market opportunity, particularly in terms of commercial real estate development.

The City of West Sacramento could offer:

- Systemwide access to conduit.
- Method, plans and budget for conduit extensions.
- Right to serve new construction via City-owned conduit.
- Access to intercity fiber.
- Access to other City assets, e.g., antenna sites, real estate.
- Development and coordination of anchor customers.

The City of West Sacramento could request:

- Installation of high strand-count cables in 100% of existing and future conduit.
- Plans for and a commitment to fill gaps in the system, with specific provisions for economic development priorities.
- Plans to support wireless connectivity.
- Full commercial access to dark fiber.
- Public rate card for fiber lease, lit services, connections to network.
- Participation in conduit extensions.

Respondents should be encouraged to be creative, look for synergies with other projects and to be brief but specific. Long and/or generic responses should be discouraged. The immediate objective is to attract as many high quality proposals for building out a modern fiber network in West Sacramento as possible.

The City's existing conduit system is only partially mapped, and its overall condition and available capacity is unknown. Conducting an engineering survey will increase the specificity, and consequently the attractiveness, of any partnerships or leases that might be proposed. Alternatively, the City could make survey work the responsibility of prospective users.

7.4. Policy recommendations

West Sacramento should consider its policy choices not just in terms of municipal authority, which is limited, but also in terms of opportunities to become a partner and an active participant in broadband infrastructure development initiatives.

The City of West Sacramento has no direct regulatory influence over telecommunications service and, where broadband service is concerned, few, if any, regulatory avenues to pursue at the state or federal level. Control over encroachment and land use permitting for broadband projects, particularly wireless projects, is also limited.

The tools that remain available are persuasion, coordination, direct or indirect broadband initiatives, and policy that promotes or impedes broadband infrastructure development. The policy recommendations below are referenced by numbers that correspond to the full list in Appendix C, where additional detail may be found.

Maximize use of City's existing influence and authority

6.1 **Regulatory position**
6.2. **Franchise compliance**
6.4. **Enforcement liaison**

The City should determine the extent of its involvement in the telecommunications regulatory process – nearly all of which is outside its direct control – and whether it will be an active participant and advocate in the broadband development process, a passive observer, or something in between. These recommendations assume that the City wishes to actively work to develop and improve local broadband infrastructure.

Before setting specific policy or launching broadband development initiatives, the City should establish ongoing working relationships with telecommunications providers. Incumbent providers, particularly AT&T and Wave, are in the best position to embark on infrastructure upgrade projects. They are also in a position to inhibit or even block competing initiatives by smaller companies or new market entrants. Engaging in an ongoing conversation that focuses on the City's vision will allow the City to ascertain the degree to which incumbents' goals coincide with its own and identify the gaps that need to be addressed.

The City can work with Wave and AT&T to develop and implement plans to address those problems, and provide ongoing information regarding service conditions to existing and prospective businesses. If they are not willing to meaningfully engage, then the City can seek remedies on its own, including pursuing regulatory options and creating opportunities for competitors to enter the market. Both state and federal policy allows cities to play a role in advocating for better service and pursuing regulatory relief on behalf of residents.

A consistent, proactive approach to enforcement of video franchise requirements, even to the limited extent allowed under California law, also puts the City in the role of an active participant in the broadband industry, albeit as a regulator who sits on the other of the table from the companies involved. Doing so can improve the City's negotiating position with some broadband providers and build, and possibly fund, in-house expertise that can be used to pursue further measures.

Baseline broadband development policy

Ten broadband development policies are recommended for near term adoption and implementation:

2.1 **Open trench**
2.2 **Conduit specifications**
2.3 **Conduit standards**
2.4 **Lateral connection standards**
2.5 **Shadow conduit - public works**
3.2 **Open access**
3.5 **GIS logging**
4.1 **Transparent process**
4.2 **Permit streamlining**
7.3 **Anchor tenant positioning**

The City has the greatest amount of influence over greenfield and new or major remodelled infill development, and over work performed in the public right of way. By establishing clear broadband-

related requirements for these kinds of projects, the City can encourage the construction of facilities that will support upgraded infrastructure. Establishing an "open trench" notification process any time excavation work is done in the public right of way offers all interested parties, including the City, potential cost savings or unique opportunities to pursue upgrade or new utility construction projects. Setting minimal technical specifications for broadband conduit, where appropriate, and requirements for main conduit and lateral connections in new or major remodelled construction, or in public works projects ensures, over time, the development of a consistent and adequate level of basic infrastructure.

The City's own assets can be offered on open terms to any qualified broadband provider, and information about all broadband infrastructure can be gathered and made available, so as to reduce barriers to entry for new competitors and promote the more efficient use of existing resources by incumbents. The City can further reduce barriers by streamlining permit processes and create incentives for infrastructure development that meets City goals by using its information technology budget to position itself as the anchor tenant for particularly critical projects.

These baseline policies primarily serve to standardize and focus existing policy and practices on well articulated broadband development goals.

Second phase broadband development policy

2.6. **Shadow conduit - undergrounding**
2.7. **Shadow conduit - excavations**
2.8. **Excavation moratorium**
3.3. **Master leases**
4.3. **Master permits**
4.4. **Single review**
4.6. **Environmental and aesthetic mitigation**
5.1. **Broadband building standards**
5.2. **Broadband wiring standards**

A baseline broadband development program can be supplemented with more proactive measures that position the City as an active participant in broadband development initiatives. These steps can be taken either at the same time as adoption of baseline policies or later, after the effectiveness of the baseline program is assessed.

Each of the above policies represent a greater level of direct City involvement in broadband development. Prospective installation of city-owned conduit, either in conjunction with routine undergrounding programs or third party utility projects, puts the City in the position of being an active developer of broadband assets as such, rather than simply making use of resources obtained in the normal course of business. Putting teeth into "dig once" policies by imposing moratoria on street excavations following an open trench notification process puts similar pressure on utility companies to do the same.

Adopting a master lease template for third party use of City assets allows for more aggressive marketing, with either the goal of increasing revenue or incentivizing development, or both. A master permit process for large scale projects can be likewise used to attract the attention of companies, including incumbents, that might be interested in pursuing major upgrades, and position West Sacramento as a better destination for investment. The same is true of a single review process for smaller projects and standard, predictable environmental and aesthetic mitigation requirements.

Adding broadband requirements to construction standards will build the City's inventory of high-tech enabled real estate over the long term and provide a competitive incentive for owners of older property to retrofit. The more properties that are "gigabit ready", the more cost effective it is to upgrade and add infrastructure and facilities upstream, and the more demand there will be for that level of service.

All of these policies are recommended for the City's adoption over the long term, and the City should consider including some in its initial baseline program if more rapid progress is desired in specific policy areas.

Wireless facilities

The changes in California and federal law regarding municipal authority over wireless facilities, as described in Appendix D, make it advisable to quickly respond by changing City procedures, specific policies and, where necessary, the Municipal Code to ensure continued control of the process and avoid permit issuance by default. A dozen specific steps are recommended:

1. Create a comprehensive checklist of items that must be included in a wireless facilities application.
2. In the application, establish the presumption that the 150-day clock applies unless the applicant 1. states otherwise and 2. provides specific information that demonstrates eligibility for the 60 or 90 day clocks. Any application for a location that doesn't already support wireless facilities would automatically be subject to the 150-day clock. Failure to provide the necessary information would be grounds for either denial or immediate tolling.
3. Include all possible questions, documentation, other city departments/outside agency approvals, etc., as a standard requirement of an initial design permit application. In particular, the application should include all information required for use and encroachment permits or other approvals by other City departments to demonstrate that it complies "with generally applicable building, structural, electrical, and safety codes and with other laws codifying objective standards reasonably related to health and safety".
4. Descriptions of the facilities, including photo simulations, should include 1. the facilities as currently designed. 2. as potentially modified according to the federal rules described in Section 6.2 above (e.g., 20 feet higher and 20 feet wider in all directions).
5. Require evidence, including blueprints and photo simulations, that shows that proposed modifications to existing facilities will not "defeat concealment" and that new facilities will be able to support concealment even if later modified under federal rules.

6. Require full documentation regarding all previous permits for existing facilities, in order to determine that a collocation/modification complies "with conditions associated with the prior approval".
7. Require all CEQA-related studies, including seasonal-dependent biological assessments, to be completed and included in the application.
8. Structure the application and the process so that denials can be issued administratively during the design permit review, even for reasons pertinent to use and encroachment permit reviews.
9. Decide what position the City will take if and when presented with the initial "deemed approved" notices from carriers. Will the City routinely challenge the presumption in court? Will it demand that the applicant obtain a court order confirming the presumption (and use its enforcement powers if the applicant refuses)? Will it concede the point but still require the applicant to follow City policies and conditions? If so, what are those policies and conditions?
10. Establish preferred specifications for streetlight mounted wireless facilities, including the light standard itself, and for equipment mounted on utility poles.
11. Create a short form application/checklist for proposed wireless facilities that are mounted on light standards or utility poles and conform to the preferred specifications.
12. Review the Municipal Code to determine if procedural changes can be made to safeguard the City's ability to reach decisions within the allowable time frames.

7.5. Summary

The City of West Sacramento can craft policy and deploy its assets in a way that can significantly improve broadband infrastructure and access for residents and businesses.

Although there is excellent basic broadband infrastructure in West Sacramento, it is underused and not easily accessed, particularly in commercial and industrial areas. This deficit reduces the value of the City's commercial real estate inventory by making it less attractive to relocating or expanding businesses. It is a common problem for Californian cities, particularly those with older industrial areas. High technology businesses will not locate or expand where broadband service is insufficient to their needs, leaving property owners with fewer options for tenants and cities with reduced revenue from jobs, sales and economic growth.

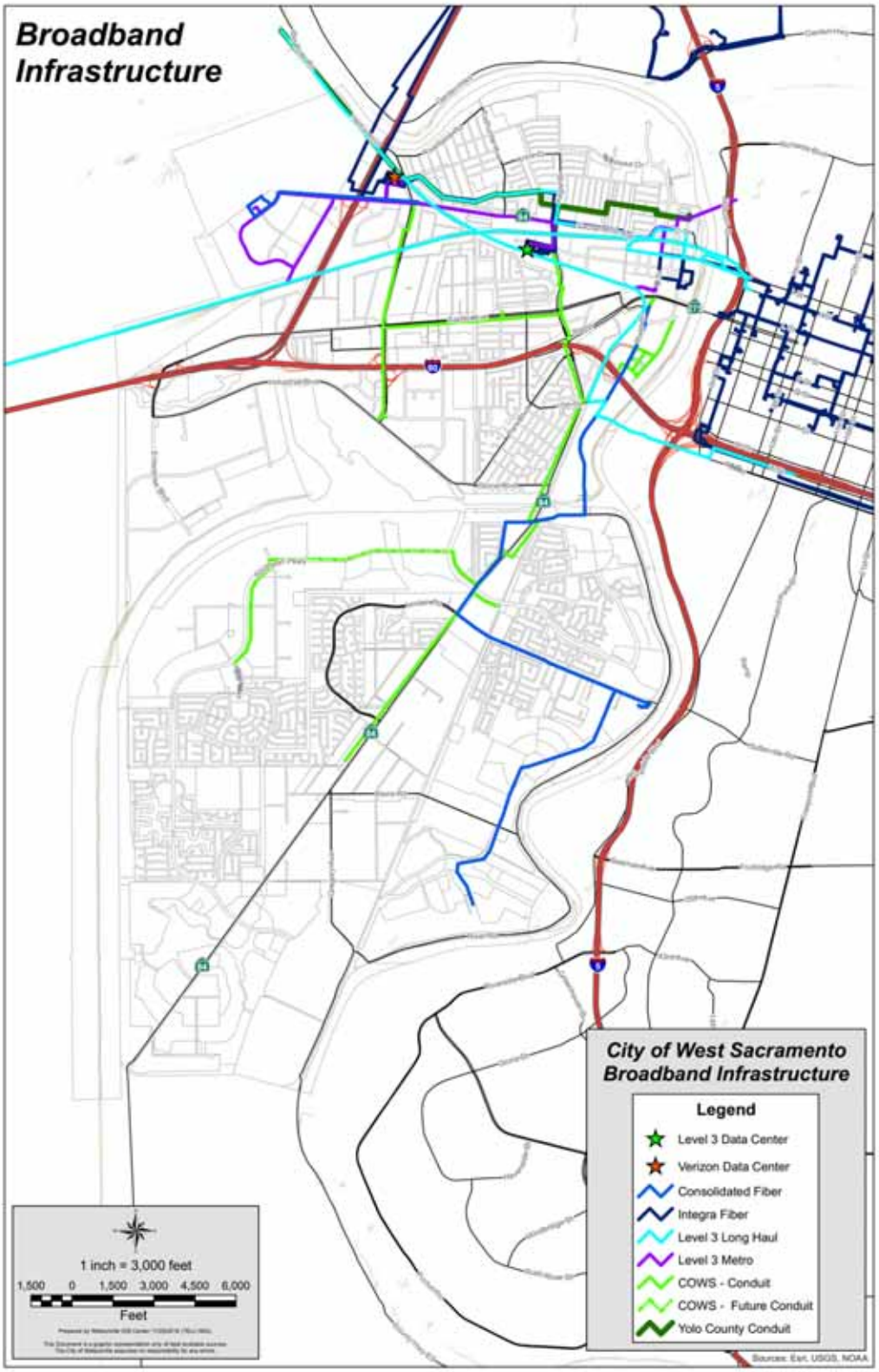
Access to broadband service – fast, reliable, high quality links to the Internet and internal networks – is a basic competitive requirement of twenty-first century economies. Broadband availability is one of the first criteria assessed when businesses consider relocating or expanding. It is considered to be a non-negotiable resource that is necessary for businesses to operate and to keep pace with global competitors.

Broadband is also a necessity for residents. Without it, people do not have access to jobs, education and services of all kinds. The correlation between low income levels and low broadband adoption rates in West Sacramento points to a vicious cycle of cause – inability to subscribe to service – and effect – less access to the twenty-first century economy and a lower standard of living.

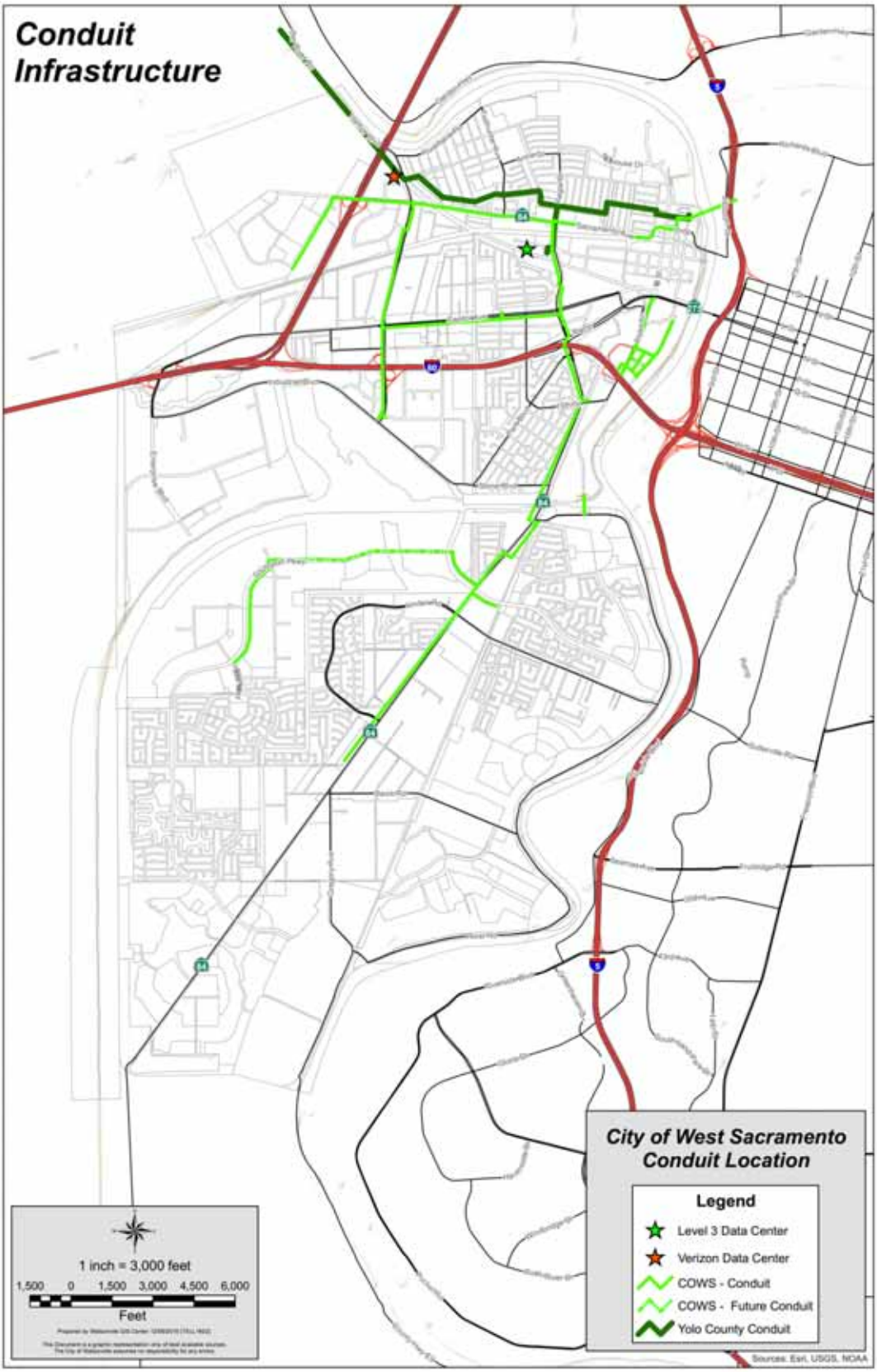
The City of West Sacramento has an opportunity to combine excellent, albeit uneven, basic infrastructure, city-owned assets, development policy and targeted programs that will develop equitable and accessible broadband service and infrastructure that is capable of supporting high tech businesses, encouraging economic growth and improving the quality of life for all members of the community.

Appendix A - Maps

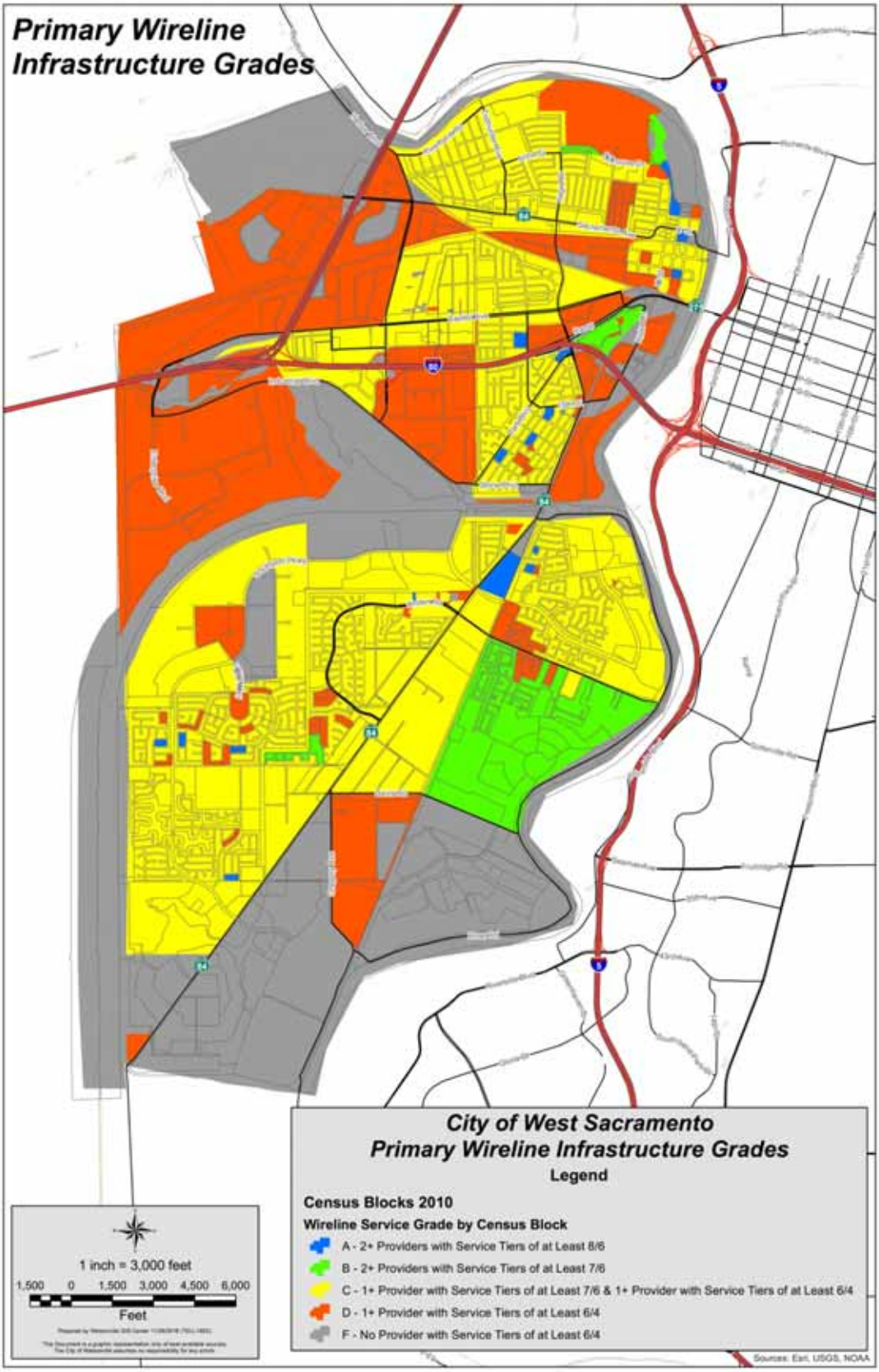
1. Broadband infrastructure



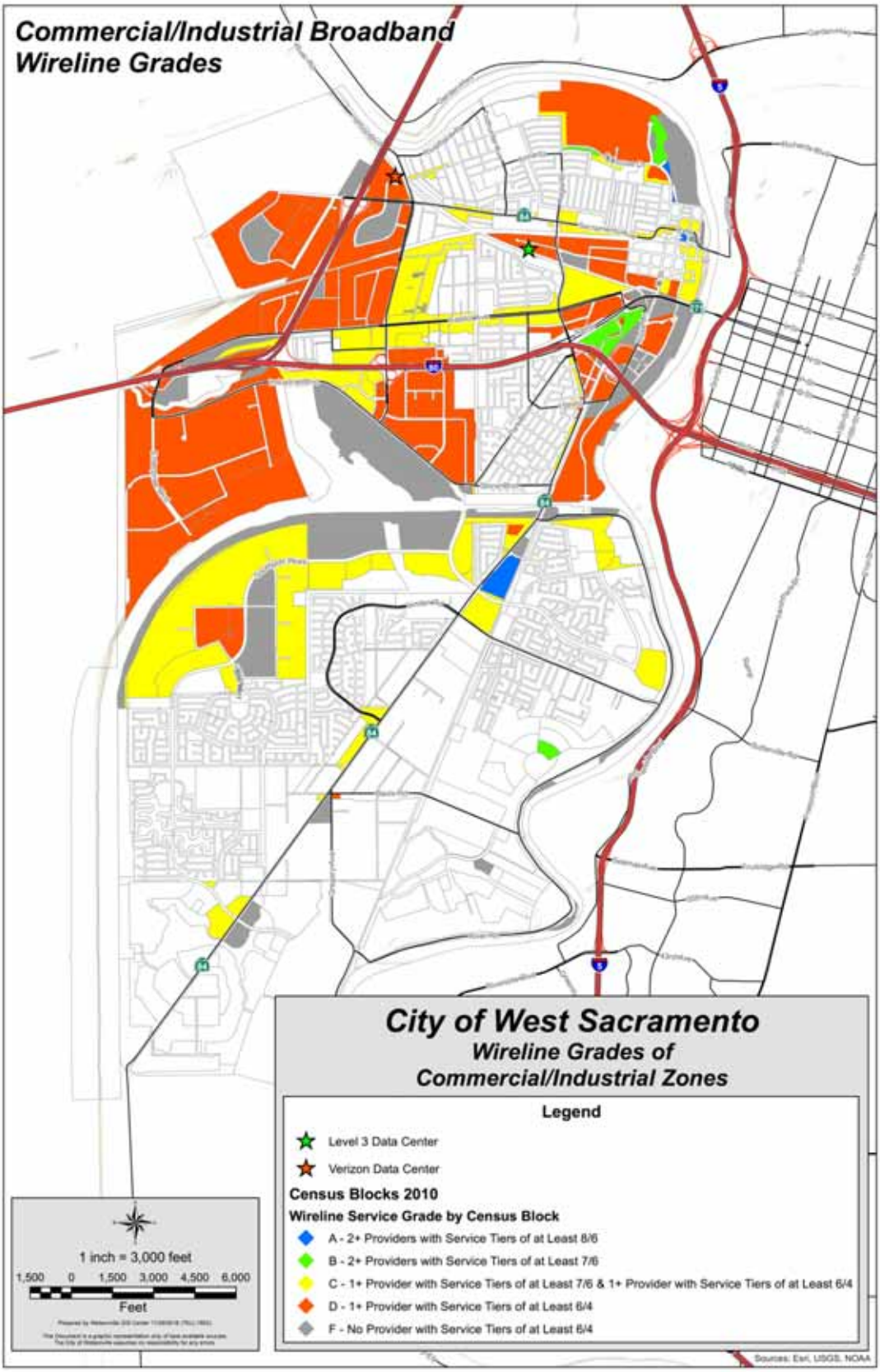
City of West Sacramento conduit



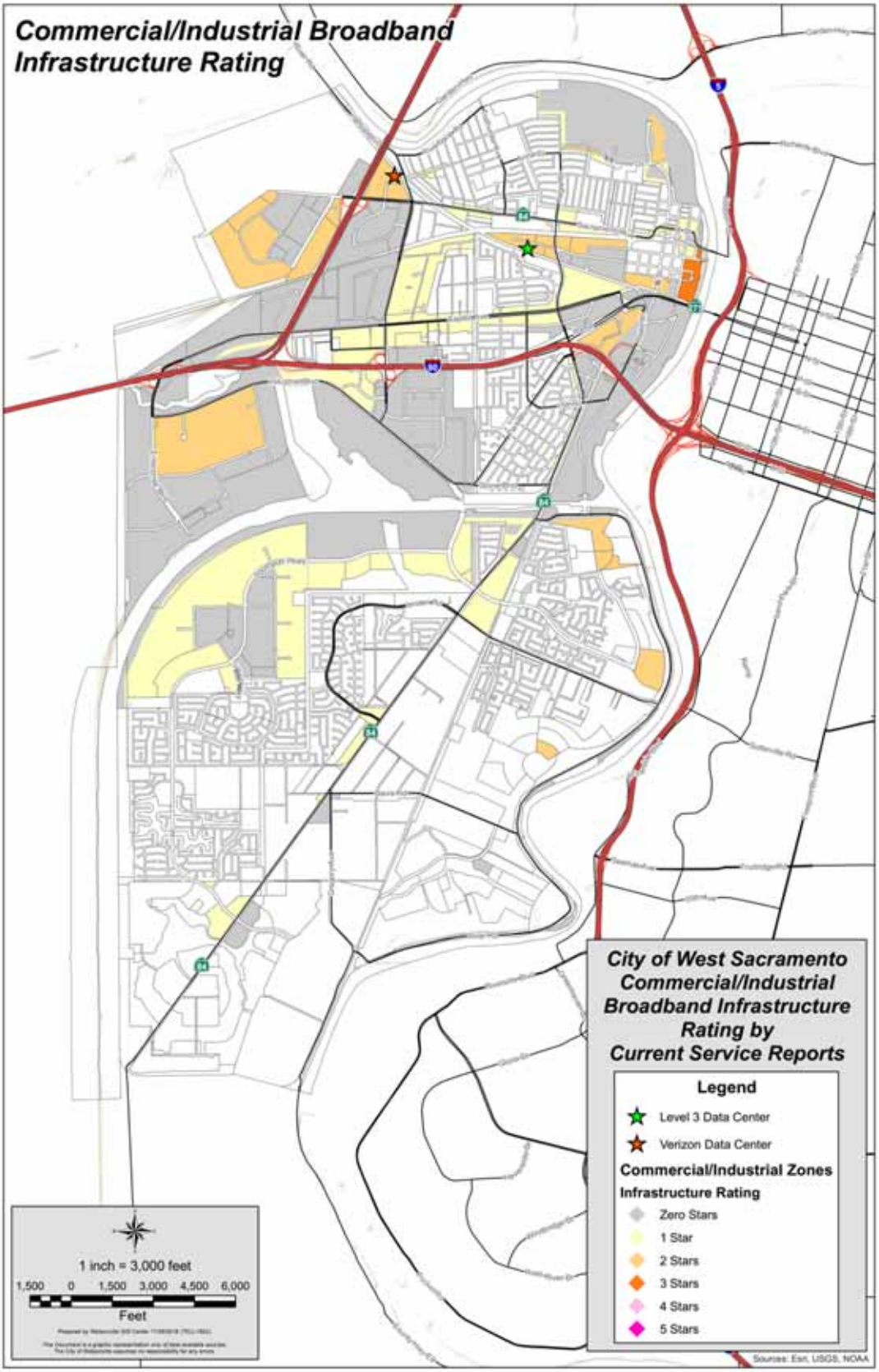
2. Primary broadband infrastructure grades



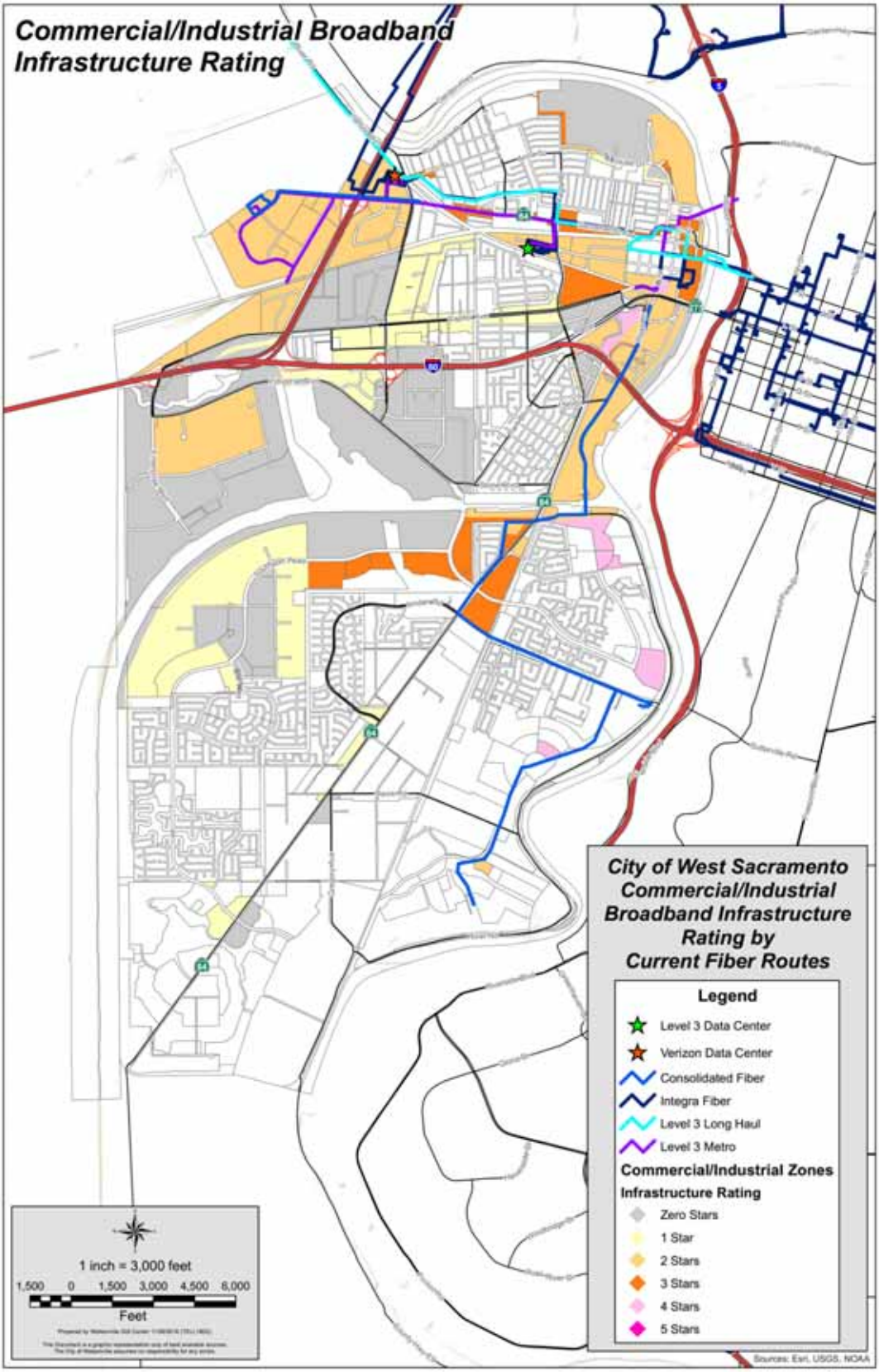
Primary broadband infrastructure grades – commercial and industrial zones only



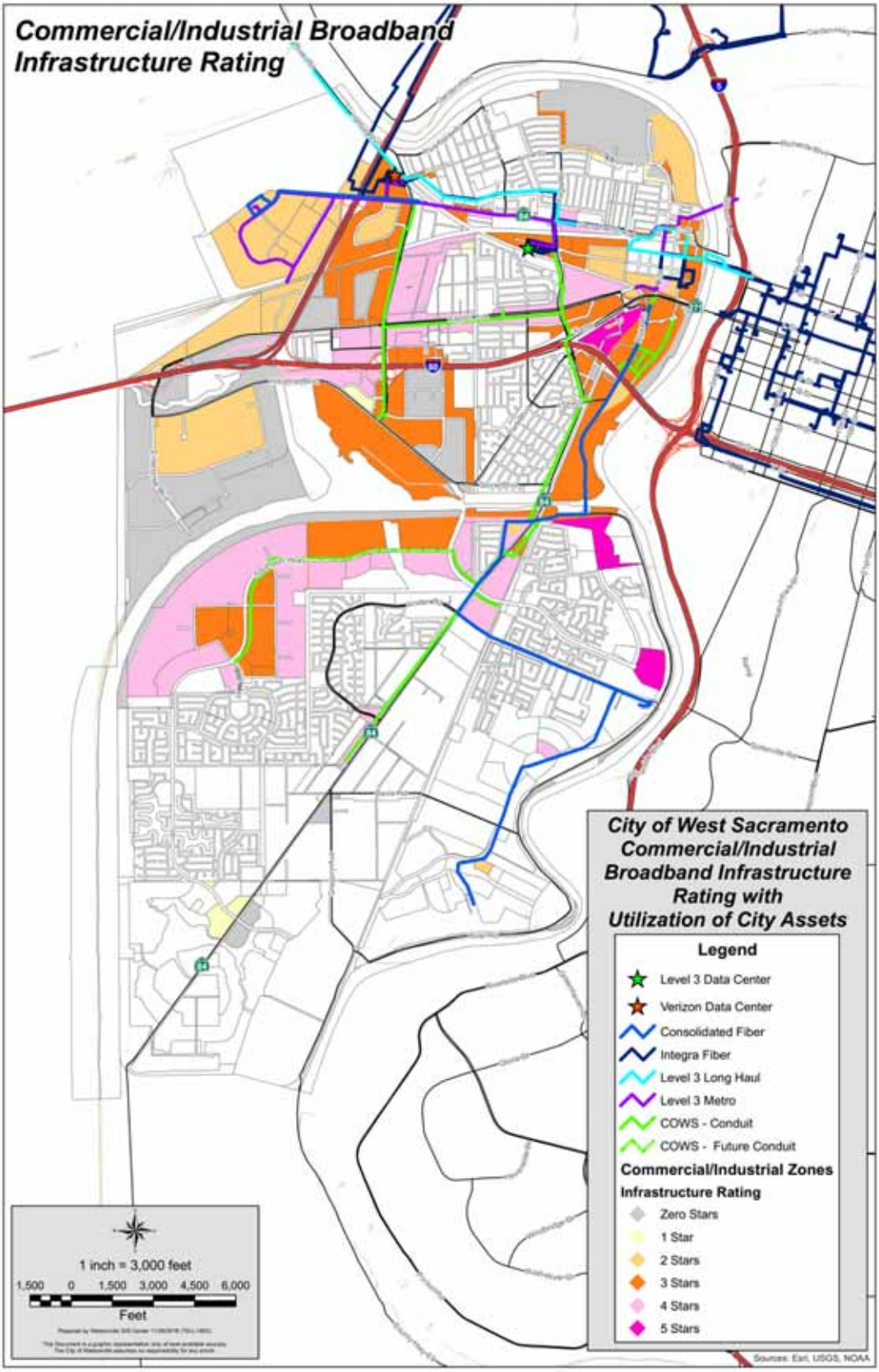
3. Commercial/Industrial broadband infrastructure Star Ratings



Star Ratings with full use of current fiber routes

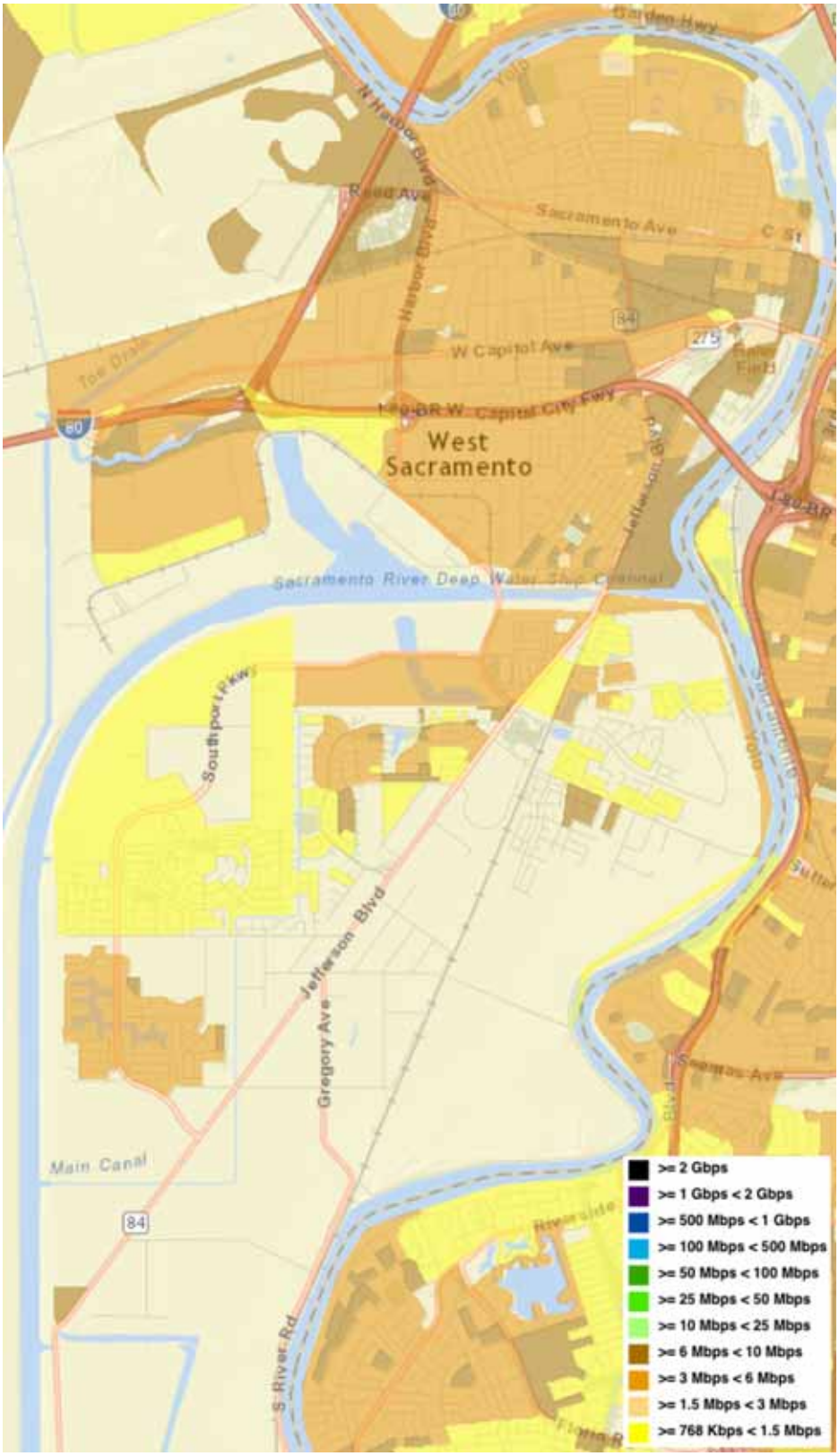


Star Ratings with full use of City conduit and current fiber routes

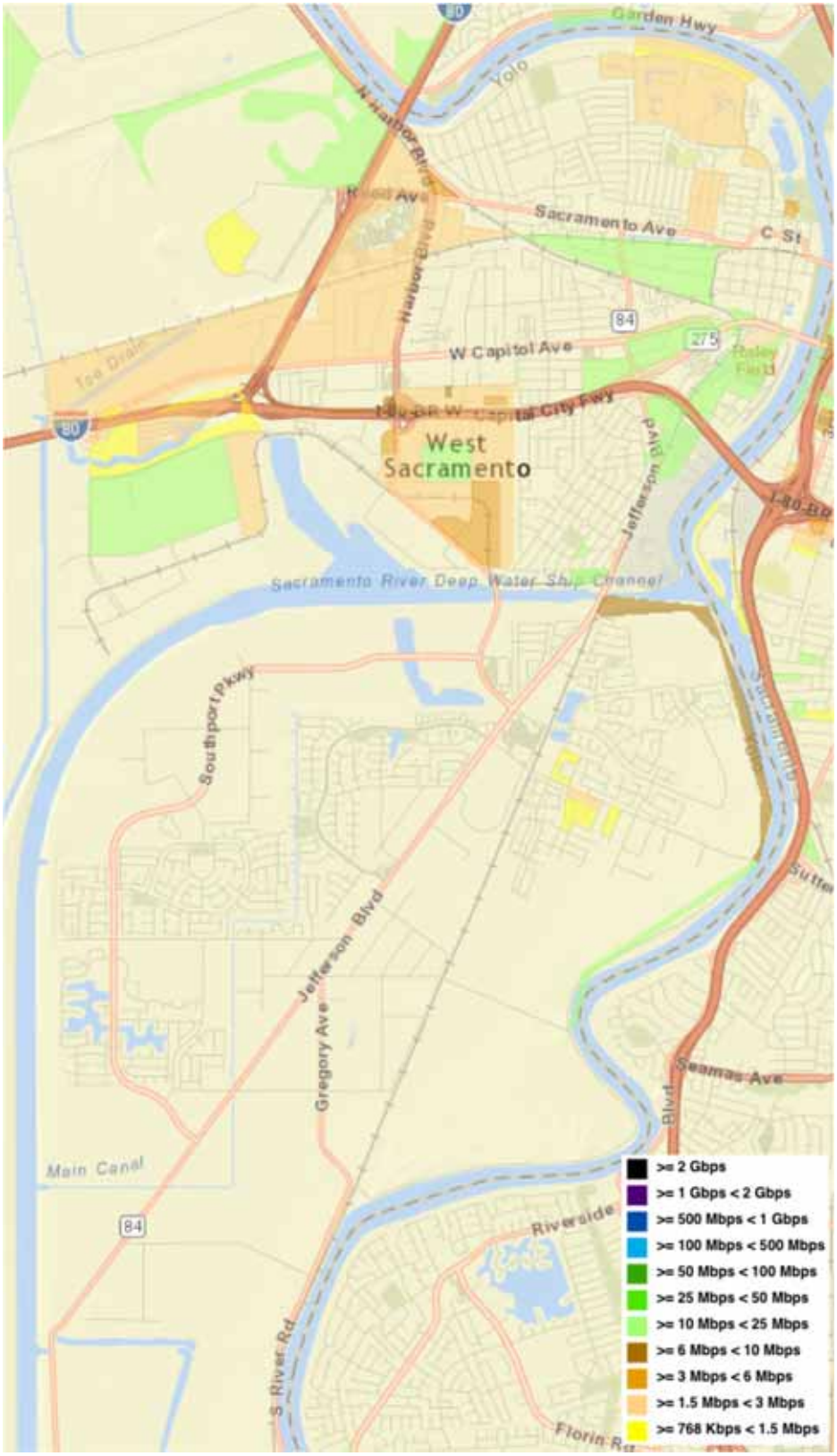


4. AT&T wireline broadband services

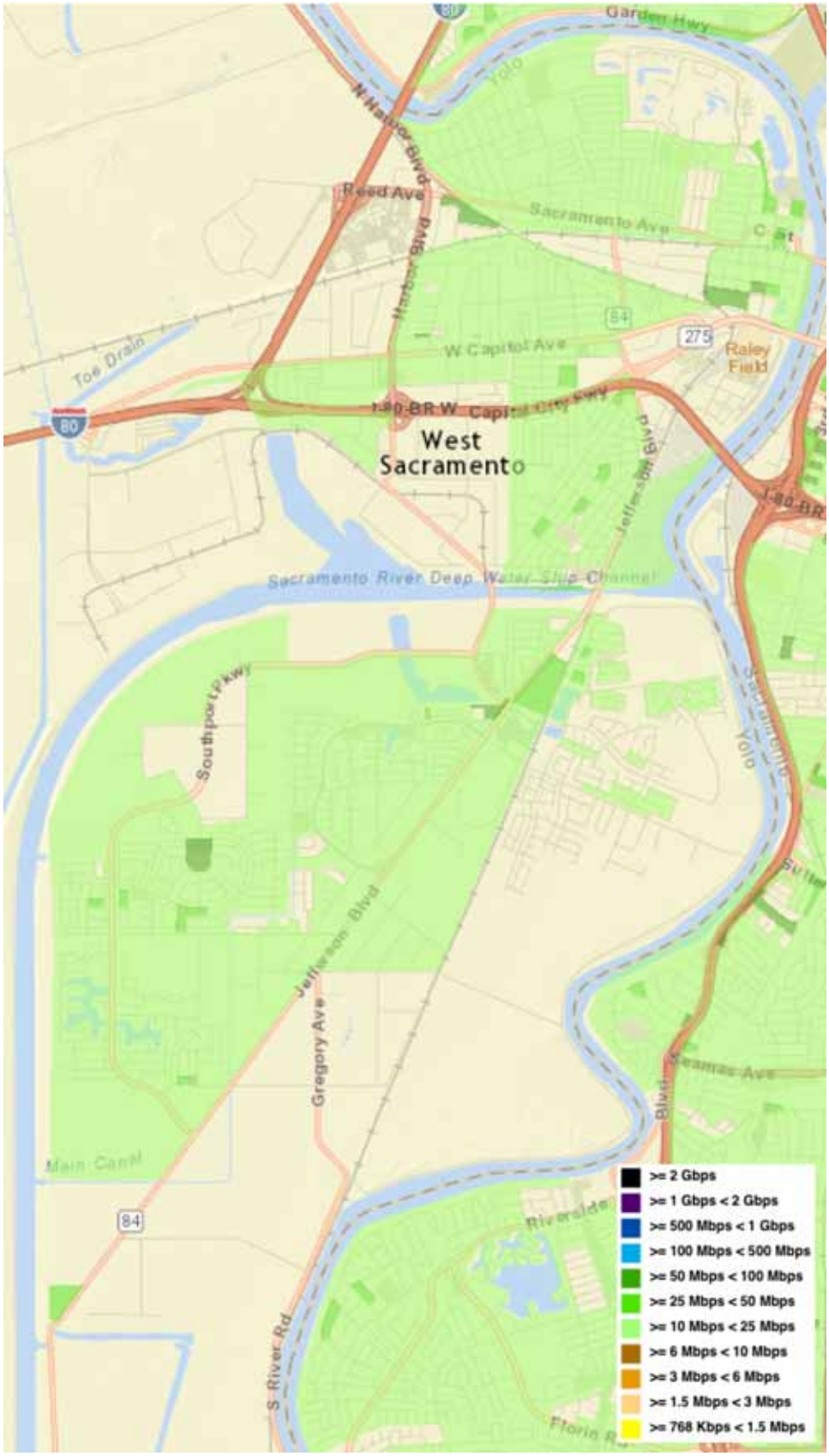
AT&T legacy DSL service



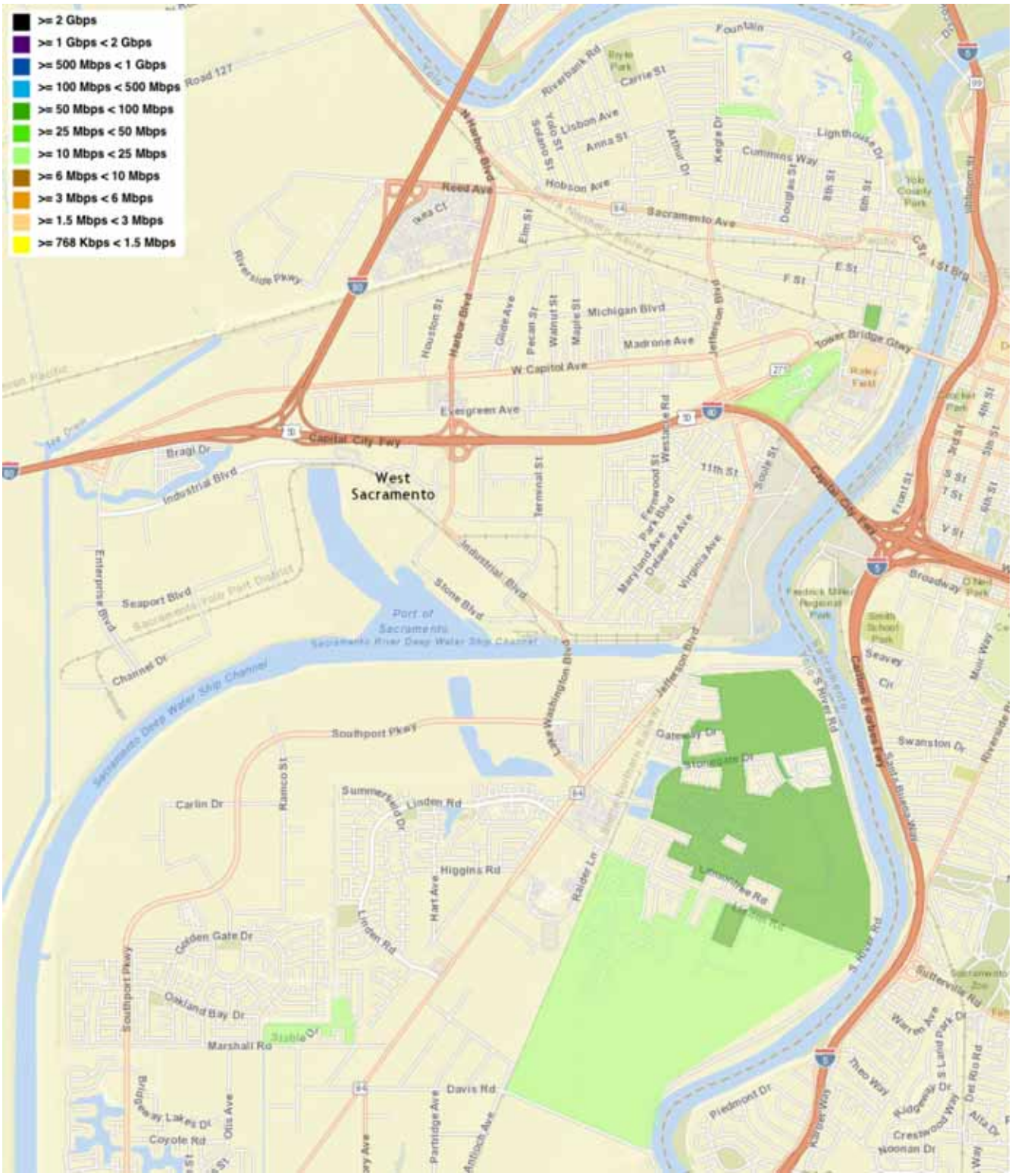
AT&T ADSL2 (lower speed Uverse) service



AT&T VDSL (higher speed Uverse) service

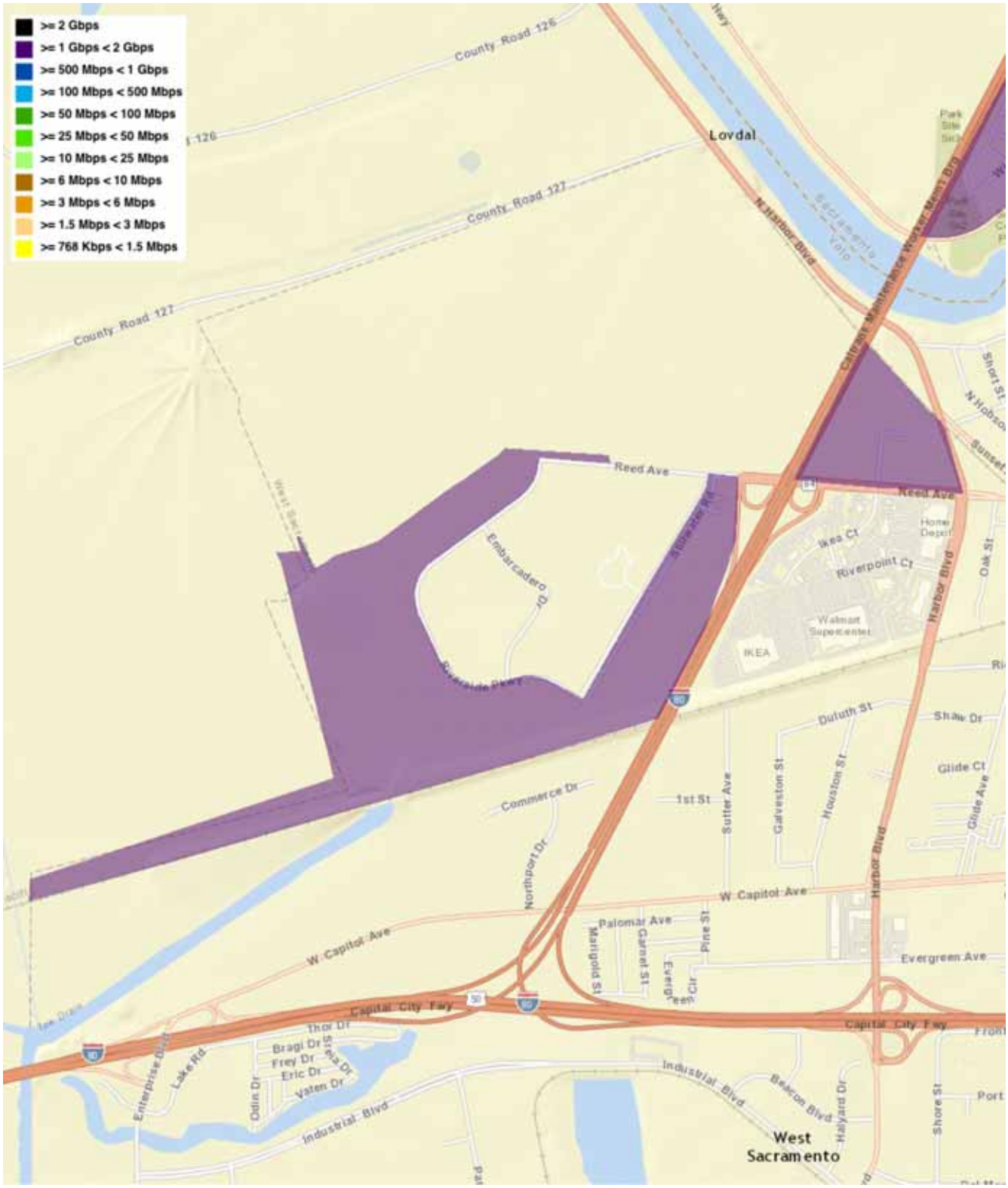


AT&T fiber to the premise service

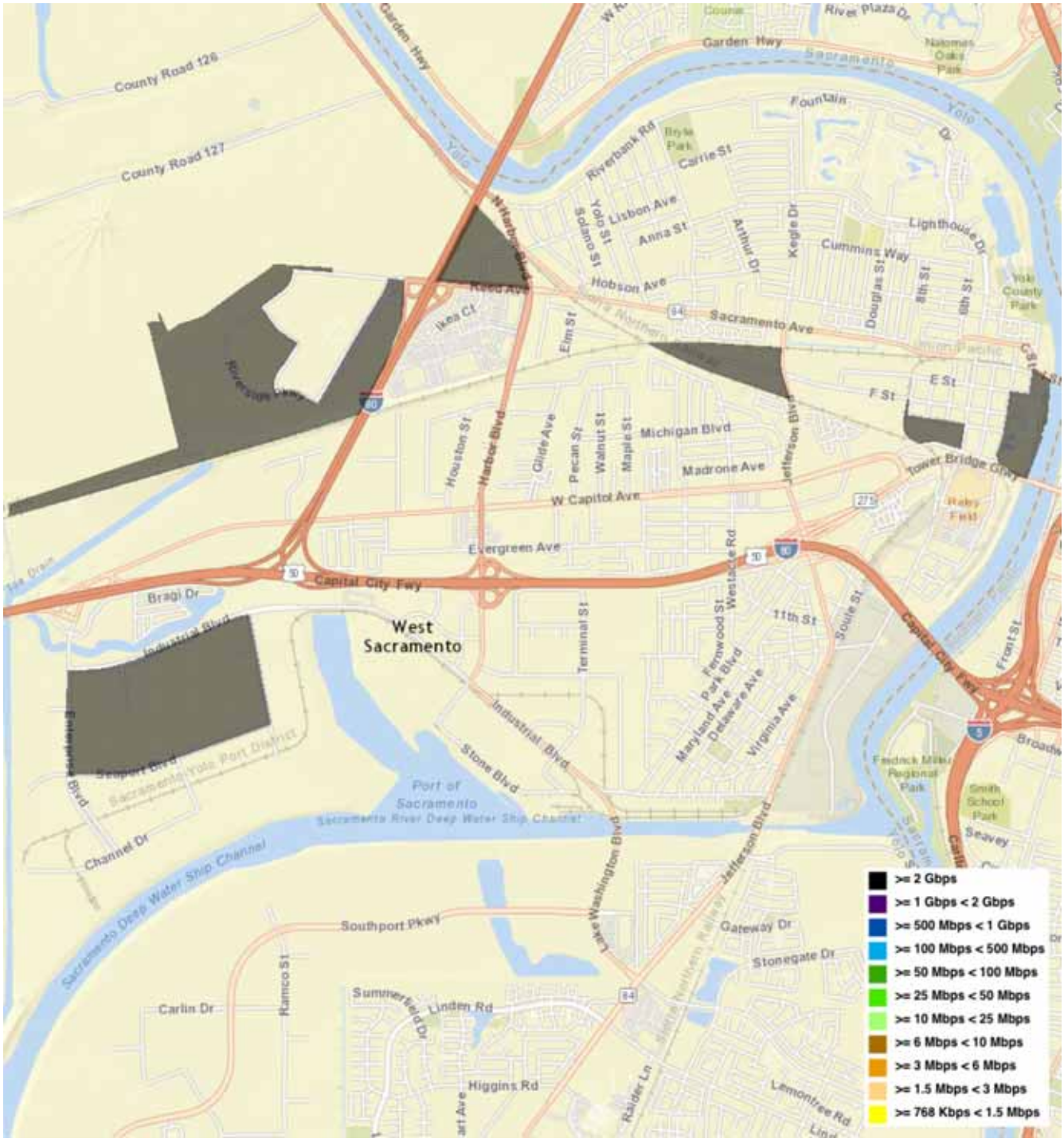


5. Wave cable modem (DOCSIS 3.0) service

6. Consolidated fiber to the premise service



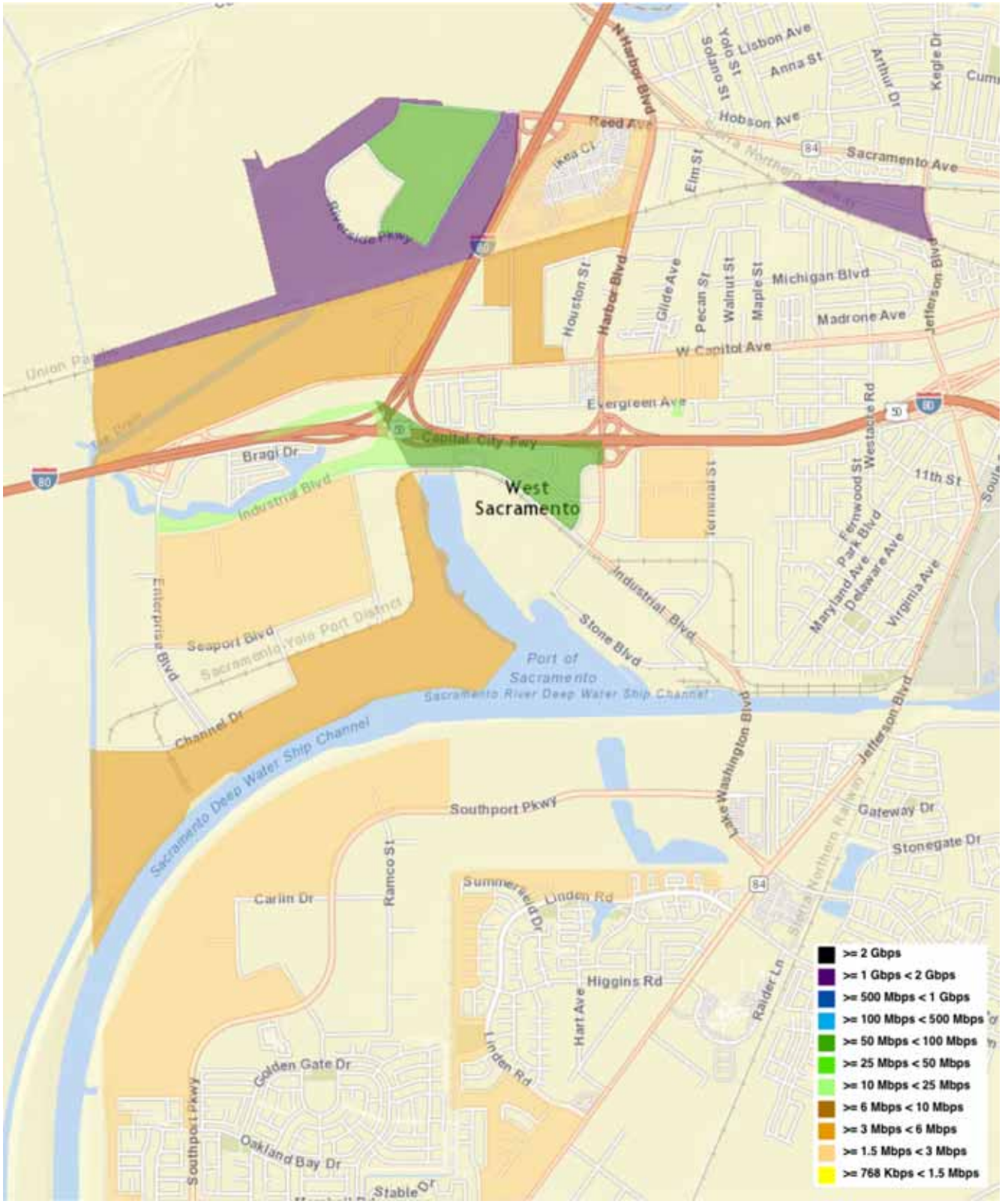
7. Level 3 fiber to the premise service



8. Secondary providers

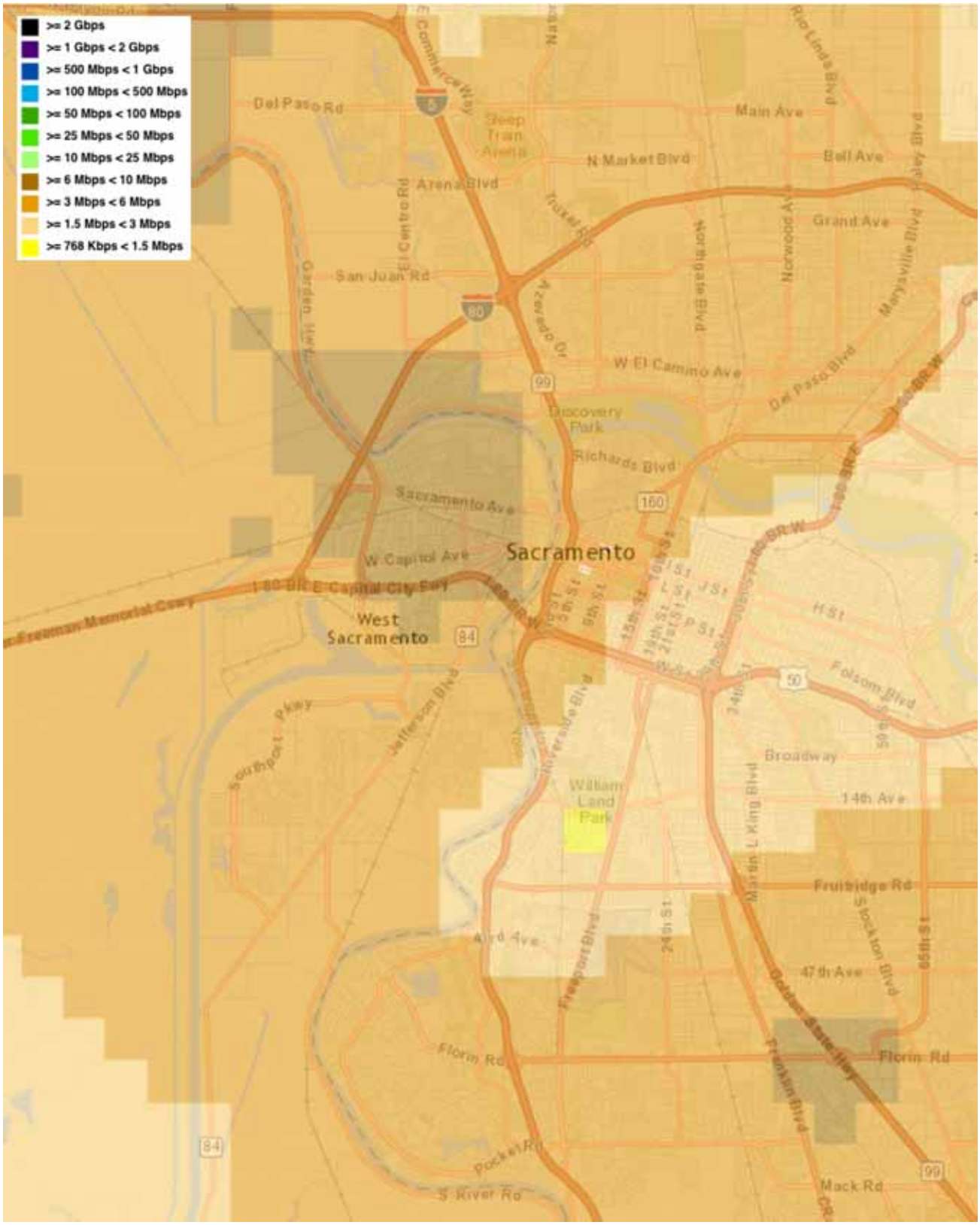
Windstream (reporting as PAETEC) fiber to the premise service

XO Communications leased line copper service

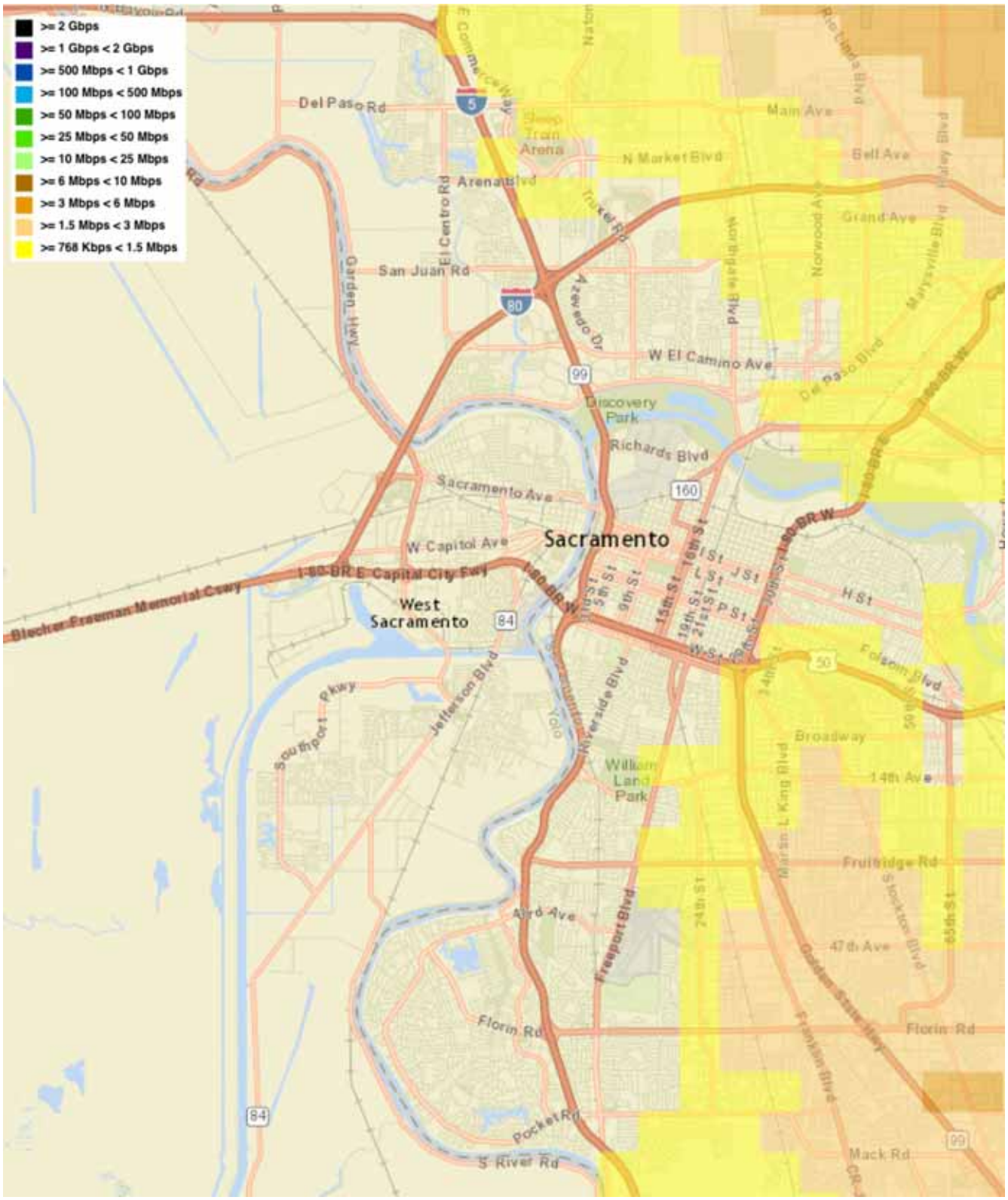


9. Mobile broadband availability

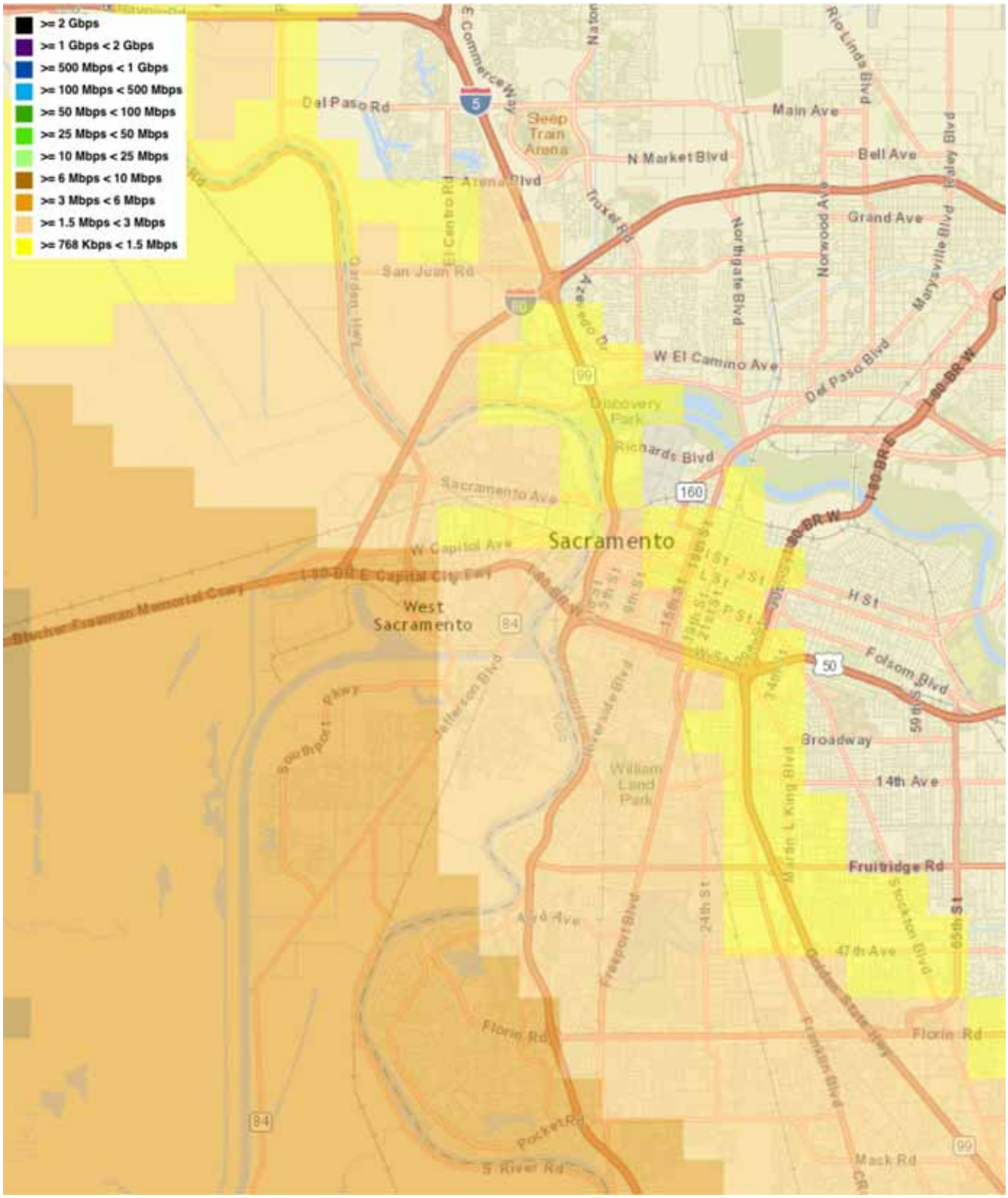
AT&T mobile broadband service



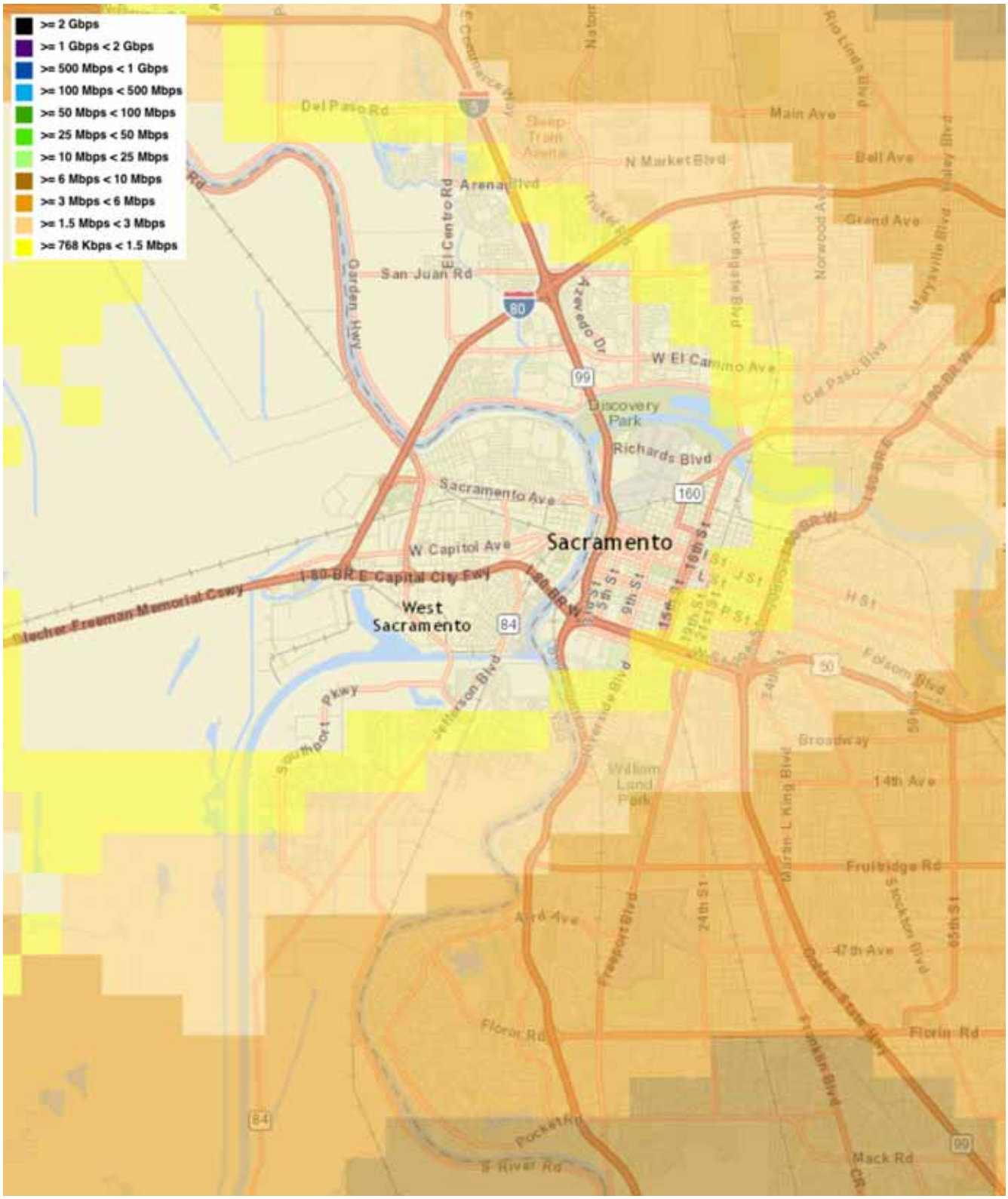
Sprint mobile broadband service



T-Mobile mobile broadband service

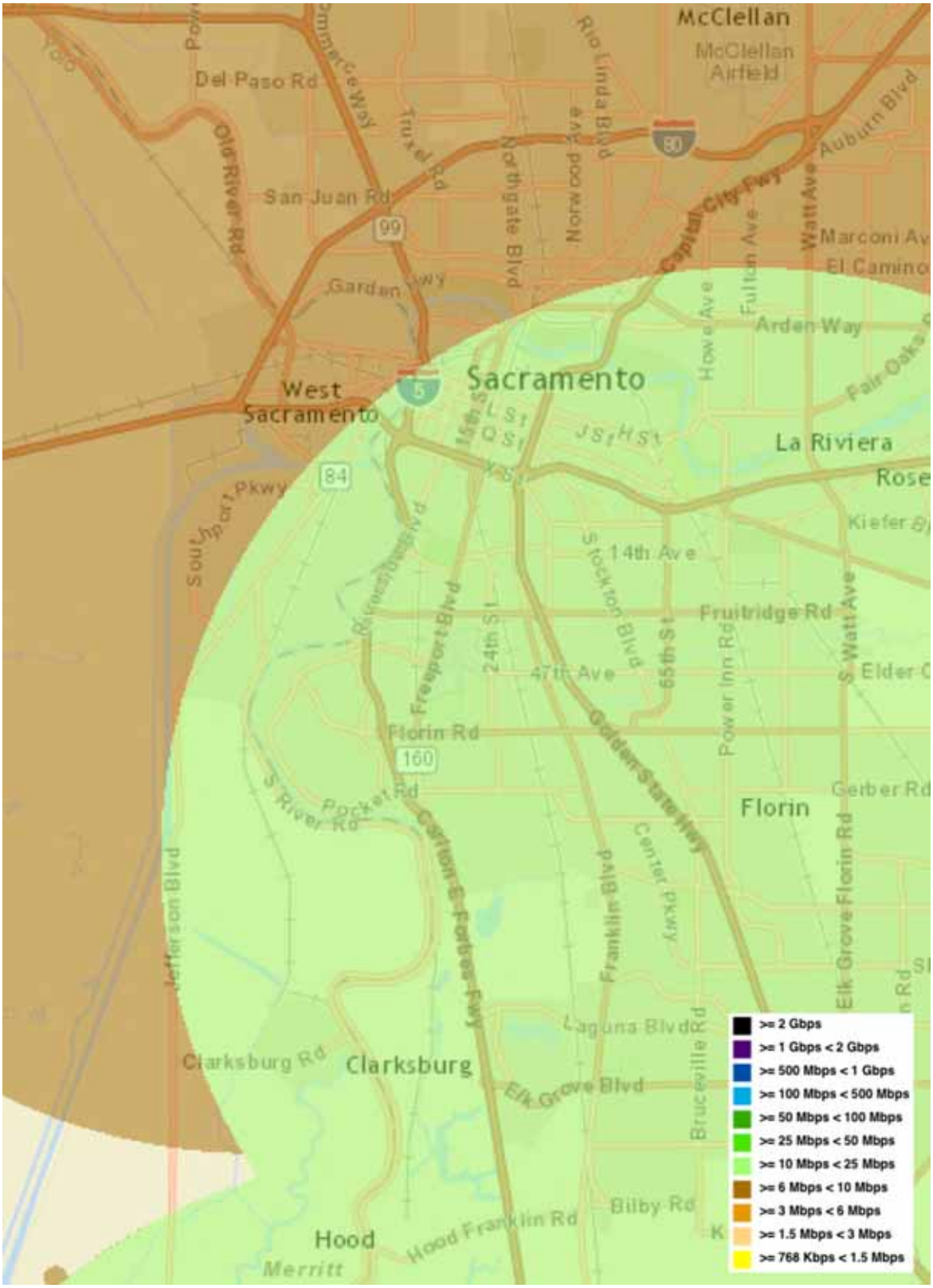


Verizon mobile broadband service

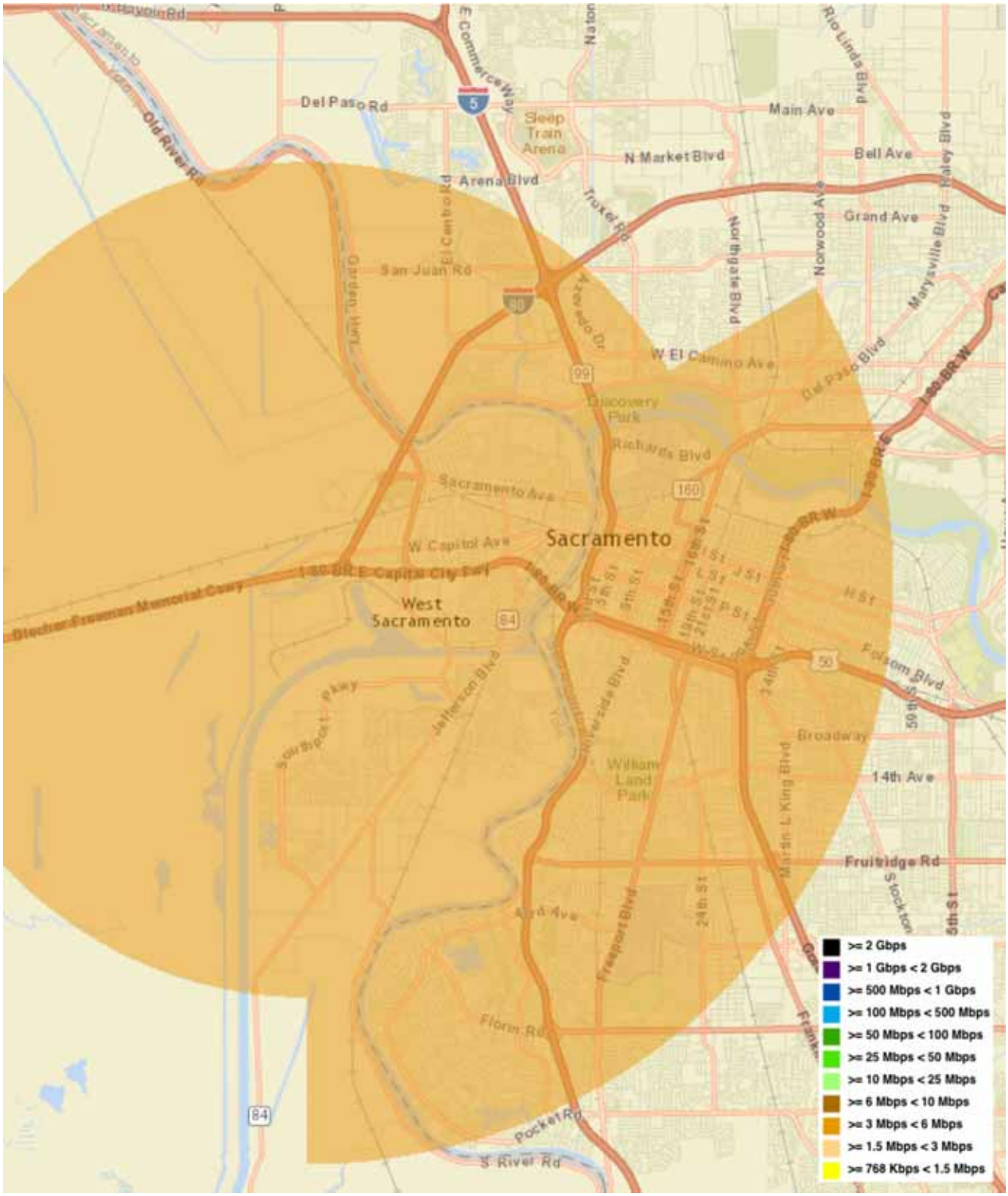


10. Fixed wireless broadband availability

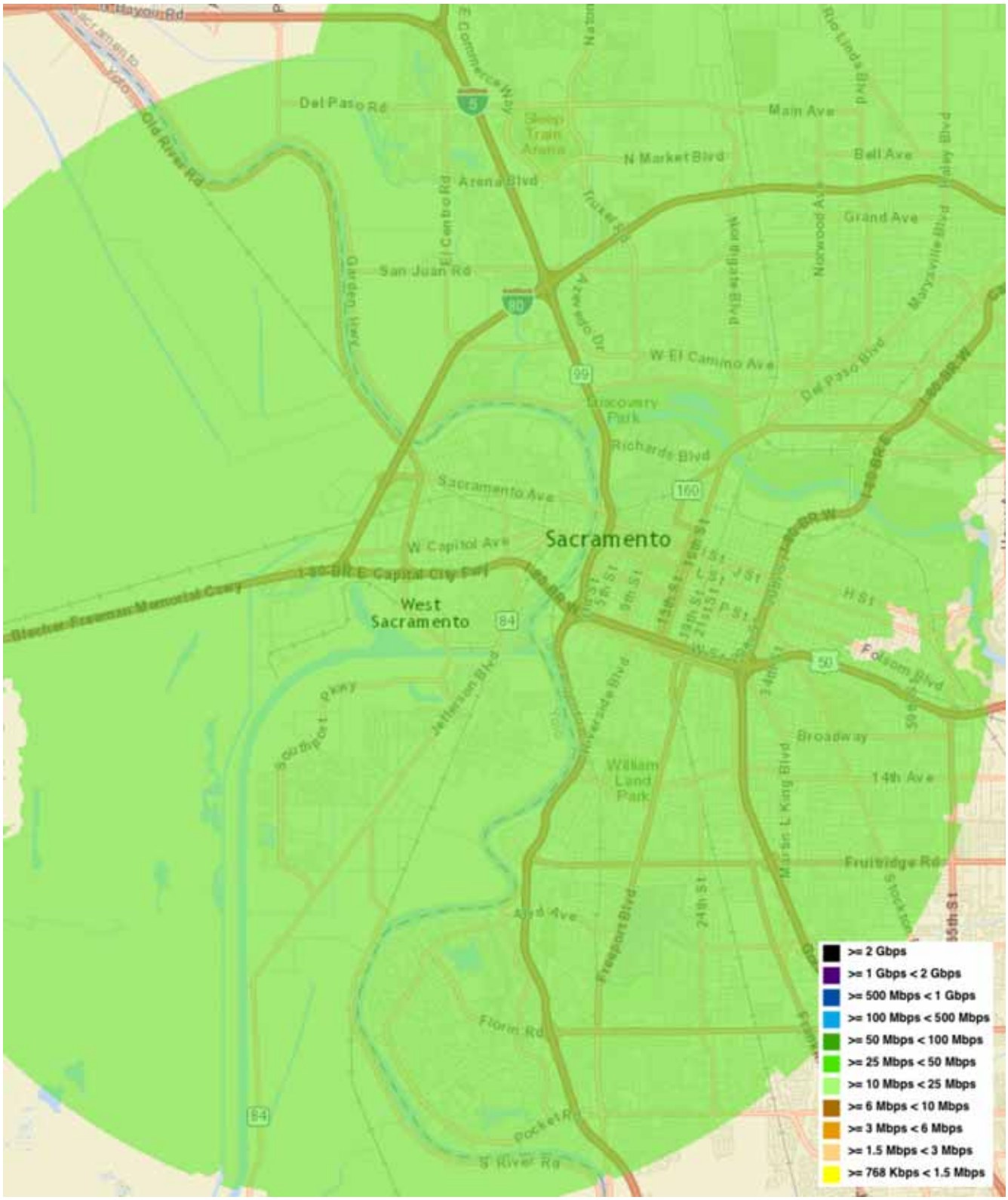
DigitalPath fixed wireless broadband service



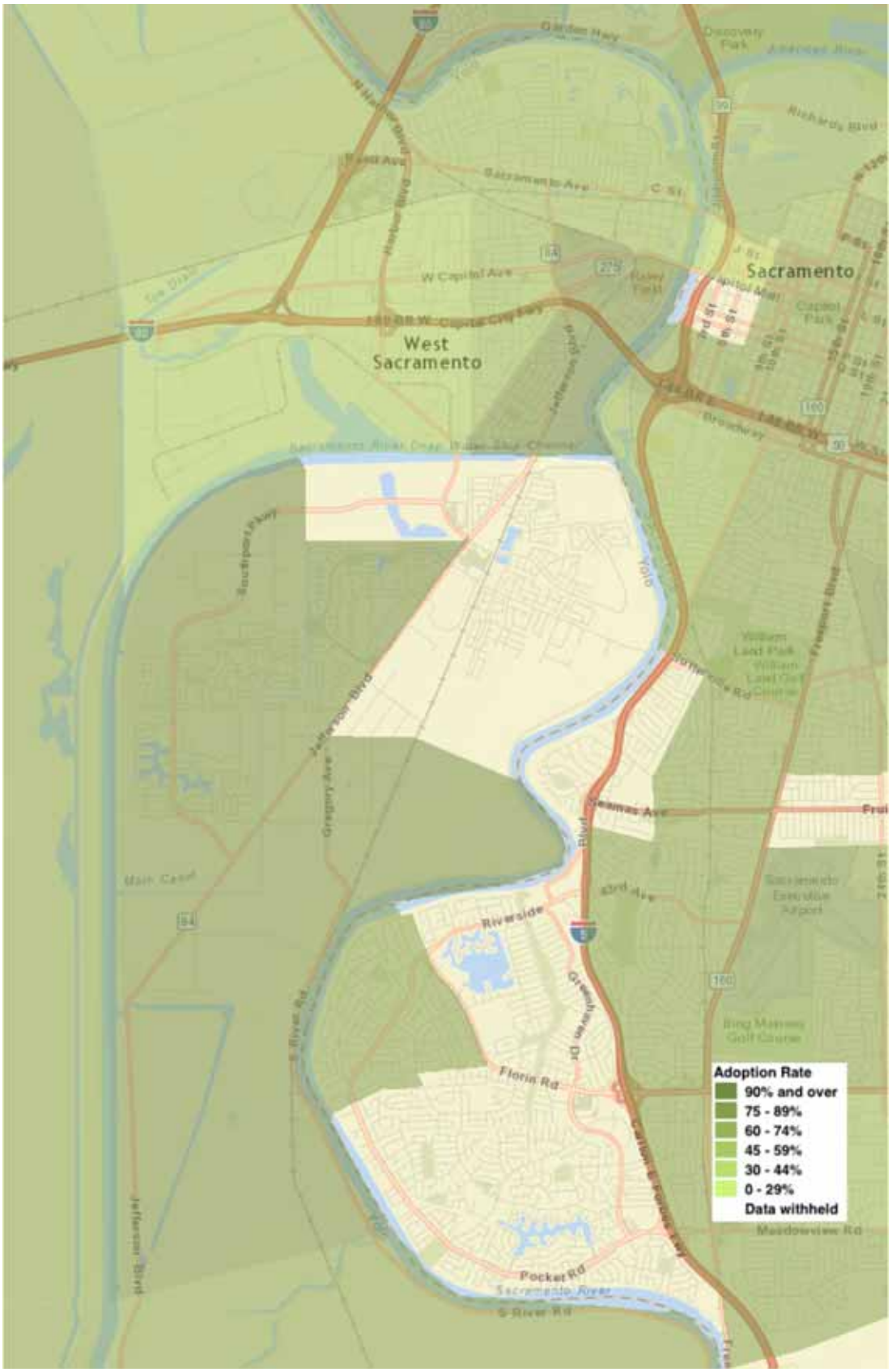
Ruralnet fixed wireless service



Succeed.net fixed wireless broadband service



11. Broadband adoption rates



Appendix B - Analytical methodologies and research

1. Primary infrastructure grades and report card

In a study conducted for the East Bay Broadband Consortium (EBBC) in 2013[13], in cooperation with the Central Coast Broadband Consortium, core broadband infrastructure was evaluated in Alameda, Contra Costa and Solano Counties using data submitted to the California Public Utilities Commission by Internet service providers. A comparative report card was developed, with the average grade – "C" – set at the most prevalent infrastructure, and corresponding service levels, in the state: a combination of relatively high speed cable modem and mid-range telephone company DSL facilities.

This methodology was subsequently used by the Central Coast Broadband Consortium to evaluate California broadband infrastructure and service on a statewide basis, on behalf of the California Emerging Technology Fund. It was later adopted by the Tahoe Broadband Consortium, the Broadband Consortium of the Pacific Coast and the California Center for Rural Policy.

The primary data for assessing the quantity and quality of broadband infrastructure comes from the California Public Utilities Commission, which collects service level reports from providers throughout the state. This data can be broken down to the census block level, and shows what level of service Internet companies claim to provide, but not necessarily what they deliver. The accuracy of this data and the definition of service levels varies from company to company, although it is generally consistent within any given company. In other words, if Company Z exaggerates the speeds and availability of home Internet service, it tends to do so to more or less the same extent everywhere. By using a comparative system for ranking, rather than using the absolute values provided, the variation in the accuracy of the data can be smoothed out and an apples-to-apples comparison can be achieved.

The data collected by CPUC was divided into three categories: core wireline service, commercial broadband service providers and mobile carriers.

Consumer-class service throughout California was assessed, and used as one of the two primary grading benchmarks, the other being the CPUC's standard for minimum acceptable service of 6 Mbps download/1.5 Mbps upload speed. Upload speed was given equal weight to download speed, even though it's generally less critical for consumers, because upload speed gives a good indication of the capacity of the underlying infrastructure. When a service provider skimps on upload speeds, as frequently happens, it is usually because its wireline infrastructure and other core equipment have a limited capacity.

Grades were then assigned as follows:

A - Two competing providers, both advertizing maximum download speeds of at least 25 Mbps and maximum uploads speeds of 6 Mbps, or 3 or more competing providers offering that standard of service in combination.

[13] *East Bay Broadband Report Card,* Tellus Venture Associates, 28 January 2014.

B - Competing providers, both advertizing maximum download speeds of at least 10 Mbps and maximum uploads speeds of 6 Mbps.

C - Competing providers, one advertizing max down/up speeds of at least 10/6 Mbps and the remainder meeting CPUC's minimum 6 down/1.5 up standard.

D - At least one provider advertizing speeds that meet the CPUC's minimum standards of 6 Mbps down and 1.5 Mbps up.

F - At least one provider offers service, but no service is available that meets the CPUC's minimum standard of 6 Mbps down and 1.5 Mbps up (meets CPUC's definition of underserved).

F- - No broadband service available (meets CPUC's definition of unserved).

A "C" grade indicates that the consumer class broadband services, and consequently the underlying core infrastructure, in a given area meets the statewide average. A "D" grade means it meets the minimum passing service standard set by the CPUC. "F" grades indicate full or partial failure, which also means the area is eligible for infrastructure construction subsidies from the Commission. "A" and "B" grades show that service in an area is superior to the California average.

The first step in grading was to give a letter grade to each census block in the three counties. Then, the grade points were tallied, weighted by population and averaged for the census blocks within cities, counties and unincorporated areas, to produce a numerical grade on a four point scale, which was rounded to the nearest tenth.

The numerical grade point average for an area was then converted to a letter grade on the following scale:

A	4.0
A-	3.7-3.9
B+	3.3-3.6
B	3.0-3.2
B-	2.7-2.9
C+	2.3-2.6
C	2.0-2.2
C-	1.7-1.9
D+	1.3-1.6
D	1.0-1.2
D-	0.7-0.9
F+	0.3-0.6
F	0.0-0.2
F-	No service available

2. Commercial/industrial infrastructure Star Ratings

The purpose of the commercial/industrial broadband infrastructure Star Rating methodology is used to assess the availability of business-focused facilities and service within commercially and industrially zoned areas of cities and counties. It was developed for the Broadband Consortium of the Pacific Coast in 2016, and initially used to analyze industrial and commercial broadband development options for the Counties of Santa Barbara, San Luis Obispo and Ventura[14]. It has been subsequently refined and used for similar broadband infrastructure and development potential assessments in other California cities.

The infrastructure grading and report card methodology (see above) assesses primary broadband infrastructure, which is owned by incumbent telephone and cable companies, and supports retail voice, television and/or broadband service for both residential and business customers. However, when deciding whether to locate or remain in an area, businesses often assess the availability of commercial and industrial grade broadband facilities, in addition to the consumer grade services provided by primary carriers.

Commercial and industrial grade service may be provided both by primary carriers and by independent telecommunications companies. This type of service is broken down into four categories:

Commercial class commodity Internet service delivered via primary infrastructure (i.e., telephone or cable systems) offered on standard terms and resembling, to one degree or another, the retail service offered to residences. Sometimes referred to as "business class" packages, these services are typically more expensive than residential service and may meet higher quality of service standards, but generally deliver similar upload and download speeds.

Enhanced commercial class broadband service delivered via fiber to the premise. This service might be offered on a commodity basis, with fixed terms and rates, or on an individually negotiated and provisioned basis. For the purposes of this analysis, this type of service is referred to as “megabit-level fiber” service and defined as any fiber-based (or advanced copper-based) service that supports a minimum *upload* speed of 10 Mbps. This service may included standard Internet access at the minimum speed or better, or simply be a “lit” service (i.e., Layer 2) that provides a high bandwidth connection between two points without necessarily connecting to the Internet.

Industrial class broadband service delivered via fiber to the premise technology. Referred to as "gigabit level" service for the purpose of this analysis, this category of service is similar to megabit class fiber service, but provides symmetrical connections at a minimum speed of 1 Gbps.

Dark fiber. This type of service involves only the rental of fiber optic strands between two points. The customer takes responsibility for providing the electronics (i.e., "lighting" it) and any other connectivity or provisioning that might be required, for example Internet bandwidth. The primary difference between dark fiber service and the three types of “lit” services is that customers pay a flat rate for the

[14] *Broadband Analysis and Planning, Broadband Consortium of the Pacific Coast Final Report*, Tellus Venture Associates, 11 April 2016 and *Broadband Analysis and Planning, Broadband Consortium of the Pacific Coast Update*, Tellus Venture Associates, 30 June 2016.

lease of the fiber and then determine how much bandwidth is used, based on equipment and related services that they purchase separately. A pair of dark fiber strands can typically support bi-directional speeds well above the 10 Terabit per second range, if desired.

The system for rating the infrastructure available in a given location is done on a point basis:

Primary service	1 point for average (“C” grade) commercial class service from primary providers.
Megabit service	1 point for enhanced commercial class broadband service delivered via direct fiber connection.
Gigabit service	2 points for industrial class broadband service delivered via fiber to the premise technology
Dark fiber	1 point for open access dark fiber.

Points for a given census block are added up to produce a Star Rating. Although there are variations, typically Star Ratings indicate the following service levels and broadband infrastructure:

Zero stars	No fiber-to-the-premise infrastructure is present and the primary infrastructure grade is "F" or "D", indicating that there is either no business class service available at all or there is only one primary carrier offering service of any kind.
1 Star	Either commercial class service is available from a primary carrier and a second primary carrier offers service that meets CPUC minimum standards (i.e., a primary infrastructure grade of at least "C"), or megabit level service is available and the primary infrastructure grade is "D".
2 Stars	Either the primary infrastructure grade is at least a "C" and megabit level service is available, or the primary infrastructure grade is at least a "D" and gigabit level service is available.
3 Stars	Either the primary infrastructure grade is at least a "C" and gigabit level service is available, or the primary infrastructure grade is at least a "D" and both megabit and gigabit level service is available.
4 Stars	The primary infrastructure grade is at least a "C" and both megabit and gigabit level service is available.
5 Stars	Meets the criteria for 4 Stars and open access dark fiber is available on standardised and published terms.

This rating system is based on the principle that the greater the range and variety of competitive services that are available in a given location, the greater its attractiveness to a greater range of businesses, and therefore the greater its value as commercial real estate.

For the purposes of this analysis, a location is defined as a census block or partial census block that is contained within an area zoned for commercial or industrial use. Census blocks are used to define boundaries because broadband availability data is reported on a census block level. Although not all parcels within a census block necessarily have access to all of the services as reported, the basic infrastructure to provide such service is present.

A Star Rating is given to each location (i.e., full or partial census block in a commercial or industrial zone) and represented on a map. Aggregate community ratings are calculated by averaging the Star Ratings for census blocks that have a centroid within a commercial and/or industrial zone in cities and census designated places, and rounding to the nearest half Star.

Because census block and zone boundaries do not coincide, many census blocks are incidentally touched by a commercial and/or industrial zone. Using only those census blocks with a centroid inside of commercial and/or industrial zone reduces the noise level of the data and provides a clearer analysis of the available broadband infrastructure within those zones. For visual representation purposes, however, the entire data set is used and any portion of a census block that falls outside of a commercial and/or industrial zone is "clipped" out of the picture, producing a complete picture.

3. Business workshop minutes

Seven West Sacramento business owners and residents participated in a 110-minute workshop, which was held on 20 September 2016 in a meeting room at City Hall. Mark Zollo from the City of West Sacramento and Steve Blum and Penny Butler from Tellus Venture Associates also attended. The workshop was conducted by Julia O'Daly from Competitive Edge Intelligence.

Participants identified approximately ten broadband providers in the area including Level 3, Wave, Hughes, AT&T, Verizon, Consolidated, DISH, DirecTv, Freedom Pop, and Wireless & Wi-Fi. In terms of reliability, all these systems were characterized as "okay", but outages and "blackouts" are not uncommon. Although participants have come to expect occasional outages, none had backup service in place.

Prices paid for service packages range from $29 per month for residential service (Freedom Pop) to $800 per month for commercial service (Wave). One participant stated that the best service available from a major provider cost $135 per month and was delivered "via cell towers".

One participant, who manages information technology resources for a local company, stated that commercial service from Wave is reliable but that consumer service has suffered a complete blackout in West Sacramento twice in the past month. He said "as a business, we need more upload than download, they say 20 [Mbps], we get about half that", and that 250 Mbps service from Wave was costing him $150 per month.

Direct fiber connections are perceived as being expensive, with one participant stating that he received a quote of $10,000 for fiber installation charges from Level 3. He described Wave's $1,500 installation

price for fiber service as “reasonable”, and said that the $800 per month cost he is paying for symmetrical 50 Mbps service is the best price available.

Wave’s customer service is perceived as improving and was described as “prompt”, however its response to residential issues is perceived as better than its response to commercial accounts. AT&T’s commercial customer service was described as frustrating, with one participant stating she can’t call AT&T or go through 20 menu items “without screaming”.

Some participants stated that rural areas are not served by major providers, and the service that is available is expensive and not very reliable. A participant said that his home is 400 feet too far to be connected to AT&T’s Uverse service. Another stated that he was informed by Wave that it would cost $30,000 to install 1,200 feet of cable to connect a group of homes in the southern area of the city. A participant commented that Wave was willing to install a similar length of fiber in a populated area for $1,000.

Broadband availability was described as key question that business must answer when considering locating in West Sacramento and an important problem that needs to be solved, particularly when new roads are constructed or other work is done in the public right of way. The ability to get sufficient broadband service into newly developed commercial and industrial properties was described as “challenged”, and larger companies with an existing business relationship with AT&T are perceived as having an easier time getting the necessary service installed.

Metro Park and the Triangle area were cited as examples of newer developments which included broadband infrastructure. The Southport area was described as more problematic, although empty conduit is available.

Newer residential areas in West Sacramento are perceived as having good broadband infrastructure, in contrast to older areas. Participants stated that these areas are growing as well and will not be able to attract businesses without reliable broadband services. New residents moving into the older areas such as Broderick will also face challenges, particularly those who cannot afford to live in more recently completed developments.

Many of the older areas are perceived as having spotty wireless coverage as well, with mobile broadband users reporting lower signal strengths. One concern that was expressed was the lack of upgrades or remediation of substandard infrastructure, such as unsafe poles and wires, even in the course of completing other projects that involve street excavations. One suggestion was to coordinate construction projects in the public right of way with broadband providers.

One participant expressed the belief that Amazon would be expanding its facilities in the area and would bring in jobs and people. However, companies such as Amazon need reliable infrastructure. Broadband infrastructure is not perceived to be an issue in new residential development or major business parks, however a desire was expressed for a city-coordinated infrastructure plan, including broadband, for new developments.

Another issue that was raised was the reliability and affordability of residential service, which is increasingly a business issue because of the greater number of people working from home.

Most of the participants did not believe they were receiving good value from their current services and generally thought they were only getting 45% to 50% of what they were promised in terms of throughput and speed. Upload speed is particularly poor.

The City of West Sacramento is not perceived as being able to help improve spotty broadband service. One participant stated he was informed two years ago that it was a state problem and the City was unable to address broadband connectivity issues. In terms of a broadband “wish list” all respondents wanted to see a citywide broadband vision and/or initiative developed that addresses all neighborhoods and demographics, but particularly the senior population and school aged youth. Transportation planning was offered as an example of something the City of West Sacramento does well and which could be a model for broadband infrastructure planning.

Appendix C - Policy options

Federal and State laws have largely preempted the ability of local government to regulate or manage telecommunications service providers. Cities may, however, adopt policies that encourage competition and put more choices in the hands of residents and businesses.

The City of West Sacramento may choose to investigate the possibility of adopting a range of new policies that directly target broadband infrastructure development and broadband service availability.

1. Planning

1.1. **Develop a long term broadband infrastructure roadmap**. *Taking into account existing resources, City networking needs, economic and social development objectives and private sector investment plans, draft specific objectives for high speed network expansion into commercial and residential areas.*

1.2. **Solicit implementable ideas for upgrading West Sacramento's broadband infrastructure**. *Hold informal staff discussions with local Internet service providers and provide notice to all interested parties of the City's goal of supporting equitable fiber optic network expansion.*

1.3. **Broadband Master Plan**. *Develop and maintain a Broadband Master Plan for prioritizing connectivity needs in future years, with an emphasis on delivering high bandwidth services to West Sacramento's industrial and commercial land use districts and community anchor organizations (education, public services, public safety, and health care).*

The benefits to a community of modern, high-speed broadband infrastructure generally break out into three categories: sustainable economic development, improved quality of life and greater social equity.

Technology forms the backbone of the local and regional economy, and will continue to do so in the future. As technology spreads through more aspects of everyday lives, tremendous opportunities arise to creatively and carefully use technology to shape the community. Technological innovation can help the City in many ways. It can facilitate citizen interaction with each other and government; company services to customers; and City services to visitors; and it can provide ways to showcase West Sacramento's commitment to a sustainable environment.

Electronic services in particular (cable television, telephone, satellite, computer networking technologies, internet, radio, and other such services) create greater accessibility to and exchange of information, impact the ways people communicate, and create job opportunities. Enhancing and improving access to these resources will have a profound effect on the quality of daily life and work. Toward improving both, the City can

examine and respond to the possibilities and challenges offered by—and the implications of—technological advances and opportunities.

2. Dig Once

Cities retain the ability to establish reasonable conditions and procedures for utility companies, including telecommunications carriers, to do construction work in the public right of way. There are many different approaches, but in general most street cut management – also known as "dig once" – policies intended to promote broadband fall into three categories: "open trench", "shadow conduit" and construction standards.

2.1. **Open Trench**. *Require and provide a process for notification and information about all major infrastructure and construction projects, including transportation projects and new residential subdivisions, to a shared data base so that broadband and other utility providers have the opportunity to coordinate infrastructure deployment with projects.*

Open trench policies require some degree of advance notice of any digging that's done in streets, sidewalks or other public places. This notice goes to other utilities that might be interested in installing facilities in that location or local agencies or both. If another utility wants to take advantage of the opportunity presented by the work, cost sharing arrangements can be negotiated or specified by policy. San Francisco, Santa Cruz and Berkeley have such policies.

Santa Cruz routinely sends out notifications of encroachment permit applications to utilities and other interested providers. Berkeley mandates participation in "city-sponsored utility coordination meetings" involving other utility companies, and requires companies to submit "general information regarding any Facilities that the Company plans to apply for permits to install within the [public right of way] in the next six (6) months, regardless of whether a permit is currently sought for those Facilities".

The City can also be a participant in the open trench process, either an installer of last resort (2.7 below) or as part of planned process for meeting internal networking needs (2.5 below).

2.2. **Conduit Specifications**. *Adopt standard specifications for placement and construction of conduit, applicable to both planned work in the public right of way and prospective installation of spare (or "shadow" conduit).*

Although the City generally does not have the authority to review proposed telecommunications projects on the basis of capacity or network design, it can create a preference for a minimum set of specifications. It can also establish standard specifications for conduit it installs, either for specific projects or on a prospective basis, and for conduit installed pursuant to building standards imposed on new development or major remodelling projects.

The City and County of San Francisco has developed standard conduit specifications for its own installations. A similar effort has been completed in San Benito, Santa Cruz and Monterey counties, and the results have been published. Likewise, Caltrans may adopt standard conduit specifications, depending on how it chooses to implement AB 1549.

2.3. **Conduit Standards**. *Require spare, city-owned broadband conduit within joint utility trenches in new developments or major remodelling projects.*

2.4. **Lateral Connection Standards**. *Require spare, lateral broadband conduit to all structures within new developments or major remodelling projects.*

Requirements for installation of empty, fiber-ready conduit can be imposed on new construction and major remodelling projects. This conduit should, as a minimum, comply with the specifications developed in 2.2 above. Ownership of the conduit can be passed to the city, as in Brentwood, or remain with the property owner with the requirement it be connected to a municipal network, as in Loma Linda.

2.5. **Shadow Conduit - Public Works**. *Require installation of city-owned broadband conduit as a part of any suitable city public works project, including public buildings and all transportation projects.*

2.6. **Shadow Conduit - Undergrounding**. *Incorporate routine placement of spare, city-owned broadband conduit into utility undergrounding programs.*

2.7. **Shadow Conduit - Excavations**. *Include evaluation of need to install city-owned broadband conduit in review of any work or permit involving excavation in the public right of way and establishes process for requiring such installation.*

Shadow conduit policies build on the opportunity presented by open trench notifications. Cities can make it a routine practice to install empty conduit prospectively any time a suitable trench is available. Typical cost estimates are in the one dollar per foot range. Shadow conduit placement can be done according to a predetermined broadband infrastructure construction plan, or routinely in any suitable location. The risk is that the conduit would never be used; the benefit is that if even a small fraction of the installed conduit is eventually used, the cost savings and/or revenue it would generate would offset the additional installation cost.

Watsonville, Salinas and Santa Cruz have all adopted shadow conduit policies. Watsonville built a cross-city fiber network which included previously installed conduit and Salinas is currently pursuing a downtown fiber network using its shadow conduit.

2.8. **Excavation Moratorium**. *Establish a 5 year or more moratorium on excavations in the public right of way after completion of work conducted subsequent to an "open trench" notification process.*

Some jurisdictions require a moratorium – five years is common – on any other utility work being done in the public right of way following major street work after potentially interested parties have been given an opportunity to participate. This policy achieves two objectives. First, it minimizes wear and tear on streets – any time a cut is made in a street, its remaining useful life is reduced by 10% to 40%, depending on the circumstances. Second, it provides an incentive for telecommunications companies and other utilities to upgrade or build infrastructure sooner rather than later by setting a deadline for doing so and by offering an opportunity to share costs.

San Francisco has such a policy, as does Berkeley, which states that "a Company may not excavate any Street that has been reconstructed or resurfaced by the [Public Works] Department or at its direction in the preceding five-year period and shall participate in City efforts to coordinate excavation activities"[15].

2.9. **Excess Capacity Utilization**. *Facilitate the use of existing conduit and other pathways by requiring encroachment permit applicants to demonstrate that alternatives do not exist, supported by City collection and coordination of information.*

To a certain extent, California law requires telecommunications carriers and other utilities to provide access to conduit and pole routes to other carriers. Cities can encourage and, to some degree, require this kind of cooperation.

Berkeley requires anyone who applies for a permit to install new conduit in the ground to first show that there is no existing conduit (or pathway) that can be used instead, including conduit owned by other companies or the city, "whenever sufficient Excess Capacity is available on commercially reasonable terms and conditions". Berkeley's ordinance also gives the city broad scope to inspect work[16] and related documents[17], and to consider the availability of existing conduit capacity in approving or denying a permit application[18].

This requirement can also be used to encourage use of publicly-owned conduit and other resources. In order to be effective, however, sufficient information must be available to both the City and applicants. The asset management policies below are integral to this process.

2.10. **Establish a dedicated revenue account**. *This account would be funded through leases or rents of City property, including publicly owned conduit, for the purpose of communications infrastructure, and to be made available for construction and maintenance of public owned conduit.*

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[15] Berkeley Municipal Code 16.10.080 C 4

[16] BMC 16.10.060 F

[17] BMC 16.10.080 G

[18] BMC 16.10.060 B 4

2.11. **Future Proofing**. *Encourage broadband providers to size underground and overhead facilities to accommodate future expansion, changes in technology, and where possible the facilities of other telecommunications and utility providers.*

Similar to shadow conduit policies, future proofing involves the installation of surplus conduits, ducts and pole space in anticipation of potential future need. Standard specifications can be included in building codes for new and major remodelled construction. For work done in the public of right of way, minimum sizes may be suggested, and encouraged by encroachment permit policies. For example, In 2000, West Sacramento reduced encroachment permit fees for Williams Communications, Inc. in exchange for the inclusion of a spare, city-owned inner-duct within conduit that the company installed along Reed Avenue/Sacramento Avenue, in the public right of way. The city subsequently leased out its inner-duct, recovered the initial cost and continued generating revenue.

Wireless facilities and supporting infrastructure, such as fiber optic networks, should also be planned with future needs in mind. The current trend is toward smaller cell areas and facility sizes, and this trend will accelerate as 5G standards are finalized and network upgrades begin.

3. Asset management

3.1. **Asset Inventory**. *Identify city-owned assets, including fiber, conduit, rights of way and towers, that can support broadband infrastructure deployment.*

3.2. **Open Access**. *Make public assets available to all providers on an open and non-exclusive basis, commensurate with adopted policies regarding public benefits.*

3.3. **Master Leases**. *Establish standard terms and conditions for the lease of City assets such as buildings, towers and land by telecommunications companies.*

Performing an initial inventory and systematically following up – e.g., routinely logging newly constructed or identified assets – and then publishing the information or making it available to telecommunications companies upon request maximizes the opportunities to put broadband-related assets to work. Setting standard lease terms and access policies reduces the time and effort necessary for telecommunications companies to take advantage of those assets, which in turn makes the city a more attractive location for infrastructure upgrades or expansion and reduces barriers to competition.

3.4. **Telecom Operations and Maintenance Matrix**. *Establish detailed delineation of responsibilities for operating and maintaining city-owned conduit, fiber and other assets, and any attachments or equipment/facilities placement by third parties.*

When a mix of public and private assets are involved in a broadband project, responsibilities and roles for operation, maintenance and ongoing capital investment must

be clearly stated. San Leandro uses an operations and maintenance matrix to assign roles and define demarcation points for responsibilities.

3.5. **GIS Logging**. *Require routine entry of conduit and other broadband asset data into geographic information systems.*

An important adjunct to both open trench and shadow conduit policies is a requirement that all conduit installed by public agencies and, ideally, private utilities, be logged into the city's GIS database. Watsonville was able to build its own city-wide data network because it had taken care over the years to keep its records up to date. On the other hand, cities that have failed to do so often lose track of where municipal conduit has been installed.

Collecting detailed information about telecommunications infrastructure, making it available in a convenient and useful way, and requiring, to the extent possible, that telecommunications companies cooperate with each other levels the playing field for smaller companies that might want to build new facilities or offer upgraded service. It also gives the City a means of participating in the telecommunications marketplace.

3.6. **Digital Plans**. *Establish a requirement that plans and other information be submitted by utilities, developers, contractors and others in an appropriate GIS format.*

Traditional, paper-based permit applications do not provide adequate access to information about telecommunications infrastructure installed in the public right of way or in conjunction other municipally regulated work. One solution, adopted by Santa Cruz County, the City of Santa Cruz and Berkeley, is to require permit applicants to submit maps in "electronic and/or other form required by the City, and include information describing the proposed facilities"[19]. This map data would also include "information regarding any Excess Capacity that will exist in such Facilities after the installation of the Company's Facilities" if requested by the City.

3.7. **Broadband infrastructure database**. *Build a database showing the types and location of broadband infrastructure in West Sacramento.*

The City can improve the telecommunications market in West Sacramento by compiling a geo-database of available infrastructure (and/or services). Information can be requested from service providers, collected from publicly available source and gathered from ground surveys. For example, the Central Coast Broadband Consortium has published a regional online, interactive map showing local and inter-city fiber routes and other infrastructure. Most of the data was the result of a professional survey, which was supplemented by information provided by local companies and other sources.

[19] BMC 16.10.040

4. Permitting

4.1. **Transparent Process**. *Delineate the process for ensuring fairness, including transparency, public notice and timetables and deadlines for timely review of any required local permits.*

4.2. **Permit Streamlining**. *Establish procedures to streamline the approval of broadband-related public right of way encroachment permits consistent with principles of fairness and competition for all providers.*

4.3. **Master Permits**. *Establish a process for issuing a master encroachment permit for large scale telecommunications projects, subject to standard conditions for specific circumstances.*

4.4. **Single Review**. *Limit permit requirements to encroachment permits for broadband infrastructure work in the public right of way.*

Complicated and/or opaque permitting processes can serve as barriers to entry for broadband companies that want to bring competitive service into a city. Permit processes for broadband projects that meet certain criteria – construction completely contained in the public right of way, for example – can be standardized through the use of checklists, reference designs and administrative reviews. As a first step, streamlining existing processes does not necessarily involve eliminating or consolidating review requirements. Rather, it recognizes that many broadband project reviews confront largely identical issues, which can be addressed in standard way.

Streamlining is important because it can reduce time and costs, and increase predictability for service providers, making West Sacramento a more attractive target for capital investment. As described in Section 6 below, permit streamlining is now unavoidable for most permits involving wireless facilities, due to continuing changes in state and federal law.

Although care must be taken to protect the public's interests and ensure community values are maintained, some jurisdictions, such as the City of Santa Cruz, are moving permitting for broadband facility construction out of planning departments and completely into the hands of public works departments, which can use a relatively streamlined encroachment permit process to achieve the same ends in a single review. Costs to applicants are expected to drop from the tens of thousands of dollars to the hundreds of dollars.

One approach, advocated by Google Fiber, is to establish a master permit process for large scale projects. Standard conditions can be established for defined circumstances, with provisions for specific conditions when unique circumstances occur.

4.5. **Evergreen Permits**. *Authorize longer-term "evergreen" permits that provide a right to providers to enter specified easements to upgrade their infrastructure for an indefinite or*

significant period of time (such as 20 years) to upgrade the broadband service consistent with the adopted policies.

An extension of the master permit concept, evergreen permits go one step further and allow upgrade and expansion work to take place within defined parameters over a longer period of time.

4.6. **Environmental and Aesthetic Mitigation**. *Set forth transparent and consistent procedures and process for preventing and/or mitigating environmental impacts and protecting and/or preserving visual integrity of jurisdiction.*

The California Environmental Quality Act allows for expedited review of many types of broadband projects, particularly when those projects occur within or on existing structures, including utility poles, or paved ground. Establishing clear guidelines for when the City will and won't allow broadband projects to proceed on the basis of a negative declaration will add predictability to the environmental review process and aid in defending any subsequent challenges.

As discussed below, state and federal law requires rapid CEQA review of permit applications for wireless projects, and only provides a limited window of time and discretion for addressing aesthetic issues. A simple and well defined process, with standard solutions where appropriate, will help avoid permit approval by default.

4.7. **Permitted Telecommunications Sites**. *Establish a preference for colocating new telecommunications facilities at existing telecommunications sites.*

As noted below, federal and state regulations provide for favorable treatment of wireless facility permit applications when a site is already used for such purposes. By establishing policies that take existing telecommunications into account when reviewing permit applications and provide for more rapid decision-making, the City can encourage greater use of existing sites.

5. Smart Cities

5.1. **Broadband Building Standards.** *Require projects to provide broadband connectivity and include the infrastructure components necessary to support broadband, similar to requirements for other essential utilities.*

5.2. **Broadband Wiring Standards**. *Establish standards for broadband wiring in residential and commercial buildings, similar to standards for other utilities.*

5.3. **Smart Building Requirements**. *Specify "smart building" requirements for land use and construction permits for all projects (public, commercial, residential, industrial).*

Building standards can be used to increase broadband availability and access, and promote the use of broadband dependent applications that promote energy efficiency, safety and

other public policy goals. The simplest approach is to require all new construction and major remodelling work to include broadband facilities and provisions for connecting those facilities to the necessary outside infrastructure. San Leandro has taken this approach.

The next level of involvement is to specify the types and extent of indoor wiring, connection panels and other "plumbing" required for new and remodelled construction, as Loma Linda has done, or establish specifications and requirements for broadband infrastructure in the public right of way and lateral connections from homes, as Brentwood has done.

The final stage is to include requirements for specific "smart building" features and applications, such as predictive climate control or health and security monitoring. These types of requirements bring intrinsic benefits, but also help drive demand for high quality broadband service.

5.4. **Public Facilities**. *Promote the provision of broadband facilities in all public buildings, major transportation and other infrastructure projects.*

It is commonplace to include basic information technology networking capabilities and Internet connectivity in plans for public buildings, transportation facilities and other public projects. These plans can be expanded to include provisions for supporting commercial broadband service on a partnership basis, for example by including spare conduit and inner-ducts or increasing the size of fiber optic cables. This spare capacity can be leased to private users or could form the basis of an economic development initiative, as AC Transit and Oakland are doing with a bus rapid transit project.

Public facilities can also serve as anchor tenants for new broadband infrastructure built by private companies, and provide a baseline of revenue that will justify the construction of facilities that can serve much larger areas of the city. The University of California, for example, offered sufficient revenue to Sunesys LLC to first build a fiber optic line from Silicon Valley to Santa Cruz, and then extend it to the Salinas Valley. These lines are available to any user along the route, and have been credited with spurring economic development, particularly within the City of Santa Cruz.

5.5. **Telecommuting - City**. *Establish a telecommuting program for city employees.*

5.6. **Telecommuting - General**. *Encourage local businesses to develop telecommuting programs.*

Factoring telecommuting incentives and requirements into reviews of planned commercial developments, and establishing policies to encourage telecommuting by city employees when appropriate, can have the double benefit of reducing automobile traffic and increasing the demand for advanced broadband services. Mono County, for example,

promotes telecommuting "as a viable method allowing visitors to stay in the region longer and work remotely, and attract new permanent residents".

5.7. **Competitive Access to Multiple Occupancy Buildings**. *Require landlords to grant access to communications service providers.*

The City and County of San Francisco passed an ordinance which prohibits owners (landlords and homeowner associations) of multiple dwelling units from denying building access to competitive broadband providers that qualify under state law to do work in the public right of way, or to interfere "with the choice of communications services providers by occupants". Single family homes are not included, however renters in those circumstances generally have sufficient control to allow access.

The ordinance sets up procedures for broadband companies and building owners to follow, and establishes remedies for failing to do. State and federal regulations also restrict the ability of property owners to limit tenant's ability to choose between competitive broadband providers. San Francisco's ordinance is more specific and far reaching, and has not yet been tested in court.

6. Regulatory

6.1. **Regulatory Position**. *Articulate the interest of the jurisdiction in monitoring the reliability and quality of broadband connectivity in the local jurisdiction and ensuring appropriate speed availability.*

The California Public Utilities Commission (CPUC) regulates "telephone corporations" and, to a lesser extent, "cable television corporations" and "video service providers". These categories include AT&T and, to a restricted extent, Wave, which are the two primary retail broadband service providers in West Sacramento. Intercity carriers are also regulated as telephone corporations.

Responsibility for regulating telephone corporations is shared between the CPUC and the Federal Communications Commission (FCC). Municipalities are allowed no authority in that regard.

Nevertheless, cities can be very effective advocates on behalf of residents and businesses. For example, the City of Gonzales intervened in the CPUC's review of Charter's purchase of Time Warner and Bright House cable systems in California, and obtained an agreement to significantly upgrade the city's broadband service and infrastructure. Similar concessions were obtained by others during the review of Frontier's purchase of Verizon's telephone systems and AT&T's purchase of DirecTv. Establishing a clear mission statement regarding the City's role as an advocate for better broadband infrastructure and service allows consistent routine communications with service providers regarding

expectations and makes it possible to move quickly when windows of opportunity, such as regulatory proceedings at the CPUC or FCC, appear.

6.2. **Franchise Compliance**. *Monitor and audit compliance with state video franchising requirements.*

Originally, regulation of cable television corporations was the responsibility of local governments in California. Many were actively involved in regulating franchisees to the extent allowed by federal and state law until the Digital Infrastructure and Video Competition Act of 2006 (DIVCA) was approved by the California legislature.

DIVCA established statewide franchises for video service providers, which now includes telephone companies such as AT&T. DIVCA severely limits the role cities and other local government entities may play in regulating or otherwise influencing video service providers. Cities still receive a 5% franchise fee from video franchise holders, and have a limited opportunity to inspect their books to ensure compliance. Requirements for public access channels, consumer protection rules and obligations to build out infrastructure are also subject to municipal review, but enforcement authority is severely limited.

Nevertheless, some jurisdictions are taking an aggressive approach to franchise compliance monitoring. Palo Alto, on behalf of itself and neighboring cities, recently completed an audit of Comcast's compliance with franchise fee and public access channel requirements. Such an audit may form the basis for formal court proceedings, or informal negotiations with franchise holders.

6.3. **Specific Conditions Compliance**. *Monitor and audit AT&T's compliance with FCC mandates.*

When it approved AT&T's purchase of DirecTv in 2015, the FCC required AT&T to extend fiber-to-the-premise service to 12.5 million locations nationwide. AT&T must also offer a $10 or $5 per month broadband package to low income families, "those where at least one individual participates in the Supplemental Nutrition Assistance Program ("SNAP")". The price depends on speed level that's available in an area – it would either be $5 or $10, not both.

The City can play a role in ensuring compliance with these conditions by identifying specific requirements that apply to West Sacramento as well as general requirements that include it. The City can directly engage with the companies, and/or seek relief from the FCC if compliance or cooperation is lacking.

In addition, the City can work with other local agencies to advocate for extending the life of this program beyond the April 2020 expiration of the federal mandate that established it.

6.4. **Enforcement Liaison**. *Establish a program for systematically collecting and aggregating public complaints and concerns regarding telecommunications services, and submitting information to appropriate state and federal regulatory agencies.*

The FCC's recent decision[20] to bring "broadband Internet access service" under common carrier regulation (often referred to as the "network neutrality" decision) tries to draw a clear line between the kind of regulation that does and does not apply to providers of those services. In particular, the FCC has ruled out regulation, by itself or states, of Internet service offerings, rates, or access to infrastructure by third parties, except to say that it will review complaints on an after-the-fact basis using a "just and reasonable" standard.

The decision specifically allows "any body politic, or municipal organization", as well as individuals and state utility commissions, to file complaints. It establishes formal and informal procedures for doing so, and creates an ombudsman's position to facilitate the process.

The CPUC's role is narrower and generally restricted to "telephone corporations", which can include traditional wireline carriers, such as AT&T, as well as broadband companies that use the public right of way. Its oversight responsibilities include enforcement of safety requirements, such as those related to utility poles, minimum telephone service standards, particularly relating to 911 access, and general compliance with applicable consumer laws and regulations. The commission has shown a willingness to couple this relatively narrow but well established jurisdiction with general but largely undefined responsibilities granted by federal law to extend its influence over broadband providers and other non-traditional telecommunications companies.

The FCC and CPUC have established procedures for the public to use in submitting and pursuing complaints against regulated companies. However, knowledge of these procedures is not widespread and making use of them involves a learning curve which can be an obstacle for many people. The City may reduce these barriers by acting as a middleman between residents and these two regulators.

The City can establish an enquiry and complaint process for businesses and/or residents that are seeking broadband services or are having problems with current providers. Although the City has limited authority in this regard, collecting this information and making it public is an effective first step toward providing incentives for telecommunications companies to voluntarily cooperate, expanding public knowledge of existing resources and constraints, and building a record for submission to the appropriate regulatory bodies.

[20] *In The Matter of Protecting and Promoting the Open Internet;* Report and Order on Remand, Declaratory Ruling, and Order; Federal Communications Commission; adopted February 26, 2015 and released March 12, 2015.

6.5. **Performance Test Participation**. *Encourage public participation in CPUC and FCC broadband speed and performance test programs.*

The CPUC and FCC have separate but complementary programs that allow the public to conduct speed tests of wireless and wireline Internet service. This data is factored into assessments of needs and eligibility for various programs. The more data points that are submitted from a given area, the better the understanding of local conditions will be on the part of the public, local officials and state and federal regulators. The City can play a role in promoting participation in these testing programs.

6.6. **Lifeline program advocacy**. *Encourage public participation in CPUC and FCC Lifeline service programs.*

The FCC has established a Lifeline program that provides telephone service subsidies for low income households. In California, this program is managed by the CPUC and supplemented with state funds. In some cases, for example when an eligible consumer chooses mobile service, broadband service might be included. The entire program is currently undergoing a redesign, and broadband service will be more widely included, with the goal of eventually replacing traditional telephone service.

7. Government operations

7.1. **Broadband Role**. *Establish an ongoing role for the City to play in identifying broadband needs and working proactively with businesses and service providers to meet those needs.*

7.2. **Evaluate long term City networking needs.** *Review existing City broadband facilities and budgets with due consideration to expected future traffic loads and expectations of available resources, and identify infrastructure development projects which are potentially of mutual interest to the City and private sector providers.*

7.3. **Anchor Tenant Positioning**. *Leverage City budget to stimulate demand for broadband facilities.*

7.4. **Interagency Coordination**. *Participate in regional and statewide planning and standards organizations.*

The City is a major purchaser of broadband services. By actively engaging with service providers as a customer, the City can influence the location and extent of infrastructure upgrades by incumbents, and provide opportunities for competitive carriers to enter the market. Coordinating these efforts, when possible, with large businesses and other agencies with similar needs multiplies this influence.

The City can identify opportunities for investment by evaluating funding available for economic development initiatives, applying that funding to broadband construction plans – both public and private sector – and determine if those funds can be directed to support those projects, either through direct investment or indirectly through administrative means.

One alternative for the City to consider is transitioning from leased facilities to lines that it owns or controls on a long term basis, perhaps via a public/private partnership that allows the City to concentrate on its own operations while a private (usually for-profit) company focuses on the utility aspects of the business. Over time, money currently budgeted for leased lines could be increasingly invested in new facilities that would support economic development, or saved for other uses.

One example of this kind of public/private partnership is Lit San Leandro. The City of San Leandro has worked with a local company to build a 20-mile fiber optic ring through the industrial and commercial areas of the city, for use by local businesses. The City contributed the use of traffic signal conduit and in return received 30 fiber strands for its own use. The remaining capacity on the network is sold to local businesses by the private, for-profit partner, Lit San Leandro LLC.

Without new investment in local fiber optic infrastructure, the City – like other agencies, institutions and companies – will face increasing operating costs over time, for the use of ageing assets. Putting additional emphasis on long term infrastructure planning and investment, in cooperation with private sector carriers, is a potential solution to this problem.

7.5. **Validate broadband infrastructure mapping**. *Review information collected by state, federal and regional organizations, incorporate it into the City's GIS system and make it publicly available.*

Publishing reliable information regarding the availability of infrastructure and services is one of the most powerful policy tools available to the City to promote broadband development. The California Public Utilities Commission, the National Telecommunications and Information Administration and other agencies collect and publish a wide variety of information about broadband availability, access and adoption. Consolidating this information, as it relates to West Sacramento, will lead to better planning and project development, by the City, telecommunications companies and others.

The City can develop a detailed geodatabase of existing fiber optic networks, including lateral connections, access points, splice points and information regarding ownership, and make it available for economic development purposes. Included in this database development can be an ongoing assessment of the condition of private utility poles and conduit. Over time, deficiencies can be documented and presented to either the owners or regulatory bodies to address.

7.6. **Upgrade broadband availability in publicly subsidized housing**. *Identify private and public sources of investment in broadband facilities and service in public housing and develop implementable initiatives.*

Publicly subsidized housing operators in West Sacramento are eligible to apply for grants to upgrade broadband facilities in their properties and support programs designed to increase broadband adoption among public housing residents. The California Advanced Services Fund is one such source, and federal agencies, such as HUD, have similar programs.

7.7. **Online Access**. *Direct how government operations and services are to be provided online.*
7.8. **Online Permits**. *Streamline and provide online access to business and development permit processes.*
7.9. **Open Data**. *Establish an "open data" policy.*

The City also is, or can be, a major producer of online content and services. Maximizing the accessibility of information and public services via the Internet provides an incentive for people to adopt and increase their use of broadband services. Offering services, such as permits, to businesses via online platforms, such as the Open Counter system originally developed by the City of Santa Cruz, will also stimulate broadband demand, and attract new, high tech businesses by engaging with them on their own terms.

The City has a wealth of stored data – information collected from its programs on topics ranging from municipal finance to scientific and sociological data. Much of this data is already publicly available though not, in most cases, in machine readable formats that programmers can easily use. The trend across local governments to make this kind of machine readable municipal data publicly accessible; this movement has been termed “Open Data”.

Appendix D – Wireless facilities permitting

1. Constraints on local agency discretion

As of 1 January 2016, permit applications for wireless facilities within California have to be approved or denied by local governments within specific time frames, commonly referred to as "shot clocks". If the clock runs out, the application is "deemed approved". The new rules are the combined result of a new California state law – Assembly Bill 57 – which took effect in January, two FCC decisions (and subsequent affirming decisions from federal appeals courts), existing California public utilities law and a California Public Utilities Commission rulemaking.

Depending on the type of facility and location involved, the applicable shot clock could be 60, 90 or 150 days. The clock begins running when the application is submitted. The City of West Sacramento has 30 days to review the application and request additional information. In that case, the clock is tolled – stops – but starts again when the applicant responds. Additional requests for information are allowed under stricter limits and will toll the clock, but a response by the applicant starts it running again.

The only other ways to toll the clock is by mutual consent, or by approving or denying the application. It will not stop due to CEQA review, public hearing requirements, council meeting schedules or any other local agency process requirement. If the City has not approved or denied the application when the clock runs out, it is "deemed approved". The applicant must notify the City that it is proceeding with construction on that basis and the City has 30 days to file a lawsuit seeking to block it.

There are three primary methods the City can use to maintain control of the process:

- Front load the application process by requiring a comprehensive submission (backed up by a standard checklist), covering all contingencies from the very beginning.
- Structure the review process so that a legitimate administrative denial can be quickly issued if appropriate.
- Adopt a short form application and review process for pre-approved, standard solutions for wireless facilities, to encourage applicants to voluntarily choose appropriate designs and locations.

2. Determining which shot clock applies

The wireless permit "shot clock" rules that went into effect last year result in three different shot clock limits (60, 90 and 150 days), and California law (including a California Public Utilities Commission rulemaking, 14-05-001) creates two different classes of wireless facilities: construction by a mobile carrier in the public right of way and everything else.

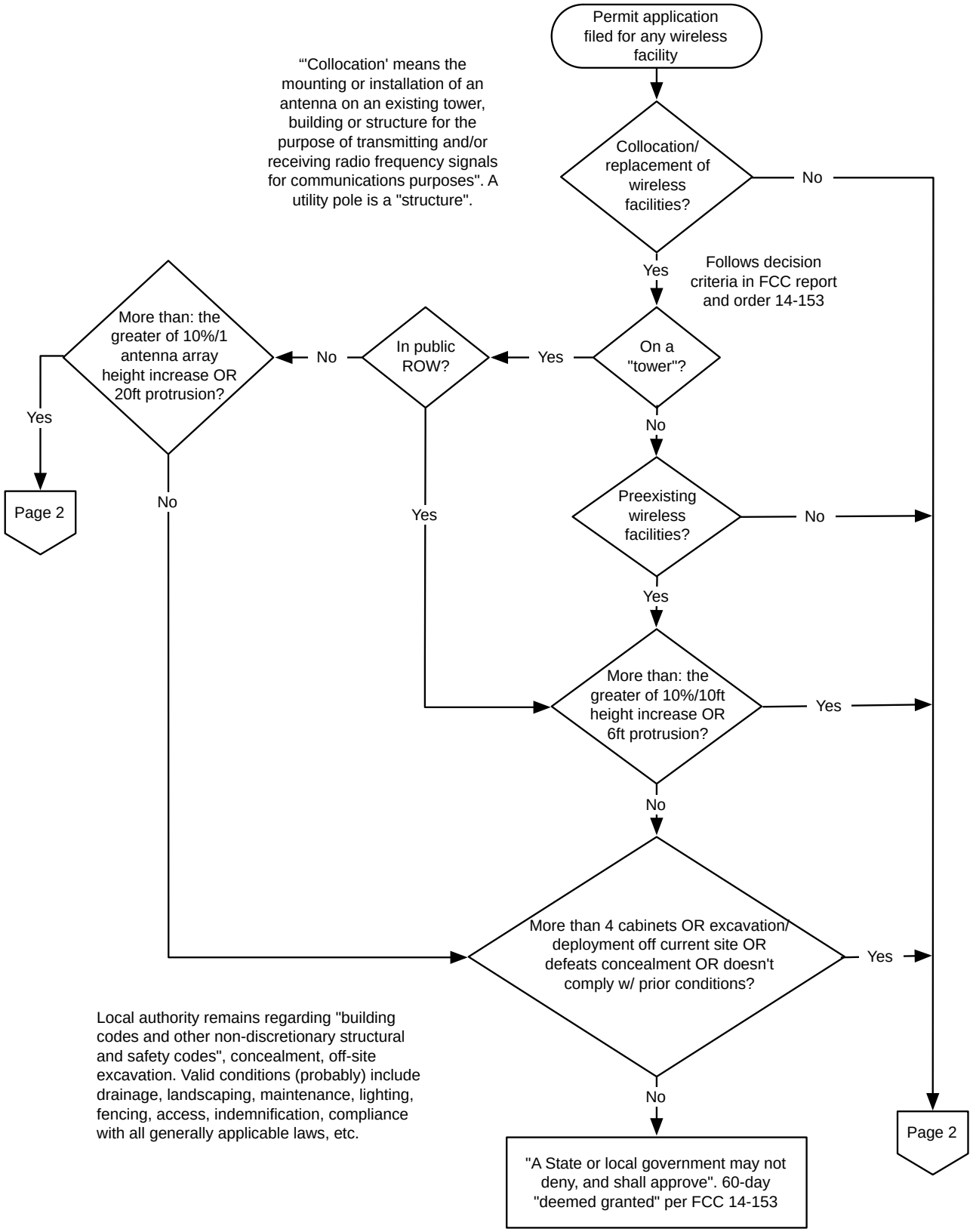

Figure 1 – Wireless permit "shot clock" flowchart, page 1.

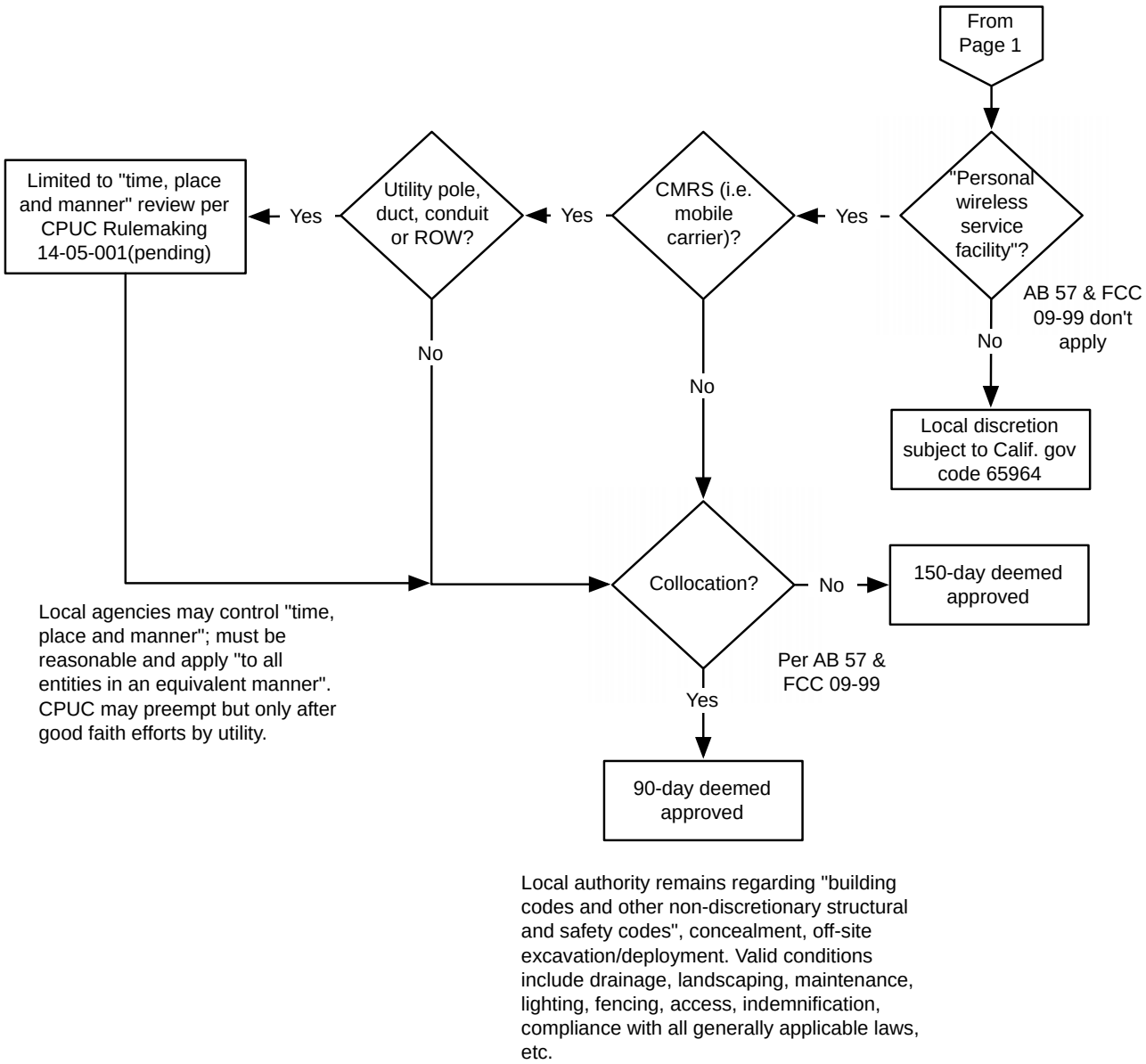

Figure 2 – Wireless permit "shot clock" flowchart, page 2.

Figures 1 and 2 contain a flowchart that gives an overview of how the different rules relate to each other. The result is three basic scenarios:

- Minor collocation of transmission equipment on an existing structure (or replacement of existing transmission equipment): 60 days with significant limits on criteria the City may consider when reviewing the application. This shot clock results from a 2014 FCC order (14-153), which was recently upheld by the federal fourth circuit court of appeals.

- Major collocation: 90 days. This shot clock is the result of the combination of Assembly Bill 57 and a 2009 FCC ruling (09-99), which AB 57 references (for the sake of brevity, I'll just refer to this as the AB 57 rule).
- New facilities (i.e., anything else): 150 days, per AB 57.

The 60-day shot clock applies to wireless facilities built for nearly any purpose; the 90 and 150-day clocks only apply to "personal wireless service", which are defined as "commercial mobile services, unlicensed wireless services, and common carrier wireless exchange access services". In other words, wireless telephone or broadband facilities. It wouldn't include, for example, satellite services or public safety facilities.

Another potential difference could be in the definition of "collocation". The FCC 60-day order is based on Section 6409(a) of the Middle Class Tax Relief and Job Creation Act of 2012, and is often referred to as the "6409 rules". The order makes it clear that in order to be eligible, a collocation has to be on an existing wireless facility, while the 2009 shot clock ruling could be interpreted as applying to any preexisting structure. That's one of many details that are likely to be worked out in court or by the FCC.

Section 6409 says in part that "a State or local government may not deny, and shall approve, any eligible facilities request for a modification of an existing wireless tower or base station that does not substantially change the physical dimensions of such tower or base station". The order says...

> A modification “substantially changes” the physical dimensions of a tower or base station, as measured from the dimensions of the tower or base station inclusive of any modifications approved prior to the passage of the Spectrum Act, if it meets any of the following criteria:
>
> - For towers outside of public rights-of-way, it increases the height by more than 20 feet or 10%, whichever is greater; for those towers in the rights-of-way and for all base stations, it increases the height of the tower or base station by more than 10% or 10 feet, whichever is greater;
> - For towers outside of public rights-of-way, it protrudes from the edge of the tower more than twenty feet, or more than the width of the tower structure at the level of the appurtenance, whichever is greater; for those towers in the rights-of-way and for all base stations, it protrudes from the edge of the structure more than six feet;
> - It involves installation of more than the standard number of new equipment cabinets for the technology involved, but not to exceed four cabinets;
> - It entails any excavation or deployment outside the current site of the tower or base station;
> - It would defeat the existing concealment elements of the tower or base station; or
> - It does not comply with conditions associated with the prior approval of the tower or base station unless the non-compliance is due to an increase in height, increase in width, addition of cabinets, or new excavation that does not exceed the corresponding “substantial change” thresholds.

The order also allows local governments to "continue to enforce and condition approval on compliance with generally applicable building, structural, electrical, and safety codes and with other laws codifying

objective standards reasonably related to health and safety". However, local governments "may only require applicants to provide documentation that is reasonably related to determining whether the eligible facilities request meets the requirements of Section 6409(a)".

Similarly, existing CPUC policy limits the scope of local authority over utility pole use in the public right of way by licensed mobile carriers to the same kind of "time, place and manner" restrictions that might apply to other telephone companies (and, as a practical matter, to cable and electric companies).

Under the AB 57 criteria, the definition of a major collocation is fairly narrow. Generally, it's any attachment of new equipment to an existing structure that falls within the same dimension limits as the 6409 rules (except the tighter restrictions on facilities in the public right of way don't apply) but entails more construction work, or modifications to existing conditions. There is room to debate whether an apparent collocation actually falls under the 150-day instead of the 90-day clock, but the clock will run while the debate continues.

Although AB 57 doesn't directly apply to the 60-day shot clock – it specifically excludes facilities that are eligible under the 6409 rules – the procedural requirements are, for the most part, identical. As a practical matter, the only question is whether the applicable shot clock is 60, 90 or 150 days. Expect wireless carriers to be more aggressive about claiming "deemed granted" status now that any application for wireless facilities falls under one shot clock or another.

Once a shot clock expires, or an applicant believes it has, then the applicant has to notify the City that it is proceeding on that basis and the City then has 30 days to challenge the "deemed approved" assumption in court. There's no guidance in AB 57 as to what happens if the City doesn't go to court – alternatives range from an applicant being able to simply start work on the basis of the notice, to the City being required to automatically issue the permits, to an applicant being required to obtain a court order confirming the deemed approved status. The City should consider the position it will initially take in those circumstances, but be prepared to adjust as practice and the courts clarify the procedure.

However it happens, though, carriers are likely to prevail eventually in at least some cases, and the City needs to consider what it will do in that event. One option is to create conditions of approval that would automatically apply if a deemed granted action occurs. Rather than trying to craft a default policy from scratch, however, the City might instead rely on existing design requirements or precedent. The carrier could be served notice that even though the applicable permits have been automatically granted, it is still responsible for adhering to the standards, conditions and precedent that apply to such permits and the City will enforce those terms as it would with any other permit. In other words, there's nothing special or exempt about a permit that's been deemed granted. The same rules apply, the only difference is in the method of approval.

3. Preserving City control of wireless permitting

The City has only a couple of sticks and one carrot left when it comes to administering permits for wireless facilities.

The biggest stick is the application requirements. An incomplete application is the only specific grounds for "tolling" (i.e., stopping) the clock, other than mutual agreement. The City has 30 days to ask for additional information, and 10 days for subsequent (albeit limited) requests if it falls under 6409 rules. The time it takes to review the application and request additional information counts against the shot clock, but the clock will be tolled (stopped) while the applicant is responding. Once an application is complete, either by default or formal acceptance by the City, the clock will run while any discussions or questions or negotiations continue.

The only way to maintain control of the clock is to explicitly require all potentially relevant information be included in the initial application. Specific, predetermined information should be routinely required in an initial application and itemized in a detailed checklist provided to the applicant.

A checklist allows the City to quickly review an application and, where necessary, write a comprehensive request for additional information. The less time required to determine that an application is incomplete, the more quickly the clock is stopped. But more importantly, it helps ensure that all deficiencies will be caught in the first review. Under 6409 rules, the City can make subsequent requests for additional information within 10 days but only in regard to items identified in the initial request. The primary FCC ruling referenced in AB 57 is less specific about limitations on additional requests for information, but until the question has been fully litigated the safest course is to assume that the same limits apply.

A further step is requiring wireless carriers to hold their own community meeting, prior to either considering an application complete or allowing a carrier to submit a new facility or colocation permit application. Such a meeting would make any subsequent public hearing less contentious by reducing the sense of surprise for community members and allow more potentially unforeseen land use challenges (e.g., noise concerns from specific equipment cabinet or generator placement) to be resolved earlier on during the review process. Furthermore the community meetings may allow for more substantive engagement by wireless carriers with neighborhood groups, so that less-intrusive sites are initially proposed. Any challenges that do occur will happen while the clock is running and could, perversely, result in an application being deemed granted because the process required for denial was not completed.

The City should take what steps it can to guard against “Trojan Horse” applications, where a seemingly innocuous facility is approved and built under the more rigorous review allowed by AB 57, but then significantly modified later under the more lax standards of the 6409 rules.

The City should also require the inclusion evidence of approval by all other necessary public agencies, such as Caltrans, as a mandatory item on the application checklist.

A community meeting requirement or Caltrans approval are examples of requirements that might apply to a new facility but not a minor collocation, for example. It's an important consideration because 6409 limits application requirements to items necessary for determining whether a proposed collocation qualifies for the expedited 60-day review. The application should establish that all applications are considered to be subject to the 150-day shot clock rule unless the applicant submits specific

information that demonstrates otherwise. If the information is omitted or insufficient, the application could be tolled or denied on that basis.

The only other stick is the threat of denial. The value of that threat is greatest when the information included in the application creates a sufficient record to support denial because subsequent inquiries could end up providing the applicant an opportunity to run out the clock. If possible, denials should be done on an administrative basis. Noticing and other requirements for City Council and Planning Commission agenda items could likewise result in a deemed granted outcome.

It can be argued that the shot clock requirements make it less likely that a denial will be appealed. Refiling the application would reset the clock and could provide the applicant with greater predictability and a faster outcome than a court challenge would offer. At that point, however, an even better alternative for the applicant might be to agree to toll the clock. The credible threat of denial creates an incentive for mutual cooperation, and does it in a way that gives the applicant a clearer idea of how to balance the costs.

The one carrot to offer is the establishment of standard, pre-approved plans and thereby create the opportunity for the applicant to avoid lengthy and detailed application requirements up front and the possibility of denial down the road. The 6409 rules allow cities to give preferential treatment to proposals for facilities that would be located on municipal property, and presumably the same would apply under the AB 57 rules.

4. Considerations for applications involving the public right of way

Other than the more restrictive qualification criteria for the 60-day shot clock and a categorical exclusion for NEPA (but not section 106 NHPA) review in the 6409 rules, the FCC's rules do not differentiate between applications for facilities in the public right of way and on private property. The 6409 order does, however, "conclude that Section 6409(a) applies only to State and local governments acting in their role as land use regulators and does not apply to such entities acting in their proprietary capacities", and it specifically refuses to draw a clear line between those two roles except to say "like private property owners, local governments enter into lease and license agreements to allow parties to place antennas and other wireless service facilities on local-government property, and we find no basis for applying Section 6409(a) in those circumstances".

The arguments laid out in the order and in subsequent court cases indicate that at least some cities consider ROWs to be municipal property, so that question is likely to be litigated at some point. California law, though, effectively makes ROWs state property and limits municipal authority over telephone company work (wired or wireless) in the public right of way to "reasonable control as to the time, place, and manner in which roads, highways, and waterways are accessed". However, local ordinances that regulate the location and appearance of wireless facilities in the ROW are allowed so long as a local government 1. "does not abuse its discretion or arbitrarily or unfairly deny requests for access", 2. establishes reasonable rules, 3. applies the rules "to all entities in an equivalent manner" and 4. the rules do not effectively prohibit wireless facilities.

Consequently, the City can enforce aesthetic and other standards for installation of wireless facilities, particularly small/micro cell sites often referred to as distributed antenna systems (DAS), on existing utility poles and on new poles placed in the ROW. The process is subject to federal shot clock limits and it may be reviewed by the California Public Utilities Commission. Location may also regulated, but not in a way that particularly singles out wireless carriers.

5. Pre-approval of standard solutions

As noted above, the City can offer the carrot of a short form application and/or expedited processing for projects that involve standard, pre-approved cell site installations. Over time, detailed specifications for what is and isn't acceptable could be developed either by the City or others, but in the short term the City could establish a process for approving reference designs submitted by either carriers or equipment manufacturers. It's possible that an interagency group, for example under the auspices of the California League of Cities or a professional organization, could assume that responsibility, but for now it's up to the City.

As a general and quickly implementable policy, the City can encourage the organization of applications such that generic, non-proprietary information – manufacturer's specs or a particular landscaping scheme, for example – is presented separately in a standardized format. Once the application has been approved, the generic elements can be published on the City's website as an example of an acceptable solution. Those elements could either be downloaded and included "as is" in subsequent applications by anyone – allowing virtually instant review by the City – or modified to the minimum extent necessary for faster review. This process could speed up review of multiple applications by a single carrier, and in the long run it could simplify the process for everyone. But any acceleration of the City's overall processing ability would happen gradually over time.

Other fast track considerations could include locating facilities in the ROW on busier or wider streets in commercial and industrial areas, rather than in residential neighborhoods, or when set back a certain distance from residential properties.

Rather than try to establish a comprehensive reference design review process, the City could consider immediately pursuing some degree of standardization for two specific cases: replacement/upgrade of streetlights and installation of new or upgraded utility poles.

There are a couple of different ways to approach light standards. From an administrative perspective, the simplest solution is to establish specifications for new light standards intended to support wireless facilities (existing City light standard specifications might suffice) and design parameters for the attachments. Initially those parameters can be stated generally, in terms of high and width/ circumference and placement on the pole (e.g., on the pole top), but as experience is accumulated, the general requirements could be replaced by specific reference designs. The carrier would either rent space on an existing City light standards, or replace a deficient City-owned light standard with a conforming one, with the City maintaining ownership of the new pole. Rent can be deferred for a period of time sufficient for the carrier to recoup the construction cost. Since it's a city-owned asset, an

encroachment permit and, possibly, a use permit wouldn't be necessary. A design permit could be issued, if necessary, on the basis of the standardized, pre-approved specifications.

Maintaining ownership of the supporting pole also gives the City more flexibility under FCC rules, since it will be acting in its capacity as a landlord, rather than a regulator. For example, it could limit or prohibit attachment of additional equipment, as would otherwise be allowed under the 6409 rules.

Another alternative is for the carrier to own the light standard and operate it under terms that are similar to those that apply to electric utilities. The carrier might be persuaded to absorb some or all of the operating cost of the light, but the City's negotiating power in that regard is limited: past a certain point, it would make more sense economically for the carrier to apply for permits under standard procedures. There's also the question of how much of the standard permitting procedure may be waived, although presumably any precedents set by the City in regard to other public utilities would apply.

It would be more difficult for the City to create significantly different standards for installation of new utility poles by wireless carriers in the ROW – in general, rules that apply to one utility must apply to all – but creating a fast track process based on the City's future needs could be defendable. It would also be reasonable to create a fast track permit process for a metal pole – either completely new or as a replacement for an overloaded wooden one – that would be available to any utility. As with light standards, the City could also establish specifications and/or reference designs for the wireless equipment that would be attached. Although opponents could still invoke the appeals process, the worst case is that the shot clock would simply expire (and the City might, in that case, be able to agree that a 90-day shot clock applies). The City could choose not to challenge the "deemed approved" status, but still be confident that the resulting installation would comply with all applicable regulations.

6. Summary

AB 57 has created a situation where rigorous review of applications for wireless facilities, including opportunities for public comment and decisions by elected officials, works against the original purpose of safeguarding the public interest. In order to work within the limits set by State and federal rules, the City should adapt its current wireless facilities review process to allow for rapid decisions via comprehensive application information, rapid administrative decisions and incentives for applicants to propose conforming designs from the very beginning. Existing city code should be reviewed and modifications considered to ensure its provisions do not work against the original intent, now that the game has changed.

Appendix E – Municipal enterprises

Several cities, including San Leandro, Benicia, Palo Alto and Santa Clara in the Bay Area, either own and operate commercial and industrial class fiber optic networks, or partner with private companies to make sure those resources are available to the community.

1. Dark fiber

Palo Alto and Santa Clara operate dark fiber networks which have proven very profitable. Once installed these systems require little upkeep other than fixing accidental breaks, and customer service is mostly limited to making the initial connections – for a fee – and sending periodic bills.

San Leandro has given a local company non-exclusive access to its traffic signal network (a near-loop of approximately 11.5 miles in length) and to 7.5 miles of new conduit it built using a federal grant. In return, the city received ownership of approximately 10% of the fiber installed by the company and eventually will receive cash payments, as the business becomes profitable. Similarly, the City and County of San Francisco is leasing surplus capacity in its own fiber optic network to Google Fiber, as part of a targeted effort to improve broadband service to multiple dwelling units.

2. Fiber to the home

Direct municipal involvement in providing consumer-class service via fiber-to-the-home (FTTH) systems has a less successful track record, particularly in communities such as West Sacramento which are served by two consumer-oriented broadband providers. AT&T is a very large company with significant economies of scale. Although Wave is considered a smaller cable operator, it too can spread operating costs over many communities. Both AT&T and Wave are selective in terms of which neighborhoods they serve and can pick and choose which neighborhoods to upgrade on the basis of expected return on investment. The two primary incumbent providers have significant competitive advantages.

City-run systems do not have those economies of scale and cannot discriminate amongst residents on the basis of their economic potential. Consequently, it is usually impossible to compete with entrenched incumbents on the basis of lower prices offered, due to national-scale purchasing power and operating efficiencies, or lower costs incurred as a result of limiting the provision of advanced services to high potential customers.

Although a municipal FTTH system could theoretically offer more television programming options and greater broadband speeds at the same price as copper-based incumbent service providers, this competitive strategy usually results in lower net revenue and ongoing operating losses, particularly when employed against incumbents such as AT&T or Wave.

The only financially successful example of a municipally operated, consumer-focused FTTH system in California is Loma Linda, which only provides Internet service – and not television service – to newly constructed or remodelled homes where the developer or property owner has installed empty conduit

for the city's use. The City of Loma Linda – which is 4 square miles in size and suburban in character – has invested in a fiber backbone network to support this service, but much of the cost of building and operating it is borne by the several colleges and hospitals in town which act as anchor customers.

It is possible for cities in competitive urban markets to build and operate FTTH systems, but it is not reasonable to expect that operating costs and capital pay-back requirements – bond payments, for example – will be met by customer revenue in the near to mid term. Instead, a municipal FTTH operator must either find a private sector partner willing to assume the risk or expect to subsidize operations for the foreseeable future, via the general fund, grant money, tax increment financing or assessments on property owners or utility ratepayers.

3. Business models

California cities have a wide range of choices when considering how to pursue broadband projects. They can work with, or even own, for profit corporations, participate in cooperatives and non profit corporations or they can own and operate a broadband network, either fully or in partnership with a private sector company.

Generally, California cities (and some special districts) can provide telecommunications services within their boundaries with few restrictions. Even if a city provides a service that falls under the CPUC's jurisdiction, it is exempt from CPUC oversight. On the other hand, it is subject to all the controls, restrictions and obligations that pertain to any other municipal function, such as public oversight, open access and Brown Act requirements.

Full City Ownership

A common way of organizing a municipal telecommunications utility is to run it via a separate enterprise fund. Examples include the cities of Palo Alto, Santa Clara, Lompoc, Alameda and Chattanooga, which all have municipal electric utilities, and Santa Monica, which operates a business-oriented lit fiber service via its information technology department.

Advantages: City controls operating policy and benefits from any profits generated, most regulatory requirements do not apply.

Disadvantages: City would have to support any financial deficits, could require additional costs such as staff time.

Partial City Ownership

When a city contributes resources to a broadband network project, it can take ownership of specific parts of that network, rather than owning and operating the entire system.

Examples include the cities of San Leandro and Brentwood, which are leasing conduit to a competitive service provider. Another example is the City of Monterey. When Comcast installed an institutional

network as part of its former franchise agreement, the city paid for extra fiber strands to be installed. Those strands are the property of the city, and are now being used to provide effectively free connectivity between city locations even though local franchise agreements have been preempted at the state level.

Advantages: City gains access to telecommunications resources for its own use and can exercise a degree of control over the operation of a system that it helped to fund.

Disadvantages: Control is only partial. Continued access to the resource may depend on the viability or cooperation of a private sector partner. Care must be taken to avoid exposure to liability or unreasonable ongoing costs.

Corporation/LLC

Limited liability companies and for-profit corporations of various types can do business with few restrictions. Telecommunications companies are potentially an exception. For example, if it is deemed to be a telephone company (CLEC/competitive local exchange carrier) a private company would fall under the California Public Utilities Commission's jurisdiction.

Corporations are owned by shareholders, and different classes of stock can have different voting rights. The assets of a corporation can be sold or assigned to shareholders or others with few restrictions. To a great degree, ongoing governance and control of a corporation can be predetermined by the founders, who can also put requirements and restrictions on how it can do business and structure it to achieve goals they set (and benefit from), within limits.

For-profit organizations make money, pay taxes and distribute dividends to shareholders. Individual shareholders can usually sell their stock, although there are ways to limit the ability of new stock owners to control the company. The City can be a shareholder of such a corporation, even the sole shareholder.

Examples run from national organizations (AT&T and Comcast) to intrastate networks (Sunesys, now a subsidiary of Crown Castle) to local companies (Cruzio Internet). Several public-private partnerships were formed to apply for ARRA grants in 2009 and 2010. Examples include the City of Oakland and the City of Watsonville, which did not receive funds.

Advantages: freedom of action, ability to maintain control, able to operate company for the direct benefit of shareholders, able to borrow money and take private investment.

Disadvantages: could bear a regulatory burden, would likely require arms-length dealings with the City, no guarantee that it will always put the public interest foremost.

Non-Profit

A non-profit corporation can do nearly everything a for-profit corporation can do. The major differences are that a non-profit must offer some kind of public benefit, has limits on the amount of cash surplus it can generate from its operations and its governance structure is less controllable by the founders.

Non-profits aren't owned by anyone. The corporation is governed by a board that can be chosen by voting members, named by organizations designated in the bylaws or picked by the board itself. There are restrictions on the degree to which board members can act on items in which they have a financial interest.

With self-perpetuating boards or boards chosen by voting members, there is a chance that the organization will take a direction that was not intended by the founders. A board with directors appointed by other people or organizations, for example the founders, is less likely to take an unintended direction but there are limits on the extent to which appointed directors can act in the interest of their parent organization.

A mutual benefit corporation is another type of non-profit, and is similar in concept to a cooperative.

In California, CENIC (Corporation for Education Network Initiatives in California) is a non-profit that runs a statewide broadband network supporting K-12 and higher education institutions. It is a membership based non-profit, controlled primarily by major public and private universities, which in turn are its major customers. Because it is a non-profit serving primarily government entities (as well as a few private non-profit schools) it can more directly serve the needs of its members than it could if its members were for-profit companies.

The Nevada Hospital Association (technically a not-for-profit professional association) received a $20 million ARRA grant to build a public access fiber network throughout Nevada. OneCommunity received a similar grant to build a fiber network in Ohio, as did the University Corporation for Advanced Internet Development, which is working on a national network primarily for higher education use.

Advantage: some freedom of action, less potential for conflict of interest with the City.

Disadvantage: can be difficult to maintain control over the long term, financial and managerial options are restricted.

Cooperative

Cooperatives are not-for-profit corporations that are usually set up to provide some kind of benefit to members. Commonly, cooperatives are set up to pool buying power. Although there can be different classes of membership with different rights, generally governance is on the basis of one vote per

member, regardless of the amount of business a member does with the cooperative. Operating surpluses, on the other hand, are usually distributed to members according to how much business they do with the co-op.

The board of directors is chosen by a vote of eligible members. Although there are ways that founders can maintain a large degree of influence, it is possible that other members, representing a majority of votes, can gain control.

Examples:

California Broadband Cooperative. This ARRA grant recipient built and is now operating a 500 mile fiber optic network from Reno, down the eastern side of the Sierra generally along U.S. 395 in California to Barstow.

Plumas-Sierra Rural Electrical Co-op. A rare Californian example of a traditional rural utilities cooperative. These sorts of organization are common in the midwest and south, and provide telecommunications services as well as electricity.

Mid-Atlantic Broadband Cooperative. Located in rural Virginia, operates a fiber optic network of several hundred miles. Built with tobacco settlement money and ARRA funds.

Advantages: can be run strictly for the benefit of members, has freedom of action and can do business as a private company would.

Disadvantage: can be run strictly for the benefit of members (rather than focusing on public policy objectives), difficult for the founders to maintain control.

4. Requests for proposals

California cities have used a number of different strategies to solicit interest in infrastructure partnerships, conduit leases and other broadband initiatives. Some examples are:

Benicia - The city targeted a specific industrial area, put $750,000 on the table and asked companies to bid to build a system that would provide service to the area. Several proposals were received and the city is in the final stages of negotiating a contract with one of the proposers. The advantage is that the city gets the economic development boost it wants at a defined cost and no additional risk or operational involvement.

Los Angeles - The city put some assets – mostly existing middle mile fiber – on the table, offered good will efforts to obtain other assets, such as pole routes that the city also owns, and asked for what amounts to a full fiber to the home system. Advantage is that it focuses attention on the city's goal of improving broadband access for all residents. Downside, so far, is that there’s been no tangible result.

Salinas - The city put its conduit on the table (but no money) and asked companies for proposals to build out a broadband network in two targeted areas: downtown and a mostly greenfield area that's designated as an agricultural technology corridor. The RFP is still in process. The intended advantage is that the city will encourage economic development in two depressed areas and improve the city's overall infrastructure, and perhaps gain the benefit of better a better internal IT network, without incurring significant costs.

Watsonville - The city stitched 3 miles of existing conduit and fiber together with a mile of new conduit. It built, owns and operates the system. It was done as a standard public works build-to-spec bid (not a formal RFP), and the city went with the low bidder. The system was built with the intention of using it as a replacement for the INET formerly provided by Charter Communications. It serves that purpose now and the city is in the process of developing a standard rate card for leasing out surplus capacity to ISPs. Advantage is that the city has complete control over the network with guaranteed completion, and a much lower cost of operation for its IT infrastructure. Disadvantage is that the city pays the full construction cost (~$300,000) and ongoing operating expense (and responsibility).

Inyo County - The county asked for someone to both build a fiber to the home network and find the money to do it. Nothing substantial was on the table. Only two responses came back. One was from a construction company that basically said "if you give us enough money we'll build it for you". The other was from a reputable fiber company that offered to look for grant funding. Nothing has come of it yet, and it doesn't appear anything will. Advantage is zero risk. Disadvantage, to date, is zero gain.

Seattle - An RFP to lease out a short section (~200 feet) of city-owned conduit was issued. Advantage is the city gains revenue, and some economic development benefit. Disadvantage is that it's limited.

San Leandro - An exclusive negotiating rights agreement (ENRA) was entered into with a major local company, OSI Soft, to build a fiber enterprise called Lit San Leandro. No public RFP was published; the ENRA was in response to an offer made by a local company for use of city-owned conduit. A similar process was used in the City of Brentwood and the City of Santa Cruz. The advantage is that the city can quickly take advantage of a firm offer made by an interested party, and have greater control over the negotiating process. The disadvantage is that it requires an interested party at the beginning.

San Luis Obispo - An RFP to lease out two miles of city-owned conduit was issued. Similar to Seattle, but for a longer distance.

5. Municipal broadband case studies

Some cities, such as Palo Alto, San Leandro, Benicia and Santa Monica, are involved to one degree or another in developing broadband facilities and services for commercial and industrial areas. Other cities, for example Alameda, Loma Linda, Lompoc and Provo, Utah, have pursued broadband projects that are focused on providing consumer-class Internet service to homes. Still others, such as Santa Cruz, Brentwood, Kansas City and Austin, Texas, have used policy initiatives to attract private fiber-to-the-home projects.

Each city has its own particular set of circumstances, constraints and needs, but all have determined that broadband is an essential twenty-first century utility – as necessary for economic development and social equity as water or electricity – and that there is a public interest in encouraging its development.

Municipal broadband business models include city or county owned and operated networks, partnerships with private companies, and facilitation of the development of completely private systems.

Examples (in California unless otherwise indicated) include:

City of Palo Alto – the municipal electric utility has installed more than 40 miles of fiber optic cables, which it makes available to business and industrial customers, and is supplementing this coverage with publicly available, amenity grade WiFi access (i.e., intended to meet occasional, on-the-spot needs of tourists and shoppers, for example, rather than daily household, business or educational needs). No residential service is offered. The system generates more than $2 million in surplus revenue a year.

City of Santa Clara - similar to Palo Alto, the city's electric utility provides access to fiber optic lines to businesses, and also uses the smart meter infrastructure it has installed to support amenity grade WiFi service. This system also generates an annual surplus.

City of San Leandro - as noted above, the city entered into an agreement with a local company, Lit San Leandro, to provide access to city-owned conduit. This private company installed fiber optic lines in the city's conduit, to support commercial and industrial customers as well as public uses. In the second phase of this project, the city applied for and received a grant from the federal Economic Development Administration to install additional conduit in order to extend the fiber network. In exchange, the city receives access to the network for its own use and, eventually, will receive conduit lease revenue. The city incurs costs to support the project and currently generates no direct revenue, but has had significant success in attracting new, high technology businesses.

City of Lompoc - the city's electric utility department built and continues to operate a municipal WiFi utility which was originally intended to provide ubiquitous Internet access to homes and businesses. Although using WiFi to provide primary Internet access to homes proved problematic, the system provides a valuable, albeit low speed, lifeline option for residents and access for visitors. The revenue generated by this service is not sufficient to meet costs, and it is currently subsidized by other city funds.

City and County of San Francisco - over the years, San Francisco has developed an extensive, municipally owned fiber system to meet internal networking needs. Surplus capacity in the system is leased to private companies, most notably Google Fiber, which may use it to connect to multiple dwelling units. Going forward, this municipal network will be expanded as opportunities are presented. A policy is in place that requires inclusion of broadband conduit in public projects and to provide an option for placement of publicly-owned conduit in private projects which involve cutting into streets and other right of ways.

City of Watsonville - since the end of local cable television franchising in California, cable companies have begun charging cities for the use of institutional networks – INETs – originally provided at little or no cost. Charter Communications initially wanted to charge the City of Watsonville $150,000 a year for the use of its INET, which connected critical city facilities. Because the city had a policy of routinely keeping an inventory of conduit and other network assets that had been installed on a prospective basis as well as for specific projects over the year, it was able to use conduit routes it already owned to duplicate all but a few segments, totalling a mile, of the INET system. The remaining gaps were connected via conduit installed by the city for about the cost of two years of service from Charter.

City of Brentwood - for the past 17 years, the city has required new home construction to include empty conduits which are deeded over to the city. An agreement has been reached with an independent Internet service provider, Sonic.net, to use the city-owned conduit to install fiber lines and provide fiber-to-the-home service to homes already served by conduit, and extend the system over time throughout the city.

City of Pacific Grove - a contract was approved with SiFi Networks, a U.K.-based company, which provides the company with access to city streets, right of ways and sewers in order to build a fiber-to-the-home network. Originally, the project would have been funded by SiFi Networks, using capital raised overseas and repaid with guaranteed leases from incumbent operators. This financing mechanism is commonly used in Europe and elsewhere in the world, however incumbent business models in the U.S. do not support it. Consequently, SiFi Networks proposed that the City take over responsibility for lease payment at an annual cost of approximately $1 million per year, which might or might not be offset by operating surplus. So far, this plan has met with skepticism.

Kansas City, Kansas and Missouri and Austin, Texas – local governments have worked with Google Fiber to facilitate construction of privately-owned, competitive fiber-to-the-home systems. This facilitation includes access to government owned facilities, such as right of ways and pole access for fiber installation and real estate leases for equipment huts, as well as a high degree of cooperation in granting permits and carrying out inspections.

Table E-1 – Municipal broadband enterprises

		Markets Served					
City	**Business model**	**Business**	**Industrial**	**Public uses**	**Amenity WiFi**	**Homes**	**Financial notes**
Alameda	Formerly public, now private.	•		•		•	Funded by revenue bonds, bondholders lost when system was sold at 50% of value.
Austin, TX	Google Fiber, private.	•	?	•		•	No direct city investment, provided concessions regarding access to city assets, permits.
Benicia	Private with public funding.	•	•				Under development, funded by transportation grant
Brentwood	Conduit is developer funded; private operator.	•	?	•		•	Conduit deeded to city required in new construction. City leases conduit to 3rd party provider.
Kansas City	Google Fiber, private.	•	?	•		•	No direct city investment, provided concessions regarding access to city assets, permits.
Loma Linda	Conduit is developer-funded; city owns & operates system.	•	•	•		•	Conduit required in new & major remodel construction. Service is optional & fee-based.
Lompoc	City owned & operated, WiFi only.			•	•	•	WiFi-only system, funded by 10 year lease-back and subsidized by utility department.
Pacific Grove	Private, city funding undefined.	•		•		•	Either city or private provider will have to pay fee to company that funds/builds.
Palo Alto	City owned & operated, funded via electric utility. Dark fiber only.	•	•	•	•		$2+ million surplus/year, initially funded as electric infrastructure, now self supporting.
Provo, Utah	Built via city utility revenue bonds; sold to Google for $2.	•	?	•		•	Ratepayers still paying off electric revenue bond obligations incurred to build network.
San Francisco	CCSF owned; operated as an ad hoc service; built via IT budget		•	•			City conduit and fiber originally installed for public purposes; funded out of agency budgets.
San Leandro	City traffic signal conduit leased to local company.	•	•	•	•		Extension funded by EDA grant. City will receive revenue in future years.
Santa Clara	City owned & operated, funded via electric utility. Dark fiber only.	•	•	•	•		$500K surplus/year, initially funded as electric infrastructure, now self supporting.
Santa Cruz	City funded, leased by private operator	•	•				Limited initial build funded by private partner.
Santa Monica	City owned & operated “lit service”: system built with IT budget funds.	•	•	•	•		Revenue appears to be at or above break even level.
Seattle	City conduit lease via RFP.		•				Limited conduit revenue only, no larger network built.
Watsonville	City owned fiber; run as ad hoc service; built via IT, public works budget.		•	•			Saved the City $150,000/year in telecoms costs, now generating revenue.

Appendix F – Funding options

Some California cities are in a position to use economic development resources, including federal and state grants and other financing vehicles to expand existing broadband facilities, either on behalf of private companies or as part of a municipal enterprise. Examples of potential funding sources include the Economic Development Administration, U.S. Department of Agriculture and the Federal Communications Commission's Connect America Fund phase 2 (CAF-2) on the federal level, and the California Teleconnect Fund, the California Advanced Services Fund (CASF) and the California Infrastructure and Economic Development Bank at the state level.

All these programs have different eligibility and matching fund requirements, service levels, application processes, design and due diligence standards and schedules. To a degree, these programs are complementary, but in many respects there are conflicting requirements or standards. Another, larger problem is that each program – including local telecommunications budgets that receive state and federal subsidies – is independently administered and, with the occasional exception of CASF, is managed without regard for the others.

To an extent, this variety is useful. For example, homes that are not eligible for CAF subsidies might be eligible for funding from CASF. The challenge is to comprehensively analyse eligibility on a census block by census block and project by project basis, and coordinate grant and loan applications and service contracts accordingly.

The challenge in West Sacramento is to identify which funding sources are realistically available, given the City's economic and demographic characteristics and existing service levels.

1. Bond funding

The City of Santa Cruz attempted to negotiate an agreement with a local Internet service provider – Cruzio – to operate a fiber-to-the-premise system that would be built with money raised via revenue lease bonds. Cruzio would have been responsible for making bond payments, although the City remained the ultimate guarantor. The City and Cruzio were unable to come to agreement on risk sharing and build out plans, and the funding plan was shelved. However Cruzio is moving forward with a more limited, self funded fiber project that is focused on business customers, and City participation has not been ruled out.

Other municipal broadband projects have been built via other types of bonds or lease-back financing.

The City of Alameda funded construction of a cable television and Internet system by its municipal electric utility with revenue bonds secured only by revenue from the project. It could not generate sufficient revenue to meet its bond obligations and the system was sold at a loss to the local private cable operator, Comcast. Because the bonds were only backed by revenue from the cable system, and not the electric utility or the city's general fund, bondholders lost approximately 50% of their

investment. The city was able to successfully defend the subsequent lawsuits. Since then, no California city has funded a broadband project using pure revenue bonds.

The City of Provo, Utah began building a fiber to the home system with bond repayment guaranteed by revenue, first from the project and then from its municipal electric utility. However, the revenue was insufficient to meet bond obligations and a mandatory $5.25 monthly fee was added to residential and commercial electric bills. The system was subsequently sold to Google for a nominal amount, although the bond obligations remain with the city and local electric ratepayers.

2. Infrastructure financing districts

Although it can be difficult to gain approval for traditional bond measures, new legislation enacted in 2014 (Senate Bill 628) gave local agencies the ability to form enhanced infrastructure financing districts and issue tax increment financed bonds with 55% voter approval. These districts can also use incremental property tax gains to pay back other kinds of financing, including private loans. Additionally, Assembly Bill 2292, passed the same year, added broadband infrastructure to list of allowable projects that may be pursued by traditional infrastructure financing districts.

To date, no California jurisdiction has formed such a district for broadband project purposes.

3. Economic Development Administration

Jurisdictions that are eligible for grants from the federal Economic Development Administration (EDA) may apply for grants to build certain types of broadband infrastructure and perform various broadband related planning tasks, including feasibility studies and engineering work. Broadband infrastructure projects can be eligible for grants under the EDA's public works program, which typically funds 50% of project costs up to $3 million. Planning grants also typically require a 50% match, and will provide up to $1,250,000 in funding.

The first such grant in California was received by the City of San Leandro to build underground telecommunications conduit, which it then made available to a private telecommunications company. Since then, the EDA put a higher priority on broadband infrastructure, and is accepting proposals for such grants within its regular application cycle. It recently awarded the City of Hayward a $2.7 million grant for a conduit and fiber project.

4. Transportation funding

Broadband projects as such are not eligible for funding under the various state and federal transportation infrastructure programs, but broadband facilities installed as elements of transportation projects are usually eligible for funding. Typically, broadband facilities must either enhance the operations of the transportation project or improve public safety. Examples include spare capacity included in traffic signal interconnect conduit and conduit installed in bike paths to support public safety agencies.

A bill (AB 1549) enacted in 2016 encourages Caltrans to include broadband facilities, such as conduit, in its future construction projects.

5. Educational broadband programs

The federal E-rate program provides subsidies to schools and libraries, including funds to upgrade supporting infrastructure under certain circumstances. The Corporation for Education Network Initiatives in California (CENIC) funds, builds and manages educational broadband networks in California, including high capacity networks for higher education. Generally, the specific resources funded through these sorts of programs are restricted to use only by qualified schools, libraries and research institutions, but in many cases those specific resources can be purchased from or be made part of a larger project. If, for example, municipal conduit projects were to be planned in West Sacramento, consideration should be given to opportunities to link to eligible schools and libraries that might be able to contribute such funds.

It is also advisable to maintain an ongoing conversation with school districts that serve West Sacramento. Educational organizations are not required to consult with other local agencies when using federal and state funds to build broadband infrastructure.

6. Telemedicine programs

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

7. California Advanced Services Fund

The State of California has established the California Advanced Services Fund (CASF) to pay for broadband infrastructure in areas where service that meets the CPUC's minimum standard of 6 Mbps download and 1.5 Mbps upload speeds is not available. Typically, CASF will subsidize 60% of construction costs in areas where substandard service is available and 70% in areas where broadband service is not available at all. An additional 20% of constructions costs, up to a total of $500,000, can be covered via loans from CASF. A separate program provides funding for broadband facilities and adoption programs in public housing communities.

8. Connect America Fund

The Federal Communications Commission gives operating subsidies to telephone companies that provide broadband service in rural and/or remote areas, as a part of its universal service mandate. In the current round – Phase 2 – of the Connect America Fund (CAF-2) program, the FCC offered large telephone companies a right of first refusal to accept these funds or not, on a state by state basis. AT&T

and Frontier Communications accepted CAF-2 subsidies for a total of 978 locations in Yolo County, however none of those locations are in West Sacramento.

The FCC closed the application window in 2014 for its rural broadband experiments program, also funded through CAF. Initially, three projects in California – two in Monterey County and one in the San Joaquin Valley – were provisionally funded, but all three failed to meet program requirements and were dropped from consideration. In at least two cases, the applicants were unable to obtain the particular kind of technical and financial expertise required by the FCC and other federal agencies. In all three cases, the areas involved had much smaller populations and were either more remote and/or had economies that were more dependent on agriculture than West Sacramento's.

9. Rural Utilities Service

The U.S. Department of Agriculture runs several broadband-related grant and loan programs via the Rural Utilities Service (RUS). These programs include Community Connect Grants, loans and loan guarantees and a series of gigabit community pilot projects. The loan programs are available on a year-round basis, while application windows are periodically announced for the grant programs.

In the past, service providers in California have had difficulty qualifying for and/or winning RUS funding. The programs have been designed with midwestern and southern business models and demographics in mind, which are markedly different from conditions in California. These programs typically define eligibility in terms of population, to distinguish between rural areas, which are fundable, and urban areas, which are not. Under any of the USDA definitions used, West Sacramento's population exceeds the established limits and would be considered an ineligible urban area.

10. ARRA programs

American Recovery and Reinvestment Act of 2009 (ARRA) included the Broadband Technology Opportunities Program (BTOP) run by the National Telecommunications and Information Administration and the Broadband Initiatives Program (BIP) run by the Rural Utilities Service. Several billion dollars in grants and loans were awarded, and the programs are no longer funded or active, except to the extent that the responsible agencies are managing implementation and compliance. In the past, though, some cities received stimulus grants for the purpose of building publicly available telecommunications networks. Chattanooga, Tennessee is the best known example. It received approximately $100 million in grants through ARRA and, via its municipal electric utility, used it to build a fiber-to-the-home system.

11. Other funding sources

Both the State of California and the federal government operate programs that provide funding to various types of agencies – for example police and fire departments, sheriffs' offices and other first responders – for the purpose of purchasing broadband and other telecommunications services and facilities. Typically, this money is not directly available for construction of commercially available broadband infrastructure but can used to support business plans on an ongoing basis.

Appendix G - Glossary

ADSL	Asymmetric Digital Subscriber Line: DSL service with a larger portion of the capacity devoted to downstream communications, less to upstream. Typically thought of as a residential service. ADSL2 is the second generation of ADSL technology and provides higher service levels.
ATM	Asynchronous Transfer Mode: A data service offering by ASI, that can be used for interconnection of customer's LAN. ATM provides service from 1 Mbps to 145 Mbps utilizing Cell Relay Packets.
Backhaul	Connecting Internet access to a location over long or short distances. Usually, wired networks, particularly fiber networks, are necessary to provide sufficient interconnection capacity, but wireless technology is also used for some applications.
Bandwidth	The amount of data transmitted in a given amount of time; usually measured in bits per second, kilobits per second, and megabits per second.
Bit	A single unit of data, either a one or a zero. In the world of broadband, bits are used to refer to the amount of transmitted data. A kilobit (Kb) is approximately 1,000 bits. A megabit (Mb) is approximately 1,000,000 bits.
Broadband	"Broadband" refers generally to any telecommunications service capable of supporting digital data transmission at high speeds. These services can include and/or support Internet, television, telephone, private data networks and various specialized uses. Broadband service can be delivered in a variety of ways, including telephone lines (e.g. DSL), coaxial cable (e.g. cable modem), fiber optic cable (e.g. Lit San Leandro), wireless cellular/mobile service (e.g. cell phones, tablets, wireless modems), WiFi, point-to-point and point-to-multipoint wireless service (e.g. TelePacific, Etheric) and hybrid networks (XO Communications). Although different organizations use different criteria, the California Public Utilities Commission considers 6 Mbps download and 1.5 Mbps upload speed to be a standard for adequate broadband service availability. Unless otherwise stated, this report uses the CPUC definition.
Byte	The amount of memory space needed to store one character, which is normally 8 bits.
Cable modem	A device that hooks to your cable TV line to allow your computer to receive Internet service.
CDMA	The type of digital cellular phone network used for 3G (and older) service by some carriers in much of the United States, but rare elsewhere in the world. CDMA stands for Code Division Multiple Access, and CDMA2000 1x is the third-generation, or 3G, extension to which CDMA cellular operators are upgrading their networks. It is a digital cellular technology that uses spread-spectrum techniques.

Cell	The geographic area covered by a cellular telephone transmitter. A connected group of cells form a cell system, which is what you gain access to when you sign up for cellular telephone service.
Cellular	A mobile communications system that uses a combination of radio transmission and conventional telephone switching to permit telephone communications to and from mobile users within a specified area.
CLEC	Competitive Local Exchange Carrier: Wireline service provider that is authorized under state and Federal rules to compete with ILECs to provide local telephone service. CLECs provide telephone services in one of three ways or a combination thereof: a) by building or rebuilding telecommunications facilities of their own, b) by leasing capacity from another local telephone company (typically an ILEC) and reselling it, and c) by leasing discreet parts of the ILEC network referred to as UNEs.
Coaxial cable	A type of cable that can carry large amounts of bandwidth over long distances. Cable TV and cable modem service both utilize this technology.
Commercial class	Broadband service similar to residential service in that the provider takes effectively all responsibility for installing, maintaining and supporting the service. Speeds are similar (6 to 100 Mbps), but service levels, reliability, consistency and pricing are higher.
Copper	Most telephone and cable lines are built using copper wires, which is a telecommunications technology that has been in use since the 19th century. The term is to distinguish lower capacity copper wires (and cables) from higher capacity fiber optic strands (and cables) that are made from glass or plastic.
CPCN	Certificate of Public Convenience and Necessity: Authorization given by the CPUC to telecommunications carriers in order to provide service in the state of California.
Dark fiber	Fiber optic cables are composed of many, very thin fiber optic strands made of glass. A laser is used to send a beam of light through a fiber optic strand, and this beam carries data from one end to the other. If no electronic equipment (i.e., the laser) is connected to a strand, it is literally dark, and cannot carry data. Dark fiber is sought after and used by telecommunications carriers and large companies that prefer to install and operate their own electronic equipment at either end.
Dial-Up	A technology that provides customers with access to the Internet over an existing telephone line.
DS3	A dedicated phone connection supporting data rates of about 43Mbps (megabits per second). Also called a T-3, the line actually consists of 672 individual channels, each of which supports 64Kbps. DS3 lines are used mainly by Internet Service Providers (ISPs) connecting to the Internet backbone. Large businesses also use DS3 lines when they have large sites to interconnect.

DSL	A common form of broadband Internet connection. DSL stands for Digital Subscriber Line.
E-Rate	A Federal program that provides subsidy for voice and data lines to qualified schools, hospitals, CBOs, and other qualified institutions. The subsidy is based on a percentage designated by the FCC. CTF benefits are calculated net of the E-rate subsidy.
E911	Enhanced 911, an emergency service that automatically sends phone number and location information to the operator. E911 comes in handy, say, when you need to get emergency help and are unable to speak or don't know your location.
Ethernet	The most common networking standard in the world, formally known as IEEE 802.3.
Fixed wireless	Broadband systems based on fixed wireless technology provide Internet service using outdoor antennas installed on homes and businesses. It is most commonly found in rural areas, but it is also sometimes used by businesses to compensate for poor wireline service in urban areas. Fixed wireless systems can provide services between two specific locations – i.e., point to point – or from a central access point to many locations in the surrounding areas – i.e., point to multipoint.
FTTN	Fiber To The Neighborhood: A hybrid network architecture involving optical fiber from the carrier network, terminating in a neighborhood cabinet with converts the signal from optical to electrical.
FTTP	Fiber To The Premise.
Gigahertz	A measure of electromagnetic wave frequency equal to one thousand million (1,000,000,000) hertz, often abbreviated as GHz and used to specify the radio frequency used by wireless devices. 802.11a networks operate at 5 GHz. 802.11b and g networks use 2.4 GHz, which is susceptible to interference from nearby cordless phones and microwave ovens that use the same frequency.
GPON	Gigabyte-Capable Passive Optical Network, a type of distribution network often used for fiber to the premise service.
GSM	Global System for Mobile Communications: This is the current radio/telephone standard in Europe and many other countries except Japan and the United States.
Hub	A common connection point for devices, such as computers and printers, in a network.
ILEC	Incumbent Local Exchange Carrier. An ILEC is a telephone company that was providing local service when the Telecommunications Act of 1996 was enacted. Compare with CLEC, a company that competes with the already established local telephone business.

Industrial class	Broadband service where the customer plays a much greater role in provisioning and supporting the service, including buying different elements from different vendors and managing installation and support. Speeds would be higher – perhaps as high as a Gigabit per second or more – and quality of service levels could be as high as Tier 1. Comcast's Business Class service or AT&T's business DSL service are examples of commercial class service. A DS-3 or dark fiber strands are examples of industrial class service.
I-Net	Institutional Network. Provides a high-speed connection between government, educational and community entities. It is often negotiated with a cable franchise, in exchange for using right-of-way in a jurisdiction.
ISP	Internet Service Provider: A company providing Internet access to consumers and businesses, acting as a bridge between customer (end-user) and infrastructure owners for dial-up, cable modem and DSL services.
LAN	Local Area Network: A geographically localized network consisting of both hardware and software. The network can link workstations within a building or multiple computers with a single wireless Internet connection.
Last mile	Infrastructure (e.g., fiber optic lines, distribution boxes, equipment vaults, poles, conduit) that provides broadband service to end users or end-user devices (including households, and businesses).
Lit fiber	Fiber optic cables are composed of many, very thin fiber optic strands made of glass. A laser is used to send a beam of light through a fiber optic strand, and this beam carries data from one end to the other. When this kind of electronic equipment (i.e., the laser) is installed and operating, then the fiber strand is literally "lit" and ready to transmit data, either for the company that operates it or for third-party customers.
Local Loop	A generic term for the connection between the customer's premises (home, office, etc.) and the provider's serving central office. Historically, this has been a wire connection; however, wireless options are increasingly available for local loop capacity.
MAN	Metropolitan Area Network: A high-speed date intra-city network that links multiple locations with a campus, city or local telephone service area. A MAN typically extends as far as 50 kilometers.
Managed services	The type of service provided by dominant incumbent providers, such as AT&T and Comcast. Rather than providing a simple connection between points – via lit or dark fiber – these companies provide full Internet bandwidth services, at a speed and quality of service level they specify, and sometimes with quantity limits, i.e., data caps. It is analogous to water service: these companies sell "water" and don't rent out access to their "pipes".
Mbps	Megabits per second: 1,000,000 bits per second. A measure of how fast data can be transmitted.

Middle mile	Broadband infrastructure that does not predominantly provide broadband service to end users or to end-user devices, and may include interoffice transport, backhaul, Internet connectivity, or special access. Middle mile facilities are the link between last mile facilities and major interconnection points, such as those that form the core of the Internet.
Modem	Short for modulator/demodulator. A modem modulates outgoing digital data into analog signals so they can be sent over copper phone lines, and demodulates incoming analog signals into digital.
Overbuilders	Building excess capacity. In this context, it involves investment in additional infrastructure project to provide competition.
PON	Passive Optical Network: A Passive Optical Network consists of an optical line terminator located at the Central Office and a set of associated optical network terminals located at the customer's premise. Between them lies the optical distribution network composed of fibers and passive splitters or couplers. In a PON network, a single piece of fiber can be run from the serving exchange out to a subdivision or office park, and then individual fiber strands to each building or serving equipment can be split from the main fiber using passive splitters / couplers. This allows for an expensive piece of fiber cable from the exchange to the customer to be shared amongst many customers thereby dramatically lowering the overall costs of deployment for fiber to the business (FTTB) or fiber to the home (FTTH) applications.
Rights-of-Way	Legal rights of passage over land owned by another. Carriers and service providers must obtain rights-of-way to dig trenches or plant poles for cable systems, and to place wireless antennae.
Router	An intelligent network device that goes one step beyond bridging by converting address-based protocols that describe how packets of information move from one place to another. In practice, this generally comes down to translating between IP addresses and MAC addresses for data flowing between your local network and the Internet. Many people use the term interchangeably with "gateway."
Subscribership	Subscribership is how many customers have subscribed for a particular telecommunications service.
Switched Network	A domestic telecommunications network usually accessed by telephones, key telephone systems, private branch exchange trunks, and data arrangements.
T-1	The T-1 standard was introduced in 1961 in order to support a bi-directional speed of 1.5 Mbps at a high quality-of-service level, using the copper wires of the time. Because it is a dedicated and managed circuit, its performance is usually substantially better than shared services such as DSL or cable modem, even in cases where the claimed top speed of those shared services is many times higher. A T-1 circuit is generally considered to be the lowest level of service that can be described as industrial or carrier class.

Telco	An abbreviation for Telephone Company.
Telecommunications	Refers to all types of data transmission, from voice to video.
Throughput	The amount of data that can be transmitted in a given amount of time. Throughput is commonly measured in bits per second. (Although throughput is not really a measurement of speed, most people, including us, use the word "speed" when talking about a high-throughput network.)
Universal Service	Originally a congressionally mandated federal program of providing every home in the United States with basic telephone service. The FCC has extended this definition to include broadband service. In California, the program is run by the California Public Utilities Commission and is supplemented with state funds.
VDSL	Very-high-bit-rate digital subscriber line (VDSL or VHDSL)[1] is a digital subscriber line (DSL) technology providing data transmission faster than asymmetric digital subscriber line (ADSL) over a single flat untwisted or twisted pair of copper wires (up to 52 Mbit/s downstream and 16 Mbit/s upstream),[2] and on coaxial cable (up to 85 Mbit/s down- and upstream)[3] using the frequency band from 25 kHz to 12 MHz.[4] These rates mean that VDSL is capable of supporting applications such as high-definition television, as well as telephone services (voice over IP) and general Internet access, over a single connection. VDSL is deployed over existing wiring used for analog telephone service and lower-speed DSL connections. This standard was approved by ITU in November 2001.
Videoconferencing	Conducting a conference between two or more participants at different sites by using computer networks to transmit audio and video data.
VLAN	Virtual Local Area Network. A network of computers that behave as if they are connected to the same wire even though they may actually be physically located on different segments of a LAN.
VoIP	Voice Over Internet Protocol: A new technology that employs a data network (such as a broadband connection) to transmit voice conversations.
VPN	A method of creating an encrypted tunnel through which all traffic passes, preventing anyone from snooping through transmitted and received data. VPN stands for virtual private network.
WAN	Wide Area Network, A collection of local area networks connected by a variety of physical means. The Internet is the largest and most well-known wide area network. Wide area network is generally abbreviated to WAN.
WiFi	Short for wireless fidelity and is meant to be used generically when referring of any type of 802.11 network, whether 802.11b, 802.11a, dual-band, etc. The term is promulgated by the WiFi Alliance. Any products tested and approved as "WiFi Certified" (a registered trademark) by the WiFi Alliance are certified as interoperable with each other, even if they are from different manufacturers.

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

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