City of San Luis Obispo, California

Broadband Plan

June 21, 2023

FINAL

Magellan
An ENTRUST Solutions Group Company

www.MagellanBroadband.com

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1. Executive Summary

The transition to a digital world has accelerated, spurred by the shift to online learning, remote work, e-commerce, the increase in the automation of services, and advances in technology. The foundation enabling this transformation are fiber optic networks that can provide the high-speed, low latency connectivity required for advanced applications and uses. An engaged community with a shared technology vision and data driven mindset will enable the City of San Luis Obispo to drive innovation, economic benefits, and overall wellbeing for the City.

Magellan was contracted by the City to undertake a Broadband Plan to help improve access and affordability to high-speed internet service for community members, businesses, and efficient delivery of City services. Magellan's scope of work included:

- Asset inventory
- Market analysis
- Needs assessment
- Review of the City's Capital Improvement Program (CIP)
- Conceptual network
- Financial analysis
- Business and service models
- Grant funding opportunities

San Luis Obispo is largely subject to the common telecom duopoly with limited competition (Charter and AT&T, though Astound is beginning to roll out residential services in limited areas). Prices for gigabit internet services are between $80 to $90 per month. However, there is a vast disparity in price between customers that subscribe to lower-bandwidth packages (<100 Mbps) – who pay $1.19 per Mbps – and those customers who purchase higher-end packages (>100 Mbps) who pay just $0.23 per Mbps. This disparity reinforces the Digital Divide by providing sub-par speeds and higher pricing for households with lower discretionary income.

The City's existing 35.5-mile communications network provides the foundational infrastructure from which the City can build, expand, and enhance its broadband presence in the City to ensure greater community access. This network could be transformed into a city-wide backbone redundant loop, capable to ensuring uninterrupted services to both City facilities and the community at large, through a 3-phased approach that would add 23.5 miles of new conduit and fiber and upgrade 120,000 feet of the existing network with new fiber cables.

The total cost for these City network upgrades and new construction is estimated at $13.5 million; however, this could be lowered to $10.4 million if the City were to continue and expand its lease of third-party fiber from private companies and the County of San Luis Obispo.

Network expansion costs could be further reduced through effective coordination of the City's Capital Improvement Program (CIP) project, public and private utility projects, and implementation of a joint trench or "dig once" ordinance. These broadband-friendly policies ensure that there is an opportunity to jointly deploy new broadband infrastructure – both public and private – at a fraction of the cost by coordinating multiple projects that require excavation within the public right-of-way.

There are also two major broadband grant opportunities forthcoming that the City should aggressively pursue that could help with a portion or all of the network construction costs: Senate Bill 156 Last Mile Federal Funding Account (one-time county-wide allocation of $22.3 million)[1], and the California Advanced Service Fund (CASF) Broadband Infrastructure Account (statewide annual allocation of $150 million through 2032).

If the City were to operate its public communications network as an Internet Service Provider (ISP), there are significant start-up, fixed, and operational costs to consider for requisite staffing, network transport equipment, maintenance, etc. A financial analysis of the expanded conceptual network design shows that more than 27,000 households and 1,800 businesses fall within a 750' buffer of the proposed new fiber backbone. Using conservative industry-standard take rates and pricing tiers, the 20-year projections suggest this network could generate positive revenues, even after accounting for start-up capital required to connect retail subscribers (but excluding the $13.5 network construction costs).

Many cities solicit an experienced, private ISP through a public-private partnership, in which the ISP operates, manages, and sells retail internet services over publicly-owned fiber in exchange for lease payments, revenue share, new City network construction, or a combination thereof. Additionally, an experienced private ISP partner will be required if the City were to apply for SB 156 Last Mile grant funding, and the partner could also assist the City in contributing toward the local match requirement.

[1] SB 156 Last Mile grant funding application scoring criteria includes up to 10 points for providing a local match. Based on existing federal infrastructure grant programs, the amount necessary to secure the full 10 points is estimated to be approximately 20% of the project costs.

2. Broadband Asset Inventory

Magellan identified significant infrastructure within San Luis Obispo that can be leveraged for broadband – whether as locations in the public sphere or right-of-way to host equipment, conduit and fiber pathways to connect facilities and neighborhoods, opportunities to deploy smart city devices and applications, or integration of public and private networks in innovative partnerships.

2.1 PUBLIC INFRASTRUCTURE

Cities already own and manage significant public infrastructure in order to provide services to the community. Many municipal assets can benefit from being connected to network infrastructure. At the same time, municipal assets can be used for community connectivity. Land, buildings, poles, and towers can support antenna. Conduit and poles can hold fiber-optic cable as it runs along streets and roads. The public easements or rights-of-way (RoW) along those roads may be the most valuable assets, along with other public property.

All of this can make widespread access to high-speed connectivity more feasible by accelerating the deployment of the requisite digital infrastructure and reducing costs.

City Conduit & Fiber Optic Cable

Use of existing conduit and fiber can greatly reduce the cost of fiber deployment. Even if fiber cables are old or limited in use, they can be replaced in conduit with higher-strand cables to exponentially increase capacity. The City can use conduit for its own purposes, and/or may lease it to network service providers to reduce barriers to entry and encourage competitive broadband services; however, conduit capacity is finite and can quickly be fully utilized with just a couple of carriers pulling in their own cables. A more preferred option is to lease fiber strands themselves to carriers (each of which can be 5-10 microns in diameter), and when combined with wave division multiplexing technology, high-strand cables (288) can provide virtually unlimited capacity.

In addition to identifying where conduit is located, each segment needs to be assessed for size (diameter), capacity (the number of cables already installed in a single conduit, and the number of fiber strands within each cable that are already in use), as well as condition (physical damage, bend radius, accessibility, etc.). Conduit does not always need be designated specifically for broadband/fiber networks; existing conduit structures, such as traffic signal control networks, street lighting, or even abandoned water/sewer lines can be rehabilitated and utilized to deploy fiber optic cable. The engineering and labor required to

deploy new underground conduit can represent 35-65% of the total cost of deployment, so utilizing existing assets can create significant cost savings.

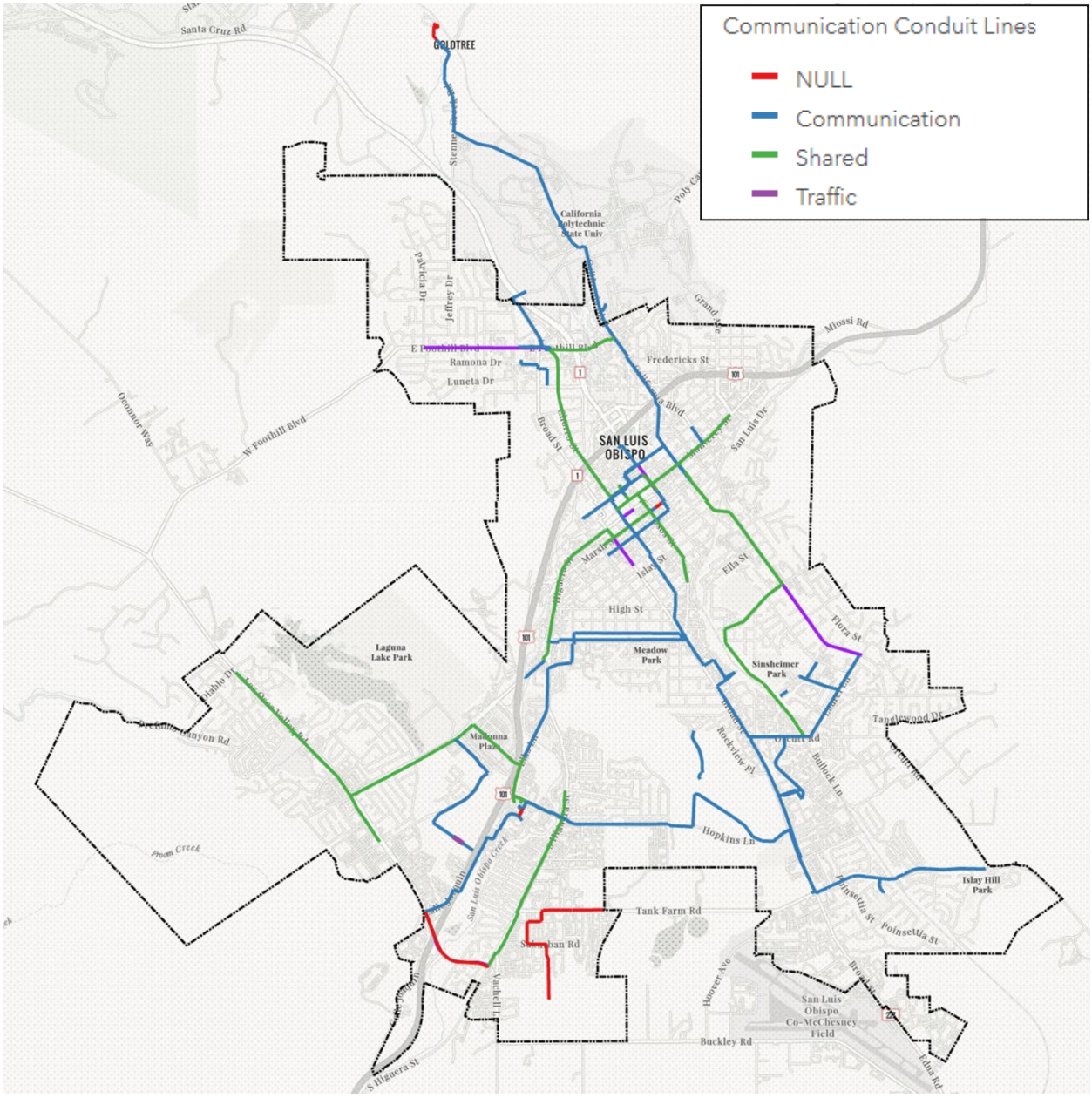

Figure 1 - City Fiber Communications Network

The City owns and manages a substantial fiber communications network of 187,154 feet of conduit and/or fiber optic cable (see Figure 1). The network is delineated between exclusive City Communications (blue), traffic signal interconnect (purple), and a portion of the network where the City leases conduit space and/or fiber strands to third parties (green). There are portions of the network identified as “null” (red) that have fiber/conduit, but it is not known whether these are shared or City-exclusive.

The Shared Network includes sections where conduit and/or fiber is leased/shard with Astound (formerly Digital West). A portion of the backbone cable is jointly owned by Cal Poly and the City, with the City allocated a number of fiber strands through a 2002 agreement that is set to expire in 2052. The specific strand count of this Cal Poly-City cable fluctuates, as does the City's strand allocation. The design engineering project will include field work and surveys would determine specific cable capacities and allocations.

The City's 35.5 mile network creates several loops throughout the City, which creates a redundant backbone to support critical City services. The network includes 440 communication boxes, handholes, or vaults placed throughout the network, providing the ability to expand and grow the network by interconnecting new assets or fiber networks.

Data and information on the size of the conduit, the number of fiber strands, strand use and capacity, as well as conduit space capacity was, unfortunately, stored on an aged-out software program that is no longer supported, so details were not available.

An operational fiber network of this size has an estimated valuation of $12-15 million, providing the City with a substantial asset that can be leveraged and/or monetized through creative lease agreements or public-private partnerships.

The City augments its publicly-owned network to ensure communications and connectivity to City facilities, buildings, and assets through an agreement with a private fiber/internet services provider Astound (formerly Digital West). The City entered a non-exclusive license agreement with Digital West in 2011, which is now being re-negotiated, in which the City allowed Digital West to install its own fiber optic cable within the City's communication network in exchange for rights to utilize Digital West fiber strands to connect existing City facilities for city services.

The City is able to connect nine (9) existing City buildings utilizing Digital West/Astound fiber located within City conduit, and will have the rights to utilize 12 strands of Digital West fiber wherever it exists in order to provide City services. As the City is under a non-disclosure agreement with Digital West, the location and details of those private assets cannot be publicly shared. These fibers licensed by Astound to the City are for governmental use only, and cannot be used or sub-leased to generate City revenue.

There are three segments of City communications conduit/fiber that are not interconnected into the rest of the network; two of these (the red portion in the southern area of the City along Tank Farm Road, and a small segment along Ramona/Benton in the northern end of the City) may be interconnected through leased fiber from Astound's network. However, the third disconnected segment between Blue Rock Drive and the Edna Saddle Water Tank does not appear to be connected with either City or Astound fiber to the rest of the network.

City Traffic Signals & Interconnect Network

Traffic signal poles and associated structures are typically located along major transportation arterials, which similarly correspond with major commercial corridors, and are interconnected with electrical and/or signal control conduit networks. Many signal interconnect networks were originally conduit with twisted copper cables, but these underground conduit networks can be rehabilitated and used to pull in fiber optic cable at a fraction of the cost of deploying new underground infrastructure. Alignment with road arterials makes signal control networks ideal assets for cost-effectively deploying new fiber backbones to critical economic development areas.

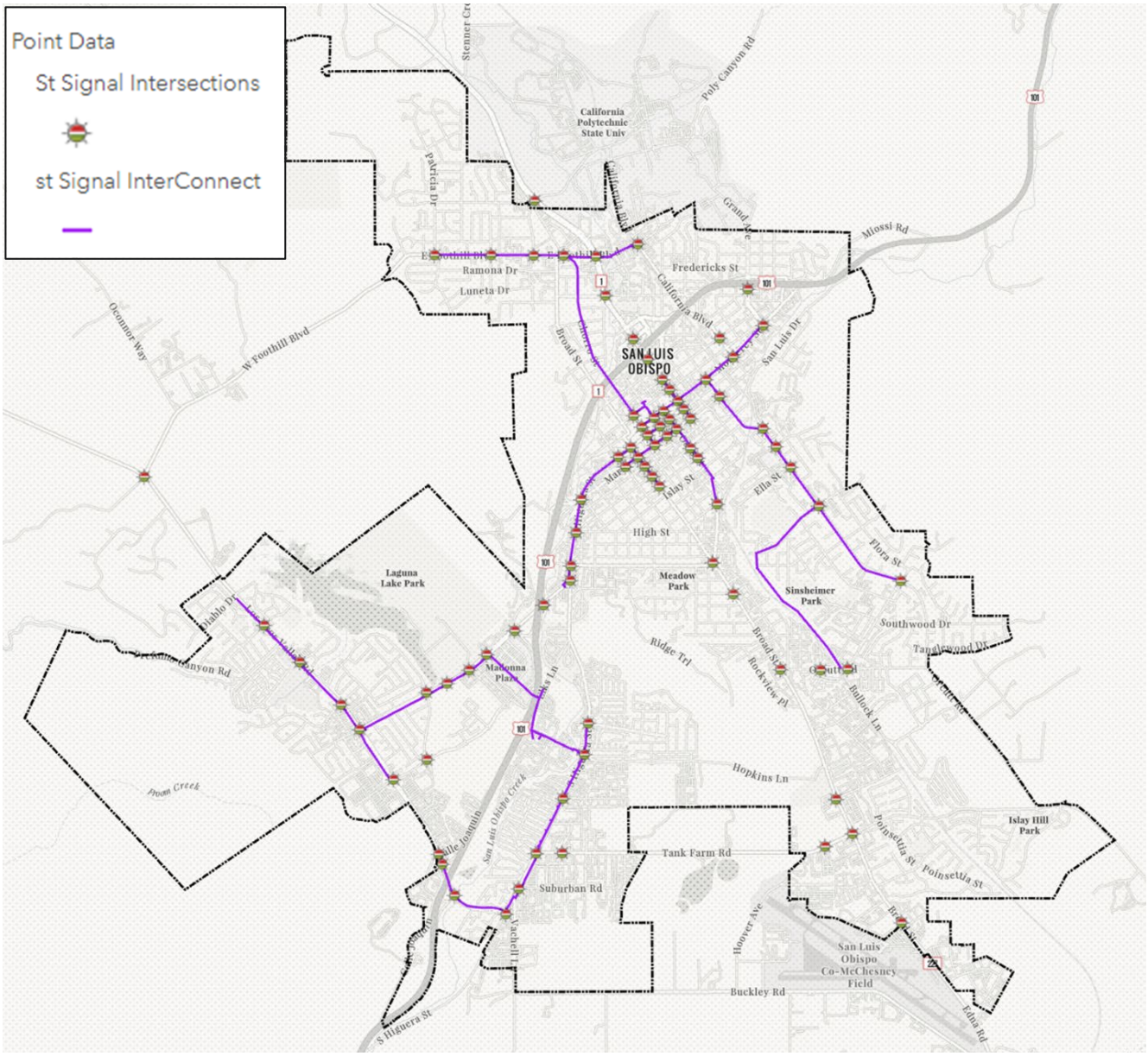

Figure 2 - Traffic Signals & Interconnect Conduit & Cables

Approximately 8,074 feet of the 13.8 mile traffic signal interconnect network has been integrated into the City's overall communications network, and may have already been rehabilitated to some degree in order to house fiber optic cable. The rest of the traffic control network coincides along the same corridors, but is physically separate from, the City's communications network. Only six of the City's 82 traffic signals are not connected through either the signal interconnect and/or the City's communication network.

City Street Lights

Public streetlights offer a significant and valuable asset that can be leveraged for broadband and smart city deployment in urban areas. The City owns and operates 2,742 street lights throughout the City, which are connected to 872 points of service (POS), owned by either PG&E or the City.

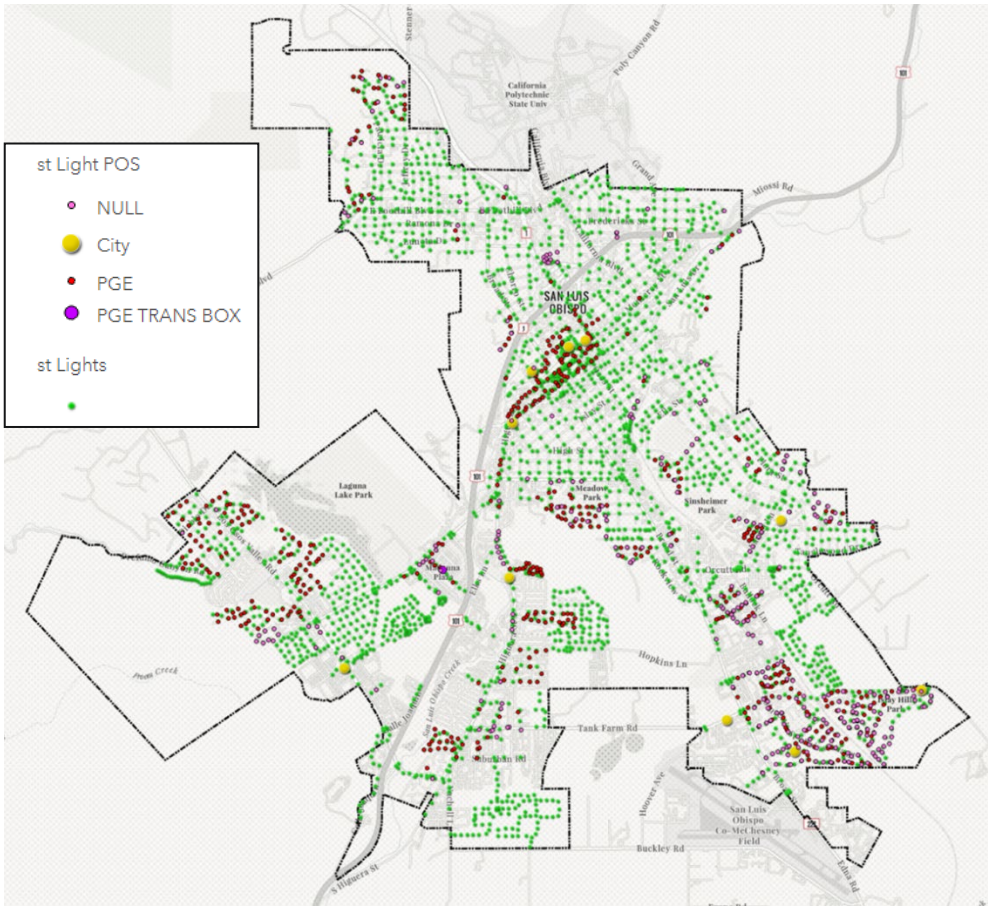

Figure 3 - City Street Light Grid

The City's fiber communication network is aligned along major transportation and commercial corridors. However, the City's extensive inventory of street lights penetrates most residential neighborhoods. The typically dense nature and geographic reach of streetlights offers a significant opportunity, particularly for deployment of 5G small cell

technology through leasing poles to the major cellular carriers (AT&T, Verizon, & T-Mobile) that can cost-effectively provide high-speed broadband coverage into neighborhoods that lack adequate internet speeds. Streetlight poles and conduit can be leased to generate revenue, or leases can be offered as in-kind contributions for public-private partnerships, providing cost-effective infrastructure that can be used to deploy new fiber cables in existing conduit, and/or install smart city devices on poles (smart lighting management, cameras, traffic management, environmental monitoring, etc.).

City Buildings & Facilities

Opportunities for expansion to support broadband and smart city applications are not limited to conduit and poles; existing public buildings, parks, and other facilities can be utilized to build out a public network through deployment of antennas, radios, sensors, cameras, data servers, community Wi-Fi spots, and interconnection points for redundancy and disaster recovery.

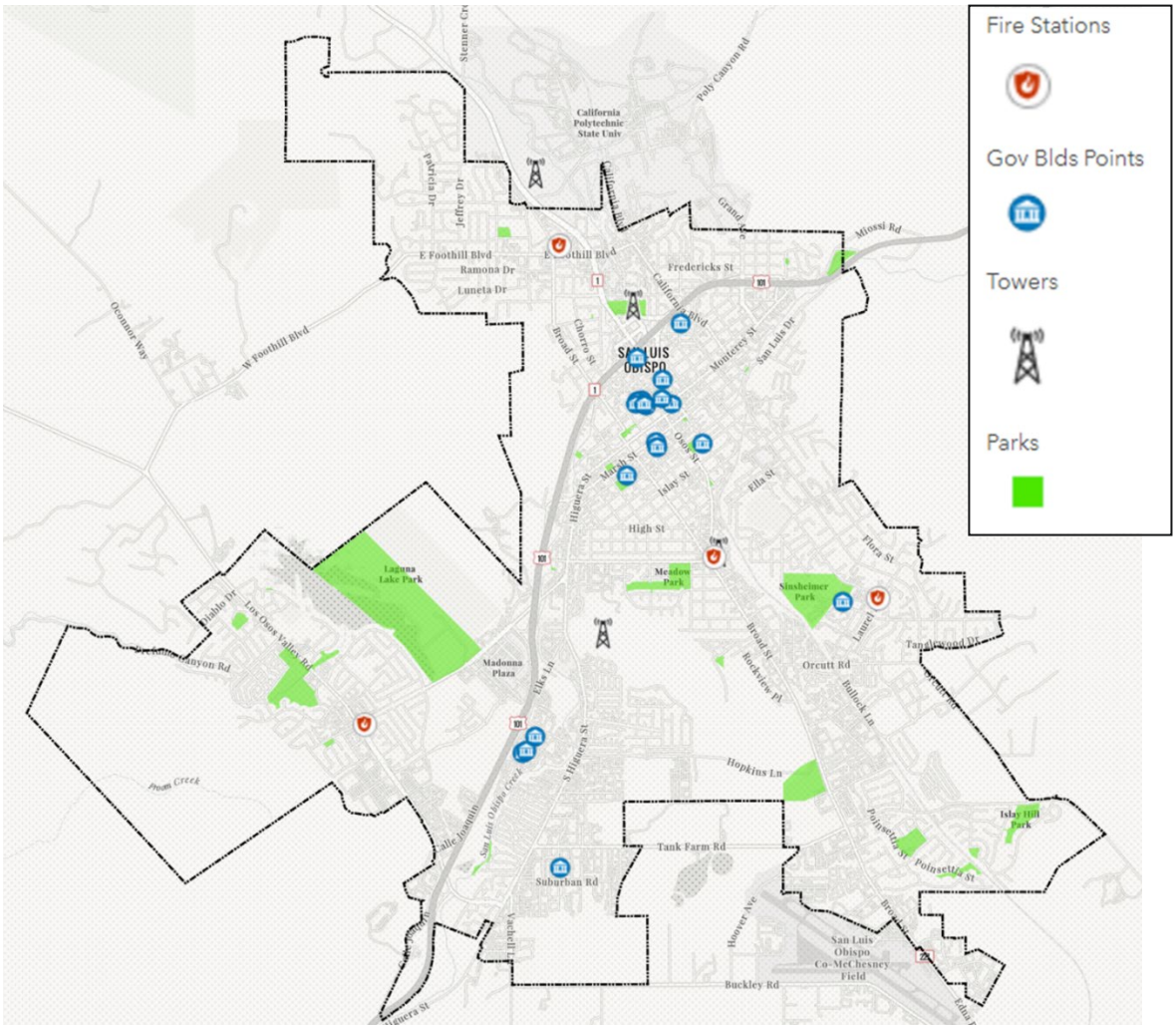

Figure 4 - City Assets & Facilities

Often the type of public asset is specific to the area targeted for broadband deployment. For example, public works maintenance yards typically allow for penetration into industrial areas; parks typically offer opportunities to reach residential neighborhoods; administrative buildings often are situated within downtowns or business districts.

The City has 19 City-owned facilities (government buildings, fire stations, parking structures, and corp yards) as well as 4 communications towers, as shown in Figure 4. However, five City-owned facilities are currently not redundantly connected to the City's municipal IT network. The City's parks also are not connected to the network at all but could function as base stations for wireless distribution if they had a fiber backhaul and connection point.

Table 1 - City Facility Connectivity

Fully-Connected Facilities on City Network	
KVEC Tower	Hwy 1 - Stenner Creek
Santa Rosa Cell Tower	150 Oak Street
Fire Station 1 Tower	2160 Santa Barbara St.
South Hills Tower	South Hills Open Space
Data Center in Fire Station	2160 Santa Barbara St.
EOC	2160 Santa Barbara St.
Fire Station 2	126 North Chorro St.
Fire Station 1	2160 Santa Barbara St.
Fire Station 3	1280 Laurel Lane
City Hall	888 Morro Street
Public Works	919 Palm Street
City Corporation Yard	25 Prado Road
City Utility Offices	879 Morro Street
Police Department	1042 Walnut Street
City Bus Yard	Prado Road
Parks and Rec	1341 Nipomo St.
Ludwick Comm Center	846 Santa Rosa St.
SLO Senior Center	1445 Santa Rosa St.

Facilities on City Network but which Lack Redundancy	
Fire Station 4	1395 Madonna Rd.
Parking Structure	879 Morro Street
Parking Structure	871 Marsh Street
City Parking Offices	1260 Chorro Street
Water Treatment Plant	35 Prado Road

The City also has five parking lots (in addition to the three parking structures), as well as 49 parking pay stations, all within a 7-block area downtown between Marsh Street and Palm Street. These parking-related assets could be interconnected, through both fiber cable and remote/wireless connections, in order to deploy smart parking management applications within the City's core.

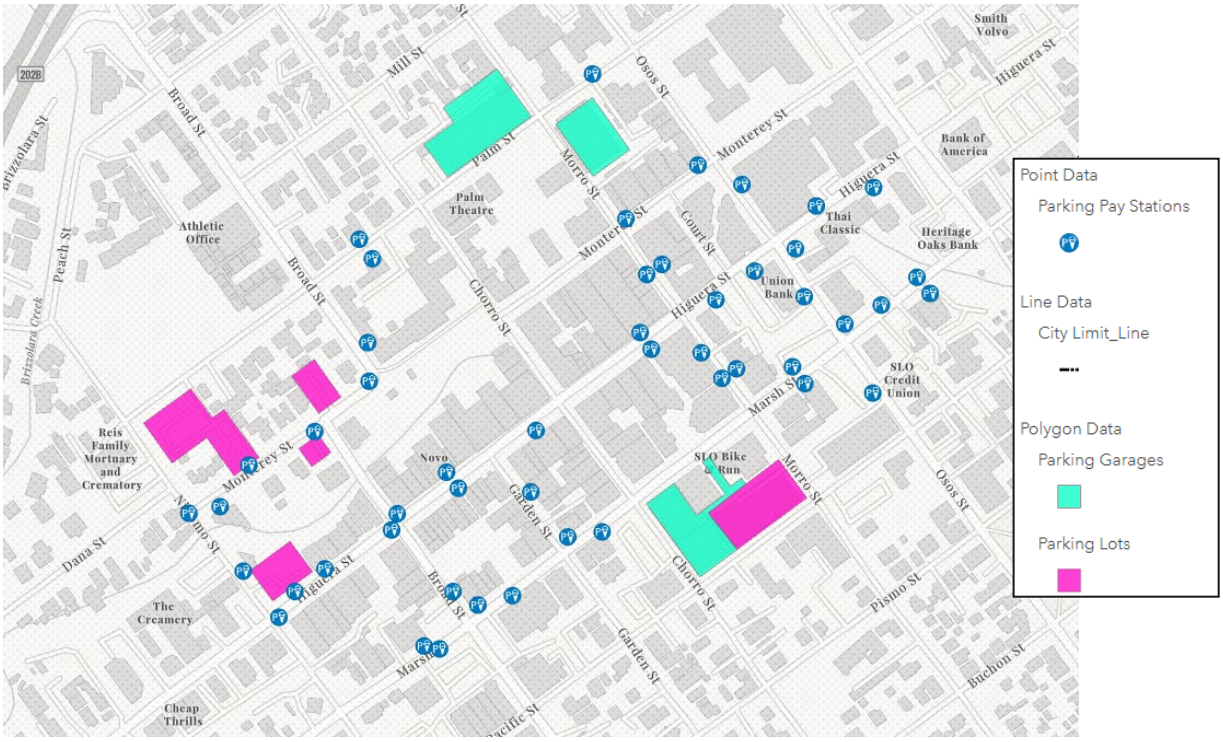

Figure 5 - City Parking Assets

City Water Assets

Water assets can provide an asset that can be utilized for communications distribution, such as water tanks that typically have line-of-sight and elevation advantages for locating wireless antenna or towers. However, there are also benefits to water service operations that can be realized through interconnecting water assets, such as remote and real-time monitoring and testing points, remote valve control, and smart water management through conservation technology and applications.

The City has significant water assets distributed throughout the City, with the water treatment plant located outside of City limits near Stenner Creek, 10 water tanks throughout the City (including two outside of City limits), 15 water sampling points, 9 groundwater sampling points, and 66 irrigation control valves (see Figure 6).

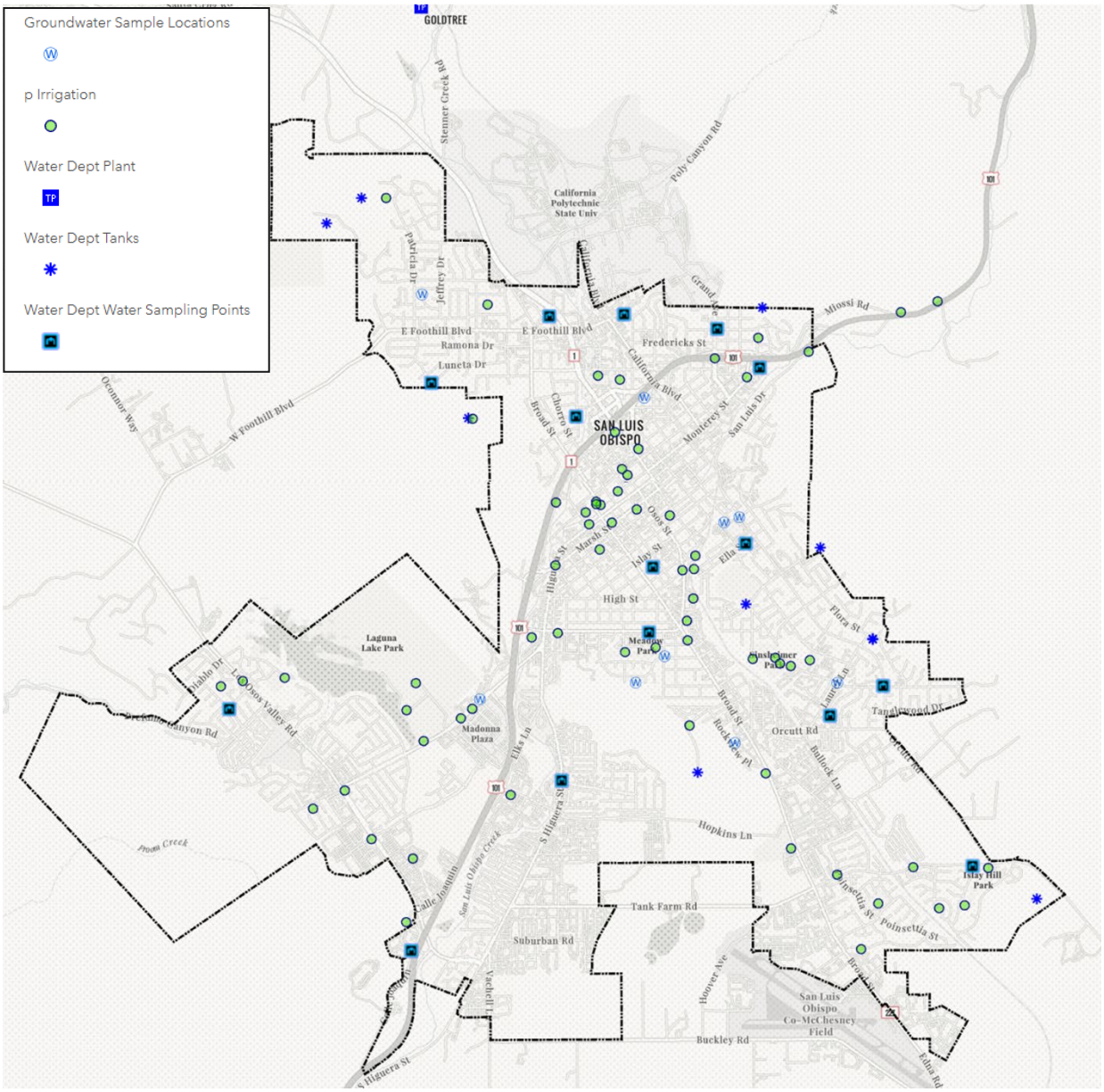

Figure 6 - City Water Assets

The water plant at Stenner Creek is already connected on the City's fiber communication backbone, but does not have a redundant path to ensure uninterrupted connectivity. Many of the irrigation valves do not necessitate connectivity over a fiber cable; however, the 10 water tanks are critical infrastructure that can also serve as a distribution point, and should be interconnected on the City's fiber network.

County Fiber & Conduit

The County of San Luis Obispo has several fiber routes, especially within the City limits, ranging from 12-strand fiber cables all the way up to 216-strand cables. These cables

connect the County's sites and assets within the City to the County's regional network. There were no details on capacity of the County fiber (used vs. available strands); however, if there were capacity available, the City could lease strands from the County to provide redundancy for critical City sites, such as the water plant near Stenner Creek. The City IT team reported that these discussions with the County are already underway.

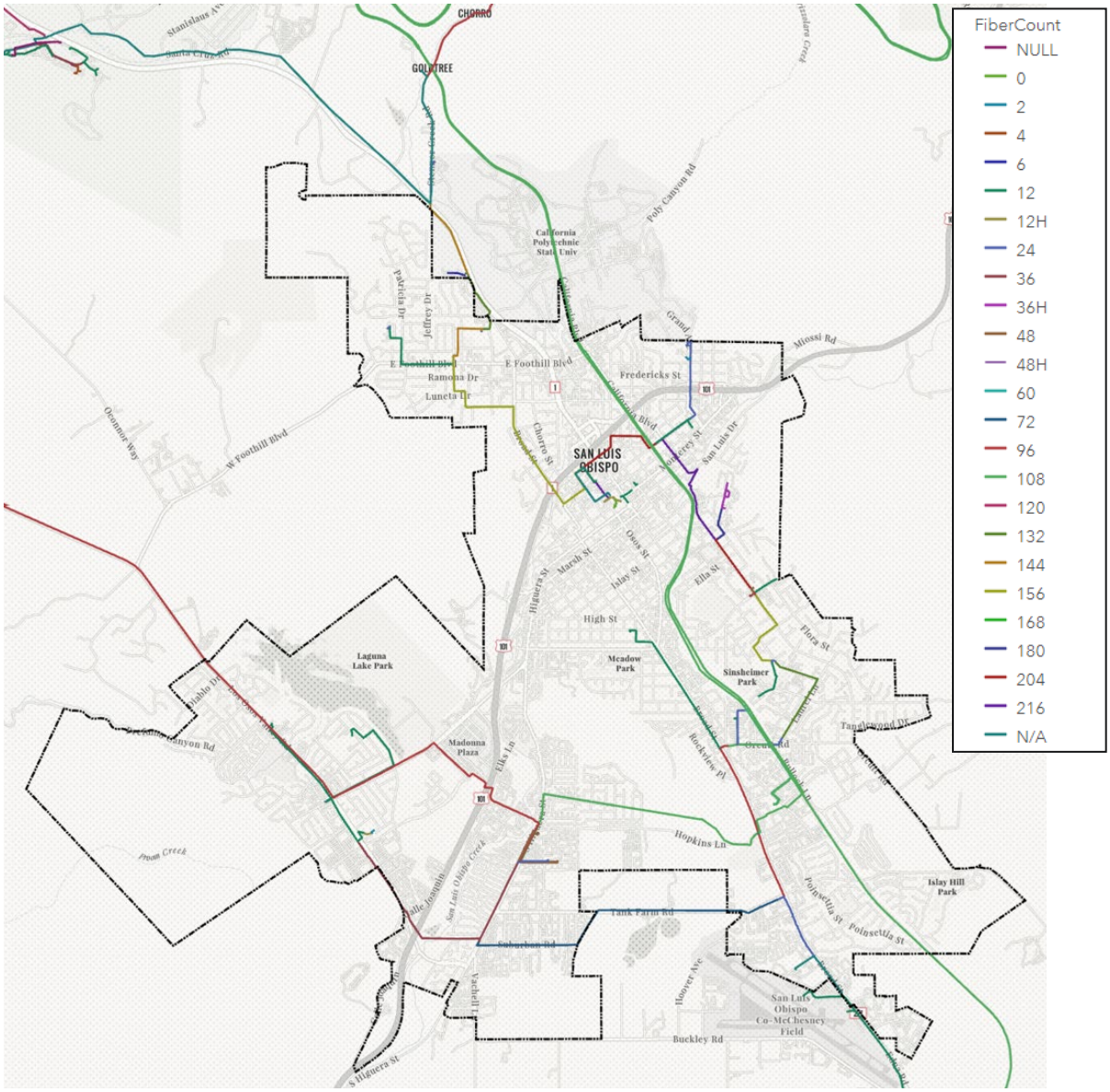

Figure 7 - County Fiber & Conduit Network

Golden State Net Middle-Mile Network

The State of California has been very active in designing and implementing broadband policies to expand broadband availability and digital literacy in the state. Governor

Newsom made significant findings in Executive Order N-73-20[2] issued on August 14, 2020, addressing the need for improved broadband services, closely followed by passage of Senate Bill 156, which addressed broadband through the 2021 budget package.

The state middle-mile network, known as Golden State Net, is well underway, with portions of the network being planned and designed within the City of San Luis Obispo along California State Route 1 and U.S. Highway 101.

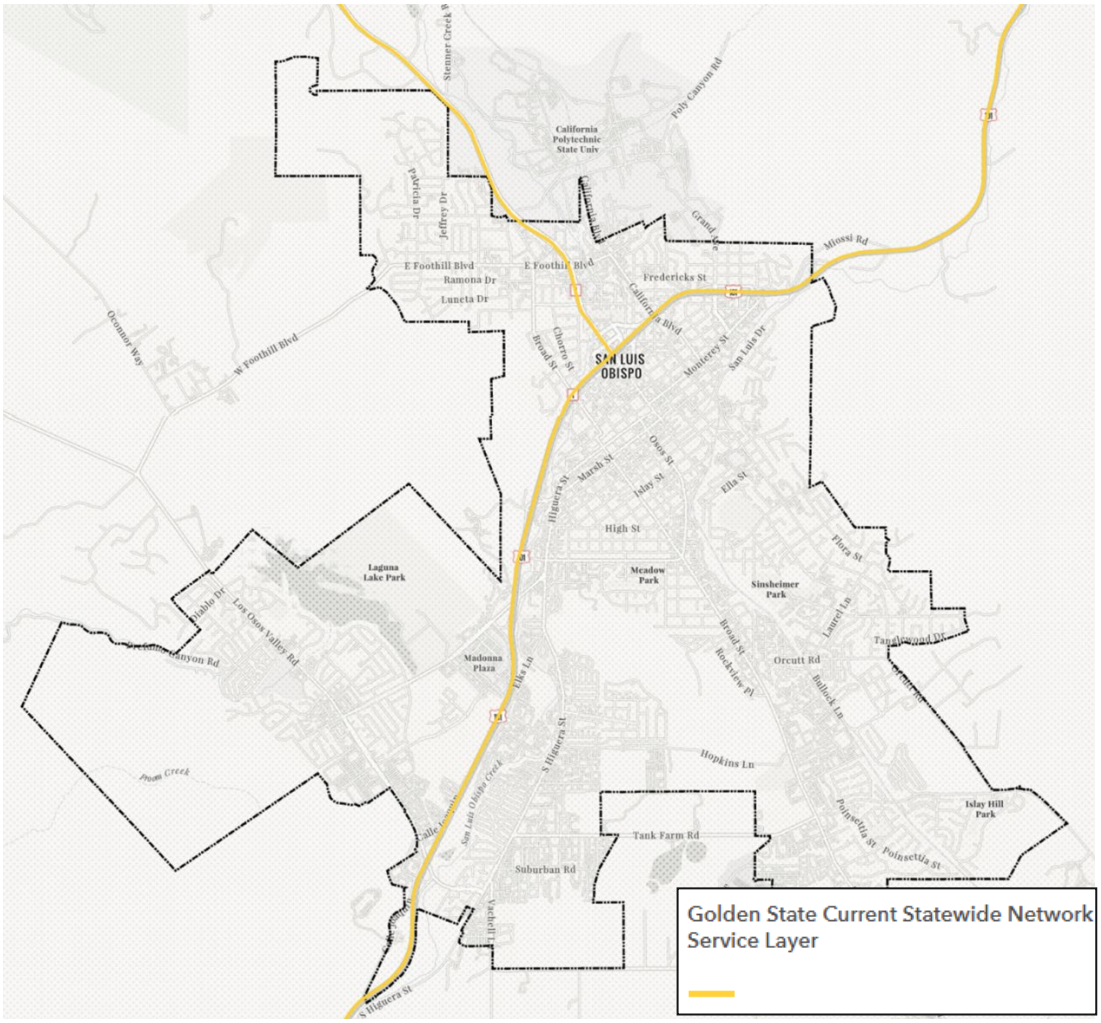

Figure 8 - California Golden State Net - Planned Middle-Mile Project

The anticipated routing of the Golden State Network in San Luis Obispo will provide a public-access fiber infrastructure that can provide the City long-haul data transport access to data centers and internet exchanges in Los Angeles, San Jose, and elsewhere. Traditionally, these long-haul transport routes would need to be leased from private organizations. Additionally, the Golden State Network can be utilized to complete local

[2] Source: https://www.gov.ca.gov/2020/08/14/38666/

network loops to ensure City redundancy without having to construct and install new routes, creating significant cost savings. The construction of the Golden State Network will provide both cost savings and enhanced network reliability for the City's fiber optic backbone.

2.2 PRIVATE FIBER ASSETS

Magellan analyzed the broadband landscape of the City of San Luis Obispo to determine the private broadband assets within the City. Emphasis was placed on "facilities-based" carriers, or those that own their own physical infrastructure including fiber, copper, and coaxial cables, as well as wireless infrastructure.

Spectrum/Charter

Spectrum is the second largest cable company in the US, with revenues near $50 billion per year. They have close to 30 million residential subscribers and over 2 million small and medium business customers nationwide.

Spectrum's network is based on a Hybrid Fiber-Coax (HFC) architecture, which includes a fiber backbone but coax cable for last mile distribution.

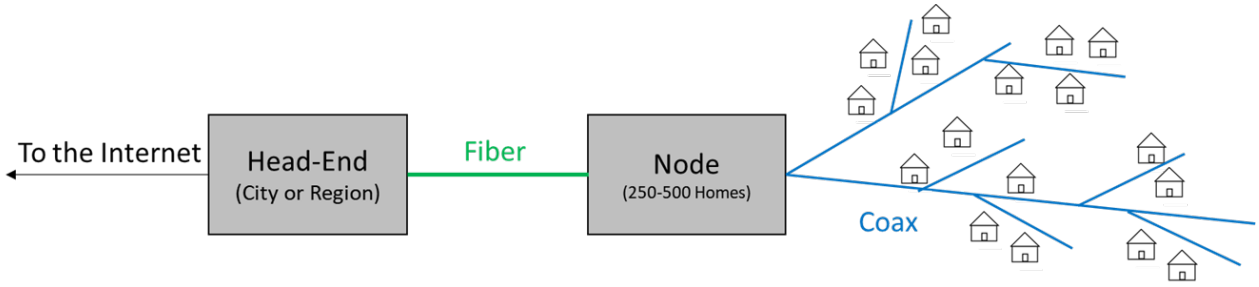

Figure 9 - Hybrid Fiber-Coax Network Architecture

These HFC broadband networks are designed to send large amounts of data from the network to the end point such as the home. Smart city applications based on remote devices sending small amounts of data can leverage the consumer-grade broadband from Spectrum. However, mission critical applications and those requiring higher bandwidth to the network (upstream) require an alternative solution.

As the legacy cable company, Spectrum has essentially 100% coverage of the residential market through their HFC network, as shown in Figure 10.

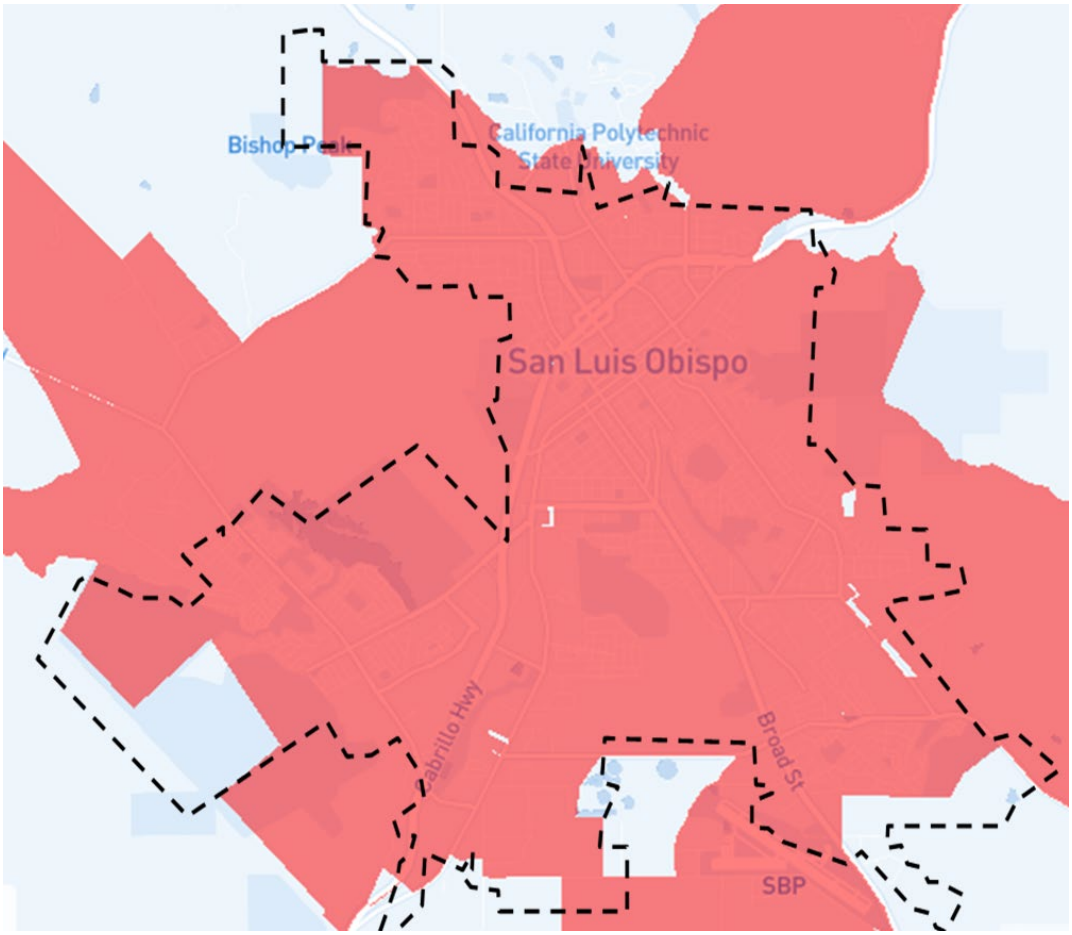

Figure 10 - Spectrum HFC Network & Coverage[3]

While Spectrum's HFC network is generally capable of delivering gigabit download speeds to its residential and small business market, these speeds, latencies, upload limitations, and service level agreements are not sufficient for enterprise-level businesses or institutional anchors.

However, Spectrum has limited fiber beyond their backbone that drives their HFC network, with few areas of the City eligible for direct fiber-to-the-premises services, as shown in Figure 11.

[3] Source: https://broadbandnow.com/

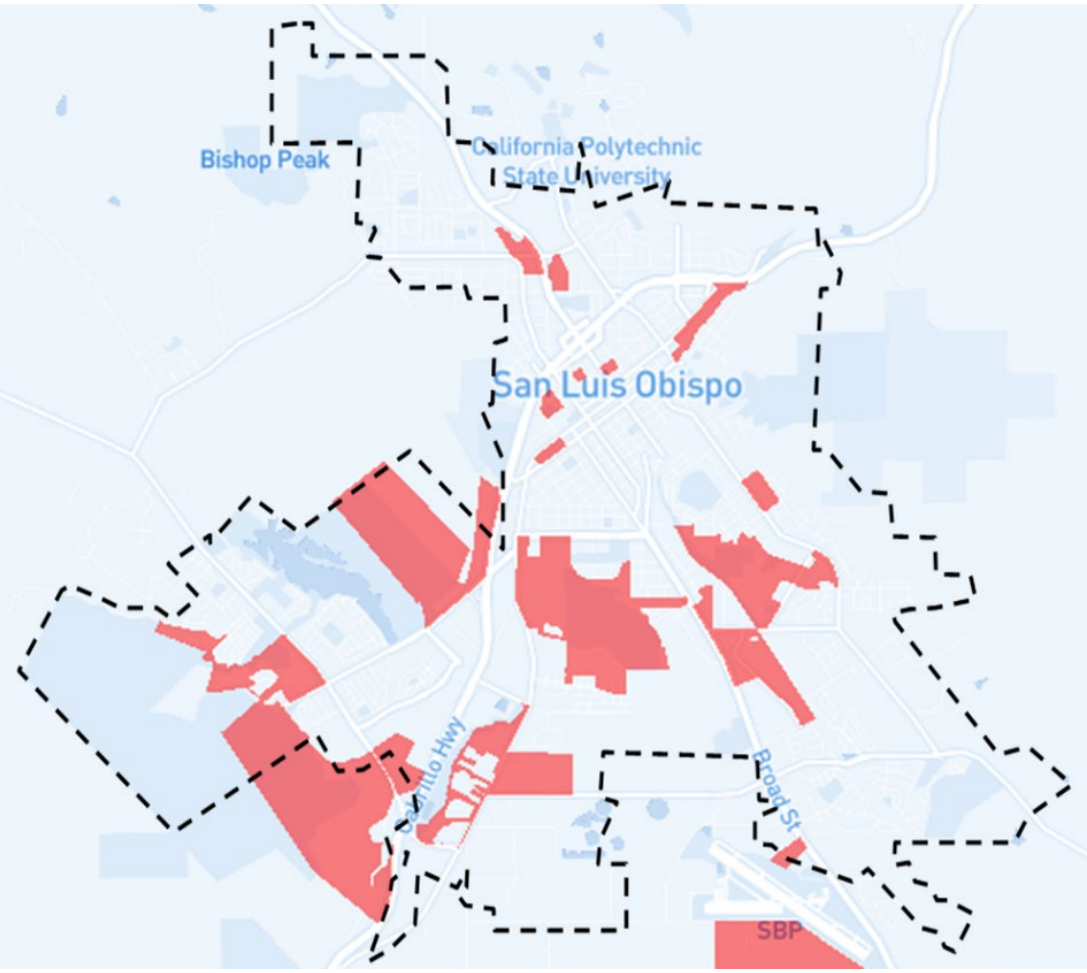

Figure 11 – Spectrum's Advertised Fiber-to-the-Premises Coverage Map[4]

AT&T

AT&T is the incumbent local exchange company (ILEC) or the legacy telephone company in San Luis Obispo. Historically, the ILEC has nearly 100% coverage and this is true with AT&T in San Luis Obispo (see Figure 12). However, this coverage is primarily through their legacy investments in DSL (Digital Subscriber Lines) technologies, which enable data services over their installed base of copper phone wires. DSL technology is obsolete with no new DSL plant being installed. The data rates supported by DSL depend on the length of the copper wire and the type of DSL deployed.

[4] Source: https://broadbandnow.com/

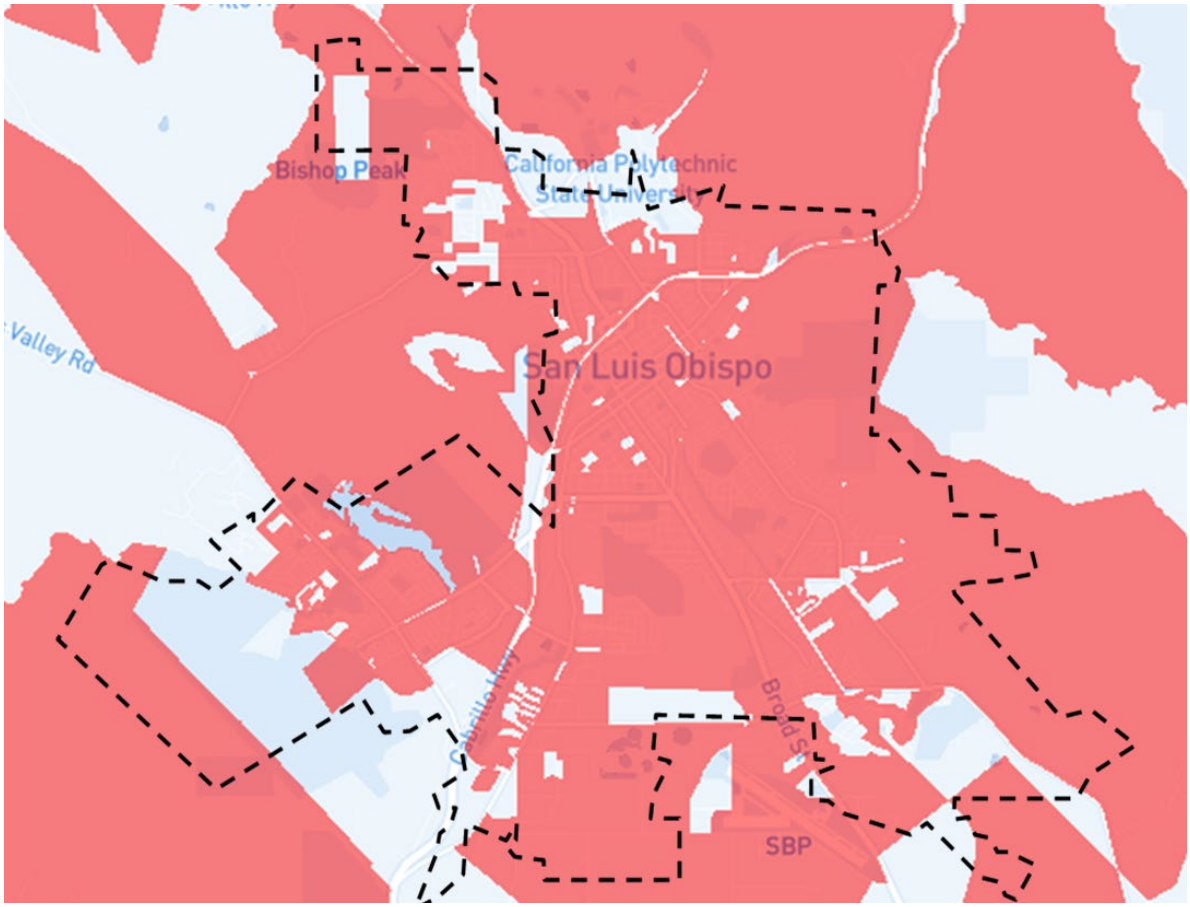

Figure 12 - AT&T DSL Internet Services Coverage Map[5]

Maximum "up to" download bandwidth speeds offered by AT&T over DSL technology typically don't exceed 50-75 Mbps, and commonly average between 5-10 Mbps. These speeds do not meet the California minimum standards of 100 Mbps, and cannot meet the speeds or service levels required by most businesses. DSL data rates above 25 Mbps would imply that AT&T has deployed some fiber to neighborhood pedestals and cabinets. AT&T does offer direct fiber-to-the-premises (home or business) in a portion of the City (see Figure 13), suggesting they have a significant fiber optic network within the City that could be expanded, and could reduce the cost and time for AT&T to upgrade more areas to gigabit Fiber-to-the-Premises networks.

[5] Source: https://broadbandnow.com/

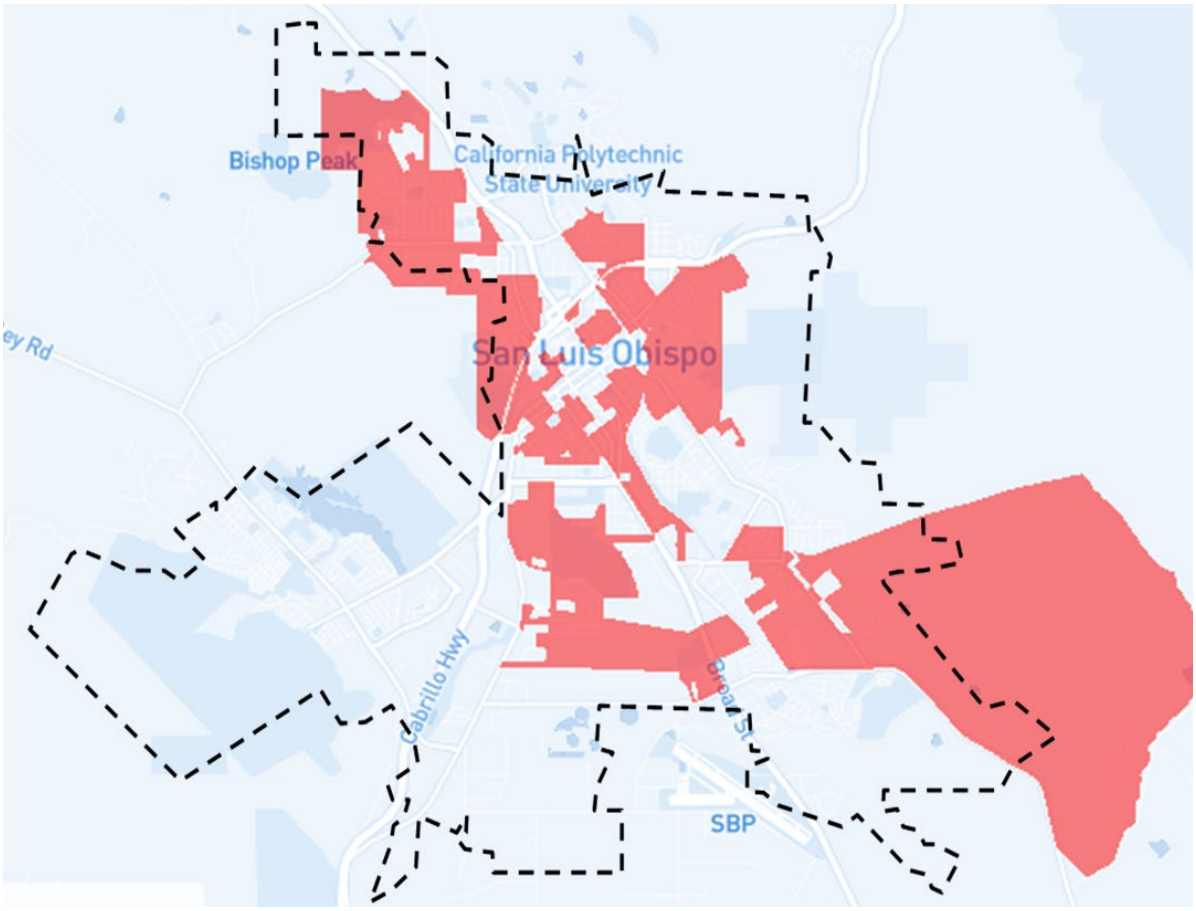

Figure 13 - AT&T's Advertised Fiber-to-the-Premises Coverage Map[6]

Astound/Digital West

Astound is a New Jersey-based telecommunications company, and prior to recent expansion into new markets across California, had served more than 300,000 residential and commercial customers in the San Francisco Bay Area. In 2021, Astound acquired Digital West, a San Luis Obispo-based data services company.

Digital West has been offering data services within the City for more than 30 years, and built a substantial fiber network (see Figure 14). Their services were historically targeted almost exclusively to commercial and business enterprises. However, with their acquisition by Astound in 2021, they are now undertaking significant expansions into the residential market, and are building new fiber assets across the City.

[6] Source: https://broadbandnow.com/

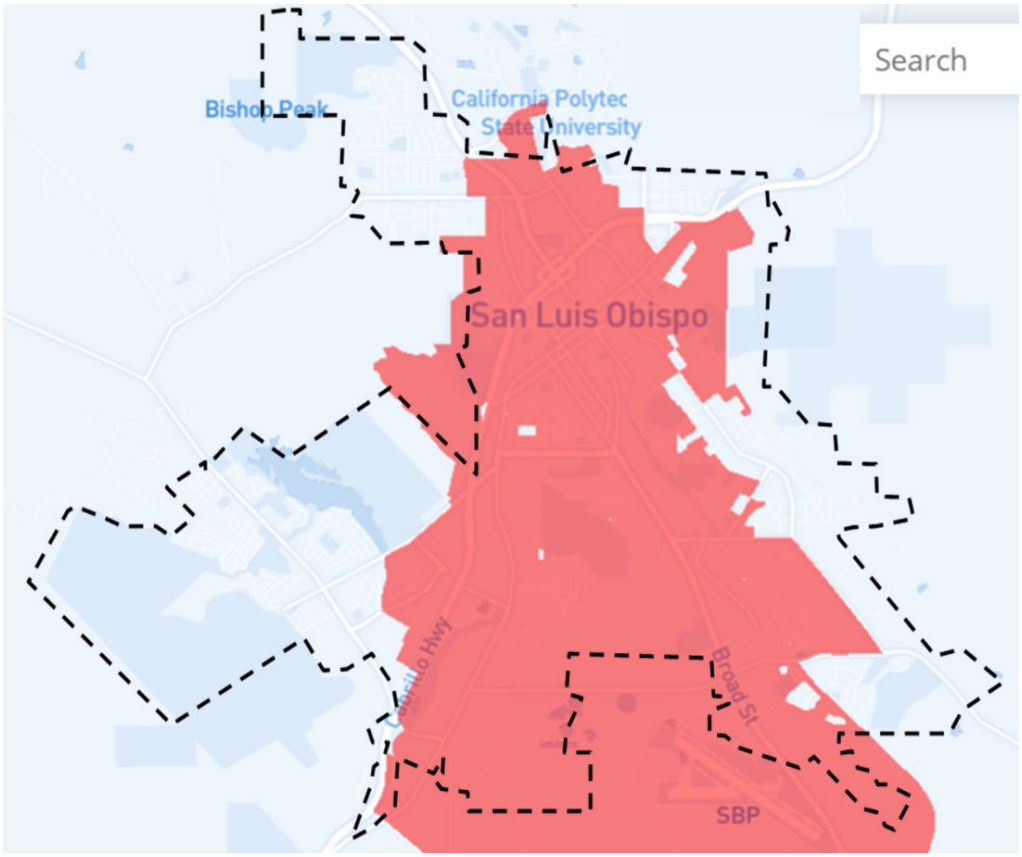

Figure 14 - Astound's Advertised Fiber Coverage Map[7]

The City entered a non-exclusive license agreement with Digital West in 2011, subsequently amended in 2016, and which is now being re-negotiated, in which the City allowed Digital West to install its own fiber optic cable within the City's communication network in exchange for a fee and the rights to utilize Digital West fiber strands to connect existing City facilities for city services.

With the acquisition of Digital West by Astound, the City is currently renegotiating a new long-term agreement which will provide additional benefits to the City, including City facility connectivity, dedicated City fiber strands, and joint build provisions for new fiber installations.

Combining Digital West (Astound's) significant fiber backbone, which is protected under a non-disclosure agreement, with the City's existing communication network is a unique and advantageous agreement for both sides: Astound is able to expand its fiber footprint within San Luis Obispo without having to incur significant capital cost for new construction,

[7] Source: https://broadbandnow.com/

thereby gaining the ability to offer more broadband services to residents and businesses, while the City can enhance its connectivity for public facilities and services.

Metro Fiber

Metro networks, as the name implies, are designed to connect major sites in relatively dense metropolitan areas to each other and to other service providers, typically via colocation data centers or exchange facilities.

Smart city applications can leverage existing metro fiber networks to connect data centers and remote devices. Applications with the need for high bandwidth, such as high-resolution traffic and public safety cameras, can be served on metro fiber networks. Services are priced on an individual case basis, based on the service level, number of sites, distance, and bandwidth required. Some carriers will lease dark fiber strands, but these are generally lit, or active services. Many companies prefer to sell connectivity as part of a suite of managed services.

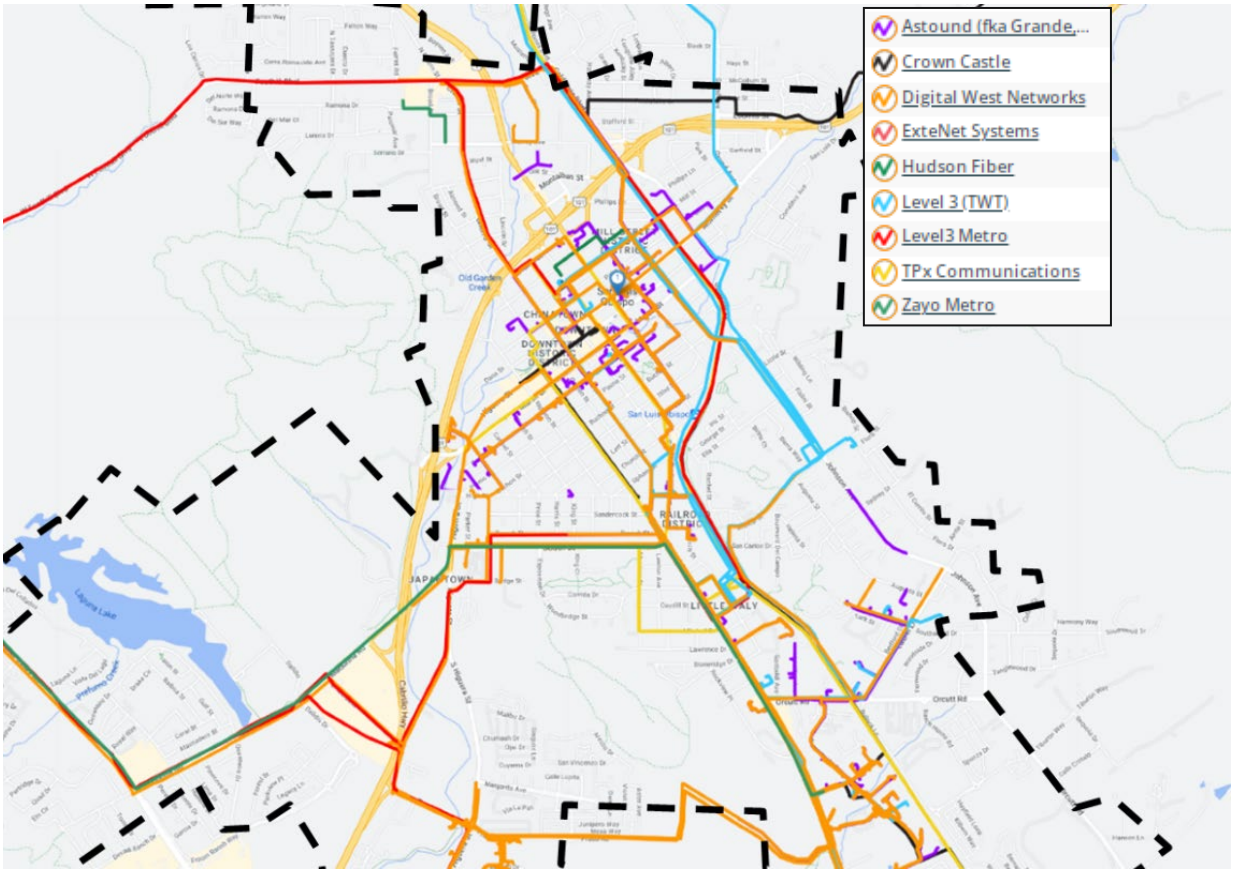

Figure 15 - Metro Fiber Networks in San Luis Obispo[8]

[8] Source: Fiberlocator.com

Long Haul Fiber

Long haul, or middle-mile, networks typically extend access to interconnection points in major cities and are of limited use for local smart city applications. However, more cities are moving their managed services and IT workloads to public cloud infrastructure, such as Amazon AWS and Microsoft Azure. Certain IT and smart city applications will require high-speed access to the remote cloud data centers, and many require low-latency connections to the cloud to function effectively. Many of these public clouds reside in the same interconnect facilities in major U.S. cities, including Los Angeles, San Jose, and Phoenix.

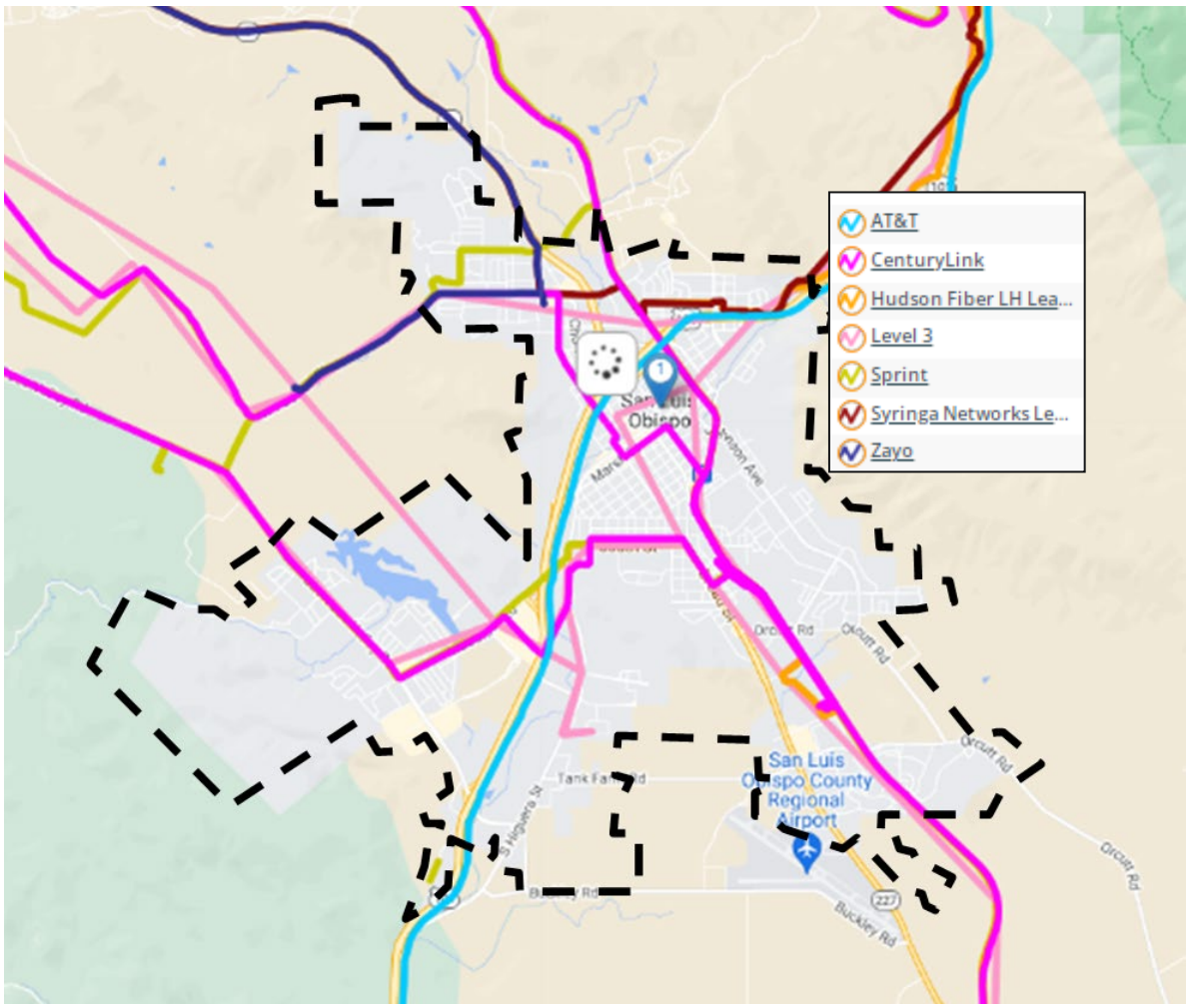

Figure 16 - Long Haul Fiber Networks in San Luis Obispo[9]

There are several long-haul fiber routes through the City, providing good interconnectivity to regional data and peering centers. The planned construction of the Golden State Network middle mile routes will add an additional, publicly-accessible long haul route.

[9] Source: Fiberlocator.com

Data Centers

City enterprise software applications and smart city applications of all types ultimately reside on a server. That server can be in an on-site city data center, in a co-location data center or "in the cloud" in a distant data center, or a combination of all three. A major trend in data and software applications is the migration of services to the cloud, which requires moving data resources closer to "the edge of the internet" or data/interconnect centers. This allows end users to reduce latency and improve application performance. Thus, data centers and peering points are increasingly being established further from the major internet centers to enable better cloud services in areas further from major U.S. cities.

As more and more mission critical applications of enterprises, governments and consumers migrate to public and private clouds, the latency to and from the internet edges and centralized public cloud data centers can become a performance bottleneck. To address this, the edge is migrating from the internet exchanges and massive public cloud data centers to nearby large cities. We expect this migration to continue and even accelerate.

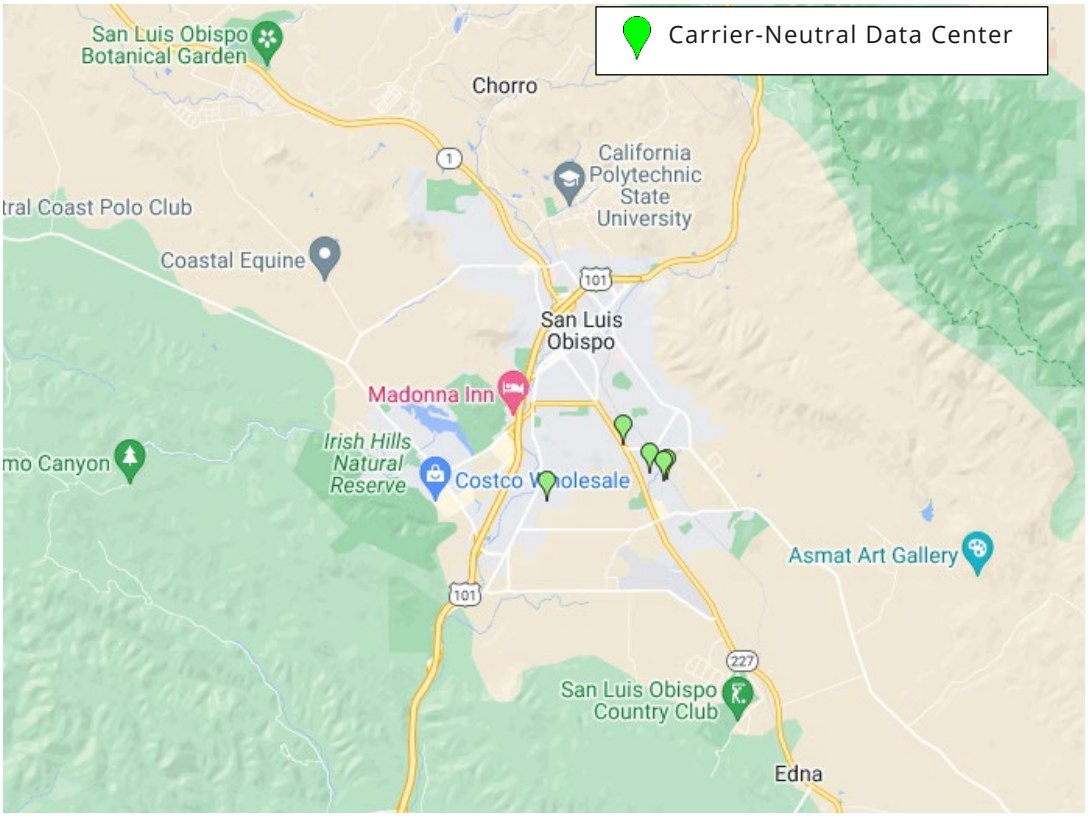

Figure 17 - Data Centers in San Luis Obispo[10]

[10] Source: https://www.datacentermap.com/

Currently, there are five public or neutral data centers in San Luis Obispo; two are Lumen operated centers, one is Digital West, and 2 are other telecom locations. These are primarily where communication service providers interconnect their networks.

2.3 MOBILE COMMUNICATIONS

Wireless communications will be a critical component of a City-wide broadband expansion project, as well as a smart city architecture. Many smart city applications are based on remote devices that send data to a centralized server for analysis, and typically send data that can utilize wireless networks. In addition to cellular services, there is wireless-supporting infrastructure, such as towers, where the city can lease space to deploy antennas to provision wireless internet access or to connect smart city devices. According to the Federal Communications Commission (FCC), San Luis Obispo is well covered with 4G mobile offerings from the three major U.S. mobile operators: AT&T, Verizon, and T-Mobile. This is shown in Figure 18 where the color purple represents robust coverage with an overlap of all three carriers.

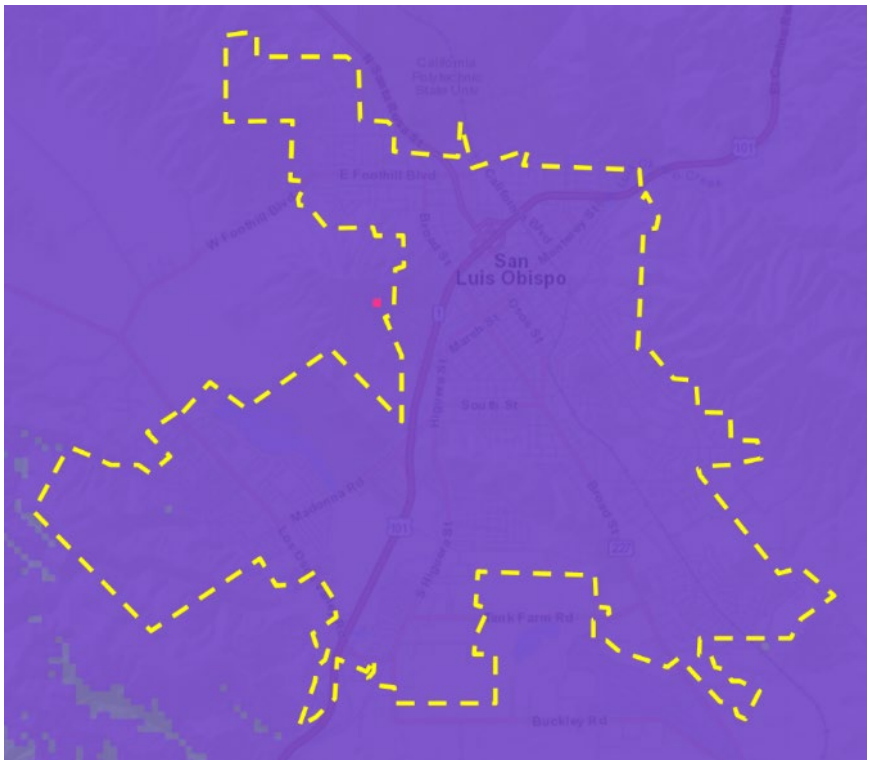

Figure 18 - Mobile 4G/LTE Voice & Data Coverage[11]

[11] Source: https://www.fcc.gov/BroadbandData/MobileMaps/mobile-map

The strong mobile coverage is largely provided by more than 119 towers and 280 antennas within a 3.0-mile radius of the center of San Luis Obispo as shown in Figure 19. This competitive wireless environment should put San Luis Obispo in the early waves of 5G upgrades.

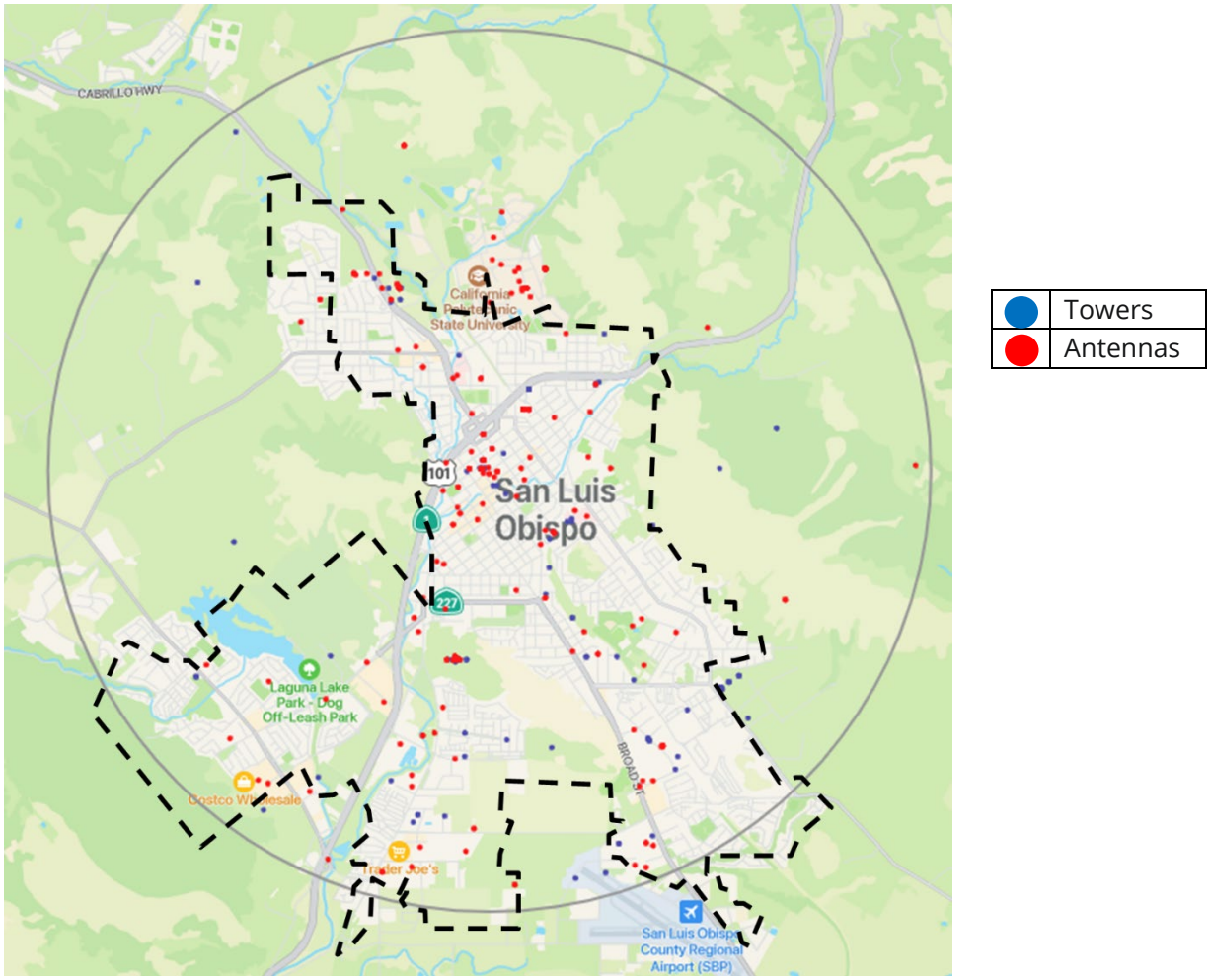

Figure 19 - Towers & Antennas in San Luis Obispo[12]

[12] Source: https://www.antennasearch.com/

3. Market Analysis

Magellan assessed the pricing, service tiers, and market environment within the City, considering both wireline (fiber, copper, or coaxial cable) services as well as fixed wireless providers.

3.1 WIRELINE SERVICES

Charter/Spectrum

Charter's offerings in the City are based on the DOCSIS 3.1 standard from CableLabs, the research and development organization of the cable industry. DOCSIS (Data Over Cable Service Interface Specification) can achieve downstream data speeds of over 1 Gbps. As a legacy cable company, Charter's HFC network is shared among multiple subscribers, so the actual real-time performance will vary based on the number of actual users. Consumer rates are "best effort," which is why ISPs often add the disclaimer of "up to" when specifying speeds (e.g., "up to 100 Mbps").

Even though the network supports gigabit connections, Charter typically offered a number of bandwidths at different price points; however, over the last 12-18 months, they have reduced the number of packages to three.

Table 2 - Charter HFC Pricing & Service Tiers

Download Speed[13]	Upload Speed	Contract Term	Monthly Rate	Extras
200 Mbps	10 Mbps	1 year	$ 40	No data cap
500 Mbps	10 Mbps	1 year	$ 70	No data cap
1 Gbps	25 Mbps	1 year	$ 90	No data cap

The upstream rates on HFC networks are currently limited to approximately 35 Mbps due to legacy use for transmitting television channels from a central location to many end users (i.e., all "downstream" traffic"). The cable industry has realized the limited upstream has become a competitive disadvantage against fiber-based competition who offer symmetrical rates up to multiple gigabits per second. To address this, CableLabs is creating DOCSIS 4.0, which will support up to 10 Gbps downstream speeds and 6 Gbps upstream speeds. However, DOCSIS 4.0 will require the cable-based ISPs to make upgrades to the coax

[13] All speeds referenced in this section are advertised as "up to" maximum speeds, depending on network congestion, time of day, location, etc.

portion of their outside cables, and will take longer to roll out over Charters' entire footprint. Magellan expects Charter to announce initial deployments in late 2023 or early 2024 in select markets, and widespread deployment nationwide could take 3-5 years.

AT&T

AT&T is the incumbent telephone company via their acquisition of Pacific Bell. They serve 75% of the City with copper-based DSL, but have deployed fiber and offer fiber-to-the-premises (FTTP) services in 22% of the City utilizing the 10 Gbps XGS-PON standards. However, the 10 Gbps is shared over 32 locations and thus the actual speeds will depend on the number of active users.

In the areas of the City where AT&T has fiber, their current offerings are less than Charter/Spectrum for comparable bitrates. AT&T's rates are symmetrical with the upstream data rate matching the downstream rate.

Table 3 - AT&T Pricing & Service Tiers

	Download Speed	Upload Speed	Monthly Rate	Extras
AT&T Fiber	300 Mbps	300 Mbps	$ 55	1 year contract, No data cap
	500 Mbps	500 Mbps	$ 65	
	1 Gbps	1 Gbps	$ 80	
	2 Gbps	2 Gbps	$ 110	
	5 Gbps	5 Gbps	$ 180	
AT&T DSL	5 to 70 Mbps	250 to 500 Kbps	$ 45	1.5 TB data cap; $10 per 50 GB of excess

It is unknown when AT&T might overbuild their copper network in the City. With a limited fiber footprint, there is little competition and choice for residents seeking more than one gigabit option.

Astound (Digital West)

Astound acquired local ISP Digital West in 2019, who had been serving only commercial/business customers in San Luis Obispo. Astound is in process of rolling out residential FTTP services in the City, but has not publicly committed to specific neighborhoods or areas (nor to an entire city-wide buildout). Where FTTP services are available, Astound has a competitive fiber pricing model that offers symmetrical services.

Table 4 - Astound Pricing & Service Tiers

Download Speed	Upload Speed	Contract Term	Monthly Rate
100 Mbps	100 Mbps	2 years	$ 25
500 Mbps	500 Mbps	2 years	$ 45
940 Mbps	940 Mbps	2 years	$ 65
1 Gbps	1 Gbps	2 years	$ 80

3.2 WIRELESS BROADBAND PROVIDERS

Fixed wireless access (FWA) solutions have been available for many years. These systems are based on proprietary equipment and use unlicensed spectrum to transmit radio frequency (RF) signals from a central antenna to antennas located at each location. These providers of FWA are referred to as wireless ISPs or WISPs. Although WISPs have served rural markets for decades, more recently they are beginning to serve dense urban markets, targeting multi-dwelling units (MDUs) with data speeds that can outperform legacy DSL services.

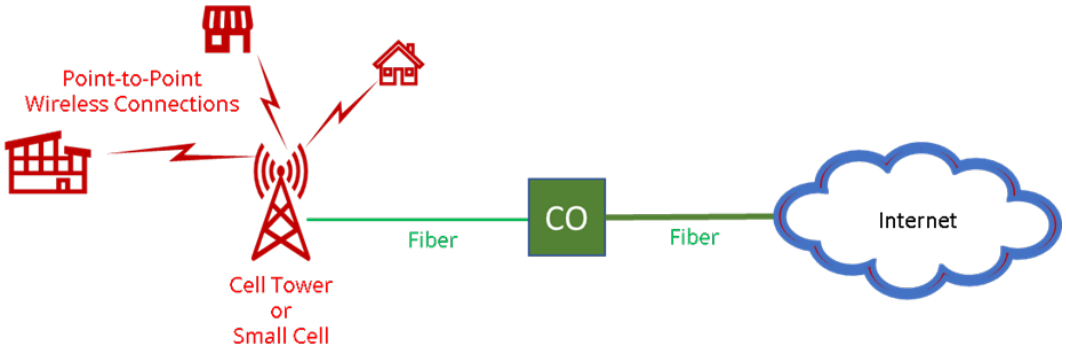

Figure 20 - Fixed Wireless Architecture

T-Mobile

T-Mobile provides 5G and 4G LTE fixed wireless services to households across all 50 states in the US. Its residential plans' main features include contract-free services and unlimited data access. The typical download speeds it offers are between 33-182 Mbps and may vary according to location, time of the day, weather, and other factors.

Table 5 - T-Mobile Wireless Internet Packages

Package	Max Download Speed	Monthly Rate	Cost Per MB	Notes
5G Home Internet	182 Mbps	$ 50	$ 0.27	Unlimited data No annual contract

Verizon

Verizon's 5G Home internet services are an affordable solution with faster speeds than satellite and DSL types of connections. Verizon offers unlimited data and contract-free plans, but speeds may vary based on a location's distance to its network towers and real-time network traffic.

Table 6 - Verizon Wireless Internet Packages

Package	Max Download Speed	Monthly Rate	Cost Per MB	Notes
LTE Home Internet	50 Mbps	$ 25	$ 0.50	Unlimited data No annual contract
5G Home Internet	300 Mbps	$ 60	$ 0.20	Unlimited data 10-year price guarantee

Peak Wi-Fi

The City has a third WISP, Peak Wi-Fi, that offers a wireless connection over a 6 Ghz frequency. They offer plans starting at $70 per month, and are upgrading equipment and will soon have 200 and 300 Mbps plans available as higher-tier options. There are no contracts, no data caps, and all plans require a $99 installation fee.

Table 7 - Peak Wi-Fi Wireless Internet Packages

Package	Max Download Speed	Max Upload Speed	Monthly Rate	Cost Per MB
Standard	50 Mbps	10 Mbps	$ 70	$ 1.16
Premium	100 Mbps	20 Mbps	$ 150	$ 1.25
Custom	100 Mbps	100 Mbps	$ 200	$ 1.00

4. Needs Assessment

Magellan examined the needs of the City through several lenses to understand the technological and socioeconomic challenges to high-speed broadband access within San Luis Obispo for the present and future – both from the community and business perspective, as well as considering the City's organizational needs in order to provide superior public services to its constituents.

Data and maps from the American Community Survey (ACS), U.S. Census, California Public Utilities Commission (CPUC), and other federal databases was used to evaluate residents' access, adoption, barriers, and resources related to broadband. An online survey was developed and promoted by the City to gather community perceptions, needs, priorities, and test actual broadband speeds. Magellan also conducted community stakeholder meetings and focus groups to acquire first-hand accounts, and met with several key City departments to consider the impact of broadband on City services delivery.

4.1 INDICATORS OF NEED

The Federal Communications Commission (FCC) identifies a location as "unserved" if it cannot secure fixed (wired) broadband services from any carrier, and qualifies a location as "under-served" if it cannot access broadband download speeds above 25 Mbps. However, the State of California and the CPUC uses a higher standard: locations receiving less than 25 Mbps download and 3 Mbps upload, *or* if the only option for internet access is a legacy DSL copper connection, are essentially "unserved" – and anything less than 100 Mbps download and 25 Mbps upload are "under-served."

The City has many addresses that qualify under California's minimum standard as unserved (lacking access to wireline 25 Mbps downstream and 3 Mbps upstream, which include locations with legacy Digital Subscriber Line and Cable DOCSIS 2.0 or older), as identified in Figure 21.

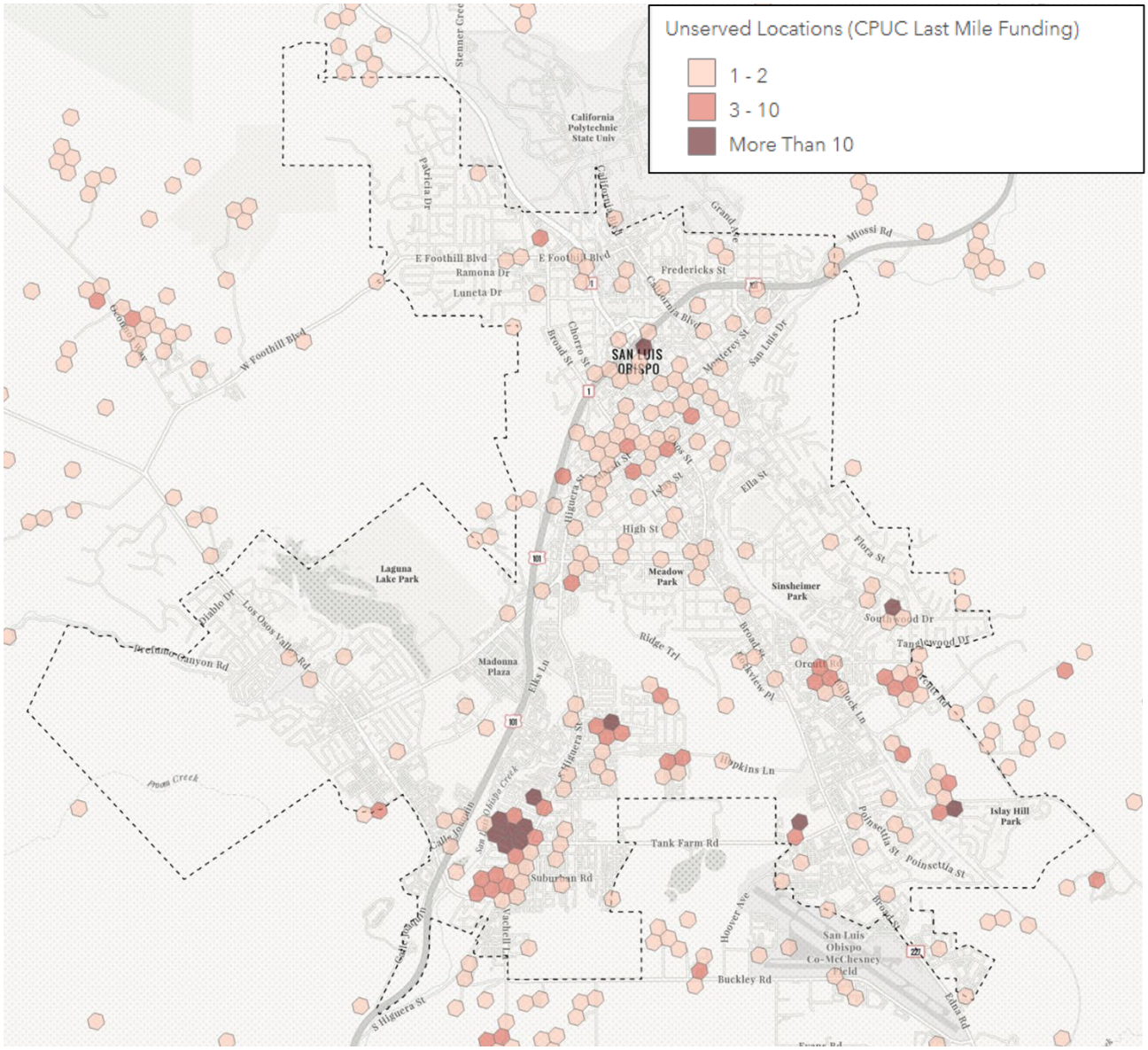

Figure 21 - Unserved Locations[14]

However, this CPUC map shows unserved addresses based solely on whether any ISP carrier is physically capable of providing service – it does not take into account individual household constraints or barriers if/when service is able to be provided.

Many households lack an internet service or connection not due to any technical limitations of the ISP, but as a result of income or other socio-economic factors (language barriers,

[14] Source: CPU SB 156 Last Mile Federal Funding Account Public Map, April 7, 2023: Unserved locations lacking access to wireline 25 Mbps downstream and 3 Mbps upstream excluding legacy technology (e.g. Digital Subscriber Line and Cable DOCSIS 2.0 or older)
https://federalfundingaccountmap.vetro.io/map#11.31/38.6185/-121.4896

digital literacy, etc.). ACS data and maps (Figure 22) identify areas with a high number of households without any internet access that could be caused by any number of these factors.

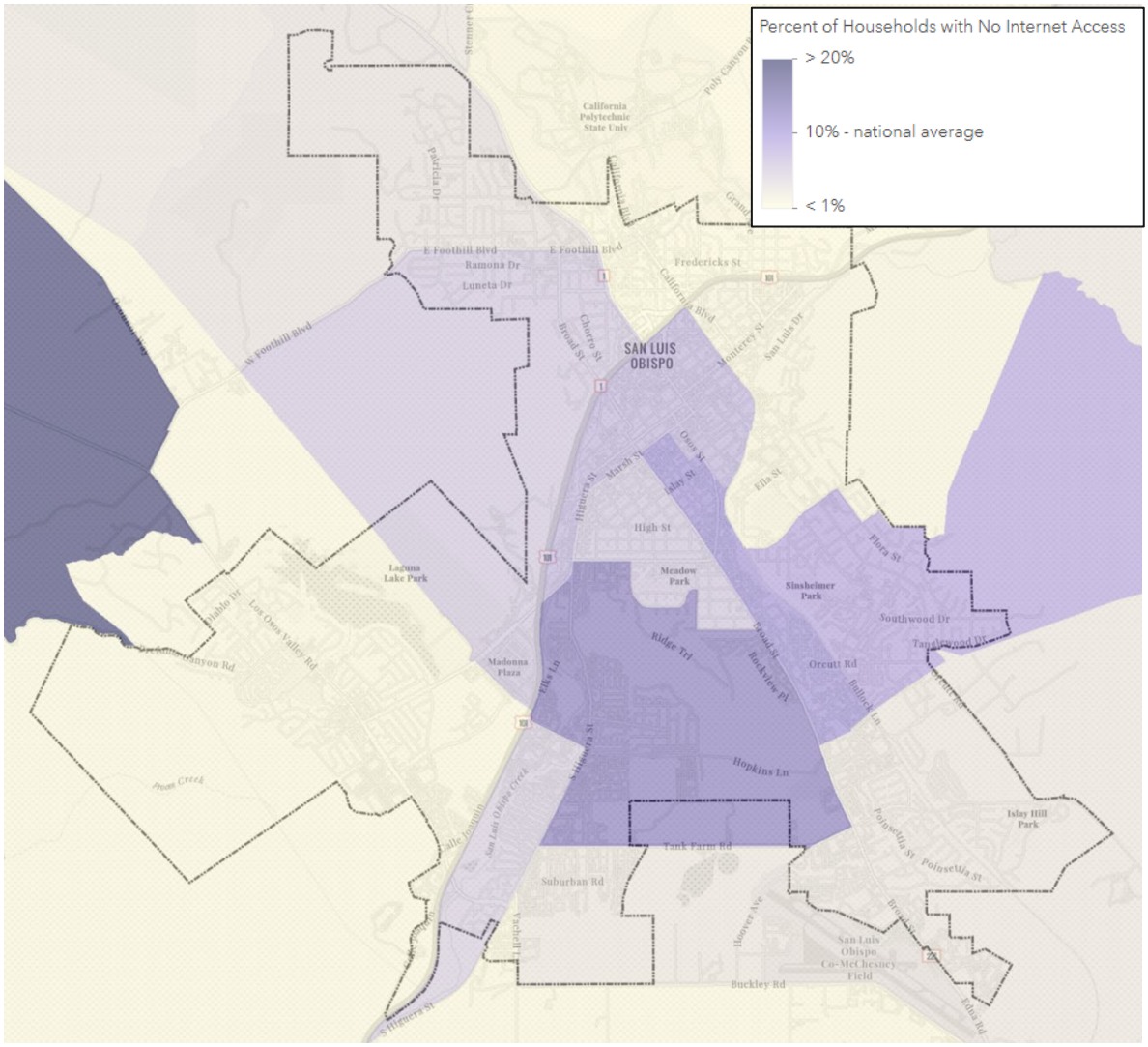

Figure 22 - Households with No Internet Access[15]

In late 2021, the federal government launched the Affordable Connectivity Program (ACP) that helps households secure affordable broadband by subsidizing up to $30 per month for an internet subscription. Households with incomes less than 200% of the federal poverty guidelines are eligible for the subsidy. However, participation in the program requires households apply through a government website, which is not often readily apparent or accessible from the carriers' sales websites, which contributes to a low participation rate.

[15] Source: ACS Internet Connectivity Variables 12/12/22

Table 8 - Affordable Connectivity Program (ACP) Participation[16]

	Eligible Households	Participating Households	% Participation
United States	51.6 million	17.1 million	31%
California	5.8 million	1.8 million	33%
San Luis Obispo	7,106	1,792	25%

The City's rate lags behind the state and national average, and identifies more than 7,100 eligible households within the City that could utilize the program to significantly reduce their monthly costs for internet services.

The City demonstrates other areas of need related to socio-economic factors – lower income areas, vulnerability indices, or other disadvantaged indicators (see Figure 23).

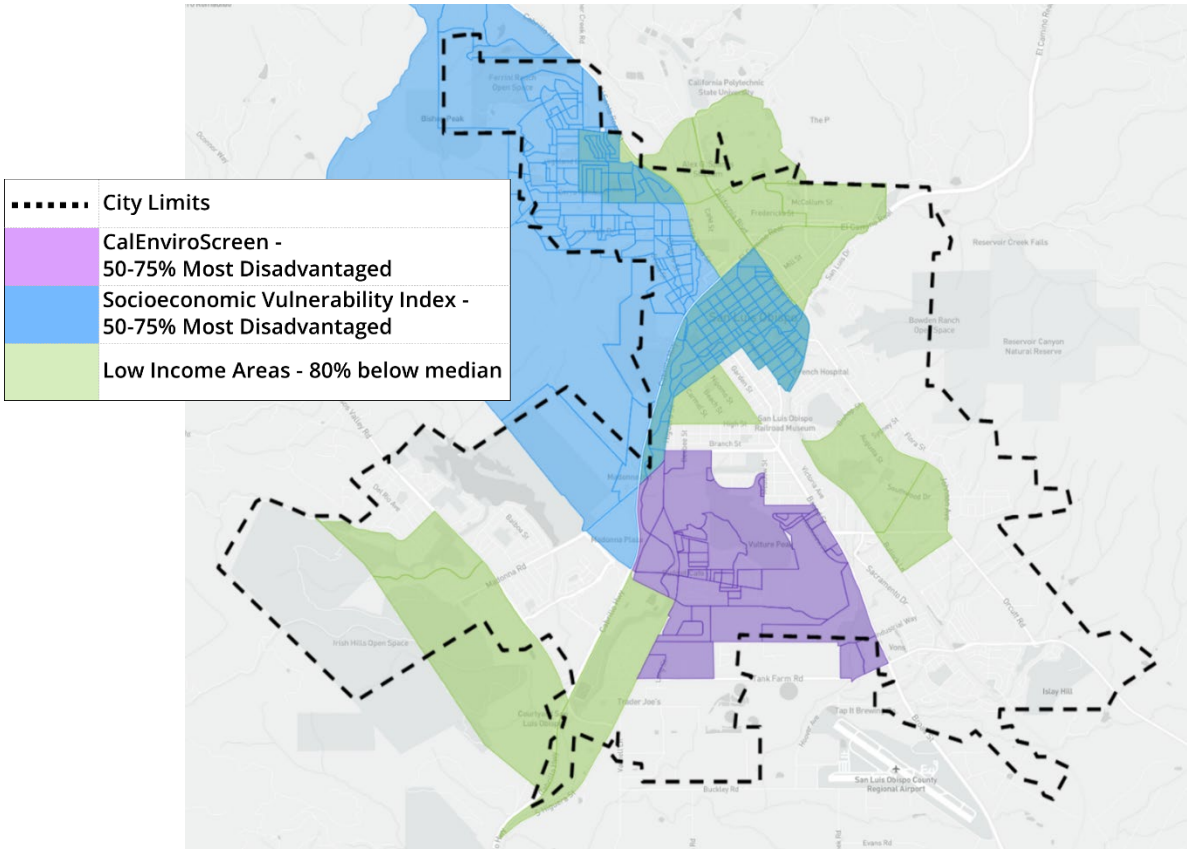

Figure 23 - California State Vulnerability Indices[17]

[16] Source: https://www.educationsuperhighway.org/no-home-left-offline/acp-data/#dashboard

[17] Source: Source: CPU SB 156 Last Mile Federal Funding Account Public Map, April 7, 2023: https://federalfundingaccountmap.vetro.io/map#11.31/38.6185/-121.4896

4.2 COMMUNITY SURVEY

As part of the planning process, Magellan surveyed community members to determine what types of internet services community members have, including the service costs, performance, and providers, and customer satisfaction, willingness to pay, and under-served status.

As detailed in Table 9, there were a total of 283 unique, usable survey responses, about two-thirds of which were complete, meaning the respondent went through the entire survey and clicked "Submit" at the end. Since total responses were less than the 300 generally required for statistical reliability, we can only say the results represent the experience and sentiments of respondents and may not be representative of the community as a whole.

Table 9 - Survey Responses by Status and Type of Internet Service

Responses		Internet service		
		Broadband	Low Speed	None
All/Total	283	94.0%	4.9%	1.1%
Complete	196 (69.3%)	94.9%	4.1%	1.0%
Partial	87 (30.7%)	92.0%	6.9%	1.1%

One of the key questions asked of respondents was the type of internet service at the location for which they were completing the survey. Over 90% had broadband, although the percentage was somewhat lower for partial responses. In total, only three responses indicated having no internet services, all of which were in the City of San Luis Obispo. There were ten responses from outside the City, including Arroyo Grande, Atascadero, Los Osos, Nipomo, Pismo Beach, and Santa Maria, all of which reported having broadband except the one response from Atascadero, which had low speed internet.

Respondent Demographics

We asked about a few basic demographic characteristics to understand how respondents compared to the overall population. Specifically, respondents seem to be older (median age of 38 years verses 26 for the population) and in smaller households than the population (median size of 2 persons compared to 2.4). Generally, respondents were more educated than the population. Part of this is because the survey was of households rather than individuals, i.e., the overall population. Therefore, educational achievement would naturally skew higher. Also, persons with more education tend to be more willing to complete surveys. Regardless, as shown in Table 10, the survey had low levels of

participation by persons with lower levels of educational achievement and relatively strong participation by more educated persons.

Table 10 – Respondent Households by Educational Achievement[18]

Educational Achievement	Responses	Population 18 Years Older
Less than high school	0.0%	3.5%
High school or equivalent	0.0%	15.0%
Some College or Associate Degree	12.3%	44.1%
Bachelor's degree	38.9%	24.3%
Graduate or professional degree	48.8%	13.1%

We also asked about occupation, for which respondents more closely matched the population, as shown in Table 11. Respondents were more likely to be in arts, business, management, or science occupations and service occupations than would be expected based on population statistics. Respondents were less likely to be in construction, maintenance, or natural resources occupations or out of the workforce. There were similar levels of office or sales occupations and production or transportation occupations for the survey responses and in the population.

Table 11 - Respondent Households by Occupation

Occupation	Responses	Population
Arts, business, management, or science	40.4%	32.1%
Construction, maintenance, or natural resources	5.6%	14.8%
Office or sales	13.0%	14.5%
Production or transportation	3.1%	3.4%
Service	11.8%	5.2%
Retired or otherwise out of the workforce[19]	26.1%	29.9%

Internet Services and Providers

More than half of respondents (56%) had internet services that met or exceeded the state's standard of 100 Mbps download and 20 Mbps upload. As shown in Figure 24, about a third of respondents had service that exceeded federal broadband standards but did not meet state standards. Effectively 10% had services that did not meet the federal standard. The

[18] Unless otherwise noted all statistics come from the U.S. Census Bureau, American Community Survey, 2021 5-Year Estimates, accessed via https://data.census.gov/.

[19] The Census Bureau does not identify retired persons. Instead, we use households with Social Security income as a proxy for retired persons.

geographic distribution of responses, shown in Figure 25, suggests that southern portions of the City have older infrastructure and technologies. Responses in the center of the City are more varied and include relatively high speeds, suggesting the issues there are more about affordability/costs.

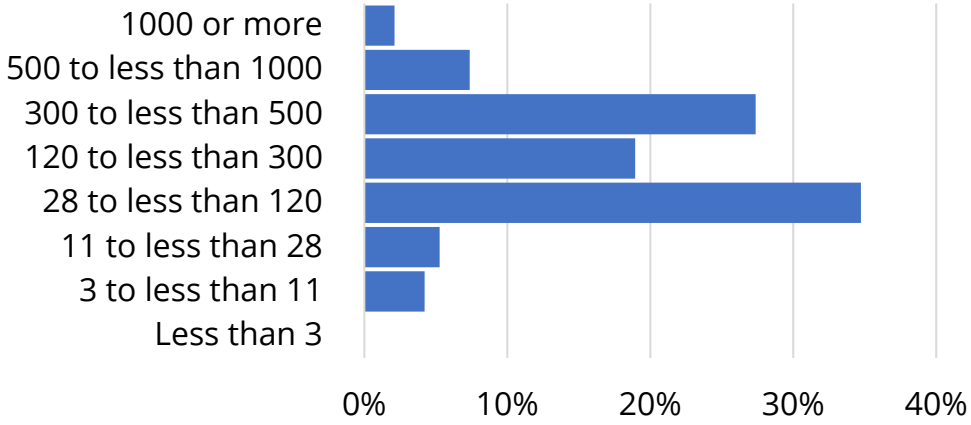

Figure 24 – Actual Tested Speeds (Mbps) of Throughput[20] (n=190)

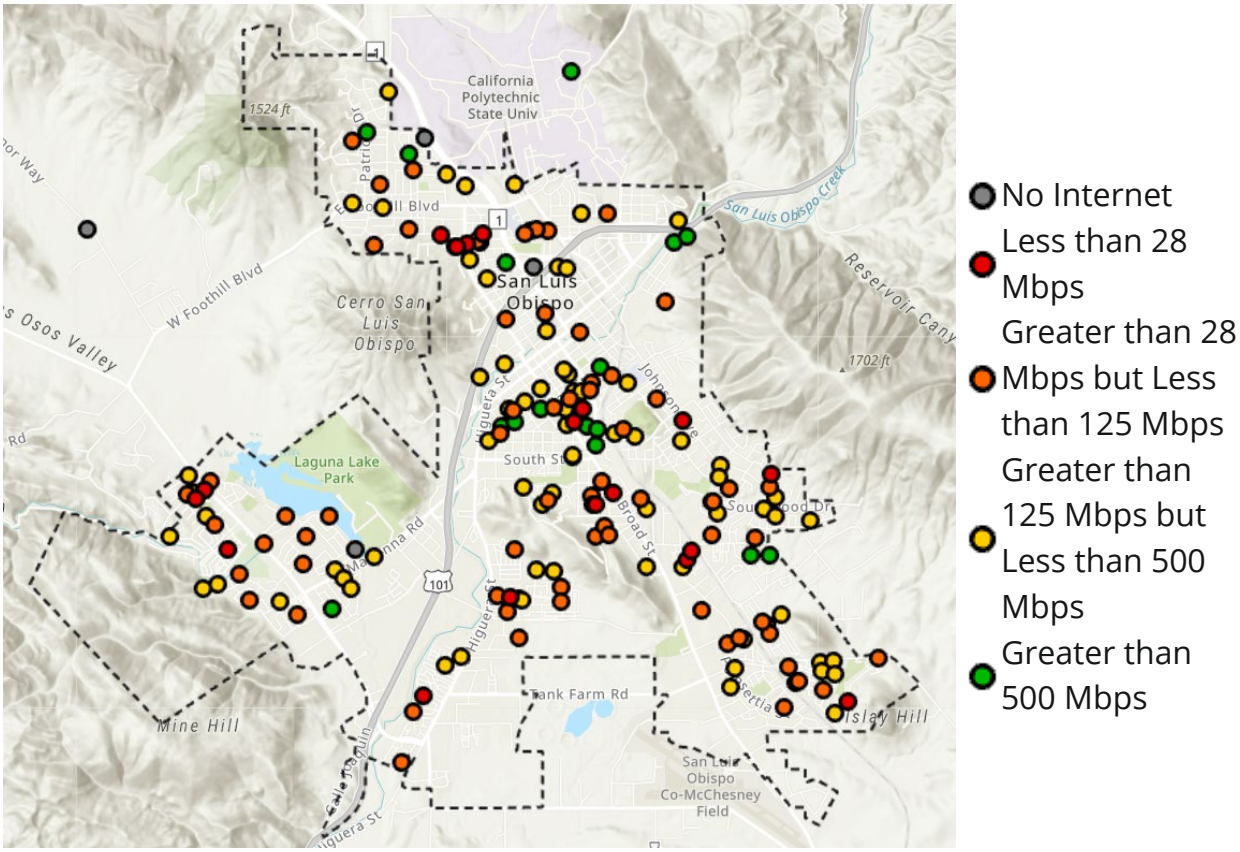

Figure 25 - Aggregate Throughput (n=190)

[20] Throughput is a measure of download + upload speeds.

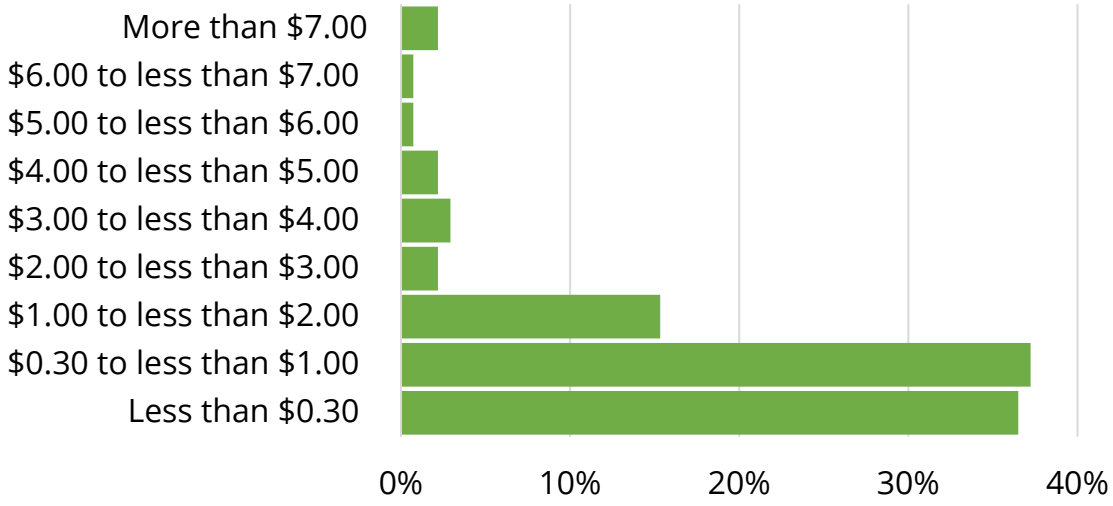

Figure 26 - Monthly Recurring Cost (MRC) per Mbps (n=137)

Just over a third of respondents paid a nationally competitive rate for internet capacity, less than $0.30 per month per Mbps. See Figure 26. A slightly larger portion paid less than $1.00 per Mbps per month. Under 10% were paying uncompetitive costs of more than $3.00. Generally, the higher monthly costs per Mbps are associated with slower services, particularly twisted pair copper wire based digital subscriber line.

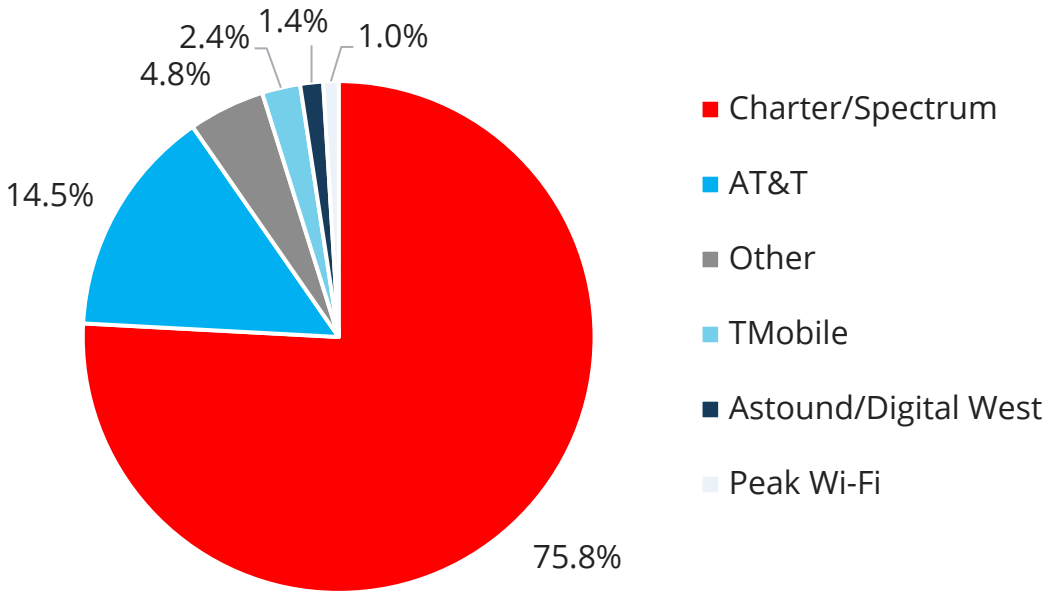

Figure 27 - Responses by Provider (n=207)

The dominant provider among respondents was clearly Charter Communications, under the Spectrum brand name. As seen in Figure 27, over three quarters of respondents indicated they have internet services from Spectrum, far exceeding the closest next most

common provider, AT&T, which was used by just less than 15% of respondents. Other providers, including those selecting no specific provider, had less than 5% of responses.

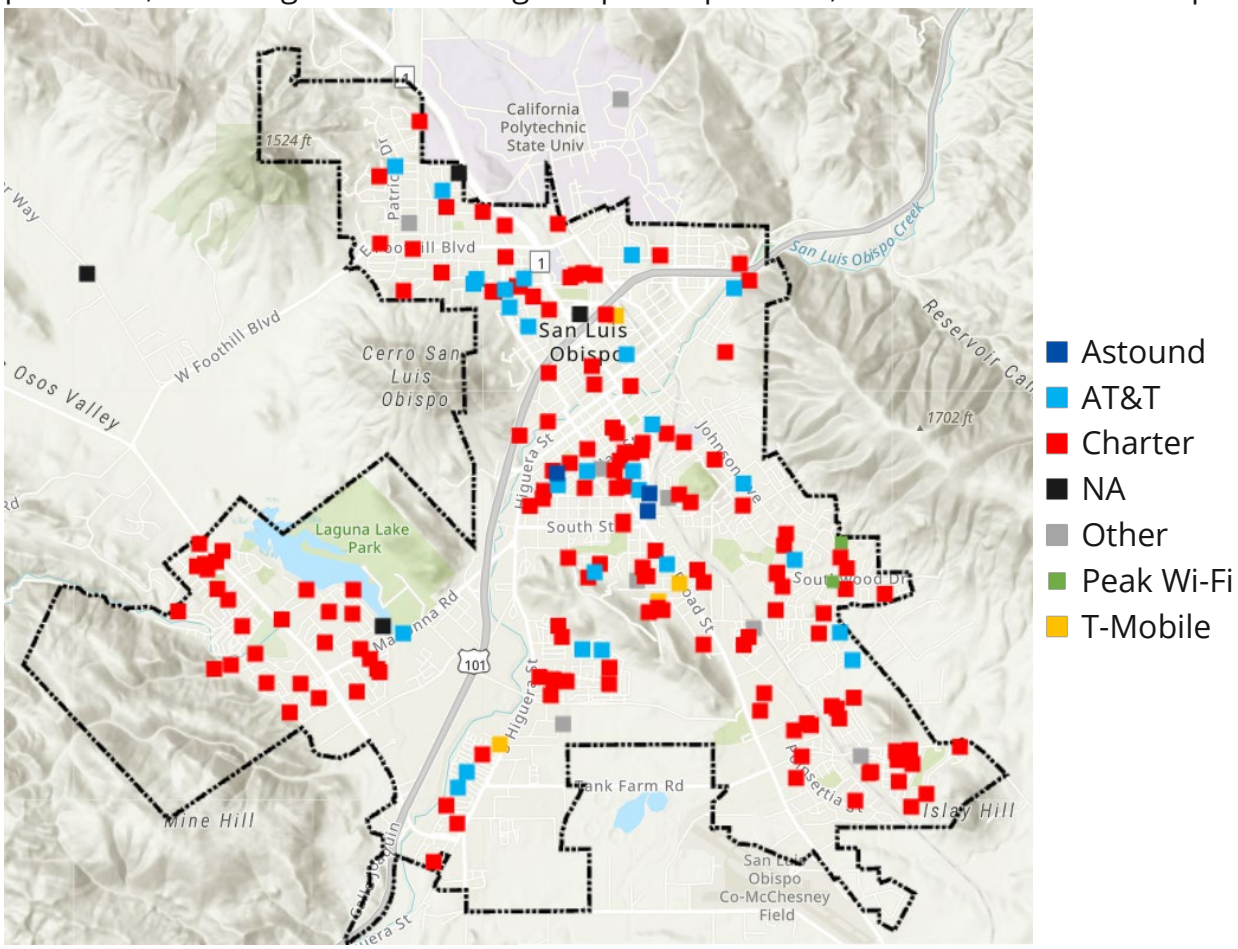

Figure 28 - Locations of Responses by Provider (n=207)

See Figure 28 for the geographic distribution of responses by provider. Charter services appear to be particularly prevalent among respondents in the southern portion of the city, with AT&T subscribers more common in the heart of San Luis Obispo. Astound respondents were centralized, Peak Wi-Fi were along Southwood Dr, and T-Mobile were along major thoroughfares. Respondents indicating broadband was not available were adjacent to State Route 1—one in an apartment complex and the other possibly an accessory dwelling unit—and on the edge of Laguna Lake, as well as outside the city boundaries in Osos Valley.

Astound customers had the fastest speeds, followed by AT&T then Charter, as detailed in Table 12, although the actual, tested speeds were far short of what respondents said were the nominal, contracted speeds. Astound's cost per Mbps was also lowest overall, averaging $0.50, while their cost for service was the highest. "Other" and Peak Wi-Fi were the least expensive services among survey respondents, followed by AT&T then Charter.

Peak Wi-Fi and T-Mobile (for which costs were not reported) test results showed the greatest latency or delay. Astound had the lowest latency, followed by AT&T. Essentially, respondents who paid less were getting much less than those who paid more.

Table 12 - Average Performance and Cost by Provider (n=207)[21]

Provider	Throughput	Latency	MRC	MRC/Mbps
Charter	204.3	20.49	$80.11	$0.75
AT&T	442.2	16.83	$71.91	$2.30
Other	179.0	20.44	$45.00	$1.01
T-Mobile	170.8	35.50	NA	NA
Astound	1,084.9	13.00	$384.67	$0.50
Peak Wi-Fi	128.8	37.50	$60.00	$3.88
All	245.6	20.4	$83.35	$1.01

Descriptive statistical analysis of responses, presented in Table 13, shows that costs and performance varied greatly among respondents. While a few respondents paid very little for broadband, most responses were over $80 per month. The mean (average) responses being higher than the median (midpoint) and mode shows that most respondents paid less than average for lower than average speeds. The one respondent that paid substantially above average was an organization with a static IP address, which indicates it had a service level agreement with its provider. It is also one of the four respondents that had over 1 Gbps aggregate throughput.

Table 13 - Descriptive Statistics for Cost and Performance Data[22]

Statistic	MRC	Download	Upload	MRC/Mbps
Responses	146	190	190	137
Max	$999.00	932.8	875.9	$10.46
Mean	$83.35	197.5	48.1	$1.01
Median	$80.00	123.2	10.8	$0.42
Mode	$80.00	N/A	10.6	N/A
Min	$25.00	3.8	0.09	$0.05

Figure 29 provides a sense of internet service reliability in San Luis Obispo. Nearly a quarter of respondents indicated have hour-long outages at least once a month, while just over a tenth said they never had such outages. Day-long outages were experienced at least once a month by less than 4% of respondents. Over 70% said they never experienced day-long

[21] Throughput statistics are megabits per second (Mbps), latency is milliseconds (MS), and MRC is "monthly recurring costs."

[22] Download and upload speeds are in Mbps.

outages. Reduced speeds were reported to occur at least once a week by nearly 43%. Just under 96% experienced brief outages.

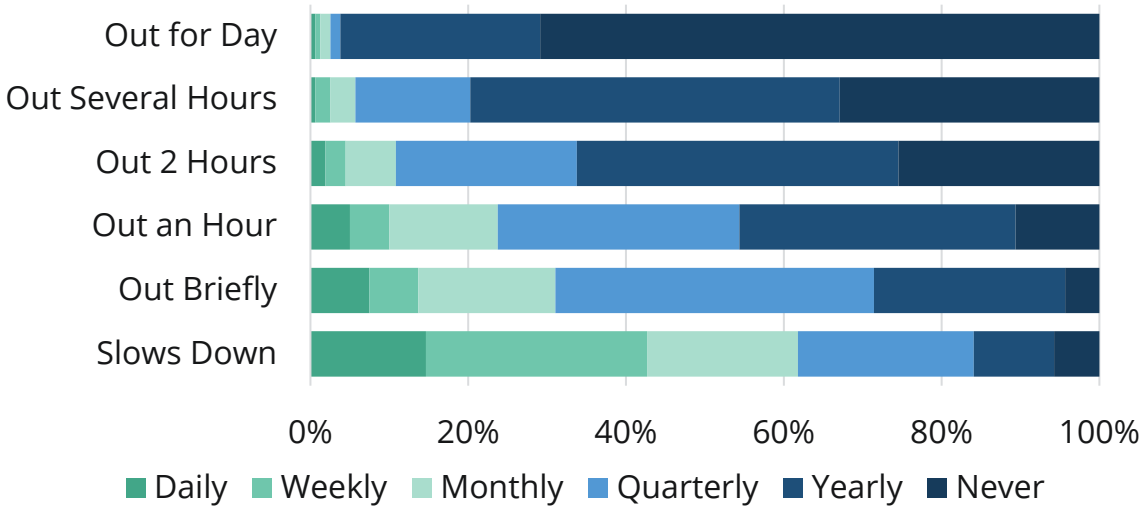

Figure 29 - Frequency of Performance Issues (n=160)

The data suggests that City residents and businesses are receiving less than half the download speeds that they pay for, and that that there are disparities between the price per megabyte paid by consumers depending on what plan they purchase (see Figure 30).

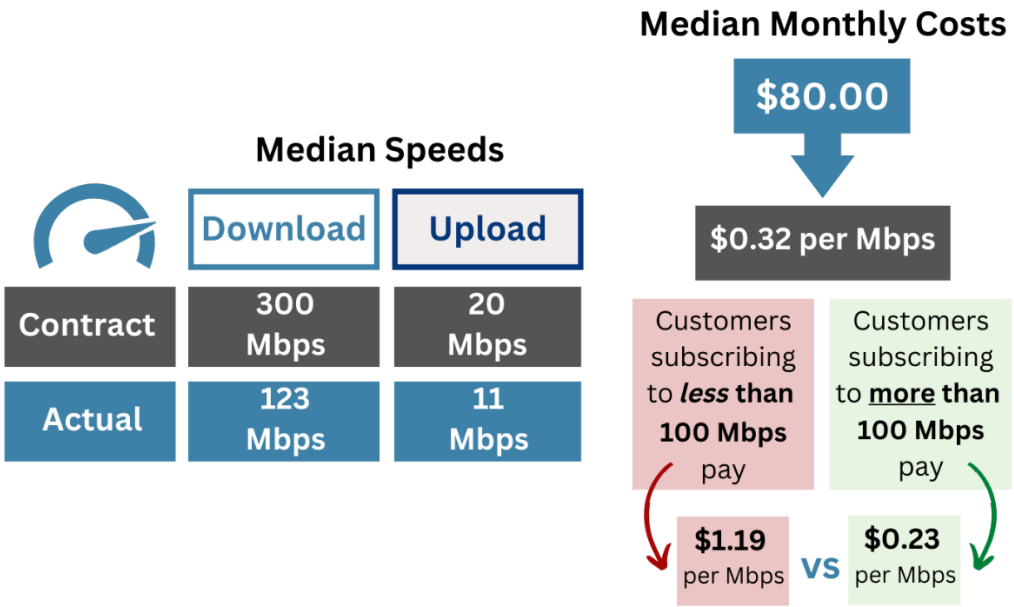

Figure 30 - Median Speeds & Costs based on Survey Results

Subscribers who purchase lower-bandwidth packages with advertised speeds at or below 100 Mbps pay five times more per MB than those customers who purchase higher-end packages of 300-500 Mbps or 1+ Gbps tiers.

This disparity in the rate per MB between minimum-speed and higher-tier broadband packages further exacerbates the Digital Divide by not only providing sub-par speeds to households with lower discretionary income, but then charging them more for those services.

Consumer Sentiment and Willingness to Pay

Internet service was rated as critical overall by 60% of respondents. Only 1.3% felt it was not important or had no opinion. See Figure 31. Reliability was the most important service characteristic for respondents. None indicated it was unimportant or had no opinion and over half said it was critical. Speed was somewhat less important, with over half rating it as "very important." As shown in Figure 32, respondents were generally satisfied with internet overall, reliability, and speed.

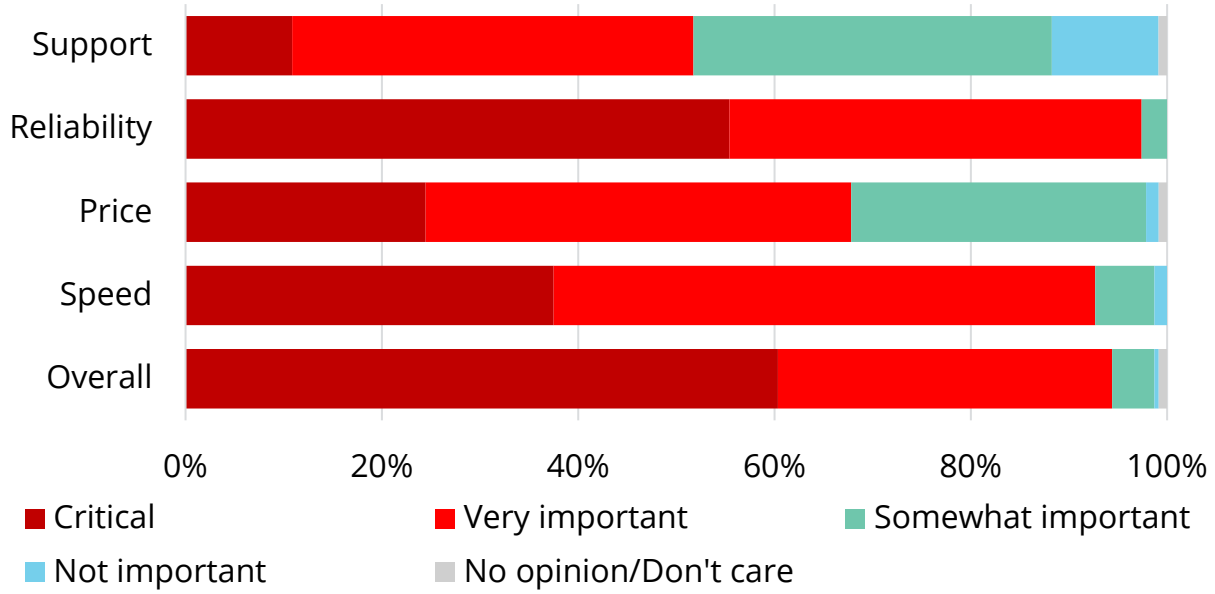

Figure 31 - Importance of Internet Service Characteristics (n=232)

Price and support did not seem to be key factors. A larger percentage of respondents were ambivalent about support than rated it as "critical." But these were also the greatest sources of dissatisfaction among respondents. Effectively three-quarters of respondents were less than satisfied with the price of their broadband service. Support had the largest percentage of respondents—over a third—that were neither satisfied nor dissatisfied or unsure.

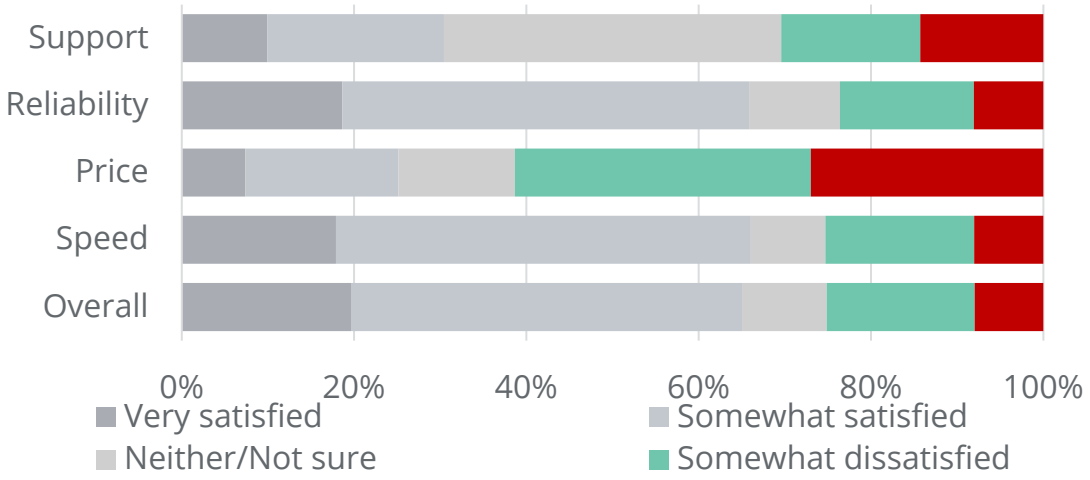

Figure 32 - Satisfaction with Internet Service Characteristics (n=163)

The value of customer and technical support was greatest among respondents for lower speed broadband, as shown in Figure 33. Overall, respondents were willing to pay an average of $0.38 per month per Mbps.

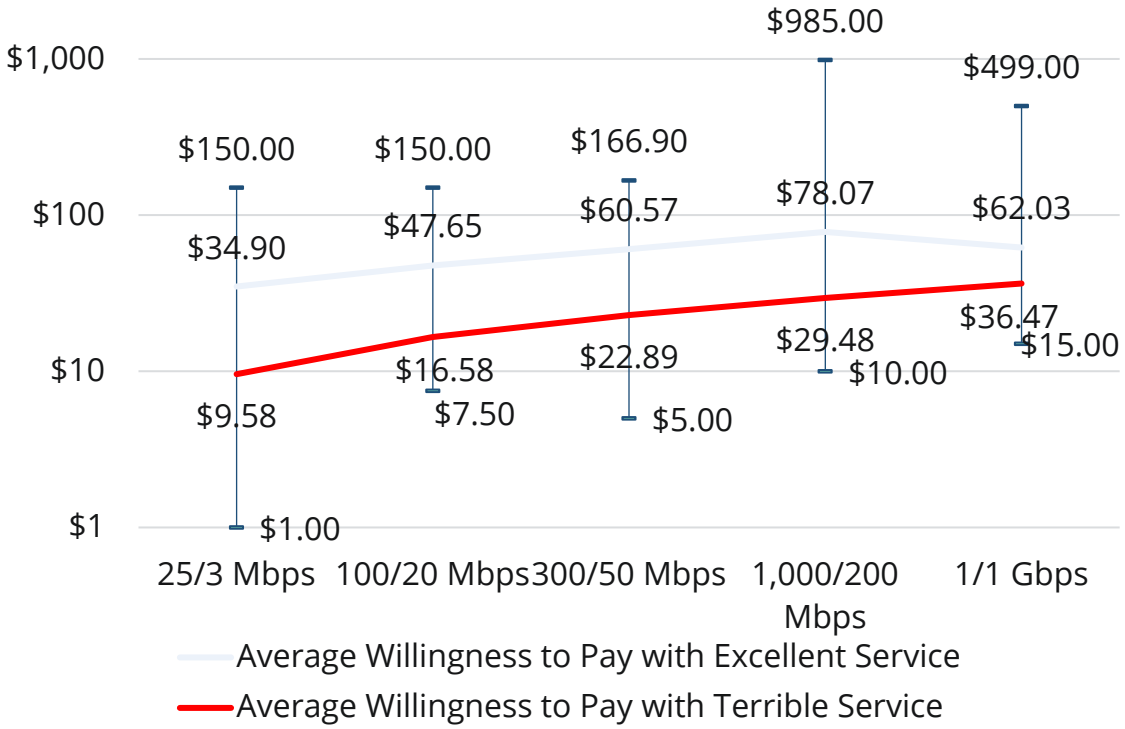

Figure 33 - Willingness to Pay[23] for Broadband Based on Service Level (n=215)

[23] Note that the vertical y-axis of this chart is a logarithmic scale with larger numbers occupying less space than smaller ones.

Regardless of an anomalously high cost for asymmetrical gigabit service, on average respondents were willing to pay between $55 and $60 per month for broadband. Responses indicated clearest willingness to pay more for 100/20 Mbps service: while the average MRC indicated by respondents was $47.65, the median was $50. While respondents rated support as relatively less important than other factors, the average difference between their stated willingness to pay for excellent and terrible customer service and technical support was $34 per month.

Broadband Uses

The most frequent uses of broadband by respondents were, not surprisingly, communication with family and friends and entertainment, followed by general interests. See Figure 34. Buying and special interests were common uses, albeit less frequent than communication and entertainment. Online buying, gaming, and learning seem to be relatively low until one remembers respondents were generally older and more highly educated than the population. Online selling was somewhat common but relatively infrequently used. Well over half of respondents never use the internet for home-based business.

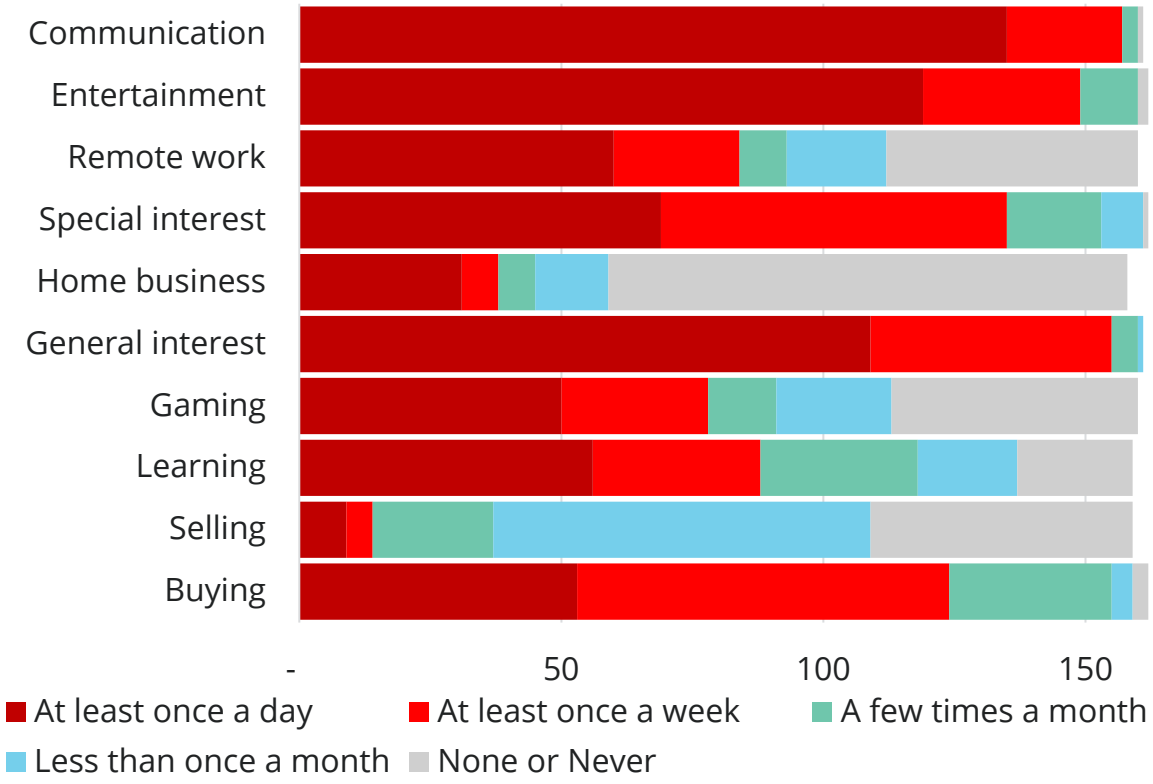

Figure 34 - Frequency of Internet Use by Purpose (n=162)

Figure 35 provides deeper insight into respondents' use of the internet for entertainment. Generally, they have "cut the cord." Over 60% of respondents said their households do not view any traditional broadcast television. Less than 20% get the majority of their video entertainment from traditional television. Only 3% do not consume any online video content or streaming services.

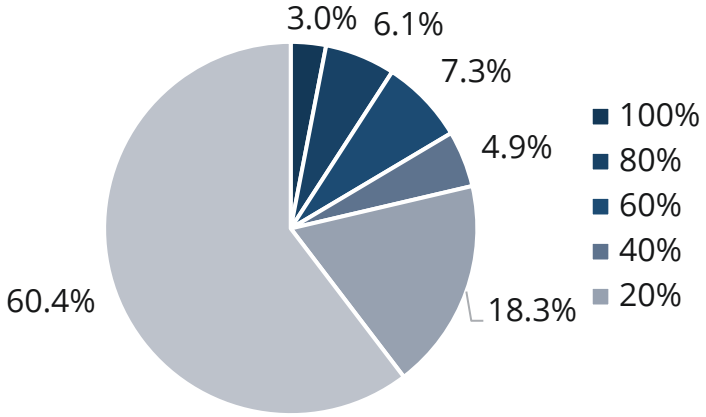

Figure 35 – Households Viewing Streaming Video Only (n=164)

More general demand drivers, comparing broadband and non-broadband respondents, are shown in Figure 34.

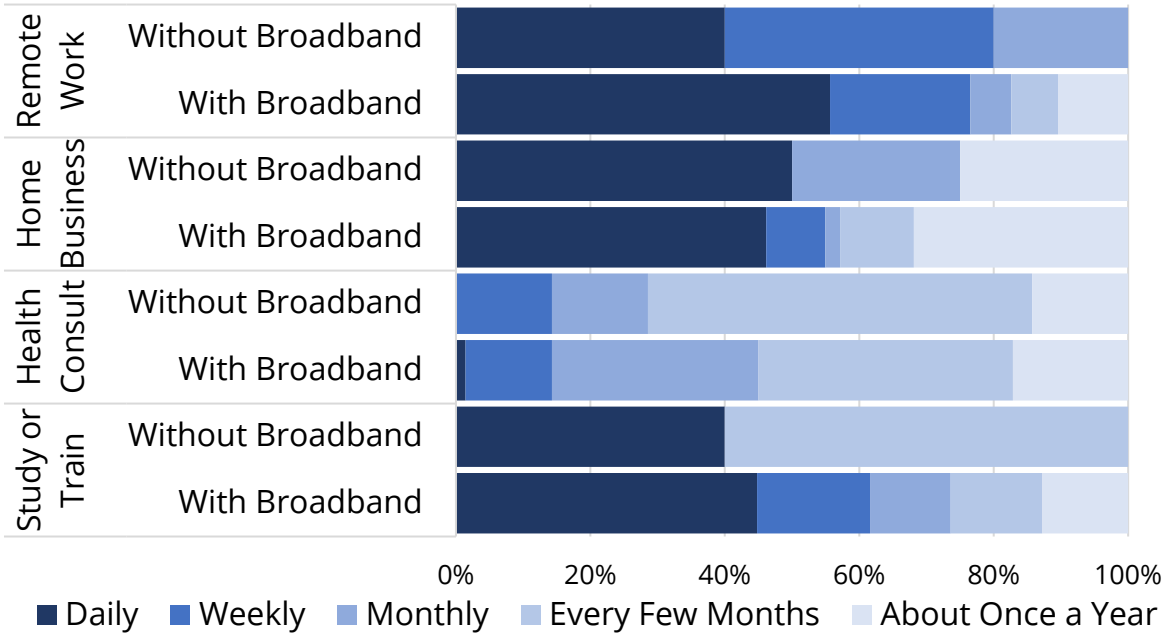

Figure 36 - General Activity With or Without Broadband

Note that respondents *without* broadband tended to work remotely relatively more often than those with broadband but not on a daily basis. Households without broadband were more likely to occasionally consult a healthcare provider and do studying or training than

households with broadband. Over three-quarters of respondents worked from home at least once a week. Half of the households without broadband were operating a home-based business every day.

4.3 STAKEHOLDER ENGAGEMENT

Business and Industry

The City of San Luis Obispo is booming with businesses, many of which are small downtown businesses that want the most economical and reliable provider. Most of these businesses have few options, spotty coverage, and slow connections. PG&E has outages, which has created a lot of problems for small city businesses. Tourism is an important sector for the City that has a lot of meetings, conferences, and hotel stays. Solid Wi-Fi connections are imperative for everyone participating in business and leisure travel. Most businesses that provide services to visitors have voiced concern about broadband for operations and customers.

The SLO Chamber wants a fiber highway through downtown for business development and productivity as well as tourism. A lot of new business is attracted to the downtown area. The city wants to ensure these businesses move in and stay. The tech industry is the main type of business moving into the downtown area. These companies require a huge amount of bandwidth. There should be plans to increase connectivity options to the north and around the city so that new businesses can expand and move into these areas.

The Cal Poly campus has great connectivity overall, but sometimes has trouble with projects that are outside of the campus core, even a 1/2 mile away. They do not have a lot of bandwidth for their tech park project, which interferes with their work. Many of the campus faculty live and teach from all over the county. Not a day goes by without calls dropping and frequent slowdowns, interfering with learning and projects. The Cal Poly Center for Innovation & Entrepreneurship is running an operation downtown that sees interference from a lack of bandwidth, and a large number of users in their spaces. In many cases, staff have left the offices at midday to work from home due to poor connection and an inability to conduct business.

All participants emphasized that business is directly related to housing, as the work-from-home culture is not going away anytime soon. Employees of all industries need good home internet connections for work as well as personal purposes. Homes will command higher prices if they have broadband access.

Community-Based Non-Profit Organizations

Participants in this focus group emphasized how their work relies on robust, widely available internet access due to quantity of data used in the office and need for fieldwork to reach clients. The SLO Noor Foundation, Child Development Resource Center, Housing Authority of SLO, and Lumina Alliance all voiced concerns about a lack of bandwidth as they expand their operations and deploy mobile services. SLO Noor offers medical advice via online meetings as well as in-person visits. Clinicians must be able to easily access their patients' records in the course of these consultations. Therefore, any interruption is unacceptable as it interferes with providing critical services. They are concerned about their connection's capacity and reliability to properly care for clients. The Child Development Research Center has experienced internet slow downs and outages due to heavy use of their system. The Housing Authority of SLO voiced similar concerns with the growing numbers of homeless persons and senior citizens getting connected.

Organizations that provide housing and shelter facilities for sexual assault survivors, homeless persons, and the elderly, are over capacity and seeing increasing demand. These stakeholders plan to expand to serve more patients, which will require even more bandwidth, better connections between offices, and access at more locations. CASA, located on Madonna Road and Higuera, uses Digital West as their provider and has broadband throughout their complex. However, the majority of those they serve live outside of the city. At the Community Action Partnership of SLO, child services consume a large amount of bandwidth due to the number of online conversations and online meetings. All participants expressed concern that their clients are not very tech-savvy and that, even with the proper tools, they would not be able to successfully navigate the internet to get the resources they need.

The focus group participants agreed that lack of connectivity options and service provider competition is a problem. Spectrum seems to dominate the region, leaving very few choices. Many families and patients/clients are low-income and cannot afford the available services. Many of the focus group participants are rolling out new mobile services that are going to require a solid connection to serve those in need. There is quite a bit of concern with being able to connect with patients properly and access the information they need to support them. With rising housing prices, much of SLO's working population lives outside of the City, and have transitioned to, or remain in, a work-from-home situation. This is causing concern about their ability to perform their jobs from home without economical, fast broadband.

Education and Social Services

Education and Social Services are vital components of any successful and forward-thinking city. The City of San Luis Obispo is no exception according to representatives of these services that Magellan spoke with during an enlightening focus group meeting. The representation ranged from the SLO County Public Health Department to Information Technology for the San Luis Coastal Unified School District, with the consensus being that the city aims to serve its citizens by serving the whole county. Participants note disparities across the city and county that have caused a divide, resulting in a range of well-connected and disadvantaged, or unconnected areas.

The SLO County Public Health Department views speed as the imperative to crisis response. Connectivity issues are unacceptable when it comes to serving the people, especially when it relates to public health and safety. Telehealth is a focal point for the City's future, which cannot be achieved without providing the public with a reliable and fast internet connection. Participants noted concerns such as some health facilities lacking up-to-date technology and infrastructure, and a large number of staff working remotely with unreliable connections. Another important note is that a number of the community members served by these organizations still visit public spaces to utilize free Wi-Fi for work, homework, and personal use.

In addition to these concerns, participants noted the need to push the public to health websites for online interfacing and health services, which will require reliable connections for all customers. The County Public Health Department is concerned for the disadvantaged and unconnected, living in mobile home communities, areas of higher poverty levels, and some more rural Spanish-speaking, and Indigenous areas. Most of the public in these areas lack both the tools and the knowledge to stay connected. The County plans for more in-person interactions with clients and hopes for a solution to spotty service while working in the field.

The San Luis Coastal Unified School District reports having a solid private network already established from Del Mar Elementary to Los Ranchos. The County and School District partner to operate infrastructure and interconnect sites. The schools are currently connected at 10 Gbps but the network lacks redundancy and the infrastructure, which is over 20 years old, will need to be replaced in the not too distant future. During the pandemic, the District distributed about 900 hotspots and identified many dead spots in areas of low-income housing. These low-income areas seem to come from primarily mobile park dead zones. The district aims to provide equal opportunity and services to those who are lacking and notes that the rising cost of living in the city is causing strain on the digital,

social, and economic divide. The school district is proud of its services thus far and yearns to provide equal opportunity to all students and their families within the region.

Real Estate and Land Use

The real estate and land use focus group provided better understanding of the connectivity climate in the SLO area as it relates to housing development patterns. The overall consensus among participants was that a strategic plan would be very helpful as greater connectivity results in more business, more prospective buyers, and a growing population. All attendees agreed that SLO is becoming an expensive city with increasing demand for housing development projects and has been deemed the 2nd least affordable city in the country for a few years in a row. The many residents that can work from home are moving further outside of the City to escape escalating prices, which is driving demand for broadband to the outskirts of the City.

A strong internet connection increases the sales prices of real estate and draws buyers. Tim Williams with Astound shared that their services are traditionally commercial, but they are now expanding into residential services in SLO County. Real estate stakeholders note that real estate pricing and attractiveness can be enhanced simply by providing developing areas with a solid internet connection. If the broadband development process does not begin to connect developing communities soon, then property values could be affected due to a sub-standard connection.

The focus group participants all thought connectivity in and around the city was better than outside it, creating a digital divide in the county. Attendees noted areas of extreme need in Dalido and San Luis Ranch, where there are a lot of development plans, but internet services are currently very limited. While this is nominally about residential development it is also about business development due to the number of people in the area working from home. Their homes are now their offices, which increases the demand for better connectivity. Competitive options for internet services in the residential areas make them more attractive to prospective buyers.

The land around the San Luis Obispo County Regional Airport has seen quite a bit of development and recent business relocations. Proximity to the coast along with convenient travel attracts prospective buyers, particularly businesses with oil money, to the area. Participants expressed desire to keep current business and attract new ones based on the city's reputation for technology and the presence of California Polytechnic State University ("Cal Poly").

Transportation and Utilities

Representatives of Peak Wi-Fi ("Peak"), City of San Luis Obispo Public Works Department, and the San Luis Obispo Council of Governments (SLOCOG) participated in a transportation and utilities focus meeting. All participants voiced an interest in improving connectivity and infrastructure for the area. The SLOCOG representative noted that there are many countywide efforts and plans to increase broadband access. SLOCOG views collaboration and a holistic approach including city projects as keys to success, increased efficiency, and digital equity as a focal point.

Peak Wi-Fi is providing transport for major carriers and wireless broadband to the community, capable of providing gigabit per second or faster connections. The ISP's goals include better understanding community needs, working more closely with the City, and closing gaps. Peak identified increased supporting infrastructure as one of their current objectives, hoping to get more antennas out. Peak has established infrastructure on streetlight poles, and water tanks spread all over but wants to expand. Peak noted that cameras for public safety and traffic management, which are installed on traffic signal poles, could be connected via their network with some customization. Focal areas for the company over the next 5 years or so include the Los Osos corridor and portions of the north county.

The Traffic Engineering Division of the City's Public Works department has interconnected most of its traffic signals. One of their goals is to deploy fiber to all traffic signals and incorporate fiber into their current infrastructure, which is largely twisted-pair copper wire. They are specifically focused on communication links with low reliability traffic signal interconnections in major arterial corridors. The Division is open to sharing infrastructure with other departments and for other purposes, but they have had issues with unauthorized work by third-party vendors on some traffic signal poles resulting in damage to City wiring. They also have video feeds set up on traffic poles, but believe that their current speeds are not fast enough to leverage this infrastructure or deploy various other tracking tools. Their focal points include key communication channels with low reliability as well as major arterial corridors. Many of the cameras need to be updated.

Participants agreed that the city should invest in new technologies and products for ongoing data collection like cameras and high-speed communications. The future of electric vehicles is still unclear, but participants were very interested in how this technology will affect the region as a whole. Participants also agreed that broadband will provide flexibility for people now working in remote positions. Participants noted the relatively large presence of software engineers and similar professionals and saw improved

infrastructure and communications as means to attract more such professionals as well as get local businesses to stay and grow in the area.

Conclusions & Implications

A broad range of stakeholders provided inputs to the City's Broadband Plan. Survey results show that many households do not have broadband that meets state standards, particularly in the southern neighborhoods. Whether this is due to high costs or limited availability is unclear, but results suggest the City's southern neighborhoods have less capacity than the areas around downtown. Charter is the dominant provider with the most economical services, but the average monthly costs are over $80 per household just for internet. Given that respondents were generally more educated and older than the overall population, and slower services tend to be cheaper but less economical, it is likely that lower income families are effectively under-served with broadband.

While respondents indicated reliability was the most important factor, and they were generally satisfied with it (a) many reported experiencing regular outages and (b) there was clear dissatisfaction with costs and ambivalence about customer service. Respondents were willing to pay substantially more than the competitive rates for broadband, which are generally below $80 and/or $0.30 per Mbps per month. Generally, respondents were willing to pay a bit higher rate per Mbps but wanted lower monthly recurring costs—approximately $0.40 and $60, which is equivalent to 150 Mbps throughput.

Again, it should be emphasized that this is among households that are likely to have relatively high disposable income and relatively low connectivity requirements. Current consumer behavior suggests they are willing to pay over $80 a month for broadband and/or nearly $1.00 per month per Mbps, recognizing that higher speeds are much more economical. In other words, broadband customers expect steep quantity discounts. At the same time, much of the utilization appears to be for general purposes. Increased use for productive purposes, including income-producing (e.g., operating a home-based business or working remotely) and time-intensive (e.g. telehealth appointments) activities may increase willingness to pay.

Stakeholder input substantiated some of these key points, especially for social services and workforce development. More economical, flexible options are required to deliver services and support disadvantaged populations. But limited connectivity isn't just impacting lower-income members of the community. Downtown businesses, research activities, tech companies, and tourism are all hamstrung by limited connectivity options, low speeds, uneven coverage, and unreliable services.

While the survey suggests that connectivity is adequate throughout most of the City, stakeholder inputs indicate that “adequate” is not adequate. The City needs multiple providers offering a wide range of technological solutions throughout the city and beyond. For example, public health workers need the ability to access their systems in trailer parks in the southern part of the City but also in the neighborhoods and downtown core. Tech executives need consistent connectivity from the airport, around downtown, onto Cal Poly campus, and beyond, for their own purposes and for their team members. Students and their families have very similar needs for very different but complementary purposes. The City itself needs the infrastructure to operate and maintain quality of life but also for making visitors feel comfortable, safe, and welcomed. Generally, San Luis Obispo needs a foundation for sustainable growth to deal with high cost of living, equally accommodate its affluent and disadvantaged residents, and provide a platform for technology innovations to improve operations and support economic development.

5. Capital Improvement Program Analysis

A Capital Improvement Program (CIP) outlines the planned and ongoing capital projects for a city that maintain or replace existing infrastructure assets such as streets, sidewalks, lighting, parks, and water/sewer lines, or construct new infrastructure assets. Long-range projects may involve significant excavation and improvements that provide the opportunity to jointly deploy broadband assets at marginal cost, typically through adding communications conduit to open trenches/excavation, or by planning for wireless/Wi-Fi capabilities and smart city applications on poles, public buildings, or other public areas.

As a key task in its scope of work, Magellan undertook a detailed review of the City's CIP, including all the projects identified in Figure 37, and meeting with the City's engineers and CIP Committee to understand current standards, processes, and gaps as it relates to economic and efficient broadband expansion.

5.1 CIP COMMITTEE

Magellan met with members of the City's CIP Committee[24] in order to understand current processes, particularly as it relates to utility coordination, considerations for broadband deployment, and how the City's standards and specifications address joint trenching opportunities and new construction techniques.

If the City undertakes a CIP project that interacts with utilities, the only coordination is a City notice to the utility owner of a requirement to relocate their facilities as needed to accommodate the project. Utilities that have no assets within the project area are not notified and have no opportunity to jointly deploy new infrastructure.

The IT Department is represented on the CIP Committee by Administration Department staff and submits projects primarily for ongoing maintenance and replacements of IT assets. Historically, project reviews by the CIP Committee have not included consideration of opportunities for broadband implement that relies, in part, on "incremental and opportunistic" network builds. Moreover, the IT Department does not have a funding source to cover the marginal and incidental costs specific to broadband, and such project costs would require a budget from the General Fund or other alternative funding source.

[24] The City's CIP Committee includes Public Works, Finance, Utilities, Community Development, Parks & Recreation, Public Safety, and the Assistant and Deputy City Managers.

In addition to the need for an effective, curated, and managed CIP and utility coordination program, the City would benefit from updating its codes, standards, and specifications to discourage "go it alone" projects and incentivize joint builds (e.g., official road moratoriums coupled with a dig once ordinance), allow for new construction techniques now required by California state law (e.g., microtrenching), or update outdated standards to allow for economic joint builds (e.g., separation requirements between wet and dry utilities). These new policies and standards could be coupled with internal procedures and processes that allow for fair and simplified cost-sharing arrangements when joint trenching does occur, ensuring that larger projects with multiple funding sources – including state and federal grants – retain strict separation to comply with project eligibility requirements.

5.2 PROJECT REVIEW

Magellan undertook a detailed review of all City CIP projects that were either in design or planning stages (see Figure 37) to evaluate their potential synergies with broadband expansion.

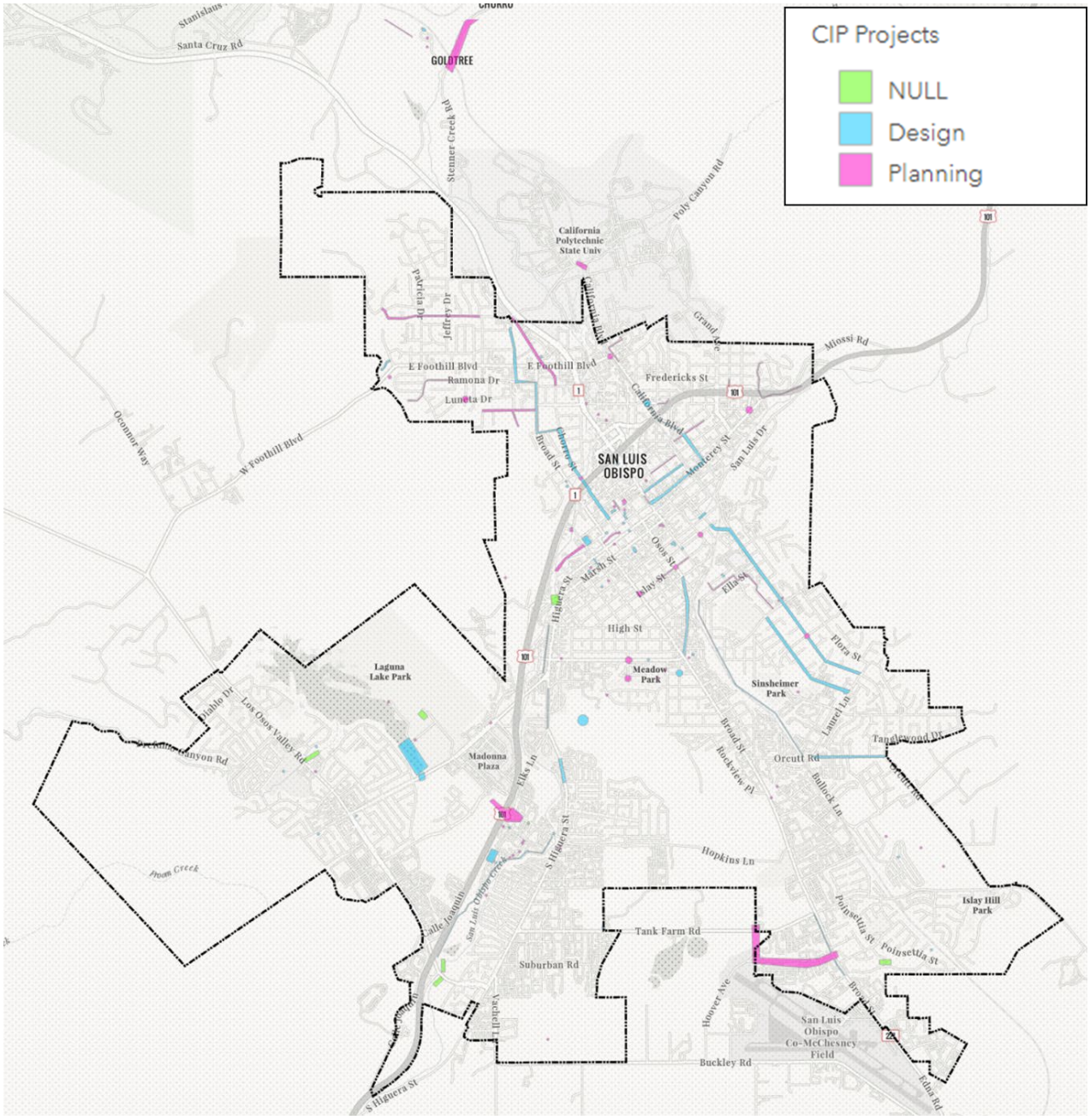

Figure 37 - City CIP Projects

All CIP projects should be considered for deploying smart city applications or devices. However, Magellan evaluated each project for additional broadband opportunities: to deploy new communications conduit in open trenches (joint trench), connecting new or existing City assets, expanding community Wi-Fi or wireless distribution points, or to take advantage of critical bridge, creek, or freeway crossings. More than 50 projects were identified as possible coordination opportunities, shown in Appendix B.

No budget information was identified for the CIP projects on the database provided by the City (larger project budgets typically indicate a bigger scope of work and, thus, more opportunity for significant broadband expansion). Further evaluation of these projects is warranted to clearly identify possible synergies and timing for broadband deployment.

Each of the projects listed in Appendix B does provide some opportunity – typically to jointly install communications conduit at the same time that a trench or other excavation takes place (also known as "dig once"). The engineering and labor of digging a trench (or, even more costly, directional boring) accounts for 35-65% of the total cost of deploying underground conduit; open excavation allows conduit to be placed simultaneously at a fraction of the normal cost. Even if the planned CIP excavation is minimal – for example, adding conduit to just a single block or section of road, or providing conduit for a key bridge, road, or waterway crossing – adding the broadband asset during other planned construction provides significant cost savings and can, over time, assist in incrementally building a robust public fiber optic network.

5.3 UTILITY & CIP COORDINATION

Broadband Infrastructure Fund

Many cities create dedicated funds for revenues generated from leases of City assets by private telecommunications companies. A dedicated fund with ongoing revenues—separate from the General Fund—prioritizes new City/public technology deployment for future build opportunities (locating new smart city devices concurrent with expansion of private wireless connectivity, or funding for fiber network expansions through incremental builds/joint trench coordination). Creating an fund in the early stages helps plan strategically for the years to come when use of public assets/ROW will increase, creating significant new City revenues. Additionally, the unscheduled nature of joint trench/dig once opportunities means cities need a dedicated funding source outside of the normal budgeting process to take advantage of open trenches to further the broadband plan. Cities often will ensure ongoing funding to this fund by dedicating any revenues received through the license of City assets or lease of City land to private telecom for the placement of cell towers, antennas, or revenues received as payments for conduit occupancy rights or dark fiber leases.

Utility Coordination, Joint Trench and "Dig Once"

Both wireline and wireless broadband services, including cellular coverage, require fiber optic cable. The Infrastructure Investment and Jobs Act (IIJA) and SB 156 in California are making significant investments in fiber optic technology, particularly in constructing new

open-access middle mile networks and last-mile fiber networks. Transportation and utility infrastructure are utilizing smart technologies and thus require their own connectivity to operate, improving traffic and reducing impact on natural resources. Additionally, IIJA provides more funding for traditional infrastructure programs (i.e., transportation)—not just specifically for broadband—which will require major excavation along public rights of way, and thereby open up opportunities for joint trenching and utility coordination.

State and federal policies are being established for coordination of utility work in the public rights of way to foster efficient and cost-effective placement of fiber whenever the public rights of way are opened for any project. The Federal Highway Administration implemented a new rule[25] in 2022 to facilitate installation of broadband infrastructure. To accommodate broadband in federal highway projects by FHA rule the state department of transportation is to identify a "broadband utility coordinator" to be responsible for facilitating infrastructure efforts in the rights of way. This is a substantial change of policy direction at the federal level, toward allowing the use of federal highway funding to expand broadband infrastructure and encouraging broadband utility coordination while working on projects involving work in the rights-of-way.

Similarly, Caltrans has implemented new policies under state legislation pertaining to wired broadband facilities on state highway rights of way on its website. This includes a new resource for "Accommodation of Wired Broadband Facilities within Access-Controlled State Highway Rights-of-way"[26] dated March 14, 2022 that addresses state legislation and considers the new rule from FWHA. The Caltrans website provides contact information for its Broadband Coordinators, including for San Luis Obispo, which is in District 5.[27] Inventory and mapping of Caltrans-owned wired data communications assets including broadband conduits is available from the Caltrans district contact.

The Golden State Network is a new public corporation that will build and operate statewide middle-mile network in Caltrans rights of way. The City should explore these opportunities with the District 7 representatives on broadband utility coordination and GSN. Deployment of additional broadband infrastructure for other purposes can be planned in conjunction with traffic fiber for Intelligent Transportation Systems (ITS) and the City's broadband plan.

Implementation of the utility coordination begins with effective coordination at the local level. City departments should ensure they are coordinating on major projects, especially

[25] See, 23 CFR Part 645.307(a), and "Assessment of City Policies and Ordinances"

[26] https://dot.ca.gov/-/media/dot-media/programs/traffic-operations/documents/encroachment-permits/attachment-a-wired-bb-accommodation-a11y.pdf

[27] Caltrans Broadband Coordinators, Caltrans. https://dot.ca.gov/programs/design/wired-broadband/poc

CIP projects, to include broadband infrastructure where needed by considering at early stages of the projects how can it be used to expand broadband capacity and availability. Going forward, all significant City projects and initiatives should include explicit consideration of broadband implications. Broadband is critical infrastructure and general plan elements should incorporate actions which support expansion of broadband infrastructure.

Planning ahead for major CIP projects that involve excavation will allow the City to cost-effectively install conduit and/or fiber concurrent with other major projects: water main replacements, street paving, sidewalk, curb and gutter replacements all can be used as opportunities to add in City conduit at a fraction of its typical cost.

Coordination should be expanded for any excavation work among all the utilities—electricity, gas, cable, internet, telephone, water, sanitation, and city street work. Providing sufficient notice ahead of excavation work will encourage more private investment from the communications industry who can install their own, private conduit at the same time that trenches or streets are opened up. Coordination can be mandated through a joint trench or "dig once" ordinance, although enforcement of any such ordinance requires close coordination and curation by the city.[28]

The City should actively identify any CIP projects that involve excavation and plan accordingly to install City-owned conduit and/or fiber cable, and should share those CIP projects, plans and schedules with other telecommunications providers so they can similarly avail of the opportunity to cost-effectively expand their networks.

Sharing this planning information among all entities working within the ROW is critical to the success of utility coordination. The City should curate and share an active planning list of all major projects occurring in the public rights-of-way – including collecting planned projects from private utilities and developers – so that telecommunications conduit and/or cables can be installed during any major excavation.

Effective and successful joint trenching/utility coordination programs are backed by a strong municipal code that requires cooperation among utilities and the City – and which is supported by an updated road moratorium list that incentivizes coordination while discouraging "go it alone" projects. The City should develop an ordinance to implement a dig once program and update publicly-available road moratorium lists.

[28] For an example of an effective dig once ordinance, see the City of South San Francisco: https://www.ssf.net/departments/public-works/engineering-division/dig-once-policy/-fsiteid-1

Development Conditions

The Public Works Engineering, Utilities, and Community Development Departments each review discretionary entitlement applications, but largely only for compliance with City codes, standards, and specifications – not for opportunities to jointly install or deploy new City assets during construction. Including IT in entitlement application reviews would afford the City more opportunities to identify broadband opportunities within private development projects.

Moreover, inclusion of requirements to place fiber/conduit, concurrent with development, in developer agreements, through the entitlement process, or as conditions of project approval would ensure faster, more efficient provision of fiber-optic based next generation broadband services furthers achievement of the Broadband Plan.

The City could require developers to include broadband infrastructure at the time of building the development to provide broadband fiber and conduit infrastructure faster, at the time of development. Similarly, broadband access and internal building wiring can be required for affordable and public housing, and CDBG and other HUD funds can be applied to this purpose.

6. Conceptual Network Design

6.1 CONCEPTUAL NETWORK ROUTES

The conceptual network design to connect all City facilities, buildings, parks, parking structures, traffic signals, and water assets into a City-wide ring network would require approximately 18.4 miles of new backbone fiber and 5 miles of laterals for service drops, in addition to upgrading 120,000 feet of the existing City network with splice points, handholes, cabinets and supporting infrastructure (Figure 38).

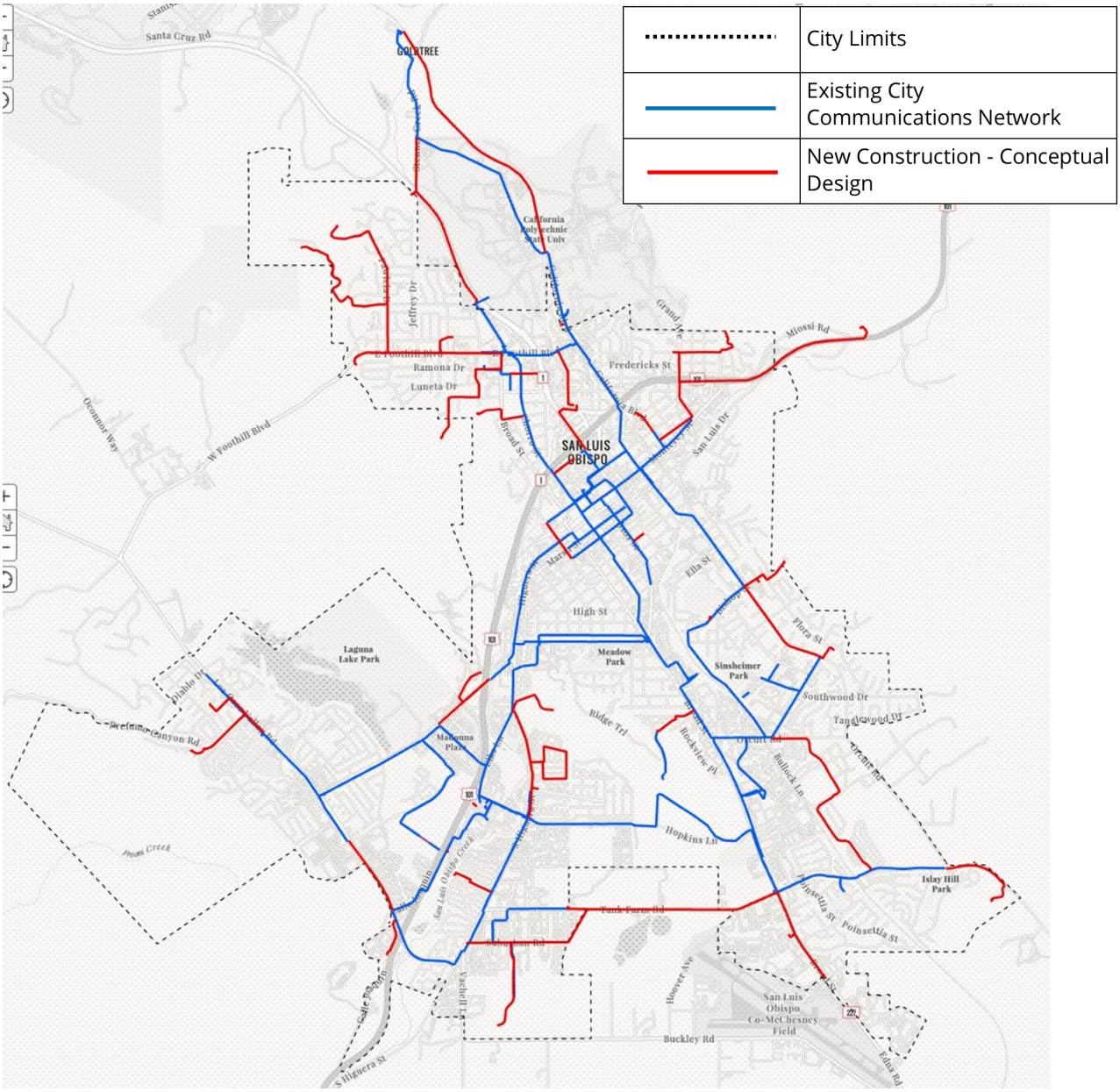

Figure 38 - Conceptual Network Design

A city-wide backbone ring network means that the broadband signal can come from two separate directions; if a backbone cable gets cut, the signal can be routed through an alternate path to continue to provide end line service. Creating a backbone loop is critical for not only uninterrupted City services, but also if the City (or its private partner) were to utilize this backbone to provide competitive retail internet services to the community and businesses. Retail internet services must be able to ensure loop redundancy to eliminate or minimize service outages.

The existing City-owned/controlled fiber network in Figure 38 is depicted in blue and varies from 96 to 288 strand cable[29], as well as some conduit with legacy copper cables that would need to be replaced with fiber. Proposed new backbone construction is depicted in red and would be comprised of two 2" conduits deployed underground at 36 inches below the surface, filled with a 288-count fiber-optic cable, capable of meeting future demand. New laterals and service drops are a single 2" conduit with a 24-count fiber cable. In addition to the 20.4 miles of new construction, the conceptual design includes 22.8 miles of required upgrades, additional fiber, and splicing of the existing City communications network to ensure redundant loops architecture and flexibility for future growth.

Table 14 - New Sites Added to City Backbone

City Assets Connected to City Backbone in Conceptual Design
Traffic Signals (3)
City Parks (30)
City Water Tanks (10)
Lift & Pump Stations (3)

Lift stations and water tanks are currently connected via different technologies, primarily through wireless radio equipment. However, wireless connections are not as reliable as fixed fiber, and are subject to weather, maintenance, and other events that can interrupt connectivity. Moreover, building fiber paths to these assets extends the City's backbone into new neighborhoods that could be leveraged through a public private partnership to provide more community members and businesses with improved internet options and services.

[29] Some of the data was retained on an aging software system that is no longer compatible with City systems and could not be accessed. It's anticipated that as the project moves into design engineering and undergoes field surveys, more information will come to light – including additional fiber cables with different strand counts, and/or some fiber connections to existing assets that are not currently showing up in records or maps.

Some City sites are currently connected via third party fiber (e.g., private ISPs, County of SLO, etc.), which means the City must rely on external parties to ensure continued service to critical City facilities. The conceptual network design includes construction of new routes to replace these leased lines, which would enable the City to connect all facilities solely through City-owned, City-controlled fiber. However, the City could retain these third-party fiber paths and reduce the total construction costs (see Table 18).

There are 82 traffic signals in the City; 76 of these are already connected through the City's signal interconnect network. Three more are proposed to be connected in the Conceptual Design generated in this project. However, there are three remaining traffic signals that are too remote to justify the cost for constructing a lateral fiber path; the City should consider interconnecting these signals using wireless or radio technology in the interim.

6.2 PHASED IMPLEMENTATION PLAN

The Conceptual Network Design can be implemented in a phased approach in order to prioritize the loop architecture necessary for greater community and business access, ensure critical site connectivity, provide flexibility relative to grant availability, budgets, and resource constraints, and to maximize the network reach into new markets to attract a private partner. The phases outlined below can be further broken down into sub-phases or built incrementally and opportunistically through effective CIP and utility coordination.

The main reason some areas within a community remain underserved[30] is typically because private companies, in the context of a corporate financial plan, weigh the project's capital costs against the market and timeline for a return on their investment; capital investment can't be justified in areas that are costly to build and that don't have adequate anticipated revenues. Often, these underserved areas coincide with neighborhoods and/or census tracts with other socioeconomic challenges, which further exacerbates the Digital Divide and quality of life.

However, public investment or access to public infrastructure can offset the private capital required, and encourages market entry. The phased approach will incrementally provide more cables into more neighborhoods – initially to connect City assets – but which can then be leased to private Internet Service Providers (ISPs), thereby reducing the private investment required for new entrants, encouraging more market competition, and enhancing retail data services for residents and businesses.

[30] "Underserved" is defined by the State of California Public Utilities Commission as services offerings below the minimum of 100 Mbps downstream and 20 Mbps upstream.

Phase 1 – City Backbone Loop & Critical City Sites

Phase 1(Figure 39) would modify the City communications backbone into a redundant loop to ensure uninterrupted services to City facilities and/or other locations receiving data services, such as potential future residential and business subscribers.

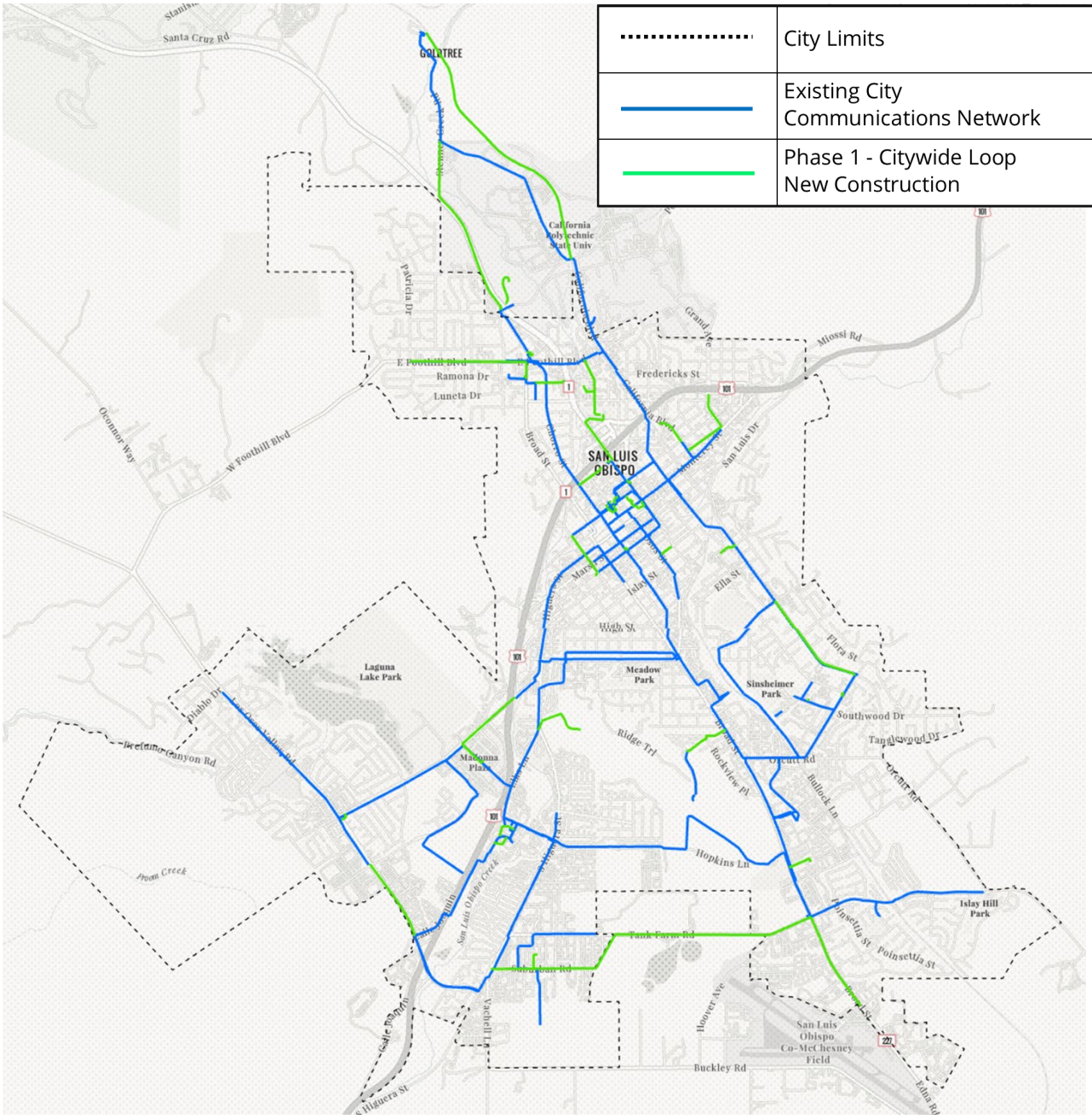

Figure 39 - Phase 1 – City Backbone Loop & Critical City Sites

The phase includes 52,348 feet of new conduit & fiber backbone construction and 5,391 feet of new conduit and fiber laterals. The phase also includes upgrades to 22.8 miles of

the existing City Communications network, including new splice points and pull boxes, and architecting the existing and new networks into a single, redundant loop.

Phase 1 would directly connect the following critical City facilities and assets with redundant services, ensuring uninterrupted City service delivery:

Table 15 - City Facilities & Assets Connected with Redundant Services in Phase 1

City Asset	Location
Fire Station 4	1395 Madonna Road
Parking Structure	879 Morro Street
Water Treatment Plant	35 Prado Road
Traffic Signals (3)[31]	Various Locations

Phase 1(b) – Residential Backbone Extension

City staff and City Council feedback following the April 4, 2023 Broadband Update identified four areas in which to consider backbone extensions in order to penetrate more residential neighborhoods. These four areas included a section of Los Osos Valley Road, an area at South Higuera Street and Chumash Drive, a residential area south of Orcutt Road in the southeast of the City, and the area immediately adjacent and northeast of the airport.

The section of Los Osos Valley Road did have a backbone extension; but that particular section is largely commercial and has minimal residential homes. Similarly, the area adjacent to the airport is commercial and does not have residential neighborhoods.

However, the South Higuera/Chumash Drive area and the Orcutt Road areas both have significant residential neighborhoods. Magellan thus added backbone extensions through these areas to maximize the number of households that could reasonably access the City's future network, resulting in 13,801 feet of new fiber and conduit backbone construction (Figure 40).

[31] There are three remaining traffic signals that are too remote to justify the cost for constructing a lateral fiber path; the City could interconnect these signals using wireless or radio technology.

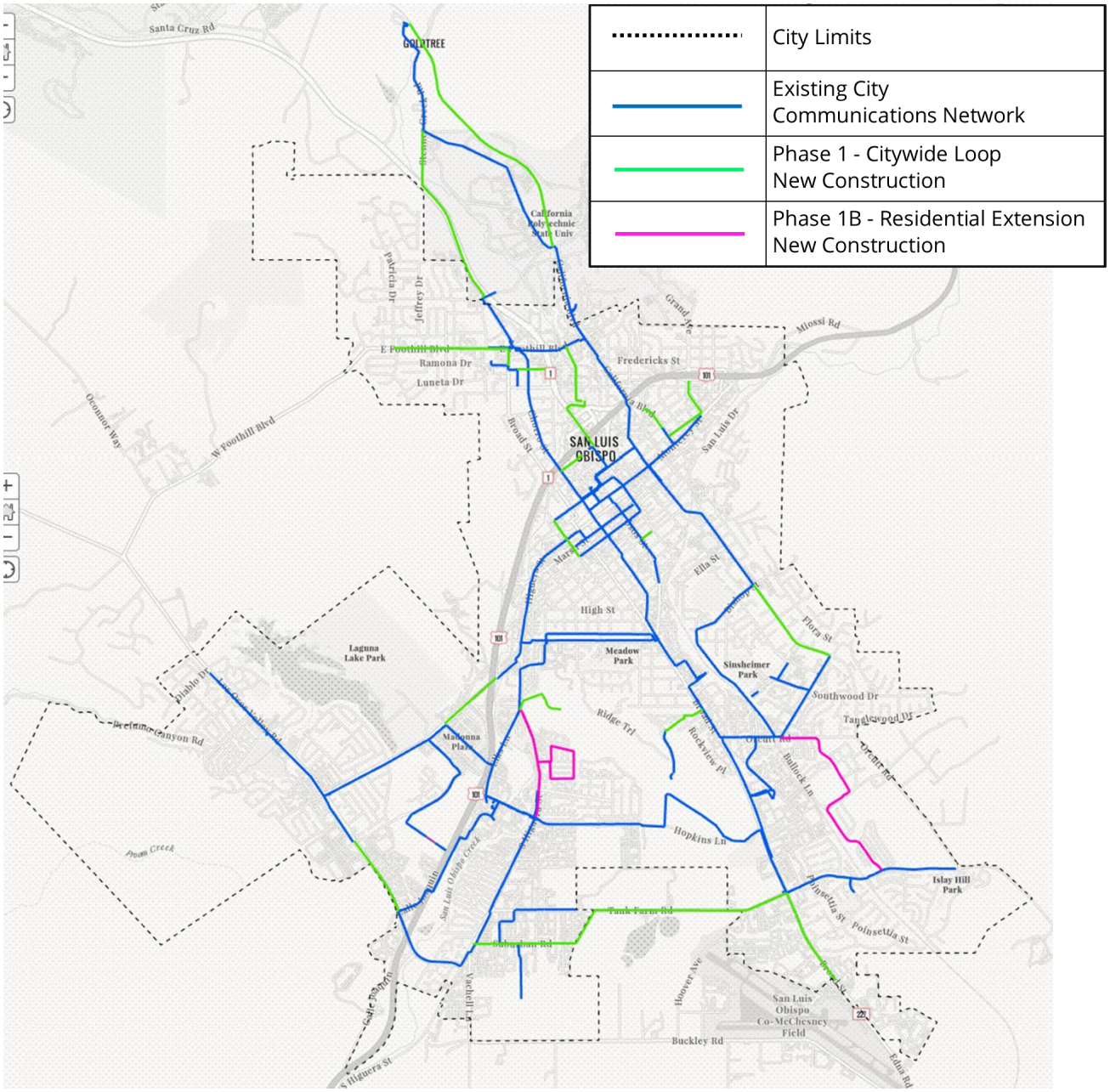

Figure 40 - Phase 1B - Residential Backbone Extension

Phase 2 – Water Assets & Parks

Phase 2 adds 31,149 feet of new conduit and fiber backbone and 16,990 feet of new laterals that connects City water tanks, lift stations, and City parks (Figure 41) These connections allow the City to not only connect these sites into its backbone network, but also to expand community and business access and leverage these locations for smart city devices and wireless distribution infrastructure.

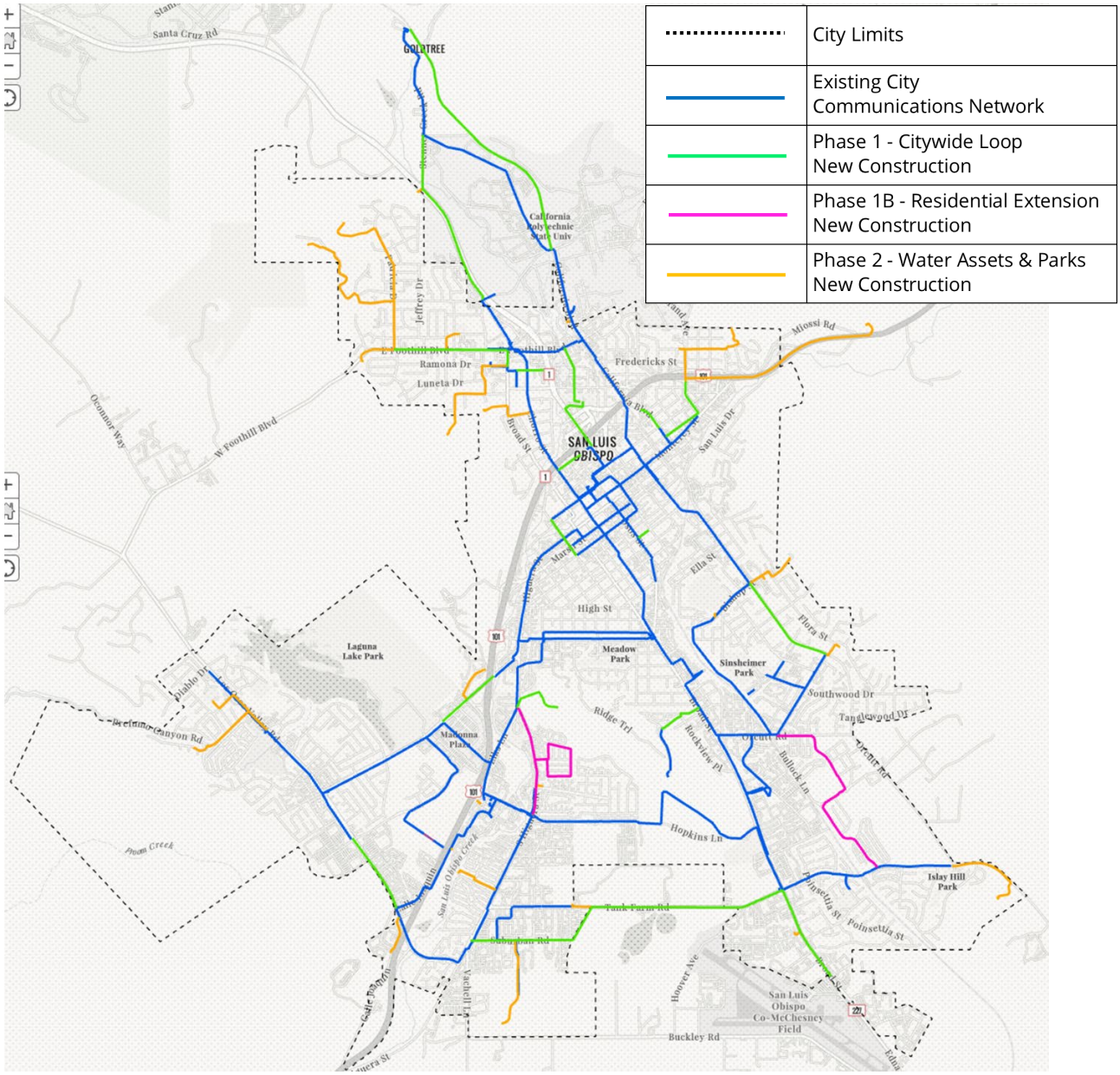

Figure 41 - Phase 2 - Water Assets & Parks

Water tanks (typically at a higher elevation with better line-of-sight) and parks (geographically dispersed throughout residential neighborhoods) can enhance community connectivity by passing more residences and businesses that could subscribe to services, or through Wi-Fi or other wireless internet access points.

Table 16 - City Assets Connected in Phase 2

New Assets Connected
City Parks (30)
City Water Tanks (10)
Lifts & Pump Stations (23)

6.3 CONSTRUCTION COSTS ESTIMATE

Because the City already has a significant fiber backbone established, there is relatively less new infrastructure to construct as compared to other jurisdictions without existing assets. The estimated capital construction cost of the Conceptual Network Design is $13,522,728, which includes design and engineering for the entire build, required upgrades to 120,198 feet of existing City conduit and fiber cables, as well 119,679 feet of new construction (see Table 17).[32] Once a competitive bid is selected and the contract completed, construction should be able to be completed within an 8-10 month period.

Table 17 - Estimated Construction Costs of Conceptual Network Design

	Length (feet)	Price per Foot	Estimated Cost
Phase 1 – City Backbone Loop & Critical City Sites			
Design & Engineering			
Design & Engineering (New Construction)	57,739	$ 1.75	$ 101,044
As-Builts (Existing City Network Upgrades)	120,198	$ 0.20	$ 24,040
Fielding Survey	--	--	$ 50,000
Public Engineering Stamps	--	--	$ 50,000
Phase 1 Design & Engineering Subtotal			***$ 225,084***
Construction			
Existing City Network Upgrades	120,198	$ 5.00	$ 600,990
New Backbone Construction	52,348	$ 110.00	$ 5,758,280
New Lateral Construction (City Assets)	5,391	$ 80.00	$ 431,280
Phase 1 Total	***177,937***	***--***	***$ 7,015,634***
Phase 1B – Residential Backbone Extension			
Design & Engineering			
Design & Engineering (New Construction)	13,801	$ 1.75	$ 24,152
As-Builts (Existing City Network Upgrades)	--	$ 0.20	--
Fielding Survey	--	--	$ 15,000
Public Engineering Stamps	--	--	$ 20,000
Phase 1 Design & Engineering Subtotal			$ 59,152

[32] Construction costs are based on Magellan's analysis of comparable cities, recent construction bids, equipment and material costs, and a regional assessment of the labor and construction market. An inflation factor has been included to address future cost increases.

Construction			
Existing City Network Upgrades	--	$ 5.00	--
New Backbone Construction	13,801	$ 110.00	$ 1,518,110
New Lateral Construction (City Assets)	-	$ 80.00	--
Phase 1B Total	**13,801**		**$ 1,577,262**
Phase 2 – Water Assets & Parks			
Design & Engineering			
Design & Engineering (New Construction)	48,139	$ 1.75	$ 84,243
As-Builts (Existing City Network Upgrades)	--	$ 0.20	--
Fielding Survey	--	--	$ 25,000
Public Engineering Stamps	--	--	$ 35,000
Phase 2 Design & Engineering Subtotal			$ 144,243
Construction			
Existing City Network Upgrades	--	$ 5.00	--
New Backbone Construction	31,149	$ 110.00	$ 3,426,390
New Lateral Construction (City Assets)	16,990	$ 80.00	$ 1,359,200
Phase 2 Total	**48,139**	**--**	**$ 4,929,833**
TOTAL – ALL PHASES	**239,877**		**$ 13,522,728**

The construction estimates in Table 17 are based on the assumption that if the City does not have maps or data indicating fiber exists, it would need to be constructed. However, there does appear to be some fiber routes that were installed on an ad-hoc basis over time, and may not be recorded in the City's maps, or may simply be retained only as institutional knowledge by some City departments. The design engineering and field surveying process would verify and record all existing assets, likely uncovering additional fiber that would eliminate the need for some of the new construction, thereby lowering the total overall construction costs. A completed design and engineering process will likely identify some areas where overhead poles exist and aerial cables can be used instead of undergrounding new conduit, which can cut deployment costs by as much as 35-45%.

The construction costs can be reduced – significantly for Phase 1 – if the City were to retain and even expand its use of third-party fiber. There is more than 27,690 feet of available third-party fiber (County or privately-owned) that could be utilized in in the Conceptual Network Design that, if utilized, could reduce the total construction costs by $3 million.

Table 18 - Estimated Construction Costs if Utilizing Third Party Fiber

Third Party Fiber Option			
	New Construction/Upgrade Length (feet)	Third Party Fiber Length (feet)	Revised Estimated Cost
Phase 1	153,407	24,530	$ 4,274,405
Phase 1B	13,048	753	$ 1,493,114
Phase 2	45,732	2,407	$ 5,473,217
TOTAL	**212,187**	**27,690**	**$ 10,421,050**

However, some third-party fiber leased by the City may explicitly be for City services use – and lease agreements may prohibit providing any internet services to the community or business.

Construction costs can be even further reduced through effective utility coordination, implementing a dig once/joint trench program, and aligning broadband expansion projects with other major CIP projects, particularly those with excavation in the City right-of-way. The labor required for excavation can account for 40-60% of total construction costs. When work is coordinated between utilities and public agencies, all parties can expand their fiber footprint at a fraction of the cost by taking advantage of synergies with other projects.

6.4 NETWORK PASSINGS ANALYSIS

Should the City elect to solicit one or more private ISP partners, it is important to consider the potential subscriber reach of any City network – both residential and business - as an aggregation of possible customers will attract qualified private partners and ultimately determine the fair market value the City should anticipate for the use of its public network.

Placing a 750-foot buffer around the backbone network and cross-referencing the residential address database and the City's current business license list provides the ability to quantify those potential subscribers that can be economically connected into the City's network (typically addresses falling within 750 feet is a reasonable distance that can be bridged by a private ISP through last mile service drops).

Table 19 - Residential and Businesses Addresses falling within 750-foot Service Buffer

	Residential Units	Businesses
Phase 1	21,679	1,750
Phase 1B	2,660	0
Phase 2	3,180	45
TOTAL	**27,519**	**1,795**

Additionally, 99 of the City's public, affordable, and/or deed-restricted housing sites are located within 750' of the backbone network. Connecting affordable housing sites to a City network – while ensuring affordable rates for high-speed broadband for residents – could help address disadvantaged communities, close the Digital Divide, and benefit from state and federal grant opportunities through the CPUC, CASF, and the U.S. Department of Housing & Urban Development (HUD).

Figure 42 identifies those residences, businesses, and affordable/public housing sites that fall within the 750-foot buffer of the *entire* City network (existing fiber and proposed new construction).

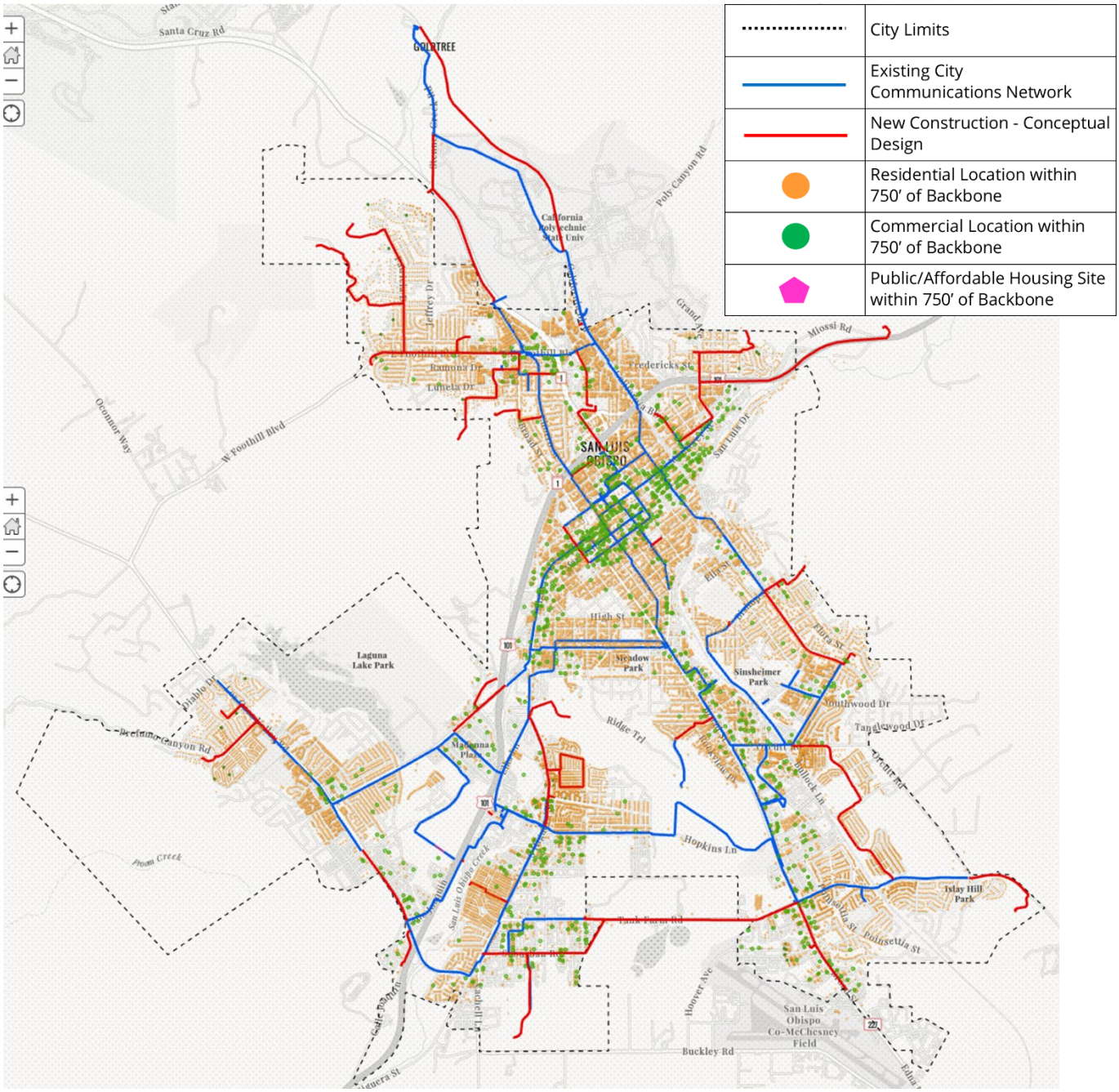

Figure 42 - Serviceable Addresses within 750' Buffer of Conceptual Design

Although more than 29,000 potential subscribers fall within the 750-foot buffer, individual service drops to connect each address to the City's backbone will still be required, which will generate significant need for start-up capital (service drops within a 500-750 buffer are typically estimated at $2,500 per unit).

7. Financial Analysis

7.1 START-UP CAPITAL & OPERATIONAL COSTS

Organizational capacity is needed to deploy, manage, and operate a network. Investment increases with the level of control in businesses models including staff and systems for these purposes. The following staffing, capital, and operational costs and resources will be needed to provide varying levels of internet provision for the community or businesses, which demonstrate the investment needed to transition a city network into a retail internet provider network. However, with the right public-private partnership, many of these capital, staffing, and operational costs could be assumed by a private partner, relieving the City of significant ongoing liabilities. However, the potential cost and scope of these costs should be considered when negotiating and evaluating a partnership arrangement.

Staffing and Systems Options

At the minimal level of an infrastructure-only business model, the City of San Luis Obispo will need at least one network technician and part of a GIS specialist position. It would probably be best to combine these roles in a Network Infrastructure Manager position responsible for executing and tracking adds, changes, or moves.

Other departments, particularly Public Works, will see marginal increases in workload as they accommodate network assets in other projects and programs. The capacity to promote the network as a useful asset for business will be needed to generate revenue. This function could be part of Economic Development's work and may be shared by staff responsible for tracking revenue from cell site leases. It would be advisable to invest in specialized fiber management software, which may require additional staff capacity.

Any business model beyond leasing a limited amount of dark fiber will require dedicated staff. If the City were to build-out a robust fiber network and undertook delivery of a high level of retail services, it would need a Broadband Director with strong understanding of facilities leasing and maintenance to be responsible for overall organizational performance, focused on finances and governance. If the City is actively promoting use of the network, it will also need a Marketing Manager for identifying and managing lessees. The Marketing Manager may also work with wholesale customers to promote their internet services to the community.

At this level, the City will have a "Broadband Department" comprised of a Director, Infrastructure Manager, and Marketing Manager. The Broadband Department will need a fiber management system (FMS) and should have a maintenance fund to cover repair costs

(approximately $75,000 for one-time software costs with annual fees of 15%). Major maintenance or repair tasks—anything requiring excavation—may be contracted out or may be handled by Public Works. If the Broadband Department offers any service that involves a service level agreement, it will need external contractors on stand-by and a dedicated full-time Network Engineer.

Table 20 - Fully-loaded Cost Estimates for Staffing a Broadband Enterprise

Position	Annual Cost
Broadband Director	$178,200
Accounting Manager	$126,360
OSP/Engineering Supervisor	$157,140
Sales & Marketing Manager	$129,600
Headend/Network Engineer	$113,400
Customer Support Manager	$105,300
Technical/NOC Support Manager	$129,600
Business/Enterprise Account Manager	$72,900
Network/NOC Technician (Data Center/Inside)	$97,718
Technical Service Rep Level 1	$50,544
Technical Service Rep Level 2	$60,653
Field Services Technician (in-house)	$77,501
Field Locates Technician (in-house)	$72,446

A retail broadband enterprise has substantial overhead and operating costs, as well as a much larger capital investment in infrastructure and equipment. Payroll can account for 90% or more of ongoing costs for a broadband enterprise. For reference purposes, Table 20 lists estimated annual costs to fully staff a broadband enterprise. Equipment licenses, maintenance, refresh, and upgrades create recurring costs. Limiting operations to a backbone network greatly reduces both up-front and on-going costs while providing critical functionality and setting the stage for private investment.

Network Infrastructure Options

There are various types of network infrastructure. Generally, local broadband networks are composed of core (backbone), distribution (last mile), and access infrastructure, terminating at subscribers' premises where it connects to private infrastructure, including routers and equipment that connect end-user devices. Local broadband networks typically utilize a ring design, which increases flexibility and resilience by minimizing risks from an equipment failure or fiber cut. Local broadband networks interconnect with long-haul and middle-mile networks to secure data paths to the internet.

Backbone routes follow major thoroughfares, as well as some secondary streets where appropriate to complete a ring. Spurs may be used to extend into remote areas where it is not practical to complete a ring. Last-mile infrastructure reaches into homes, offices, vehicles, and literally the palm of your hand. The City of San Luis Obispo is not going to become a retail broadband service provider, so is unlikely to deploy last mile distribution and access infrastructure.

Therefore, we focus on backbone infrastructure, which could be leased to third party Internet Service Providers who would then design and construct the last mile connections in order to serve subscribers. We analyze the preliminary route design in order to assess the potential geographic reach, municipal facilities, subscribers, and customers within a reasonable buffer (~750') that could be connected via last mile infrastructure by an ISP.

We also review options for access infrastructure because (a) it defines prospective providers' capital investment and connectivity requirements, (b) it is required for achieving some of the City's goals, mission, and vision, and (c) the City may decide to deploy it for specific projects or purposes.

Equipment and Services

Backbone fiber can be managed as a physical asset by assigning specific strands to specific users, commonly on a lease basis. Strands in various cables must be physically spliced together or optically interconnected, including via splitters, to form complete paths so that any light shone (transmitted) down the fiber is seen (received) at the other ends. This approach has relatively low cost because it doesn't require purchasing or operating equipment, but it can also be very inefficient.

For example, if two strands in a 10-mile-long backbone (20 strand-miles total) are used to connect two sites that are a mile apart (2 strand-miles), the other 18 strand-miles become stranded and can only be used on each side of the interconnected sites. This approach also misses the benefit of redundant paths: If the fiber is cut between the two sites, the connection is lost because the information can't flow in other directions.

There are two general classes or types of services that can be provided over modern network infrastructure: access or transport. Access services are relatively inexpensive, "best effort" that do not include any solid performance guarantees, which are typically considered retail broadband. Transport services are dedicated services that typically come with guaranteed bandwidth and uptime commitments, which are referred to as service level agreements (SLAs). Transport services are variously referred to as "backhaul," "bulk IP," "carrier-class," "enterprise," "long-haul," "managed," "metro," or "middle-mile" services,

depending on the context. Generally, they are used by large organizations, including internet service providers.

Access and transport services are complementary but involve different components and costs. As San Luis Obispo is most likely to offer transport as part of any future public sector connectivity business, we describe transport services infrastructure first, followed by information about co-location, a related service. We include a reasonably comprehensive consideration of access service infrastructure, as San Luis Obispo may seek private partners to offer those services using a portion of the City's network.

Transport Services

Transport services involve relatively few stable, but high-performance connections. Users are major businesses and institutions, including network service providers. The service is moving information from one point to another, rather than leasing an asset, so the value comes from ensuring the information keeps moving. This requires equipment that lights the fiber, maintains connections, and transmits data as diagrammed in Figure 43. Some form of interconnection with other networks or services, which requires additional equipment, is commonly a part of transport service.

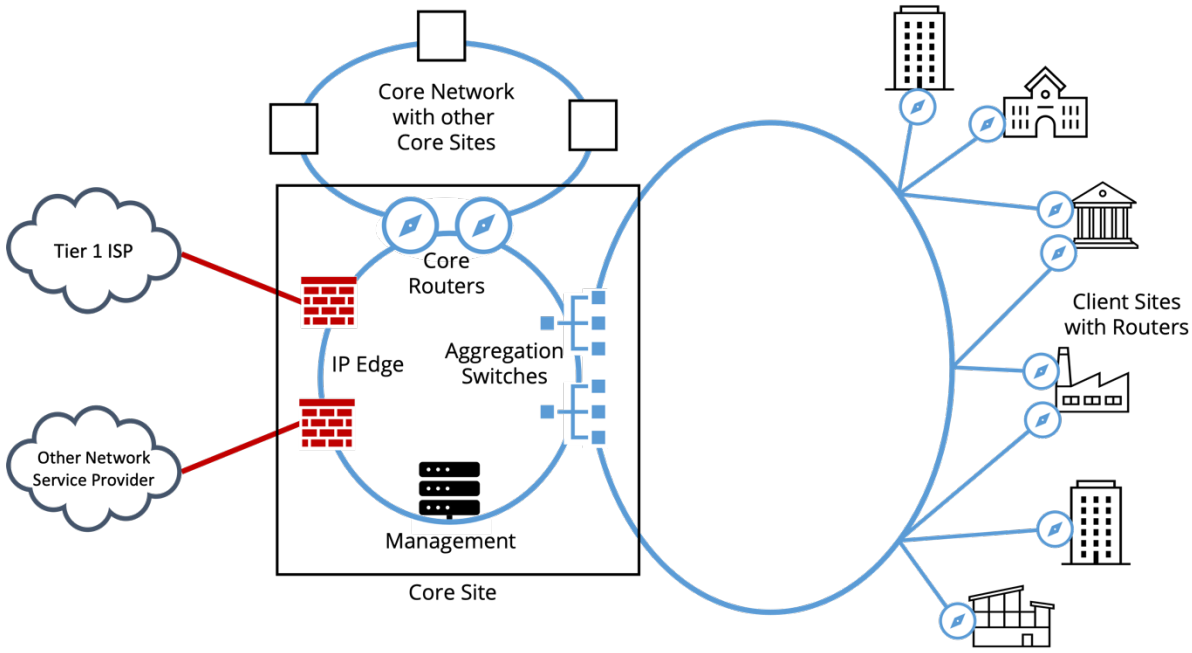

Figure 43 - Transport networks Architecture

Networks typically have a core network composed of a few centralized sites—called central offices, data centers, or headends depending on type of ISP—interconnected by fiber in a ring architecture. Core sites contain critical equipment to connect the local network to the global network. They must be secure, with reliable power and backups, and preferably

centrally located. At least one site, but ideally two, must connect to high-capacity dedicated internet services, ideally via different providers with fiber following separate routes, for backhaul.

Transport customers typically have substantial network operations of their own that incorporate services where needed, which requires next generation technologies—specifically software-defined wide-area networks (SD-WAN) and sophisticated management systems. Customers may require dual-homed connections, which connect to the core site via two diverse routes, and redundant connections to cloud services, tier 1 ISPs, and other service providers.

Transport service providers often co-locate in other companies' data centers to reduce costs. Access service providers generally prefer to own their core network sites, where they can access infrastructure called "pedestals" or "points of presence" (POP). This is changing somewhat with the emergence of wholesale open access infrastructure. Interconnection sites between different providers ranges from massive data centers to relatively small structures.

The network equipment required to deliver broadband services to customers is comprised of several functional groups and multiple components. All business models require core equipment, which is very similar to what the City of San Luis Obispo has in place already for its wide-area network. This must be supplemented with various types of access equipment and infrastructure.

Core Equipment

The core equipment aggregates traffic from all access equipment, connecting customers and routing their data to and from the IP edge equipment or other end-point destinations. Standard network protocols provide link redundancy and dynamic traffic re-routing in the event of an equipment failure or fiber cut. Core equipment can easily support thousands of customers and hundreds of gigabits of traffic throughput at deployment and will accommodate future system growth through the addition of service modules, optical interfaces, and/or software licenses.

Internet Protocol Edge (IP Edge) Equipment

Separate from the core switches, the network must maintain an "internet perimeter." The internet perimeter will include internet routers and internet firewalls to be used to manage routing throughout the network. Firewalls will be utilized to protect critical back-office systems, including provisioning, network management, data storage, and other information. The two core switches will be interconnected to two internet routers providing redundancy for internet services in the event of a single interface or equipment failure. As

mentioned above, backhaul circuits should be acquired from at least two providers using diverse paths, one of which should be a Tier 1 provider.

Estimated Costs

The estimated one-time capital costs for equipment and services to establish a transport network for the City of San Luis Obispo's 63 sites, based on vendor-provided pricing, would be about $550K as summarized in Table 21. The core network in this scenario would consist of the City's data center as the "central office" and a secondary, backup site, which we assume would be an existing City facility. We assume that each site would have a single router combining edge/core functionality, an aggregation switch, cloud service/firewall appliance for security, Internet Protocol services, and management software for server, network elements, and back-office functions.

Table 21 - One-time Capital Expenses for Transport Network equipment

Item	Unit Cost	Quantity	Total
Core/Edge Routing	$80,000	2	$160,000
Switching	$7,500	2	$15,000
Software	$15,000	2	$30,000
Security	$50,000	2	$100,000
Management	$30,000	2	$60,000
IP Services	$5,000	2	$10,000
Spares	$15,000	1	$15,000
			$390,000
CPE	$1,200	63	$75,600
			$465,600
Pro Services	$78,000	1	$78,000
Total Capital Cost			**$543,600**

Utilizing this approach, all the City's sites would get 1 Gbps connections, scalable to 10 Gbps. Each site requires customer premise equipment (CPE) that terminates the transport network and provides an interface to the site's local area network (LAN). We assume there is existing LAN equipment capable of 1 Gbps connections. Sites without connections or legacy equipment would involve additional site-specific costs. Annual maintenance and other recurring equipment costs are estimated at $47,000.

The central office would house core and edge equipment for ISPs serving customers within the area. Other carriers could be co-located in these sites so circuits and traffic could be connected and routed to the rest of the world. Equipment and facilities requirements are reasonably modest—primarily separate, secure cages for providers and major network users to place equipment, along with environmental controls and clean, reliable power. We assume the central office would be the City's data center. Otherwise, costs to build out a

data center, not including property acquisition or construction costs, could be an additional $500,000.

Access Services

The major difference between a local transport network and a fiber access network is the addition of access and distribution infrastructure, including hubs and multi-site terminals, illustrated in Figure 44. The core network delivers much the same functionality to broadband distribution hubs—also called points-of-presence (POP)—as to transport service customer sites. The dedicated connections function as feeder lines, which are also typically deployed in rings, between the core sites and distribution hubs. The core and feeder networks and hubs comprise the "transport" network. Access requires additional equipment that supports connections to many customers.

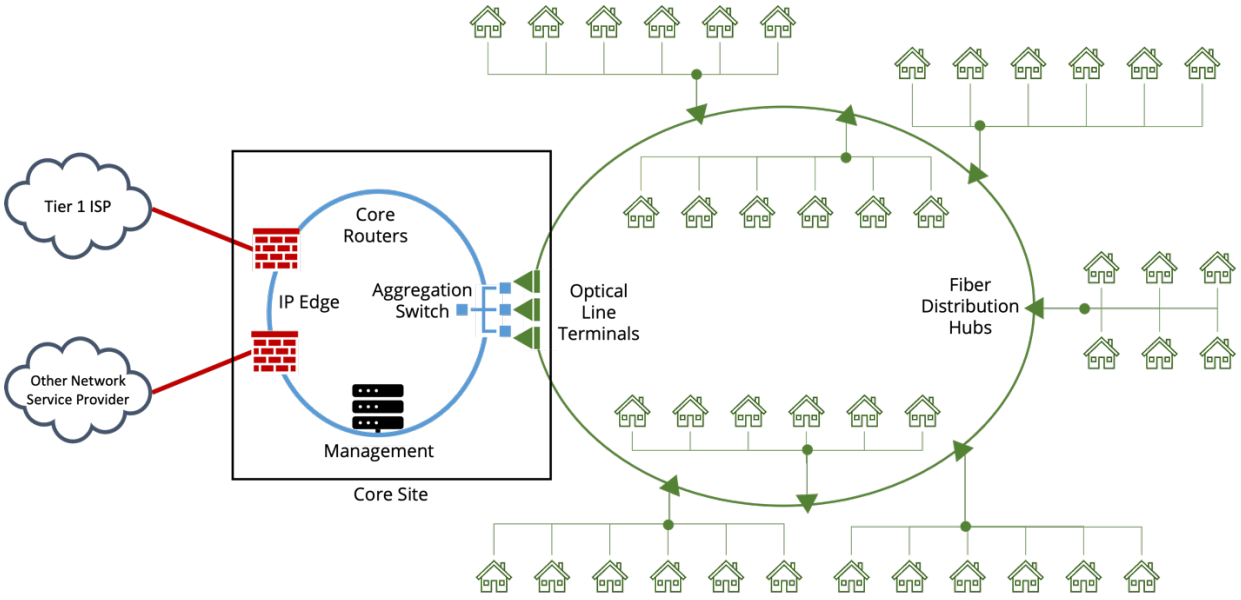

Figure 44 - Passive Optical Network (PON) Architecture

Feeder fiber connects optical line terminators (OLT) in the core sites to passive splitters called fiber distribution hubs (FDHs), typically in outdoor cabinet enclosures placed strategically throughout the service area. Splitters may also be located within the access POP itself. In areas where aerial fiber deployment may be used, FDHs may be placed aerially or transitioned from the aerial pole to a ground mounted FDH. As this plan is limited to assessing major corridors as fiber routes, we assume coverage is limited to customer premises within 500 feet of the backbone. This requires only a single FDH.

The distribution network branches out from the FDHs. Multiple access lines drop off the distribution lines—hence the term "fiber drops"—via drop terminals into customer premises. Major sites can be directly and diversely connected to the core sites via "laterals,"

basically putting them on the feeder network. The backbone fiber may be used for a distribution, feeder network, and/or laterals, as well as core network. The particular use of specific fiber strands is a matter of how they are spliced together and where they terminate. Indeed, a single fiber cable can accommodate multiple physically separate networks for purposes such as SCADA or traffic signal interconnection.

Hubs may be powered cabinets, prefabricated shelters, or existing structures with sufficient space for equipment racks and other components. Fiber in the routes analyzed above could connect retail service providers' POPs anywhere in the City of San Luis Obispo with backhaul via diverse routes to multiple upstream service providers for maximum fault protection. In practice, a distribution infrastructure can and should be built in a phased manner in response to consumer demand and/or in conjunction with other capital projects.

Feeder and Distribution Fiber

Feeder infrastructure that extends from the POPs to neighborhoods and business districts typically requires only a few fibers, at most a single 24-strand buffer tube. The backbone typically consists of 288-strand fiber therefore at least a hundred strands would be available for use as distribution. The estimated costs are based on feeder fibers are sized based on the demand forecast and sizing of each enclosure to ensure that each service area is well equipped for broadband services. These details are addressed in engineering design to get optimal coverage for the least practical costs.

Each OLT serves 512 subscribers at a 1:32 split. The number of POPs and OLTs per POP depends on the number subscribers. The cost includes OLT and backhaul hardware necessary to connect each POP to the core routers. In an actual design/implementation, each OLT would not need backhaul hardware, two line cards, 16 optical interfaces, etc.

Distribution fiber extends from the splitters in the FDHs to network access points (NAPs), or drop terminals, which connect individual fibers entering customers' premises. NAPs may be attached to aerial strand, located in ground level pedestals or placed in underground vaults or hand holes located near the sidewalk or curb in residential neighborhoods or business districts. NAPs are costed as an integral component of the distribution infrastructure estimates. Fiber distribution to NAPs will be sized based on the service area density to provide service to between 8-12 premises per NAP.

Fiber Service Drops

Fiber drops connect from each NAP to the customer premise equipment that delivers broadband service. At the customer premise, the drop cable terminates in a protective "clamshell" enclosure attached to a home or building for storage of slack and connection to

the home equipment. Drop fiber may be installed aerially or underground, typically for a flat fee. Providers may charge additional drop costs for special circumstances such as burying fiber through difficult landscapes or under driveways. The estimated average cost of a fiber drop at the time of this study, including all of these components and labor and recognizing that drops can vary greatly in complexity and distance, is $2,500.

Optical Network Terminal

An Optical Network Unit (ONU), sometimes called an Optical Network Terminal (ONT), serves as the demarcation point between the retail ISP's fiber network and the router or firewall connecting to the customer's local area network (LAN). There are two general methods for installing ONTs. The first method involves mounting an outdoor rated ONT on an exterior wall of the structure and extending service wiring inside the premise. The second method involves extending the fiber into the premise and installing an indoor-rated ONU inside. In either case, the ONT is typically installed somewhere near the fiber entrance and an AC power source. The ONT terminates the fiber-based PON signals and provides customer access to their services through traditional copper interfaces. XGS-PON ONT's supporting greater than 1 Gbps data service may also support optical small form-factor pluggable (SFP) interfaces for connection to enterprise-class LAN equipment.

7.2 OPERATING REVENUE & EXPENSE PROJECTIONS

Whether the City elects to operate a retail data network itself or enters a public-public partnership with a private ISP to operate on its behalf, the proposed network will necessarily need to demonstrate financial viability and, by extension, consider rough revenues and expenses if operated as a retail subscriber network. The model below works from the premise that the City completes construction for both Phase 1, 1B, and 2, the City's new expanded 58-mile backbone network does not carry any debt or associated debt service (i.e., constructed using grant funds), and thus could potentially provide retail internet services to residents and businesses falling within a 750-foot buffer of the backbone.

Given the number of dependencies and uncertainties that come with projecting expenses and revenues based on a conceptual routing (as opposed to a fully engineered & designed network), the best approach may be to provide a conservative estimate of expenses and revenues. The model uses the following assumptions:

- Excludes the estimated $13,522,728 construction costs because it is assumed to be constructed using state and federal infrastructure grant funds

- $50 per month Residential subscription rate for 1 Gbps symmetrical service
- $150 per month Business subscription rate for 1 Gbps symmetrical service
- 30% take rate over the first three years of units within the 750' buffer of the sub-rings
    - The 750' buffer touches a total of 27,119 residences and 1,795 businesses. The 30% take rate in 3 years equates to 8,136 residential subscribers and 539 business subscribers by Year 3, and assumes no subscriber growth thereafter.
- Estimated construction cost per service drop of $2,500 to be incurred by the network provider/owner (not grant funds)
- Minimal cost recovery for service drops through a one-time installation fee:
    - $250 for business installation
    - $50 for residential installation
- 2% annual inflation for recurring expenses
- Other potential revenues from dark fiber leases/IRUs, macro-micro cell site leases, data transport circuits, etc., are excluded from this projection.

Table 22 - Phases 1, 1B, & 2: Projected Operational Revenues & Expenses

	Year 1	Year 2	Year 3	Year 10	Year 20
REVENUES					
Retail Subscribers	1,950,240	3,900,480	5,850,720	5,850,720	5,850,720
Installation Fees	180,470	180,470	180,470	--	--
TOTAL ANNUAL REVENUES	**2,130,710**	**4,080,950**	**6,031,190**	**5,850,720**	**5,850,720**
EXPENSES					
Direct Costs of Services	353,000	616,701	667,826	622,006	713,512
Administrative Costs	770,349	1,293,617	1,851,568	2,238,804	2,700,440
Reserves	53,268	740,218	788,974	784,462	784,462
TOTAL ANNUAL EXPENSES	**1,176,617**	**2,650,536**	**3,308,368**	**3,645,272**	**4,198,414**
CASH FLOW					
Beginning of Year	--	(6,789,576)	(10,618,382)	5,542,622	32,623,009
ADD: Net Income	332,417	1,495,688	2,836,853	2,314,967	1,761,824
ADD: Depreciation	674,944	674,944	674,944	674,944	674,944
LESS: CAPEX	(7,796,938)	(5,999,438)	(6,028,352)	(50,000)	(50,000)
END OF YEAR	**(6,789,576)**	**(10,618,382)**	**(13,134,937)**	**8,482,532**	**35,009,777**

Critically, the model also assumes the City constructs the network, and does not rely on third party fiber. If the City were to continue utilizing third party fiber, it's likely that those parties would not allow the City (or a private partner) to generate revenue off those fibers through retail internet service under the current terms of their agreement with the City.

The model also does not calculate or include any internal rate of return that private equity might seek in exchange for providing the significant start-up capital required ($2,500 per address to construct service drops, customer equipment, etc. necessary to begin offering service to paying subscribers). While the models project a seemingly large revenue stream by Year 20, that figure will be reduced once a private partner begins to account for their own investment returns.

The cash flow is anticipated to be negative through Year 7, with a debt requirement of approximately $13.1 million to sustain operations in Year 3 (the initial capital requirements are driven from service drops and equipment purchases). This demonstrates the City need for a private partner to not only bring operational experience, but also private capital in order to sustain cash flows through the first few years. However, breakeven is hit by Year 8, with $2.5 million in estimated positive revenues, and could reach as much as $35 million in Year 20.

This projection is intended only as a tool to assist the City as a starting point in negotiations with a private partner, and is not a definitive accounting of income, expenses, or guaranteed market share.

8. Business & Service Models

To determine which business model for municipal broadband is best, local governments should understand various factors, such as: community needs, competitive market factors that define infrastructure options, and organizational and operational capabilities of the local government itself.

The various business models involve different levels of investment and control that come with varying risks and rewards. The City of San Luis Obispo has numerous options – from a lassie-faire, public policy-only approach all the way across the spectrum to a full retail internet business.

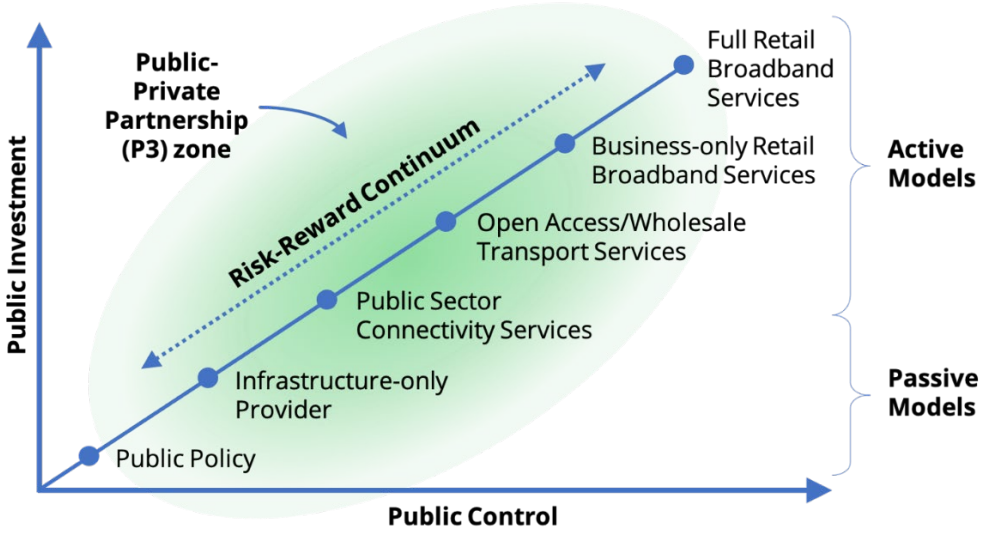

Figure 45 - Broadband Business Models Differing Levels of Control and Investment

8.1 BUSINESS MODELS

Public Policy Only

The municipality utilizes its public policy tools to shape and streamline the private sector's efforts to design, construct, and manage broadband infrastructure. Focus areas include right-of-way access, permitting processes and costs, construction practices and placement methods, franchise agreements, and utility fee assessments. Examples of broadband policies and standards include joint trenching and "dig once" policies, utility relocations, road moratoriums, and funding mechanisms for design, labor, and materials. A public policy approach is not a model per se; however, it can be combined with other models for municipalities to take a more active, direct role and maximize impacts.

Public Services Provider

Municipalities utilize publicly-owned fiber and broadband resources to interconnect multiple public organizations with fiber or wireless connectivity. These organizations are generally limited to the community anchors within their jurisdiction, including local governments, school districts, higher educational organizations, public safety organizations, utilities, and healthcare providers. Santa Monica, California and Scott County, Minnesota utilize the Public Services Provider model.

Infrastructure Provider

Municipalities provide conduit and dark fiber services to local organizations businesses, and even ISPs and broadband providers. These organizations use public fiber to connect to one another and to data centers to reach the Internet, cloud services, and other content networks. Dark fiber[33] is the core product of most infrastructure providers and is generally utilized by larger businesses and institutions in order to reduce their telecommunication expenses and achieve higher bandwidth speeds. Huntsville, Alabama and Lincoln, Nebraska are two municipalities that utilize the Infrastructure Provider model.

Open-Access Provider

Municipalities that own substantial fiber-optic networks in their communities will equip the network with the electronics necessary to establish a transport circuit to interconnect ISPs with the local network. The concept of open access enables competition among ISPs across a network that is owned by the local government. The municipality remains neutral and non-discriminatory, and is open equally to any providers that seek to deliver services over the network. Typically, this model works best in large cities with substantial demand – both residential and commercial. Utopia in Utah and Ammon, Idaho are two examples of an Open Access Provider model.

Municipal Retail Provider

Municipalities construct significant fiber networks, including service drops to individual businesses and residences, and offer competitively priced Internet by providing services directly – i.e., the municipality is providing broadband as a utility. In order to compete with the incumbent providers, municipalities will offer triple-play services consisting of phone, television, and Internet, along with providing the required customer service center, billing

[33] "Dark Fiber" is simply the fiber optic pathway – the user (or lessee) must provide their own equipment and connections on either end of the fiber to function and transmit data. "Lit Fiber" is the full suite of data services, where the subscriber just needs to "plug in" in order to access the internet; the owner of Lit Fiber provides the end line equipment and connectivity to the world wide web.

services, technical, installation, and field maintenance crews, and supporting administrative staff to operate an ISP. Chattanooga, Tennessee and Sandy, Oregon are two cities that utilize the full broadband utility model.

Public-Private Partnerships

Public-private partnerships (P3s) are an emerging business model that provides an innovative solution to an ongoing municipal broadband issue: how does a local government invest in municipal broadband without operating a broadband network?

The key factors that define a public-private partnership, as opposed to simply a customer-vendor relationship, is that: (a) all parties contribute, (b) each parties' benefits are shared based on their contributions, and (c) one partner does not pay another; there are few or limited transactions between partners.

Generally, P3s create a cooperative platform for a local government and one or more private organizations to plan, fund, build, and maintain a broadband network within the municipality's jurisdiction. To make a P3 successful, each organization should align on negotiable agreements, which can include:

- Who has rights to access the network – is it exclusive or non-exclusive?
- What are the public and private partners' goals and how are they incentivized?
- What roles and responsibilities does each partner have?
- What assets are financed through the public?
- What revenue model is used to recoup investment?
- What requirements must the private partner meet, in terms of service availability, speed, price, build locations, and performance schedules?
- How will the partners determine future buildouts and who pays for them?
- What happens if the private assets are sold or acquired?

The essence of such a partnership is that for-profit and for-people entities collaborate to achieve complementary, if not common, objectives. The bottom line for private entities is profit, while it is quality of place for public agencies. In concept, private entities can flexibly mobilize resources where there is money to be made and public agencies can redistribute resources to ensure no one is left out. A P3 can help realize both these outcomes: public involvement reduces risk to private investment, and private involvement enables faster and more extensive execution. Generally, partnerships decrease risks while enabling larger or new forms of rewards.

Magellan recommends San Luis Obispo consider a public-private partnership model to implement the Broadband Plan in which the City could publicly solicit and select a private ISP to operate, manage, and sell retail internet services over publicly-owned fiber in

exchange for lease payments, revenue share, new City network construction, or a combination thereof. This P3 approach is particularly suitable to the City given capital resource constraints, existing conduit- and fiber-sharing arrangements that could multiply subscriber reach, and the relatively limited amount of new construction required as identified in the Conceptual Network Design.

Additionally, an experienced private ISP partner will be required if the City were to apply for SB 156 Last Mile grant funding, as the City cannot currently demonstrate experience and capacity to operate and maintain a retail internet service network. Leveraging a public-private partnership could also help secure the local match funds required for both the SB 156 Last Mile and EDA grants.

Initial revenue and expenses projections suggest that expanding the City backbone by constructing the Conceptual Design would achieve positive cash flows and generate a return on investment, which will be attractive to a qualified private partner. Completing Phases 1 and 2 would pass more than 24,000 residences and nearly 1,800 businesses, providing them with greater access to internet services. The final plan report will contain a detailed financial analysis that will assist the City in soliciting and negotiating any potential future public-private partnership.

8.2 GOVERNANCE

Implementing a City-wide broadband project – even through a public-private partnership - will require a governance and operational structure to ensure it meets the needs of City while effectively leveraging and managing public resources. The governance structure is designed to oversee the network and to ensure its long-term evolution and financial sustainability.

Within the context of a public-private partnership with an ISP to operate and manage the day-to-day operations of the network, there is an important distinction between governance and operations: governance is future-focused, and deals with transformational issues to ensure relevance, whereas operations address daily transactional issues to ensure continuity of defined services.

As owner of the public infrastructure, the City – through its elected leaders and appointed administrators – should be tasked with exercising the executive decision making and implementation. However, the City leaders and administrators would benefit from the input of key stakeholders, organized around the common goal of expanding broadband in the community, and formally tasked with advising the City on the strategic growth of the network.

Broadband Advisory Board

A City-appointed Broadband Advisory Board can act as primary liaison within the community, provide oversight and evaluation of the project, and present informed recommendations to City leaders and administrators for consideration. Specifically, the Advisory Board should include the following:

1. ***Strategic Leadership.*** The governing board must understand the vision and goals of this broadband initiative, and act to ensure the benefit of all businesses, citizens, and institutions within the City.
2. ***Well-defined Processes.*** Processes for making recommendations should be equitable, transparent, and designed for quality, simplicity, agility, and speed.
3. ***Collaborative Decision-making.*** The board should set priorities, and to make objective recommendations that are driven by the business needs of the organization and constrained by the availability of resources, reached through consensus, based on documented and communicated decision criteria, and flexible yet related to overall goals.
4. ***Sustained performance and learning.*** Education is an important aspect of governance. The board should create and participate in opportunities to learn about emerging technologies and should serve as a sounding board for new ideas and initiatives that may capitalize on the network.

Advisory Board members can be nominated for appointments, or added ad-hoc by the City, to serve the strategic interests of the organization. A formal charter will need to be developed to address and define the scope and purview of the board.

9. Funding Options

9.1 GRANT FUNDING OPPORTUNITIES

The state and federal broadband policy environment strongly supports expansion of local public broadband infrastructure in California and the US. State and national policy is squarely focused on eliminating the "digital divide" by funding a coordinated, shared approach to deploy broadband infrastructure for broadband access available to all citizens and communities. The State of California, recognizing the importance of internet access, leveraged federal funds for broadband development in Senate Bill 156 by using federal American Rescue Plan Act (ARPA) funds. The State of California is also expanding broadband infrastructure funding under the existing California Advanced Services Fund and is planning to distribute sub-grants for broadband infrastructure under the NTIA's Broadband Equity, Access, and Deployment program.

ARPA

The major elements of the SB 156 broadband budget are:

1. $3.25 billion in funding (all from ARPA) for construction of a state-owned open-access middle mile network designed to provide connectivity for rural and urban areas to achieve the greatest reductions in the number of households unserved by broadband service under state and federal standards.
2. $2 billion in funding ($1.072 billion from ARPA) for "last mile" projects, funded through the Broadband Infrastructure Grant Account program, divided between rural and urban counties.
3. $750 million (general funds) to assist local governments and non-profit organizations in financing broadband projects.

Other major provisions of SB 156 include:

1. Establishment of the Office of Broadband and Digital Literacy at the Department of Technology, with duties including oversight of the acquisition and management of the statewide open-access middle-mile network.
2. Requirement for CPUC to identify and prioritize statewide open-access middle-mile locations according to specified priorities, including:
    a. Locations where there is no known open-access affordable middle-mile networking, that would enable last mile connections.
    b. Areas unserved or unserved by open-access middle-mile networks where such networking can be built expeditiously.

   c. Locations that would enable last mile connections to unserved residences and community anchor institutions and tribal lands.
3. Requirement for CPUC to prioritize state highway rights-of-way for open-access middle mile network construction.
4. Stipulates that the open-access middle-mile network is for a public purpose and can be leased for less than fair market value.
5. Exempts certain broadband projects from CEQA requirements.
6. Removes limitations on local governments receiving grant funding.

Last Mile Federal Funding Account

The 2021 California Budget Package included $2 billion in funding (partially from federal ARPA funds) created by Senate Bill 156 for the construction of last mile fiber networks to serve un- and under-served households ($1 billion for rural areas and $1 billion for urban areas)[34]. The funding was allocated by county, with San Luis Obispo County receiving $22.3 million in order to reach and serve 10,575 un/under-served households already identified.

Competitive applications for funding must demonstrate clear readiness to build and operate a fiber network as evidenced by:

- The applicant (city, county, tribal organization, etc.) will receive up to 20 of 100 total points in the evaluation based on experience and capacity in operating and maintaining a retail internet service network *or have an experienced private ISP partner*, and
- Local match funding is required in order to be awarded maximum points, estimated at up to 20% of the total project cost, *which could be provided partially or in full by a private partner*.

However, updated maps were released by the CPUC in early April 2023 that incorporate five key eligibility indicators:

1) Mass Market Unserved Locations - locations lacking access to wireline 25 Mbps downstream and 3 Mbps upstream, excluding locations with only legacy technology (e.g. Digital Subscriber Line and Cable DOCSIS 2.0 or older)
2) CalEnviroScreen 4.0 Index – disadvantaged communities burdened by multiple sources of pollution and with population characteristics that make them more sensitive to pollution.

[34] California Public Utilities Commission Last Mile Federal Funding Account, https://www.cpuc.ca.gov/industries-and-topics/internet-and-phone/broadband-implementation-for-california/last-mile-federal-funding-account

3) Socioeconomic Vulnerability Index – the relative socioeconomic standing of a community based on five indicators: poverty, unemployment, educational attainment, linguistic isolation, and percent of income spent on housing.
4) Disadvantaged communities (DACs) – CalEPA's index based on census tracts receiving high overall and cumulative CalEnvirosScreen scores and areas under the control of federally recognized Tribes.
5) Low-Income Areas - areas where aggregated household incomes are less than 80 percent of area or state median income.

Figure 46 shows each of these five eligibility indicators within the City of San Luis Obispo, demonstrating areas throughout most of the City with some level of need and eligibility for Last Mile grant funding. *(Note: No areas of the City fell under the DAC category).*

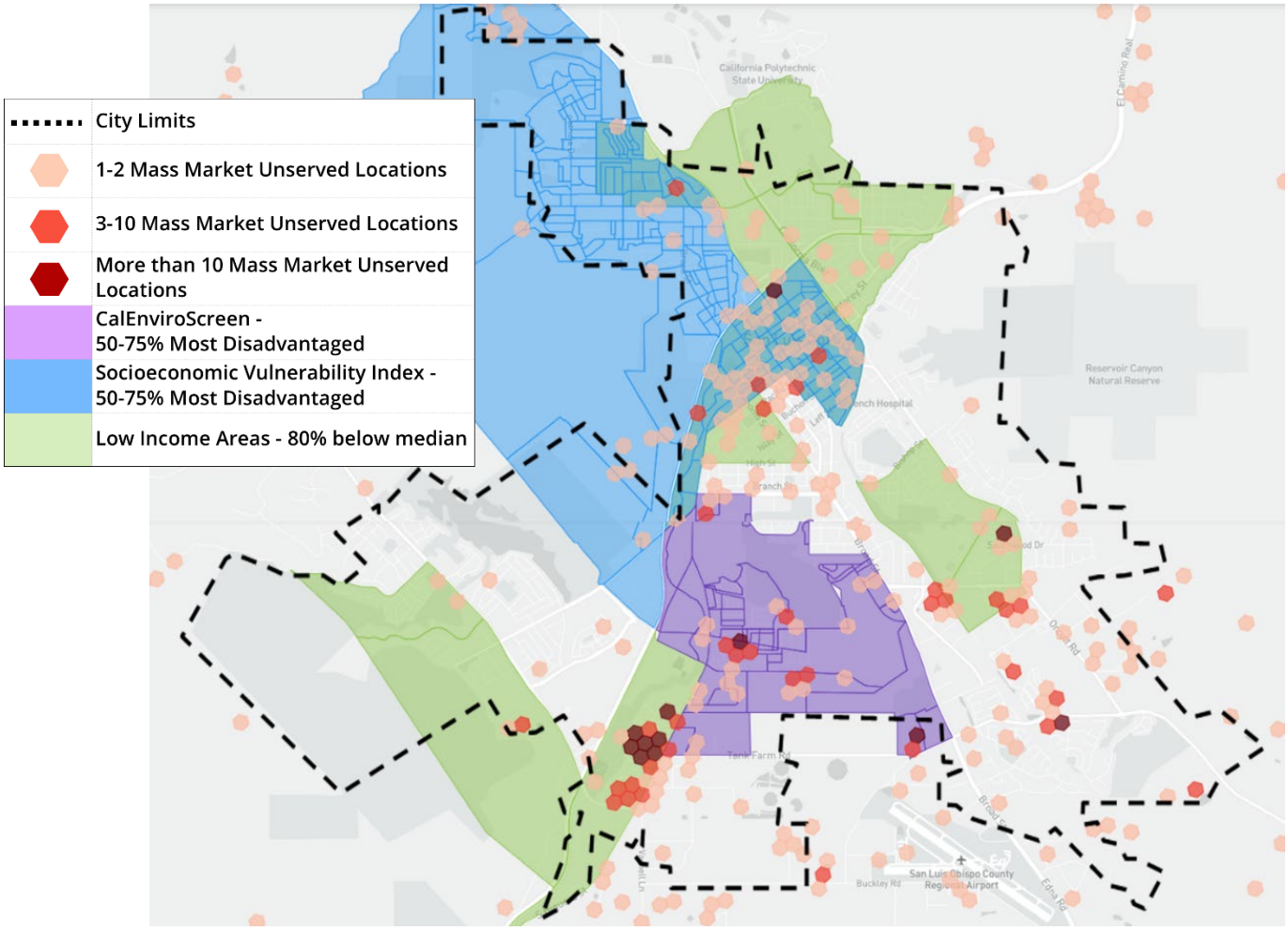

Figure 46 - Last Mile Federal Funding Account Eligibility Map[35]

[35] Source: California Public Utilities Commission Last Mile Federal Funding Account, https://federalfundingaccountmap.vetro.io/map#5.65/37.393/-116.87

Looking specifically at CPUC-designated unserved locations within 750’ of the proposed Conceptual Design backbone identifies grant-eligible areas that could reasonably be connected and served via a future City network (see Figure 47) SB 156 Last Mile grant funding does allow for the funding and construction of backbone and middle-mile networks, provided that those are directly supporting last-mile distribution to eligible locations. The City should identify at least 2-3 concentrations of unserved locations along the Conceptual Network Design and include fiber-to-the-premises service drops as part of any SB 156 Last Mile funding application to ensure grant eligibility.

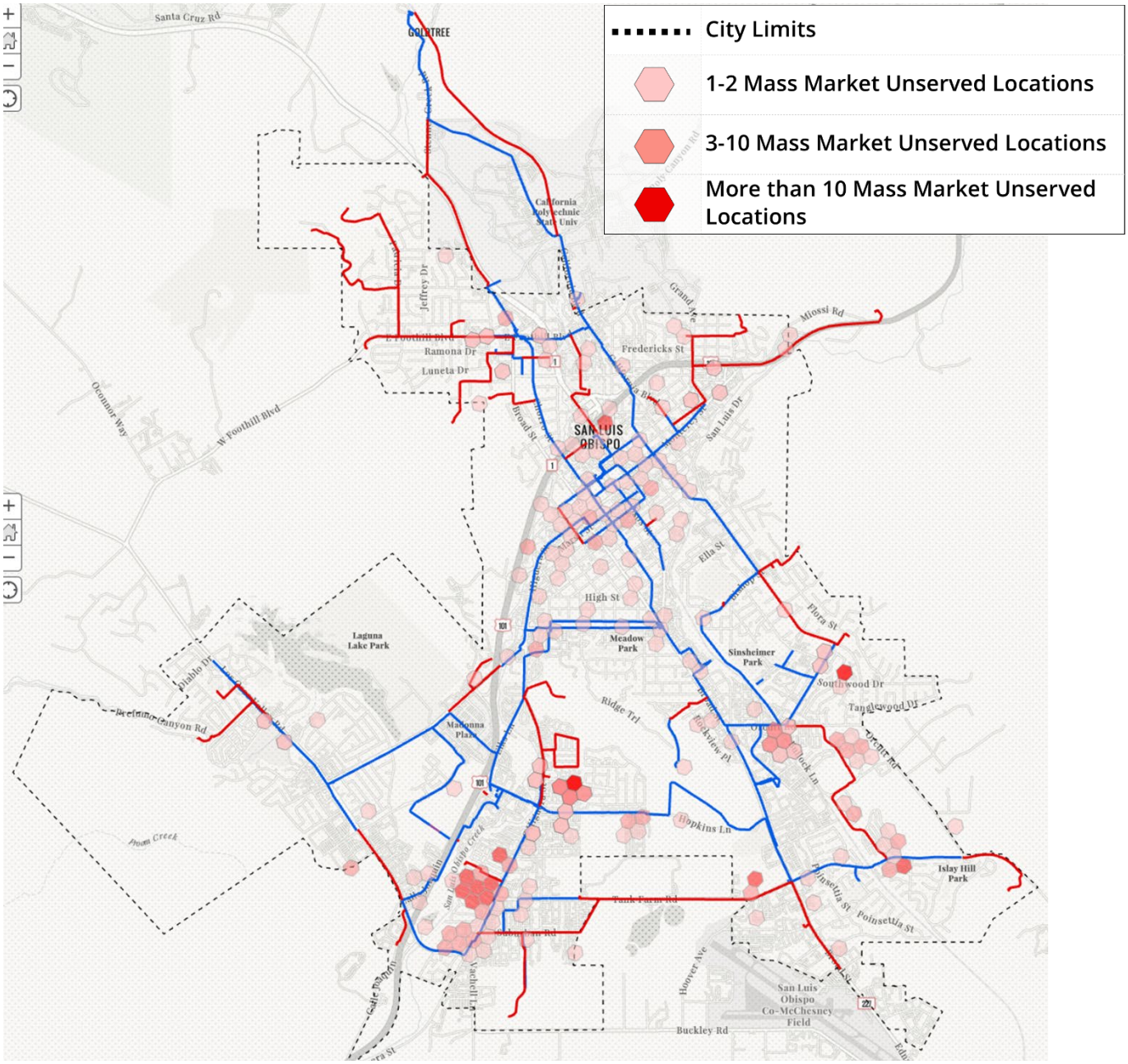

Figure 47 - CPUC-Designated Unserved Locations within 750’ of City Backbone

The buffer analysis in Figure 47 identifies a significant number of unserved locations within a reasonable distance from the City's proposed Conceptual Design that could be connected to improved broadband through an SB 156 Last Mile grant application.

Table 23 - CPUC-Unserved Locations by Phase

Phase	Number of CPUC-Unserved Locations
Phase 1 – Citywide Loop	161
Phase 1B – Residential Extension	30
Phase 2 – Water & Park Assets	26

The CPUC is still in process of rolling out the Last Mile grant process: an engineering, economic, and business case tool is expected to be released in May 2023, with the application window now anticipated to open in June 2023.

California Advanced Services Fund (CASF)

The California Advanced Services Fund was created in 2007 to bridge the "digital divide". CASF is administered by the CPUC and has been modified progressively over the past 15 years. The latest modification under SB 156 increased CASF funding, modified CASF programs, and created new CASF subaccounts.

Broadband Infrastructure Account

The infrastructure account is used to subsidize the cost of middle-mile and last-mile infrastructure to expand the state's broadband network. The Commission gives preference to programs and projects in communities with demonstrated low broadband access and in communities facing socioeconomic barriers to broadband access. SB 156 modified infrastructure account requirements to define "unserved area" as those without internet access service of at least 25 Mbps download and 3 Mbps upload, and to require CASF funded projects to provide speeds of at least 100 Mbps download and 20 Mbps upload.

The CPUC has further modified Broadband Infrastructure Account provisions to recognize new federal funding from the Broadband Equity, Access and Deployment Program under the IIJA (below). More recently the CPUC postponed the deadline for infrastructure grant applications to June 1, 2023. The postponement was due to delays in updating the California Interactive Broadband Map which identifies unserved locations eligible for grant funding. Part of the delay was from adding socioeconomic data as an additional layer. The updated new map (Figure 48) indicates there are unserved locations in San Luis Obispo for which the City could apply for funding from the Broadband infrastructure Account.

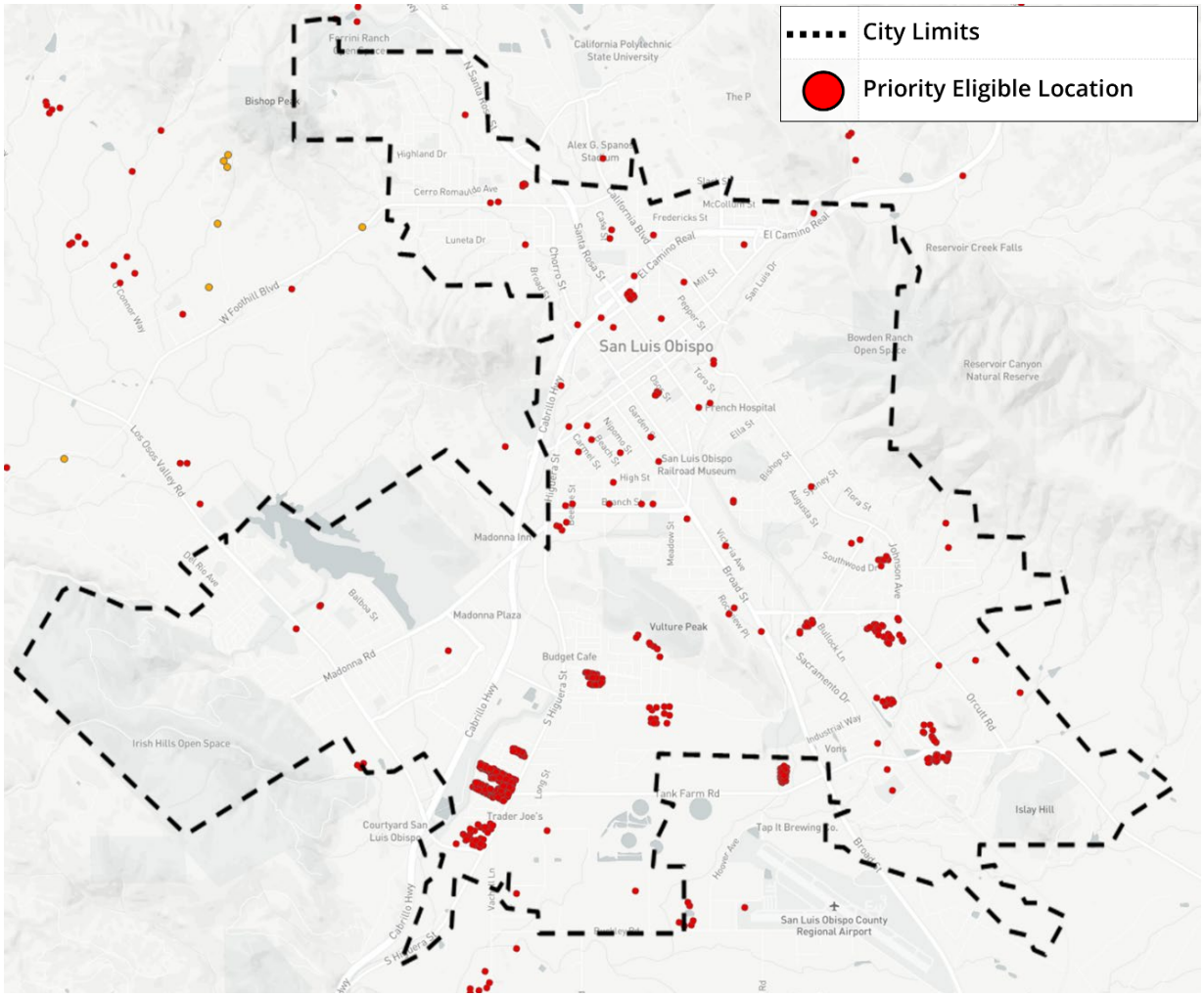

Figure 48 - CASF Infrastructure Account Eligibility[36]

Public Housing Account

SB 156 expanded eligibility for grants and loans to include publicly supported housing developments, and other housing developments or mobile-home parks with low-income residents, and to make funding available to low-income communities to finance projects to connect broadband networks that offer free broadband service that meets or exceeds state standards, if the low-income community does not have access to any broadband service provider that offers free broadband service that meets or exceeds state standards. This will support up to 100 percent of the costs to install inside wiring and broadband network equipment in eligible public housing.[37]

[36] Source: https://broadbandmap.ca.gov/

[37] https://www.cpuc.ca.gov/industries-and-topics/internet-and-phone/california-advanced-services-fund/casf-adoption-account

Broadband Adoption Account

Local governments and other eligible organizations with programs to increase publicly available or after school broadband access and digital inclusion, such as digital literacy training programs are eligible to apply for grants. Digital inclusion projects may include digital literacy training programs and public education to communities with limited broadband adoption, including low-income communities, senior citizen communities, and communities facing socioeconomic barriers to broadband adoption. Publicly available or after-school broadband access projects may include free broadband access in community training rooms or other public spaces, such as local government centers, senior citizen centers, schools, public libraries, nonprofit organizations, and community-based organizations.[38]

Infrastructure Investment and Jobs Act

The most recent Federal broadband funding programs arise from the **Infrastructure Investment and Jobs Act** (IIJA). The IIJA will provide generational funding for broadband deployment and be available beginning this year and next from the IIJA.

The IIJA contains the **Broadband Equity, Access & Deployment program (BEAD)**. The BEAD program provides grant funding for broadband planning and deployment, mapping, digital equity, and adoption projects and activities. A total of $42.45 billion is funded nationally for this program to be administered by the National Telecommunications and Information Administration (NTIA) and allocated among the states in block grants. The allocation to each eligible state will be based on the proportion of unserved locations in each state, as determined by the Federal Communications Commission's (FCC) Broadband DATA maps. The current expectation is that the NTIA will announce state allocations of BEAD funds based on the FCC broadband mapping by **June 30, 2023**.

The California Public Utilities Commission (CPUC) is administering the sub-grants in the state and has an open rulemaking proceeding[39] to determine the rules for CPUC sub-grants under federal rules administered by the NTIA. Per the IIJA, a state may award BEAD fund sub-grants competitively for eligible uses to include:

[38] https://www.cpuc.ca.gov/industries-and-topics/internet-and-phone/california-advanced-services-fund/casf-adoption-account

[39] Order Instituting Rulemaking Proceeding to Consider Rules to Implement the Broadband Equity, Access, and Deployment Program; Rulemaking 23-02-016; before the California Public Utilities Commission, filed February 23, 2023.

- Projects deploying or upgrading broadband facilities in unserved or underserved areas;
- Projects deploying or upgrading broadband facilities to connect an eligible community anchor institution;
- data collection, broadband mapping, and planning (beyond the planning fund allocation);
- installing internet and Wi-Fi or providing reduced cost broadband in multifamily residential buildings with priority to those with unserved households or where the percentage of households at or below 150% of the poverty line exceeds the national average;
- broadband adoption programs including provision of devices;
- training and workforce development; and,
- other uses including Digital Equity programs.

Federal requirements regarding state broadband infrastructure grants include:

- Funds will be disbursed based on a competitive grant process administered by each state under rules promulgated by the National Telecommunications and Information Administration (NTIA). The CPUC
- Funding will be based on updated FCC mapping of broadband availability.
- Priorities and specific allowed uses of funds:
  - First, infrastructure for areas without 25/3 Mbps service.
  - Then infrastructure for areas without 100/20 Mbps service. Then eligible community anchor institutions.
  - Multi-Dwelling Units (MDUs): Installing internet and Wi-Fi infrastructure or providing reduced-cost broadband within a multi-family residential building, prioritizing those with a substantial share of qualified low-income households.
  - Programs for broadband adoption including provision of affordable internet-capable devices.
  - Broadband data collection, broadband mapping and planning.
- Project requirements for funding:
  - Speeds of at least 100/20 Mbps with low latency. Higher speeds will receive priority.
  - 25% match required from non-federal sources, such as in-kind contributions, unspent COVID relief funds or provider investment.
  - Projects prioritized based on higher speed, greater scalability, faster buildout and service coverage for high poverty areas.
  - Projects must be completed within four years.
  - Projects must offer at least one low-cost broadband option (rates are not regulated, but determined by state, approved by NTIA).

- Additional requirements included regarding service quality, reliability, cyber rules, prohibition on using gear manufactured in China, required technical and operational capacity for the subgrantees.

Broadband Mapping

Distribution of federal BEAD funding is determined by the proportion of business and residence locations in each state that are unserved by broadband. Unserved locations are identified by the FCC Broadband map "broadband data fabric", constructed using data collected from various sources. The FCC has published a series of draft maps open to challenge since September 2022. The latest challenge window closed on March 15, 2023 and the CPUC submitted its challenge – identifying locations it believes are unserved in addition to those depicted on the FCC map – prior to that. NTIA expects to announce its BEAD allocations, relying on FCC broadband mapping, to each state by June 30, 2023.

Economic Development Administration (EDA) Grants

The EDA periodically offers grant assistance for cities seeking to develop or redevelop key commercial areas or corridors, and publicly owned fiber optic networks are an eligible expense for these funds. EDA grants typically tie eligibility and competitive scoring criteria to specific job creation or retention, making key development sites or zones prime candidates for EDA funding where high-speed broadband could help attract or retain key employers. EDA's Notice of Funding Opportunity was released March 15, 2023 and there is no submission deadline – applications will be accepted on an ongoing basis.

Proposed projects must be consistent with the region's current Comprehensive Economic Development Strategy. EDA has funded projects for expansion or enhancement of public facilities with higher quality fiber optic cables and telecommunications infrastructure and broadband infrastructure deployment. Applications are relatively complex and time-consuming to submit and process, and a local match is required, ranging from 20-40%.

The City should consider future EDA grants as a possibility, particularly where it aligns with its key economic development areas and major development projects.

9.2 ALTERNATIVE FUNDING MECHANISMS

Special Taxing Districts

Special taxing districts have been used throughout the State of California to fund infrastructure investment including broadband. Most common special taxing districts are fire protection, health care and water districts. Other types of special districts include sanitation, life support/EMS, transportation, libraries, and others. Community Service

Districts are one type of Special District, which is "independent" in nature. In contrast, the County Service Area is "dependent" since it is governed and administered by the County.

Community Service Districts (CSD)

More than 300 communities formed community service districts between 1955 and 2005, under the previous laws.[40] The underlying theory of these CSDs was to support consistent and adequate service levels across large and diverse geographical areas within counties.

The CSD statute was amended in 2005 to remedy its structure which had become convoluted over time and to convert it to modern statutory construction. In 2008, Senate Bill 1191 added provisions to allow a community services district to construct, own, improve, maintain and operate broadband facilities and provide broadband services "if a private person or entity is unable or unwilling to deploy broadband services."[41] The CSD is obliged to transfer ownership and operation (or lease the operation) of the broadband facilities when that entity is "ready, willing and able to take over the facility" or operation. The transfer or lease is to be at "fair market value."[42]

A CSD must be approved by the Local Agency Formation Commission (LAFCo) prior to undertaking the activity. Residents initiate the formation of a CSD through petition or resolution at the county level. A CSD can issue bonds or form an improvement district to support bond issuance. Property owners will pay taxes or special assessments for services including infrastructure development within the district. The CSD may be governed by an independent board of directors.

County Service Areas (CSAs)

A CSA is a form of special district that is governed by the county Board of Supervisors, administered by county staff and is designed to deliver more county services to a specific geographic area where constituents are willing to pay for them. Residents (by petition) or county supervisors (by resolution) initiate the formation of a CSA. Once proposed, the formation of the CSA is subject to public notice and hearing. If more than 50% protest, voter approval at a special election may be required.

The basic premise of a CSA is to fund consistent and adequate levels of service across large and diverse geographical areas or in small communities in unincorporated areas that the County would not otherwise be able to fund through traditional sources (property tax, sales

[40] Cal. Gov. Code § 61001(a)(4).
[41] Cal. Gov. Code § 61100.
[42] *Id*.

tax, fuel tax, etc.). This funding is created by a direct assessment, paid by property owner for a particular service. The most common type of service and associated assessment is for road and drainage maintenance in new subdivisions, but there are others ranging from lighting to fire protection. One benefit of CSAs is that they allow a county to segregate costs and benefits of providing additional services.

Community Facilities Districts

The Mello-Roos Community Facilities Act of 1982 allows establishment of Community Facilities Districts (CFD) to support financing of public improvements and services by a county, city, special district or joint powers authority[43] – the CFD must have a sponsoring local government agency. Formation of a CSD requires a two-thirds majority vote of residents living within the proposed boundaries. Upon formation, a special tax lien is placed on each property in the CFD, which is covered by a Special Tax paid each year. Also, municipal bonds can be sold to fund initial investments.

A CFD can be used to finance "maintenance and operation of any real property or other tangible property with an estimated useful life of five or more years that is owned by the local agency or by another local agency pursuant to an agreement entered into under Section 53316.2".[44]

[43] Joint Powers Authorities are legally created entities that allow two or more public agencies to jointly exercise common powers. Forming such entities may not only provide a creative approach to the provision of public services, but also permits public agencies with the means to provide services more efficiently and in a cost-effective manner. https://www.bbknowledge.com/general/the-ins-and-outs-of-joint-powers-authorities-in-california/

[44] Cal. Gov. Code § 53313(g), emphasis added.

10. Recommendations

1) Expand the City's Fiber Backbone Loop to Provide Greater Access for the Community and Businesses.

The City can complete a backbone loop necessary for a qualified operator to provide competitive, reliable retail internet services to the community and business at an estimated cost of $13.5 million. The backbone loop design would also connect remaining City facilities and assets – including parks, water tanks, and lift stations. Construction costs can be further reduced to $10.4 million through lease or use of third-party fiber, or broken into more than two phases, depending on project funding availability.

2) Initiate Design & Engineering for Phase 1, 1B, & 2.

Ensuring the City can submit a competitive SB 156 Last Mile grant application and/or a CASF Infrastructure Account grant application will necessitate completing the full design engineering for Phases 1, 1B, & 2. Based on discussions with the City's Public Works Department around staffing capacity, the City should plan to begin with Phases 1 and 1B. This will allow the Cit to use its allocation of SLFRF funds before the statutory deadline for those funds expires.

Design engineering will include field surveying and verification, identifying additional usable assets that may not be recorded in City maps, value engineering to reduce the overall cost, confirming the final routing and design, and compiling a Bill of Materials. This work will demonstrate to the State and the CPUC that the City is "shovel-ready" to begin construction.

3) Solicit & Negotiate a Public Private Partnership.

The City is in a favorable position to leverage an expanded, looped backbone network through a public-private partnership, which could secure: (a) the qualified network operator needed for grant eligibility, (b) all or part of the required match funding for SB 156 Last Mile grant funds, (c) a partner willing to construct all or a portion of Phases 1, 1B, & 2 in exchange for rights to sell retail internet services utilizing City fiber, or a combination thereof. The City should publicly solicit ISPs for a partnership through an RFP process, select a qualified partner, and negotiate a partnership agreement in concert with a SB 156 Last Mile grant application. City IT staff should lead this effort, and consult with applicable City departments and Council per City purchasing policies.

4) Pursue Competitive Grant Opportunities through SB 156 Last Mile Federal Funding Account and the CASF Broadband Infrastructure Grants.

The State of California and the CPUC have designated more than $22 million in broadband construction grant funding for San Luis Obispo County through the SB 156 Last Mile grant process, and CASF allocates $150 million annually (through 2032) for broadband infrastructure grants, which both aim to connect unserved and disadvantaged households with high-speed fiber services. The City is eligible for both of these funding sources and should pursue these grants to cover the backbone loop design construction costs of $13.5 million and for the marginal costs to connect CPUC-designated unserved households and other at-need neighborhoods. The City should identify which concentrations of unserved locations will be included in the initial grant application based on the CPUC maps and the proximity to the proposed Conceptual Network Design. Other municipalities – and the County itself – will be competing for these grant funds, which will require the City to demonstrate commitment, completed planning, and construction readiness in order to secure a grant award.

5) Coordinate Joint Build for CIP and Utility Projects

Coordinating infrastructure expansion through joint utility work is the most cost-effective strategy to expand City broadband assets, particularly into under-served areas and new developments. Effective coordination on all projects that require excavation will ensure that all utilities—public and private—can economically expand their broadband footprint in San Luis Obispo. The City can incrementally and opportunistically build its own fiber network, connect key City facilities, and enable Smart City applications. The full CIP analysis can be found in the full plan document, starting on page 57.

6) Apply Development Conditions to new Projects to Expand Public and Private Fiber Assets

The City should implement favorable development conditions through City Council action and ordinance that requires developers on new projects to place fiber/conduit to ensure faster, more efficient provision of fiber-optic based next generation broadband services.

7) Explore a Broadband Infrastructure Fund to finance future smart city applications and network expansion

Many cities create dedicated funds for revenues generated from leases of City assets by private telecommunications companies. A dedicated fund with ongoing revenues—separate from the General Fund—prioritizes new City/public technology deployment for future build opportunities (funding for fiber network expansions through incremental builds/joint trench coordination or for locating new smart city devices concurrent with expansion of private wireless connectivity).

Creating a fund helps plan strategically for the years to come when use of public assets/ROW will increase and could create significant new City revenues. The unscheduled nature of joint trench/dig once opportunities means cities need a dedicated funding source outside of the normal budgeting process to take advantage of open trenches.

The City should consider holding revenues generated by the City through lease or other agreements for use of City broadband infrastructure – including cellular antennas on street light poles, placement of cabinets or vaults in the ROW, leasing land or towers for cell tower installation, dark fiber or conduit occupancy leases, or other telecom-related/ROW revenue generating activities – in a separate account to offset maintenance and expansion costs.

8) Adopt broadband infrastructure and fiber-optic standards.

The City should adopt standards and industry best practices to ensure City investments are future proof, adaptable, and support multi-vendor interoperability over the expected 30-50 year life cycle. Broadband infrastructure should include strategically placed access points, high-count (288+ strand) fiber optic cable, and installation standards for depth, separation from other utilities, and allowing new installation technologies (e.g., microtrenching) when appropriate to ensure future builds are simple, cost-effective, flexible, and durable.

Appendix A: Participating Stakeholders

Ancient Peaks
Astound Broadband
Broadband Consortium of the Pacific Coast
Cal Poly Center for Innovation and Entrepreneurship
Cal Poly Division of Research and ED
City of SLO Community Development Department
City of SLO Economic Development
City of SLO IT
City of SLO Network Services
City of SLO Public Works
Community Action Partnership of SLO
County of SLO Behavioral Health
Downtown SLO CEO
Housing Authority of SLO
Lumina Alliance
Oasis Associates
Peak WiFi
People's Self-Help Housing
REACH
San Luis Coastal Unified School District
SGT Dee CEO
SLO CASA
SLO Chamber
SLO Child Development Resource Center
SLO Council of Governments
SLO County Health Agency
SLO County Public Health
SLO Noor Foundation
SLO Tourism
Trust Automation
VHV Real Estate

Appendix B: CIP Projects with Broadband Opportunities

Project No.	Project Title	Description	Status	Broadband Opportunities
1000506	Bus Shelter Replacements	Replace bus shelters, end of life	Planning	Wireless/Wi-Fi connectivity
100083	New Buckley Lift Station	Avila Ranch development, SW of Airport Specific Area	Planning	Connect City Assets
91369	Fiero, Clarion Gravity Sewer, Airport Lift WW Station	Replace Airport Lift Station	Planning	Connect City Assets
1000082	Silver City Lift Station	Replacement	Planning	Connect City Assets
1000079	Foothill Lift Station	Replacement	Planning	Connect City Assets
1000543	Stenner Canyon Water line replacements	Replace the water pipes to Stenner Canyon	Planning	Joint Trench; Bridge/freeway crossing
1000545	California Ave - Stafford to Mill Water line replacements	Replace a critical transmission main crossing Highway 101.	Design	Joint Trench; Bridge/freeway crossing
1000547	Chorro - Highland to Meinecke Water Line Replacements	Replace the water pipes on Chorro from Highland to Meinecke	Planning	Joint Trench; Bridge/freeway crossing
1000544	Highland - Oakridge to Cuesta Water Line Replacement	Replace the water pipes on Highland from Oakridge to Cuesta	Planning	Joint Trench; Bridge/freeway crossing
1000546	Highland at UPRR and Cal Poly Waterline Replacement	Replace the water pipe crossing Highland at UPRR	Planning	Joint Trench; Bridge/freeway crossing
1000545	California Ave Stafford to Mill Water Line replacement	Replace a critical transmission main crossing Highway 101.	Design	Joint Trench; Bridge/freeway crossing

1000539-02	Islay, Henry, Sierra Way	Wastewater pipe replacements at Islay, Henry, and Sierra Way.	Planning	Joint Trench
1000539-06	Morro, Mill, Santa Rosa	Wastewater pipe replacements at Morro, Mill, and Santa Rosa.	Planning	Joint Trench
1000539	San Jose, Ramona, Monte Vista, California	Wastewater pipe replacements at San Jose, Ramona, Monte Vista, and California.	Planning	Joint Trench
1000539	Taft, Hathaway, Phillips, Buena Vista, Loomis	Wastewater pipe replacements at Taft, Hathaway, Phillips, Buena Vista, and Loomis.	Planning	Joint Trench
1000093	Serrano, Bressi, Dana Pipe replacement	Wastewater pipe replacements at Serrano, Bressi, and Dana	Planning	Joint Trench
1000037	South St. Median Landscaping	Irrigation system to support future landscape plantings in the medians on South Street.	Design	Connect City Assets; Joint Trench
90346	Pavement areas	2024 - Pavement Areas 8 & 9 Local and Collector Streets	Planning	Joint Trench
91610	Higuera St. Widening, Bridge St. to Elks	Widen the segment of South Higuera Street between Bridge Street and Elks Lane and improve on-street bikeways.	Design	Joint Trench
91610	Higuera St. Widening, Fontana to Chumash	Widen the segment of South Higuera Street between Bridge Street and Elks Lane and improve on-street bikeways.	Design	Joint Trench
91613	Prado Road Interchange	Connect Prado Road and Dalidio as an overpass over 101 with on and off ramps	Planning	Joint Trench; Bridge/freeway crossing
1000052	Buchon-Santa Rosa Intersection improvements	Reduction of flooding issues updating the curb ramps and providing a high visibility crosswalk.	Design	Joint Trench
91503	California and Taft Roundabout	Installation of a roundabout at the intersection of California & Taft	Design	Joint Trench; Bridge/freeway crossing
91293	Railroad Crossing Upgrade California and Foothill	Railroad crossing	Planning	Joint Trench; Bridge/freeway crossing

91252 / 91203	Prado Road Bridge & Road widening	Widen the bridge across San Luis Obispo Creek and the intersection at Prado and South Higuera.	Design	Joint Trench; Bridge/freeway crossing
1000029	Chorro Bridge Replacement	Replace Chorro Bridge	Planning	Bridge/freeway crossing
1000031-08	Laguna Lake Golf Course	Replacement of irrigation system	Design	Connect City Assets; Wireless/Wi-Fi connectivity
1000057A	Laguna Lake Improvements	Development of Parks with recreation amenities at Laguna Lake.	Planning	Connect City Assets; Wireless/Wi-Fi connectivity
1000512	Downtown zig zag lighting	Upgrade the downtown overhead "zig-zag" lighting	Design	Wireless/Wi-Fi connectivity
1000535	EV Infrastructure Upgrades behind the meter	Construct electric vehicle infrastructure for electric transit buses.	Design	Wireless/Wi-Fi connectivity
1000155	Downtown Renewal	Installation and removal of parklets and sidewalk dining areas, activation of Mission Plaza, and temporary street modifications	Design	Connect City Assets; Wireless/Wi-Fi connectivity
90435-2	Cultural Arts District Parking Structure	Install a new parking structure at the Palm/Nipomo intersection	Design	Connect City Assets; Wireless/Wi-Fi connectivity
100530	SH Line and Pump & Bioassay Test	Expand the distribution system for recycled water for irrigation	Planning	Connect City Assets
1000053	Bus Wash Replacement	Water Conservation focused replacement	Design	Connect City Assets
1000502	RRST Preliminary Engineering	Continue the Railroad Safety Trail (Tiburon to Orcutt).	Planning	Wireless/Wi-Fi connectivity
1000057	Orcutt Area/Righetti Ranch Parks	Development of Parks with recreation amenities at Trail Junction.	Design	Connect City Assets; Wireless/Wi-Fi connectivity

1000513	Parks & Rec EV charging station	Electric vehicle charging stations at the Parks and Recreation Department	Planning	Connect City Assets
1000528	Recycled Water Broad St. Tank Farm to Aerovista	Install critical infrastructure needed to serve the East Airport Annexation	Design	Connect City Assets
91368	Reservoir 2 Replacement	Replacement of Reservoir #2	Planning	Connect City Assets
99653	Treatment Major Facilities Maintenance	Replace failing components of the Water Treatment Plant.	Planning	Connect City Assets
1000541	Water Treatment Plant, power storage units	New power storage units for use during PG&E power outages.	Planning	Connect City Assets
1000550	WWRF and Wastewater Collection Shop	Re-purpose existing building areas	Planning	Connect City Assets; Wireless/Wi-Fi connectivity
1000542	WTP Cityworks Integration	Replace failing components of the Water Treatment Plant.	Planning	Connect City Assets
	990 Palm City Hall Remodel	Remodel City Hall downstairs office space	Planning	Connect City Assets; Wireless/Wi-Fi connectivity
91365	Public Safety Center	Improve the Police Department Facility site.	Design	Connect City Assets; Wireless/Wi-Fi connectivity