Broadband Assessment Study

FULL REPORT

City of Carson, California

June 12, 2024

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1. Executive Summary

Introduction

Communities around the world now regard broadband as a public utility, akin to water and power. The shift towards online learning, remote work, telehealth/medicine, e-commerce, automation of services, autonomous vehicles, and technological advancements necessitates a long-term vision for community growth and prosperity. Fiber optic networks are the cornerstone of this digital transformation, providing the high-speed, low-latency connectivity essential for advanced applications and services.

Scope of Work

The City of Carson contracted Magellan Advisors (now ENTRUST Solutions Group) to conduct a Broadband Assessment Study to enhance access and affordability of high-speed internet service for residents, businesses, and City operations. The study's scope included:

- Asset Inventory
- Existing Conditions Assessment
- Market analysis
- Needs assessment
- Gap Analysis
- Conceptual network design
- Phased implementation plan
- Business model evaluation

Findings

- **Current Service Reliance:** The City primarily uses commercial internet services for its facility connectivity.
- **Service Availability:** Most of the City has Spectrum cable services offering speeds up to 1 Gbps, while 25% has access to AT&T fiber services with speeds up to 5 Gbps. T-mobile, Verizon and AT&T also provide wireless home internet services, although coverage and speed vary.
- **Stakeholder Concerns:** Focus groups with Carson businesses highlighted significant concerns about internet service availability, particularly in commercial and industrial areas, where frequent and sustained outages disrupt operations.
- **Resident Challenges:** Despite access to at least one gigabit provider, many residents subscribe to low-speed services at high prices, indicating challenges related to the Digital Divide. These include affordability, technology access,

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digital literacy, geographic limitations, or language barriers. Centralizing digital resources through a City-hosted website could mitigate these issues by allowing residents to compare internet providers, find job and digital training courses, locate public Wi-Fi hotspots, and access to employment resources.

Design Concepts

ENTRUST developed two Conceptual Network Designs.

1. **Backbone Network**: this 20-mile network would upgrade 1.2 miles of existing city fiber, add 5 miles of new fiber in existing city conduit, and install 14 miles of new underground conduit and fiber at an estimated cost of $12 million. This network would enhance connectivity for city facilities and public facilities and create opportunities for the City to work with private service providers to reach underserved residential and commercial cost-effectively. The network could be built all at once or phased to align with traffic network upgrades, opportunistic conduit placement during street replacement, and other capital improvement projects (CIP), significantly reducing build costs.
2. **Fiber-to-the-Premise (FTTP) network:** this comprehensive network would add 88.5 miles of new fiber construction at an estimated cost of $113 million, providing fiber to all homes, with laterals crossing business and industrial areas. This network can be built all at once or phased, with the city prioritizing areas of interest such as unserved residents, industrial areas, cable-only areas, and areas adjacent to the existing network.

In addition to the projects proposed in this study, the City has several active grant applications that, if awarded, should be incorporated into the planning for any city networks going forward.

Analysis and Recommendations

The analysis of existing grant programs and the financial performance of the concept networks lead to the following recommendations:

- **Prioritize Broadband Improvement:** Make broadband improvement a city priority by creating a budget for broadband opportunities and staff coordination activities.
- **Policy for Conduit Installation:** Adopt policies to install conduit during all appropriate Capital Improvement projects (CIP) such as traffic signal upgrades, street repaving, and sidewalk replacement.
- **Solutions now:** Staff or contract for a broadband coordinator to assist businesses and residents with broadband questions, manage hotspot loaner program, and coordinate cost sharing between neighboring businesses for new fiber installation or lease.
- **Invest in Engineered Network Design:** Invest in engineered network design to be 'shovel ready' for CIP, grant, and partner/joint build opportunities.

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- **Prioritize Network Construction:** Prioritize network construction adjacent to California Public Utility Commission (CPUC) identified unserved locations to improve eligibility for California Advanced Services Fund (CASF) and related Grants.
- **Attractive Assets for Private Partners:** Construct assets that are attractive to partners for lease or to be contributed to a Public/Private Partnership (P3).
- **Collaborate with Partners:** Recruit and collaborate with a public or private partner to address city priority areas.

Recommendations for City of Carson by Cost and Impact					
Program Name	Relative Cost	Actual Cost	Impact	Ready?	Next steps
Adopt Broadband Focus	0	Staff time	👍👍👍👍	Yes	Review All CIP, Find Broadband Opportunities, Direct Staff
Policy update	$	$50K-$100K	👍👍👍	Yes	Budget, Update code
Hotspot Program	$	$50K-$1m	👍	Yes	Budget, Setup grant program or hire contractor
Broadband coordinator	$	$50K-$75K salary+	👍👍	Yes	Determine Program Goals, Budget, Hire Staffer or Contractor
CIP Conduit Budget	$$	$100K-$1m	👍👍	Yes[1]	Policy Update, Budget, Include Conduit in all CIP
Engineered Design	$$	$175K-800K	👍👍	Yes	Budget, Hire Engineering Design firm
Backbone Network	$$$	$8m-$12m	👍👍👍👍	Yes[2]	Adopt Broadband Focus, Engineered Design, Budget, Build
Citywide FTTH	$$$$$	$75m-$112m	👍👍👍👍	No	Feasibility Study for Go / No Go, Budget, Build

Conclusion:

There are significant broadband challenges that City initiatives can address effectively. The primary question is not whether the City should act, but rather how much the city should invest and how quickly it wants to address these problems.

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[1] Ready to go but requires another program as preliminary step

[2] Ready to go but requires another program as preliminary step

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2. Asset Assessment

Asset Assessment

ENTRUST assessed the Carson area for existing public and private broadband assets and infrastructure that could be utilized, leased, shared, or otherwise leveraged to develop and construct a functional, cost-effective broadband network. This included surveying and mapping several data sources available in the region, including public infrastructure, buildings and facilities, conduit and fiber networks, communications towers, streetlights, traffic signals, statewide middle-mile networks, and private telecom assets, including middle-mile networks and data centers.

2.1 Public Infrastructure

Cities typically own and manage significant public infrastructure to provide community services. Many municipal assets can benefit from being connected to network infrastructure. At the same time, those assets can be leveraged to provide enhanced community connectivity. Existing conduit and fiber networks, typically used for exclusive City communications or traffic control, can act as foundational infrastructure for residential and business internet access. Land, buildings, poles, and towers can support antenna to improve wireless connectivity. The Public rights-of-way (ROW) along public roads may be the most valuable assets, along with other public property, allowing for quick and cost-effective deployment of new public communications infrastructure. This can make widespread access to high-speed connectivity more feasible by reducing costs and accelerating the deployment of digital infrastructure.

City Communications Network

Using existing conduits and fiber can significantly reduce the cost of fiber deployment. Conduit with copper wires, aging fiber cables, or fiber with limited capacity can be replaced in conduit with higher-strand cables at a fraction of the cost of deploying new underground conduit. The City can use conduit for its 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 cables. A preferred option is to lease fiber strands to carriers (each of which can be 5-10 microns in diameter), and when combined with wave division multiplexing technology (using different light wavelengths to create many transmission channels within a single fiber), high-strand cables (288) can provide virtually unlimited capacity.

In addition to identifying where the 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 to be explicitly designated for broadband/fiber networks; existing conduit structures, such as traffic signal control networks, street lighting, or

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even abandoned water/sewer lines, can be rehabilitated and utilized to deploy fiber optic cable. The engineering and labor required to deploy new underground conduits can represent 35-65% of the total cost of deployment, so utilizing existing assets can create significant cost savings.

The City of Carson relies on commercial internet services largely from Spectrum for most of its connectivity. City hall receives service via an infrastructure collaboration on fiber between the city and the South Bay Fiber Network operated by American Dark Fiber and Race Communications.

The city owns an additional communications network of conduits with copper cables currently used exclusively for traffic signal management. Many of these assets are located near city facilities and may represent an opportunity for creative reuse as broadband infrastructure if in good condition and upgraded to fiber in conjunction with a traffic signal upgrade capital improvement project.

The City spends approximately $120,000 annually on commercial internet connectivity to city facilities. This operational cost represents potential savings for the city that could be realized as part of a citywide broadband effort.

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Carson owned conduit   Traffic signal interconnects V2
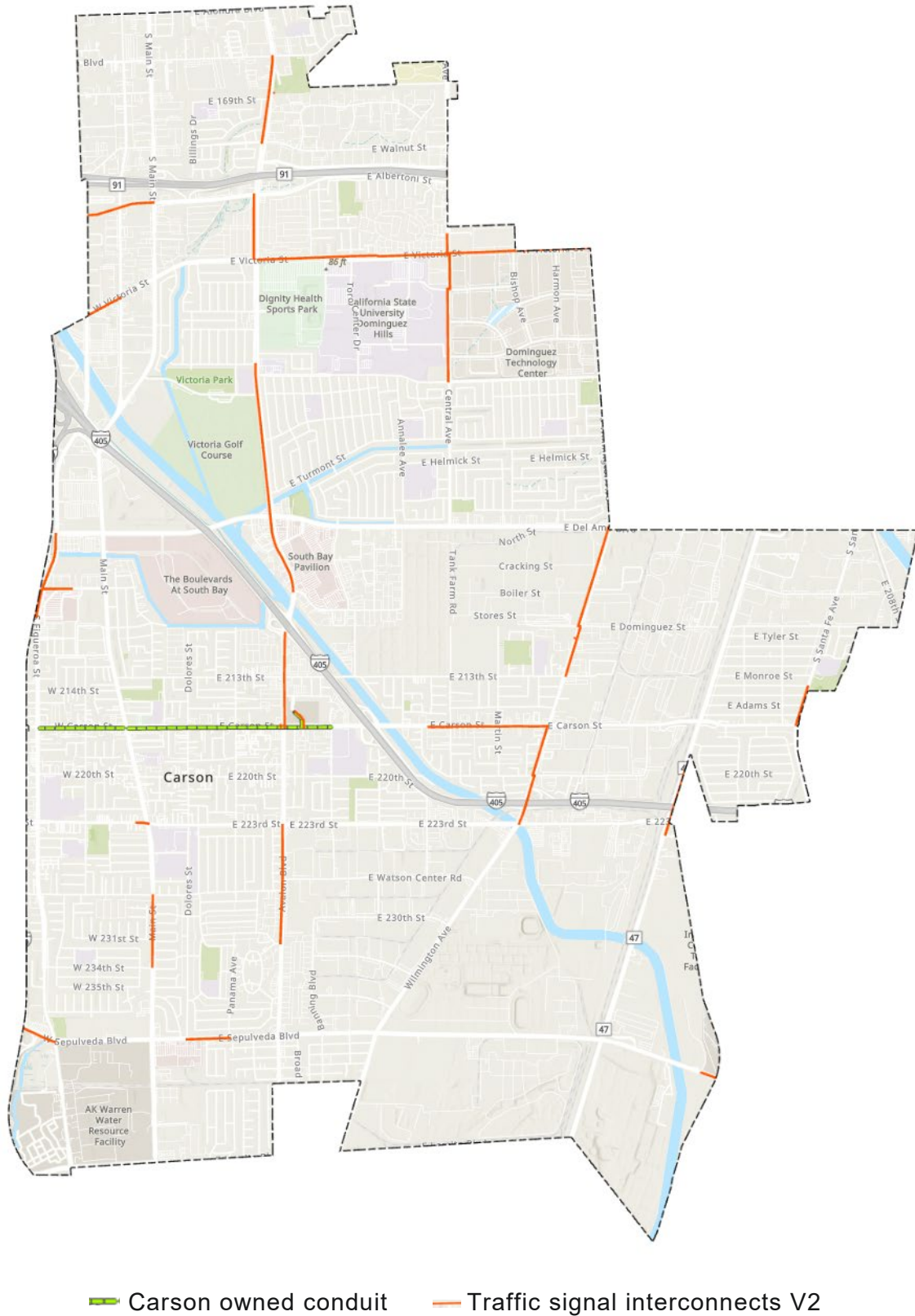
Figure 1 – Existing city-owned communication conduits and cables

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Buildings and Facilities

Public and community anchor buildings and 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.

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

City Facility (3)   Pool (4)   Park (17)

Figure 2 – City Buildings and Facilities

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The City's inventory of 24 sites and the other 32 public and private anchor institution sites can be leveraged to expand community access to broadband, both through routing a backbone fiber loop between these critical facilities, and as distribution points for fiber and wireless connectivity.
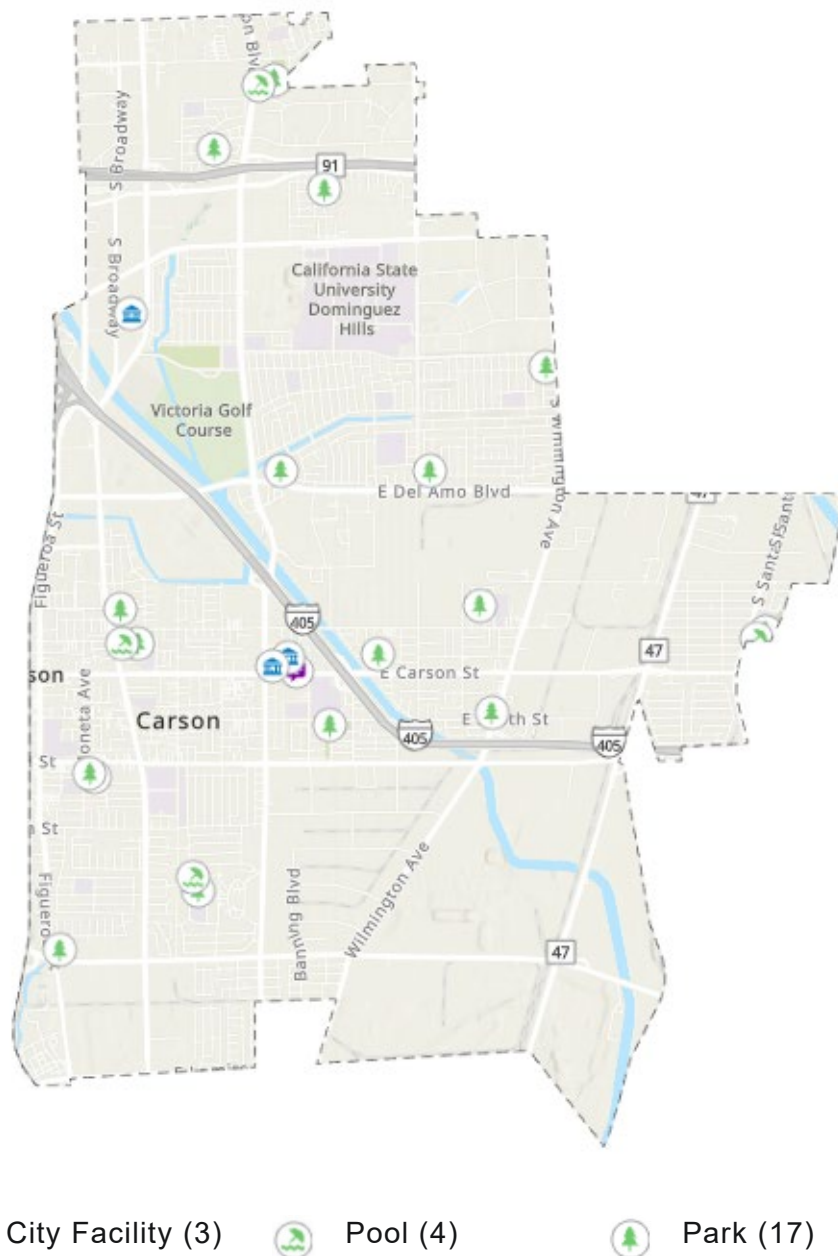
Schools play a pivotal role in the importance of broadband connectivity. Access to broadband in schools ensures that all students have equal opportunities to learn and thrive in the digital age. It enables students to access online educational resources, research materials, interactive learning platforms, and virtual classrooms. By bridging the digital divide, schools can provide an equitable education experience, ensuring that every student has the tools and resources they need to succeed academically.

As with public buildings and facilities, community parks can be sites for broadband distribution, locations of need for Wi-Fi hotspots, or both. Parks typically offer opportunities to penetrate residential neighborhoods, and municipalities are increasingly looking to offer free Wi-Fi hotspots as a community amenity where people congregate.

Streetlights

Public streetlights offer a significant and valuable asset that can be leveraged for broadband and smart city deployment in urban areas. There are 9,151 streetlights throughout the City.

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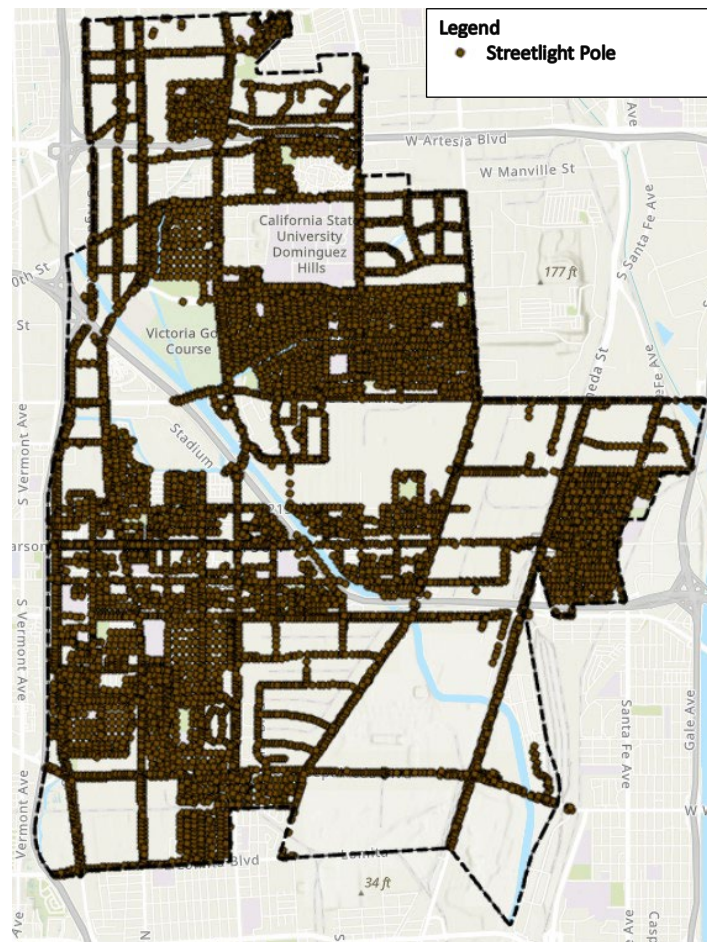
Streetlight pole

Figure 3 – Street Light Poles in the City of Carson

These are a mix of metal, wood, and concrete marbolite poles. On major thoroughfares, they are located in the center of streets or used to mount traffic signals. The typically dense nature and geographic reach of streetlights offer a significant opportunity, particularly for the 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 (if owned by a City) 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.).

The extensive inventory of streetlights penetrates most residential neighborhoods, providing the requisite vertical infrastructure to deploy City-owned/operated wireless communication devices (wireless, Wi-Fi mesh networks, or 5G/mobile antennas) that

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could enhance community broadband services and speeds. City-owned poles were upgraded to LED within the past few years and now have 7-pin receptacles for smart controllers and other applications.

Traffic Signals

Traffic signal poles and associated structures are typically located along major transportation arterials that correspond with commercial corridors and are interconnected with electrical and signal control conduit networks. Many signal interconnect networks were originally conduit with twisted copper cables; some have been updated to fiber cables. 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.

The City has 167 signalized intersections. Approximately 50% of the signals are interconnected via copper in conduit.

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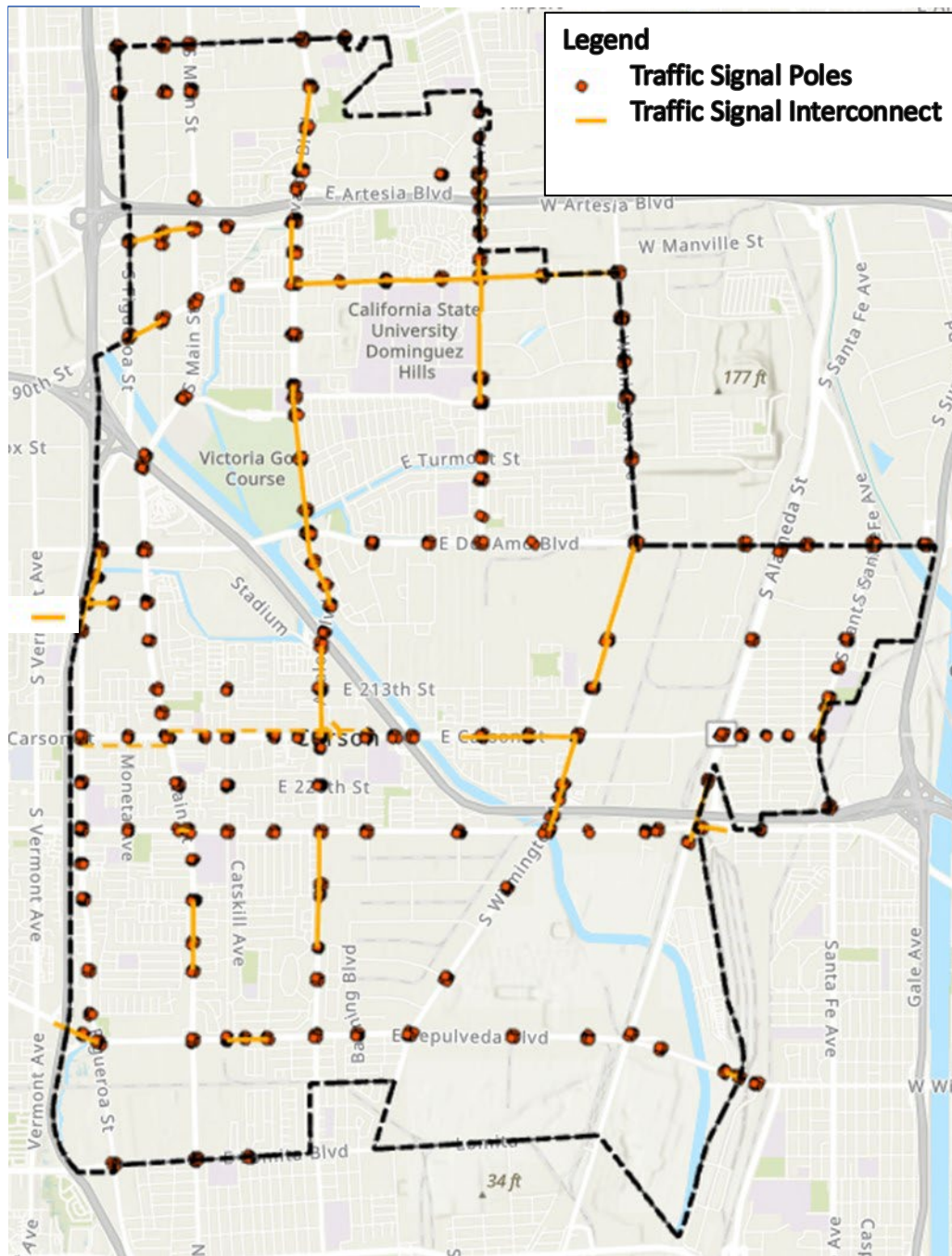
Figure 4 - Signalized Intersections in the City of Carson

Connecting traffic signals offers two significant advantages for broadband expansion:

1) The conduit networks that interconnect the signals may be rehabilitated and upgraded to fiber backbone cables to meet the City's other communications needs.
2) Interconnected traffic signals and poles can be utilized to deploy traffic management systems, smart city devices, monitors, and other data

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applications. Note: The city does not have a current inventory of signalization equipment currently deployed.

Water & Wastewater Assets

The City of Carson does not own, operate, or maintain the majority of water and wastewater infrastructure used within the City. Water service is provided by California Water Service and Golden State Water Co. Storm drain infrastructure is primarily owned and maintained by the Los Angeles County Flood Control District. Sewer infrastructure is owned by the City, but maintained by the Consolidated Sewer Maintenance District, which is operated by Los Angeles County Public Works.

Vertical Communication Assets

Vertical assets can be used for wireless (Wi-Fi, cellular, or radio) distribution points to enhance broadband access in the community, often leased to private telecommunication companies to serve their subscribers. Typically, these assets serve a primary purpose other than communication/data (e.g., water tanks, streetlights, or traffic signals). Water tanks generally are higher in elevation and provide good line-of-sight for macro cell towers, radios, or point-to-point communication equipment. Streetlight and traffic signal poles offer the ability to penetrate into neighborhoods by installing micro equipment intended to fill the gaps in coverage or alleviate capacity issues that cannot be resolved by larger, more expensive macro cell sites.

However, the city can similarly use these assets to enhance community broadband – either directly by installing public Wi-Fi, radio, or cellular distribution equipment or indirectly through creative leases and agreements with private telecom companies that exchange rents for serving city-targeted areas.

The City does not appear to own any towers or water tanks. Several small cell sites appear near the city boundary.

The use, rents, leases, and equipment specifications are closely governed by the U.S. Federal Communications Commission (FCC), and permitting is a ministerial process with a strict shot clock to review any application (for both new installations and changes to existing sites). However, cities and counties still retain some administrative control over aesthetics.

However, master license agreements that were executed before the 2018 FCC ruling may allow for more flexibility and discretion by municipalities, including the amount of rent that can be charged per site, options for in-lieu rents or in-kind contributions, and other arrangements exchange use of public assets in return for public benefits.

Commercial/Privately Owned Towers

Commercial towers in the city allow carriers to provide cellular coverage, fixed wireless internet, and some smart city services. The city can improve cellular

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coverage by permitting and zoning, allowing towers to be built where needed. Today, there are 15 commercial towers located within the city boundary.

	Cell Tower
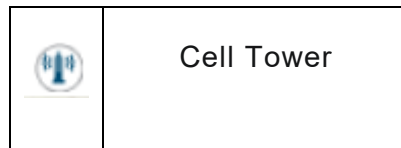
Figure 5 - Commercial towers

California Middle-Mile Broadband Initiative (MMBI)

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 issued Executive Order N-73-20[3] on August 14, 2020, addressing the need for improved broadband services, closely followed by the passage of Senate Bill 156, which addressed broadband through the 2021 budget package.

The MMBI routes through the City of Carson are shown in Figure 15[4]. There may be opportunities for public and private fiber entities to collaborate during the construction process (e.g., Joint Trench/Conduit Sharing).

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[3] *See*, https://www.gov.ca.gov/2020/08/14/38666/

[4] Source: MMBI - Network Interactive Map

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Joint Build Route   New Construction
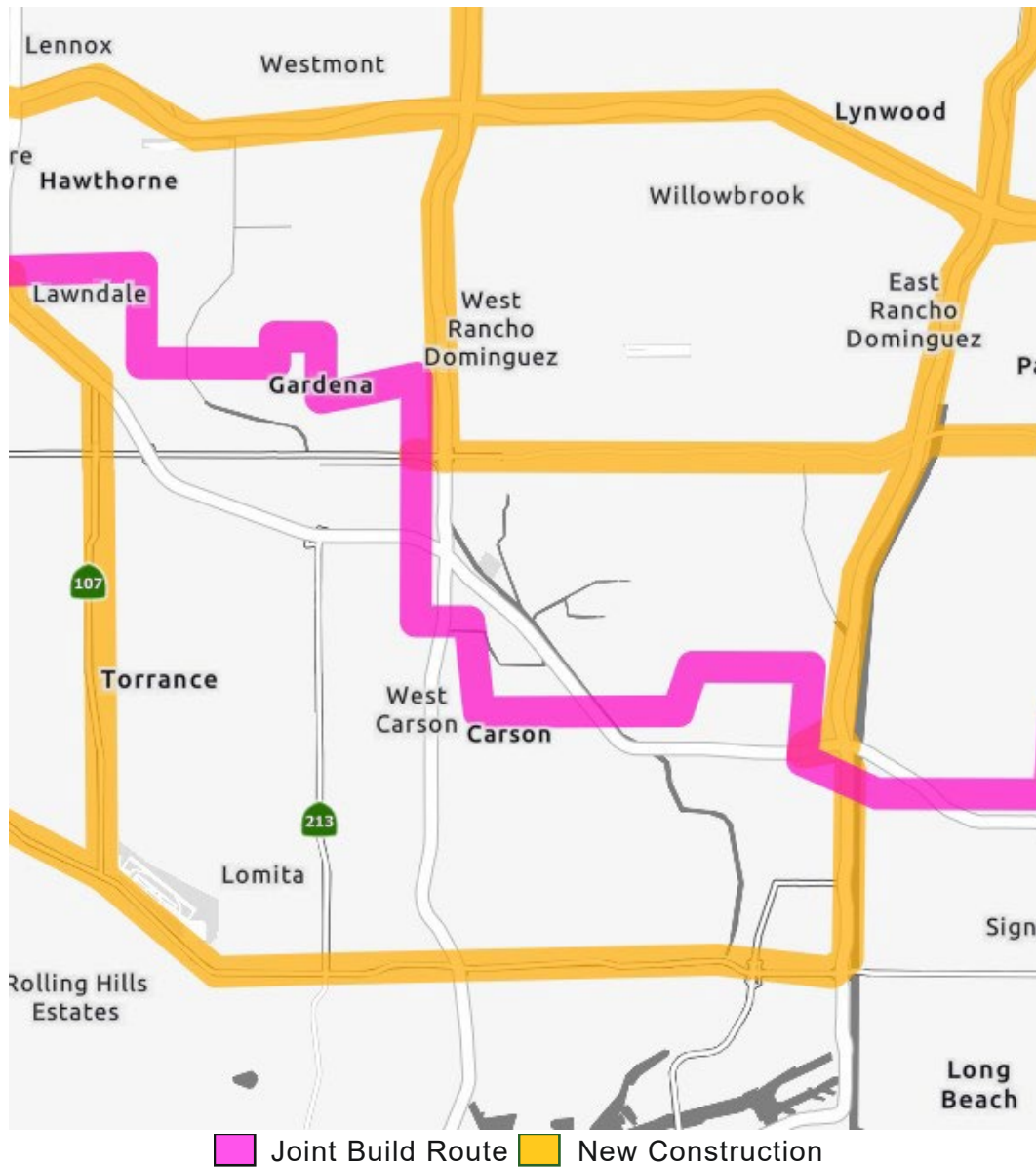
Figure 6 – MMBI Network Routes in Carson

2.2 Private Infrastructure

Metro Fiber

Metro networks, as the name implies, are designed to connect major sites in metropolitan areas to each other and to other service providers, typically via colocation data centers or exchange facilities. Mobile network operators use metro fiber to connect towers and 5G small cell sites.

- **City Usage:** Metro fiber can be used by the city for parts of its City IT network and for many smart city applications to connect data centers and remote

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devices. Applications with the need for high bandwidth, such as high-resolution traffic and public safety cameras, can be served on metro fiber networks.

- **Service Pricing:** 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 8 illustrates the metro fiber in Carson.

- **Current Infrastructure:** The Internet connection for City Hall is a metro fiber connection from the South Bay Fiber Network supplied by American Dark Fiber / Race Communications. This unique Public / Private Fiber Network within the city limits could be a part of a larger partnered solution or City Network.

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■	Crown Castle	■	Lumen (Level 3)	■	Zayo	■	Lumen
■	TPx Communications	■	City of Los Angeles	■	American Dark Fiber		

Figure 7 - Metro Fiber Networks in Carson[5]

Crown Castle

Crown Castle is a leading provider of fiber to businesses, cellular infrastructure (e.g., towers and small cells), and other key anchor institution locations. They have substantial fiber assets throughout Southern California and are often the dominant metro fiber provider. Crown Castle builds to demand where recurring revenues recoup their initial investment, such as cell sites for major cellular carriers, or to large businesses that have high data demands. They do not provide "retail" broadband services to residential customers.

As illustrated in Figure 9, Crown Castle has fiber in the City of Carson and substantial fiber in neighboring areas.

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[5] Source: Fiberlocator.com

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	Crown Castle			City Boundary
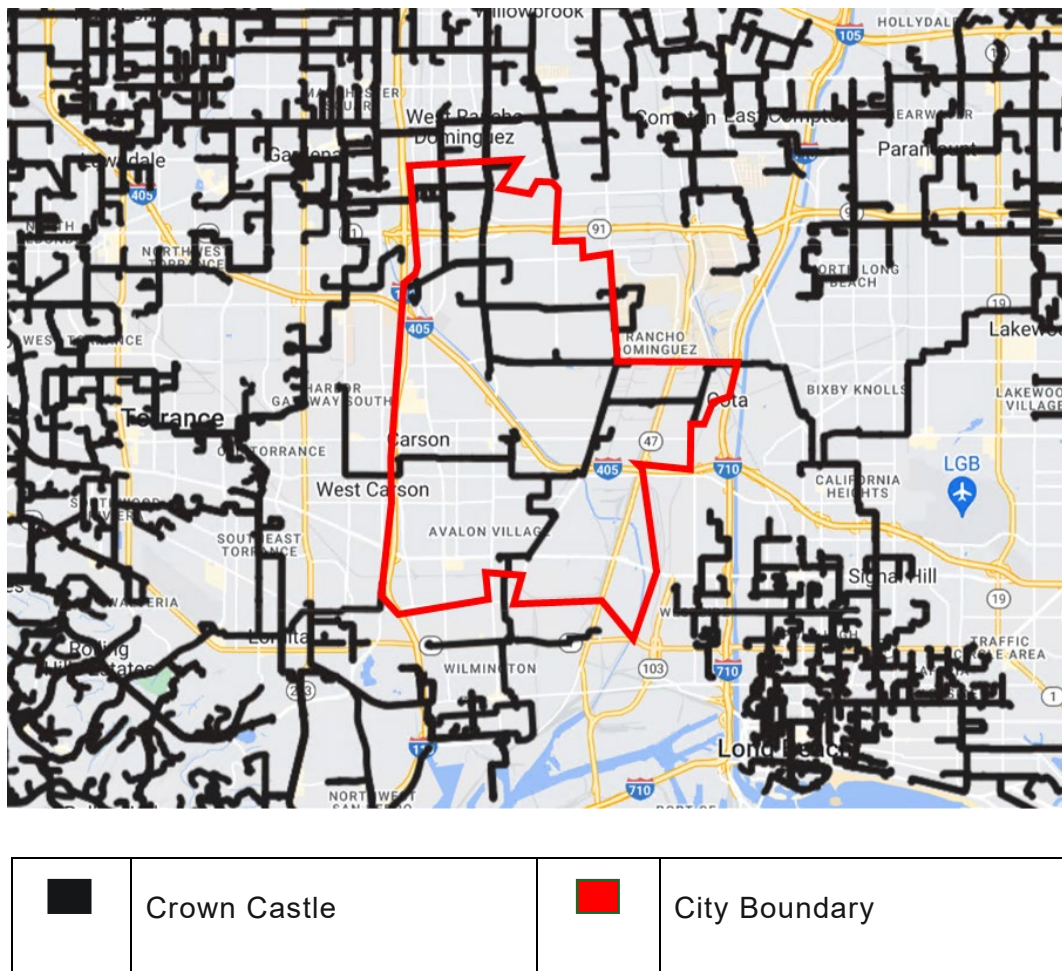
Figure 8 - Crown Castle Fiber

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 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, Las Vegas, and Phoenix.

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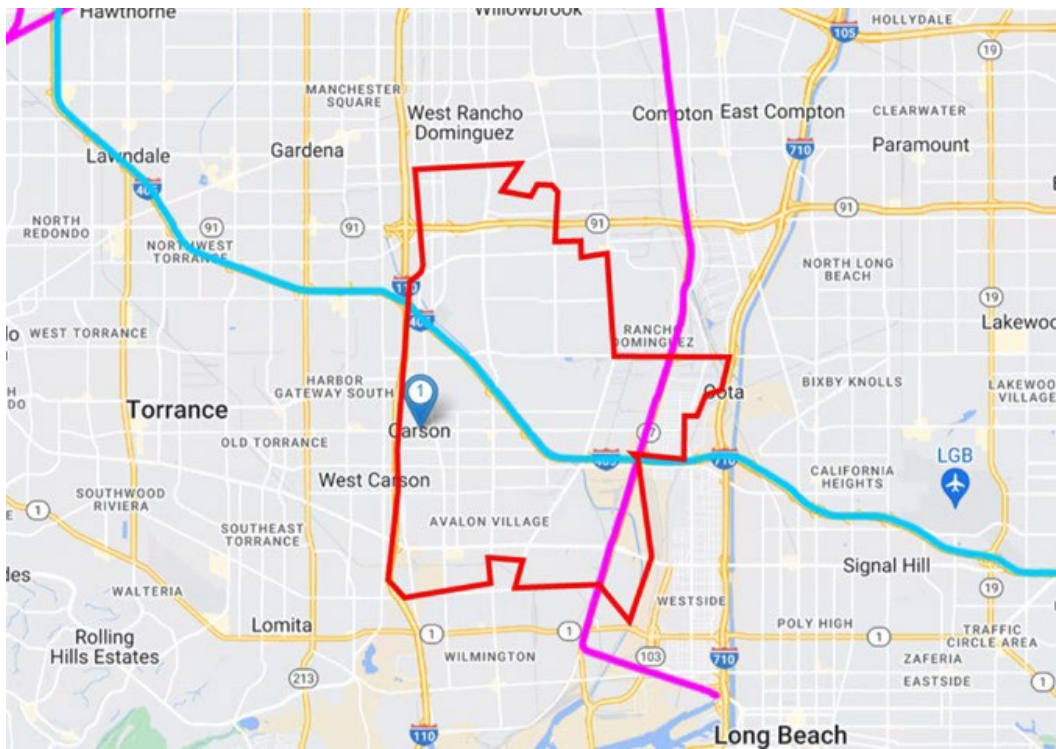
AT&T		LUMEN

Figure 9 - Long Haul Fiber Networks in Carson[6]

- **Key Locations:** For Carson, a key inter-exchange point and major data center cluster is located at One Wilshire Boulevard in Los Angeles, one of the most interconnected facilities in the USA and in the World.

Current Availability: There is limited long haul fiber available to the City or to private companies in the City. There are two providers that can be utilized to provide the path redundancy and carrier diversity requirement often demanded by private businesses and municipalities. Given the proximity to Los Angeles, many Metro fiber providers can offer connectivity options.

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 more likely in 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

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[6] Source: Fiberlocator.com

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data/interconnect centers. This allows end users to reduce latency and improve application performance.

- **Migration Trends:** As more mission-critical applications of enterprises, governments, and consumers migrate to public and private clouds, 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.

- **Path Redundancy:** Cities should have path redundant connections from two service providers to two tier-one IXPs. The current long haul fiber is limited in Carson but would enable this.
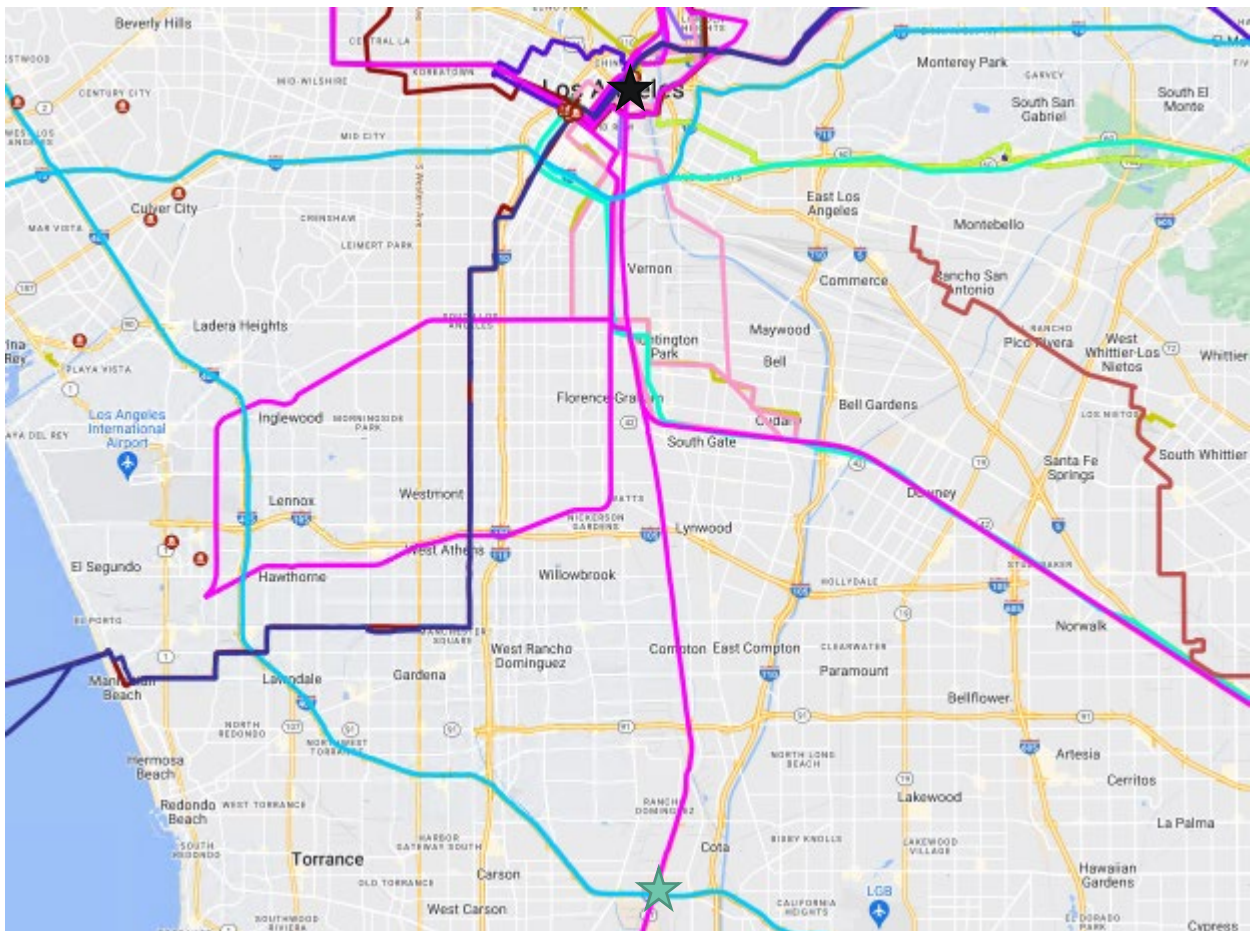
	Lumen		AT&T
⭐	Suggested IXP location	★	One Wilshire Public IXP

Figure 106 - Long Haul Routes - Carson to One Wilshire IXP via AT&T and Lumen

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Recommendations:

1) **Expand Metro Fiber Utilization:** Leverage existing metro fiber for more smart city applications, such as high-resolution traffic cameras and public safety cameras, which require high bandwidth.
2) **Partnerships with Private Providers:** Foster partnerships with providers like Crown Castle to enhance fiber network coverage. Crown Castle's infrastructure can be used to support citywide broadband initiatives.
3) **Improve Long Haul Connectivity:** Enhance long haul fiber connectivity to major data centers and inter-exchange points like One Wilshire Boulevard. This will ensure low-latency, high-speed connections necessary for cloud-based applications.
4) **Invest in Data Center Infrastructure:** As applications migrate to the cloud, investing in local data centers or enhancing connectivity to existing data centers can reduce latency and improve performance.

By implementing these strategies, Carson can significantly enhance its broadband infrastructure, ensuring it meets the growing demands for high-speed internet and supports smart city initiatives.

2.3 Summary of Findings

ENTRUST identified significant infrastructure within Carson that can be leveraged for broadband – whether existing conduit and fiber cable pathways to connect facilities and neighborhoods, locations in the public sphere or right-of-way to host distribution equipment, opportunities to deploy smart city devices and applications, or integration of public and private assets in innovative partnerships. Key assets identified during the assessment include:

Core Fiber Backbone Network

- **Existing Infrastructure:** The City has a core fiber network that can start connecting critical City and public facilities. This foundational infrastructure is crucial for expanding broadband access and improving connectivity across Carson.
- **Infrastructure Evaluation**: The City has 11 miles of underground traffic conduit already deployed, and 1.2 miles of fiber cables installed. However, these existing communications networks must be assessed for condition, size, and suitability for broadband use when planning future capital projects and investment decisions. This assessment should include evaluating the capacity and physical state of the current infrastructure.
- **Interconnection Opportunities:** The City can interconnect all city facilities and potentially partner with other anchor institutions to strategically build out its broadband infrastructure. This approach ensures equitable access, fosters community engagement, improves administrative efficiency, and enhances critical services.

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Leveraging Vertical Assets

- **Attracting Private Investment:** The City's vertical assets, such as street light poles and traffic signals, can be leveraged to attract private investment and improve wireless and cellular coverage. These assets can be used to deploy broadband and smart city applications via wireless or cellular connectivity. Leasing these assets to mobile carriers can generate revenue and improve broadband coverage.

Streetlight and Traffic Signal Networks

- **Broadband and Smart City Applications**: There are approximately 9,151 street light poles, which may be used for broadband deployment and smart city applications. The geographic reach of streetlights, aligned along major transportation corridors and residential neighborhoods, provides opportunities to enhance 5G mobile coverage and other wireless services.
- **Traffic Management Systems:** The City's traffic signal system can be interconnected to deploy traffic management systems, smart corridors, smart city devices, monitors, and other applications. This integration can improve urban mobility and safety.

Communication Towers

- **Enhancing Community Broadband:** The City has 17 existing communications towers that can be utilized to enhance community broadband by directly installing public Wi-Fi, radio, or cellular distribution equipment. Utilizing these towers can improve connectivity and support various public safety and community applications.

Regional Fiber and State-wide Network Plans

- **Golden State Network (MMBI):** The planned California middle-mile Golden State Network (MMBI) fiber routes along Interstate 405, 710 and CA State Routes 91 and 1 including a route along Carson St. 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. Partnering with initiatives like MMBI may reduce costs and enhance broadband access.

Existing Networks and Partnerships

- **South Bay Fiber Network:** The city's existing connection to the South Bay Fiber network already connects the city to Data Center resources at One Wilshire Blvd. This connection could be scaled up to feed internet to the entire city backbone. Exploring cooperation and potential partnerships with this network may enhance broadband services.

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Long-Haul and Metro Fiber

- **Utilizing Existing Fiber:** There are other existing long-haul and metro fiber within the City, which can be utilized by the City and local businesses to grow and interconnect with the global economy. Leveraging these assets can facilitate better connectivity and economic development.

By addressing these findings and incorporating best practices from other successful municipal broadband projects, the City of Carson can enhance its broadband infrastructure, improve service delivery, and foster economic growth and digital inclusion.

3. Market Analysis

ENTRUST has conducted an inventory of existing providers and broadband assets to gain an understanding of what Internet service offerings are currently available to businesses and residents in The City of Carson. This analysis identifies the available services, who the providers are, what levels of Internet service are offered, including pricing, and where the services are available. This report is informed by Carson-specific conversations with existing providers, research utilizing public information as well as our comprehensive broadband database and third-party research. After reading this section, you will have a nuanced understanding of what is available on the market today in the City of Carson.

As part of Entrust's research validation process, the "actual" services available to randomly selected addresses from different parts of the city were checked against the FCC Broadband Map. Two facilities-based last-mile providers, Charter/Spectrum, the legacy cable company, and AT&T, the legacy telephone company, had services available at most locations.

Spectrum has a 1Gbps service to all locations and AT&T has copper-based DSL services with data rates between 0.50 Mbps and 50 Mbps to all locations and 5 Gbps fiber to approximately 25% of the city.

T-Mobile's and Verizon's Fixed Wireless Access (FWA) services were available throughout the city, but neither is available everywhere. T-Mobile's FWA is delivered using infrastructure on towers and Verizon's is more reliant on small-cell deployments. Availability is also highly dependent on local conditions such as foliage and other buildings between the location and the antenna.

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Table 1 – Service Coverage Data Per Randomly Selected Address

Address	Spectrum	AT&T	T-Mobile	Verizon
Island Ave.	Cable	DSL	FWA	FWA
W 235th St.	Cable	Fiber	FWA	
W. 20th	Cable	DSL		FWA
E. 20th	Cable	DSL		FWA
Nestor Ave.	Cable	Fiber	FWA	
E. Kenbridge Dr.	Cable	DSL	FWA	FWA
E. 218 Pl. Ave.	Cable	DSL	FWA	
Alvar Pl. Ave	Cable	DSL	FWA	FWA
Orangetree Dr.	Cable	DSL	FWA	
S. Wilmington Ave.	Cable	DSL		FWA
Grace Ave (2)	Cable	DSL	FWA	
Galway Ave (2)	Cable	DSL	FWA	
Commercial Addresses				
E. 236TH St.			FWA	FWA
S. Avalon Blvd	Cable		FWA	
S. Wilmington Ave.	Cable	DSL	FWA	
Carson St.	Cable	DSL		FWA

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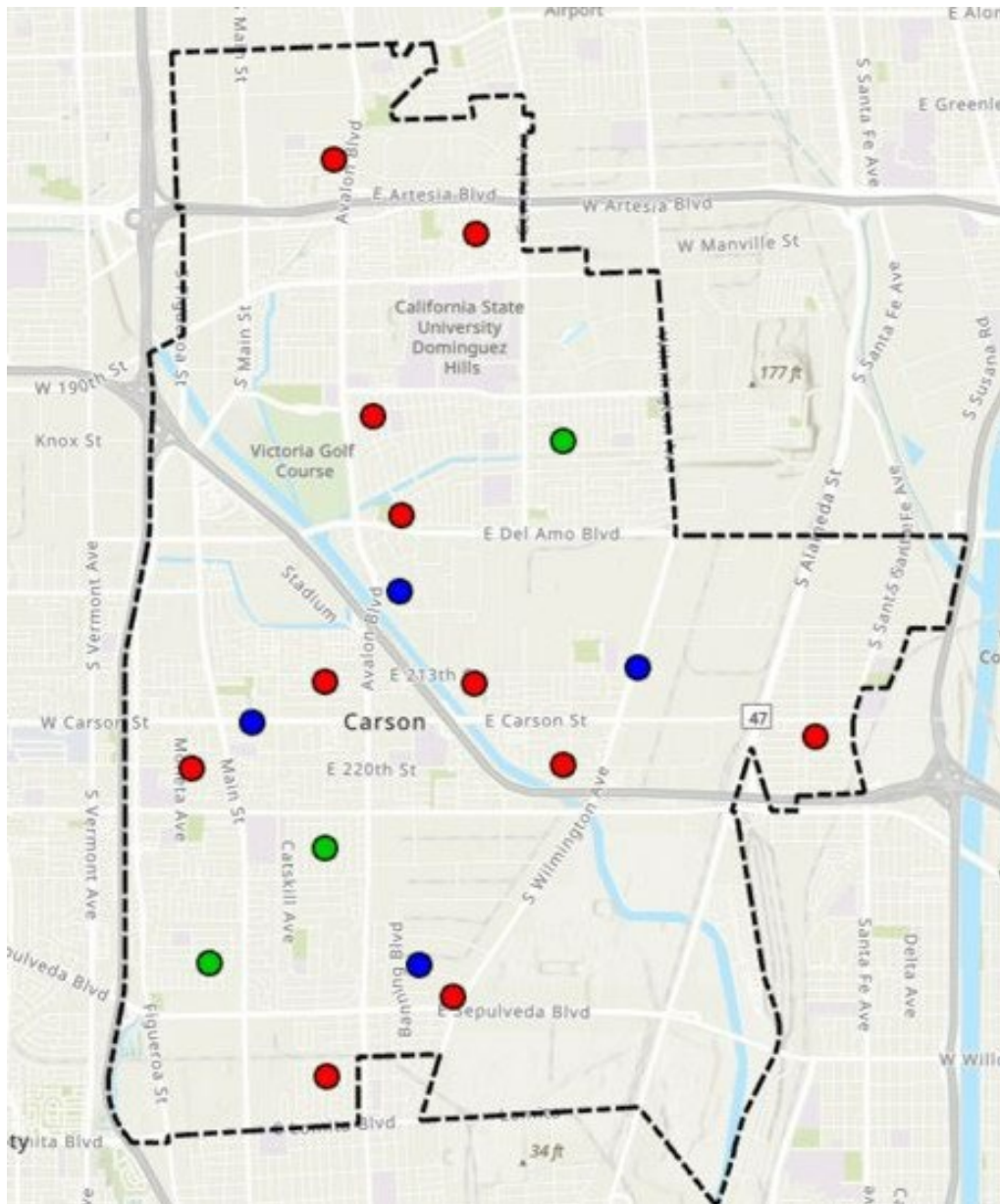
	Cable, DSL, FWA		Cable, Fiber, FWA		Commercial

Figure 11 – Map of randomly selected addresses

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3.1 Wireline Providers

1. Incumbent Internet Service Providers

Overview

The broadband market in the City of Carson is dominated by traditional telephone and cable TV companies. Both have leveraged their legacy networks to offer internet access services. AT&T has reached the technical limits of DSL and is in the process of 'overbuilding' their copper network with Fiber-to-the-Premises to offer multi-gigabit data rates. Spectrum's hybrid-fiber-coax network can offer 1 Gbps downstream, however the upstream is limited to 35Mbps due to legacy network architectural constraints. Spectrum's future plans include an electronics upgrade (DOCSIS 4.0), which will enable them to offer multi-gigabit symmetrical rates.

Mobile Network Operators (MNOs) are providing Fixed Wireless Access (FWA) access through their 5G cellular networks. The data rates available are typically above DSL and below Cable. Technical improvements and upgrades are expected to improve coverage and capacity over time.

Charter / Spectrum

Charter/Spectrum (Spectrum) is the second largest ISP in the U.S. just slightly smaller than Comcast. Spectrum's 2022 revenues were $54 billion, and they ended the year with 32 million customer relationships. This includes 30 million residential subscribers and 2.2 million small and medium businesses. They also have a total of 5.3 million Mobile 5G customers.

Spectrum's legacy cable TV assets are based on the Hybrid-Fiber-Coax (HFC) architecture. The head-end and hubs connect to nodes with fiber optics. The node translates the downstream optical signals into radio frequency (RF) signals which are retransmitted on the coax cable. The reverse is true on the upstream. The residential cable modem sends RF signals which are translated into optical signals at the node.

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Figure 12 - Spectrum HFC Network & Coverage
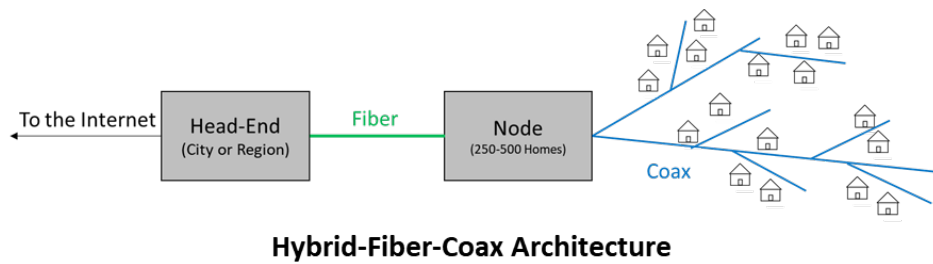
Hybrid-Fiber-Coax Architecture

As shown in the figure above, the HFC network is a shared network so the actual real-time performance will vary based on the number of actual users at any given time. Consumer rates are 'best effort,' and therefore ISPs add the phrase "up to" when specifying data rates. Their current offerings in the city are summarized below.

Table 2 - Spectrum's Published Internet Service Offerings in Carson

Package	Type of Connection	Download Speed	Upload Speed	MRC	MRC per Mbps	Notes
Spectrum Internet	Cable	300 Mbps	10 Mbps	$50	$0.16	Price for 1 year, no data caps, nationwide Wi-Fi
Internet Ultra	Cable	500 Mbps	20 Mbps	$70	$0.14	Price for 1 year, no data caps, nationwide Wi-Fi
Internet Gig	Cable	1 Gbps	40 Mbps	$90	$0.09	Price for 1 year, no data caps, nationwide Wi-Fi

Spectrum's offerings in Carson are based on the DOCSIS 3.1 standard. DOCSIS (Data Over Cable Service Interface Specification) specifies how data is transmitted over the HFC network. With DOCSIS 3.1 download data rates of over 1 Gbps can be achieved. However, due to historic spectrum allocation in the coax, the upload data rate is limited to approximately 35 Mbps.

The cable industry recognizes that the limited upload speeds currently available have become a competitive disadvantage against fiber-based competition which offer symmetrical rates up to multiple gigabits per second. The DOCSIS 4.0 standard,

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released in 2017, will support up to 10 Gbps download speeds and 6 Gbps upload speeds and is expected to be implemented in the next few years.

Spectrum expects 50% of its national footprint to be able to offer 5 Gbps/1 Gbps data rates by the end of 2025. The major benefit of DOCSIS 4.0 and outside plant improvements is it will enable the cable industry to leverage its installed base of network assets and remain competitive for many years.

To further compete with both telco-fiber and new-entrant fiber providers, Spectrum created a new connectivity bundle that includes national 5G mobile plans. Spectrum recently announced, "Spectrum One." This offering includes Internet, Whole-home Wi-Fi, and 5G Mobile. Bundles have been shown to increase customer retention by increasing the friction required to change any single service.

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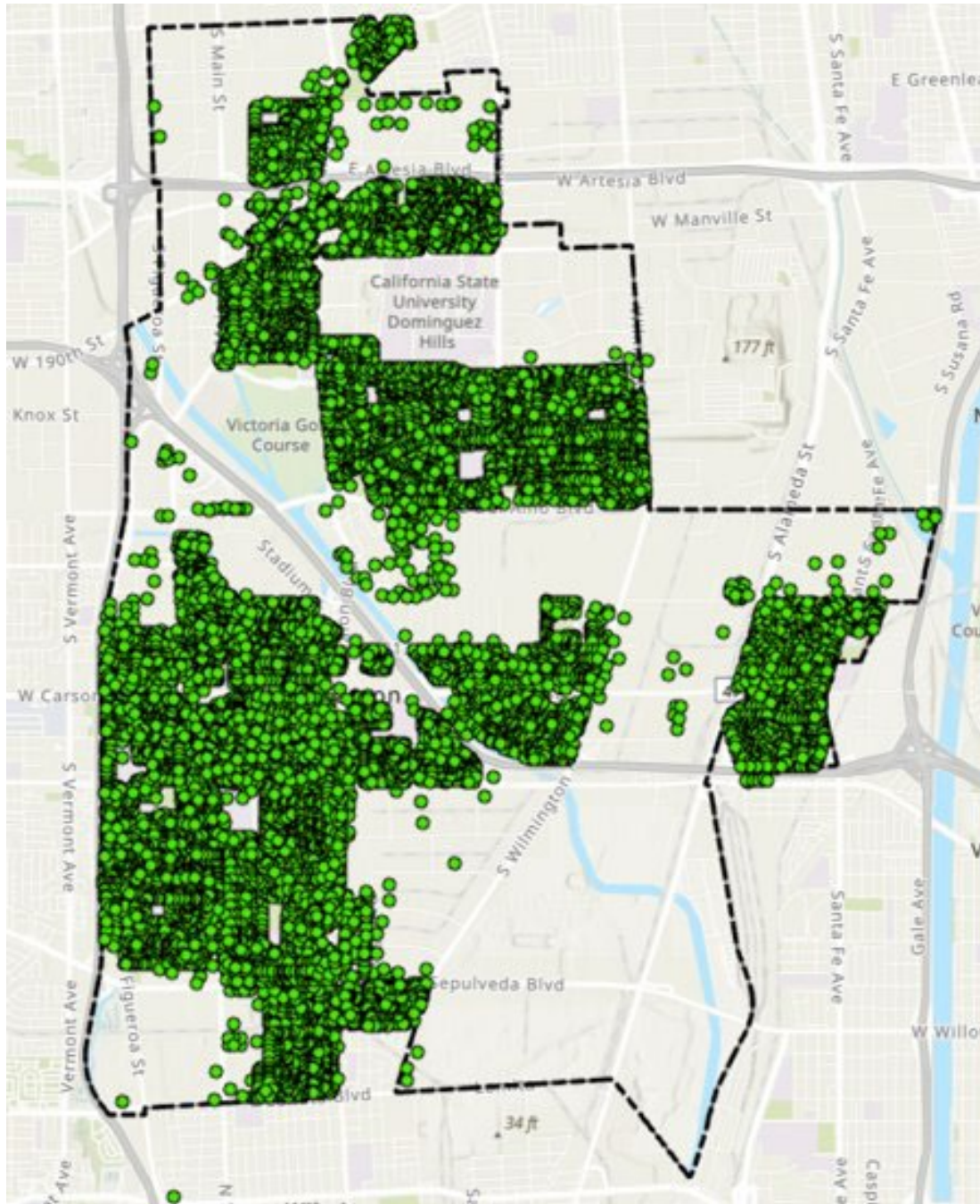
Figure 13 – Spectrum Cable Footprint in Carson

●	Cable Served Location

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AT&T

AT&T is the Incumbent Local Exchange Carrier (ILEC), or the legacy telephone company in the city. Like most ILECs, AT&T offers service City-wide through a network of twisted copper phone lines. AT&T is also a national wireless carrier with a 5G wireless network. To remain competitive in the wireline internet services business, AT&T has been overbuilding its copper network with fiber and has now passed between 20 and 25 million locations nationally including 7 million new locations passed in 2022. Their stated goal is to pass 30 million locations by 2025. In Carson, they have deployed a Fiber Optic Next Generation Passive Optical Network architecture (XGS-PON) in approximately 25% of the City. The remaining locations are served with legacy DSL-based Internet service which is unable to offer competitive broadband-level service. In Carson, their DSL and Fiber footprints are shown in Figure 5. Deliver technology architectures are shown in Figures 6 and 7.

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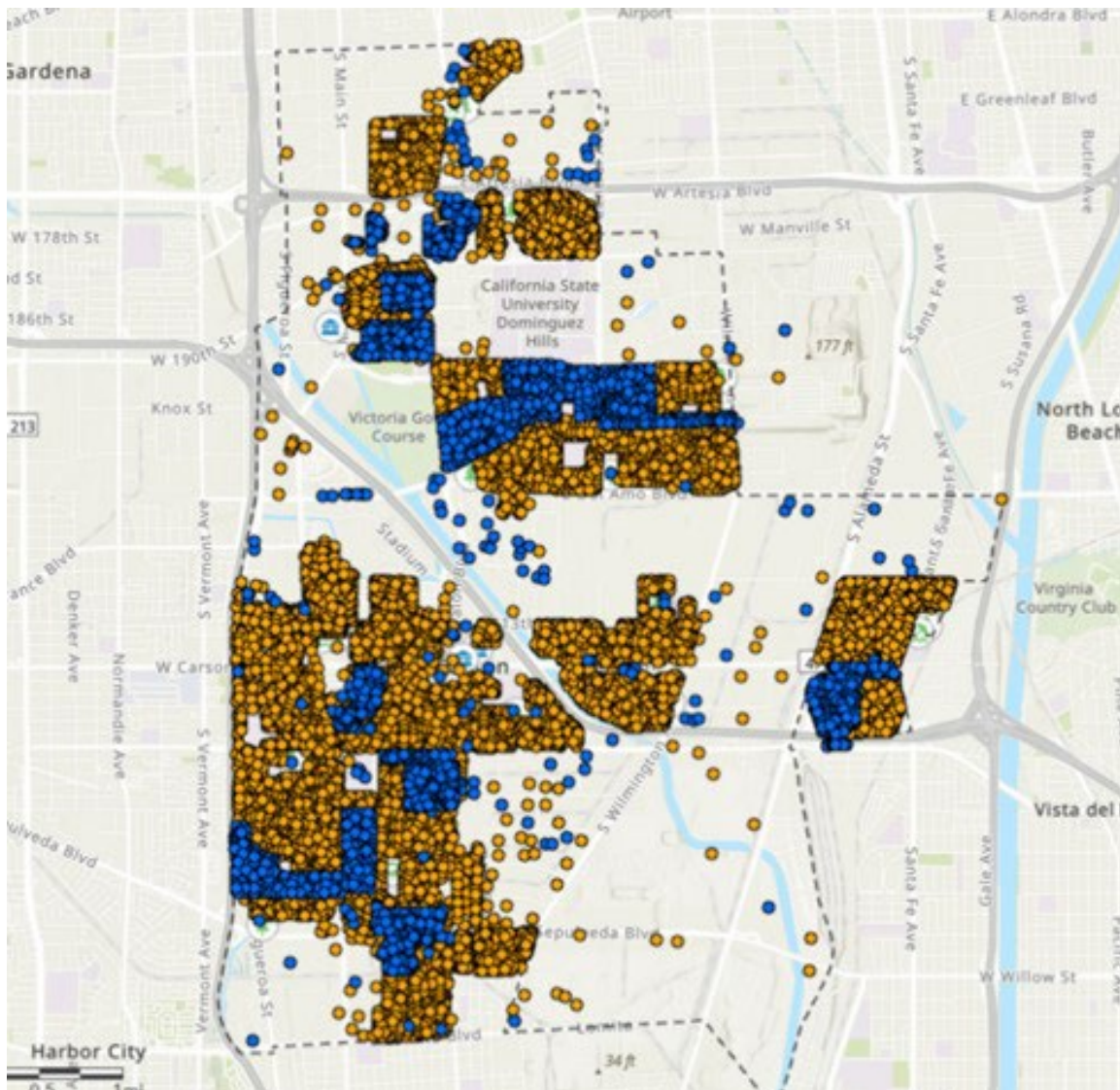
Figure 5 - AT&T Footprint in Carson

■	Fiber Served Location	■	DSL Served Location
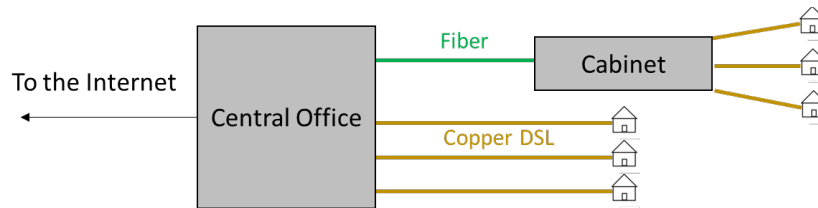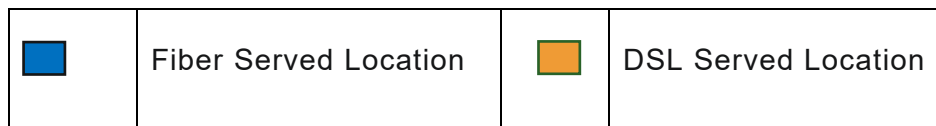
Figure 6 - DSL Architecture
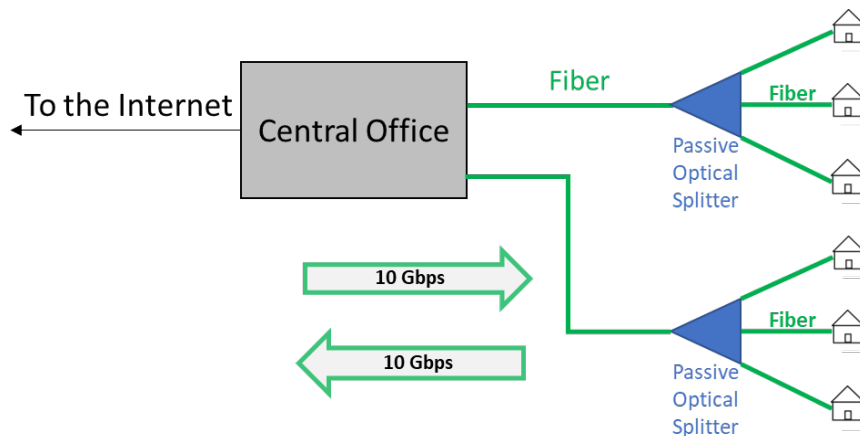
Figure 7 – Fiber Optic XGS-PON Architecture

To expand on the map in Figure 5, AT&T, like every national provider, must justify their investment on a per 'neighborhood' basis. Carson residential neighborhoods are 'dense' with approximately 30 locations (Homes) per 1000 feet of roadway. This is financially attractive as it enables fiber builders to spread their construction costs over more locations. Given AT&T's publicly stated fiber strategy and the competitive dynamics in Carson, we expect AT&T to expand their fiber footprint in the next few years. However, when asked, AT&T did not share the details of their fiber buildout

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plans, we do see that they have applied for a $9m state grant (FFA)[7] to build out additional Fiber network within the city should they receive the grant.

Existing Wireline ISP Comparisons

This section compares the offerings of Spectrum and AT&T. Table 3 compares the pricing for the ISP's new customer introduction rates.

Table 3 - ISP New Customer Introductory Pricing Comparison

Carrier	Service Tier	Monthly Rate	Term	Extras
Spectrum (Cable/HFC)	300/10 Mbps	$ 50		No contract, No data cap, Free modem
	500/20 Mbps	$ 70	2 years	
	1 Gbps / 35 Mbps	$ 90		
AT&T (DSL)	768 Kbps to 50 Mbps	$ 55	None	No data cap Free modem
AT&T (Fiber)	300/300 Mbps	$ 50	12 Months	No contract, No data cap, Free modem
	500/500 Mbps	$ 65		
	1/1 Gbps	$ 80		
	2/2 Gbps	$ 110		
	5/5 Gbps	$ 180		

Table 4 and Table 5 are a detailed comparison of their "gigabit" service and their 300 Mbps service. These tables factor in applicable equipment fees and add-ons for Wi-Fi. Spectrum provides a "modem" for free, whereas AT&T-Fiber provides a Wi-Fi Router with the modem built-in. Spectrum, and Comcast, allow customers to purchase a Wi-Fi Router from a retail outlet and connect to their modem via Ethernet.

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[7] https://broadbandportal.cpuc.ca.gov/s/gms-application/a0K3d000002bkRyEAI/los-angeles-1

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Table 4 - Spectrum and AT&T gigabit service comparison

Gigabit Service	Spectrum	AT&T - Fiber
New Customer Promotional Rate[8]	$69.99 (1G/35M)	$80.00 (1G/1G)
Price Guarantee	24 Months	12 Months
Data Cap	None	None
Contract	None	None
Equipment	Free Modem (No Wi-Fi)	Free Wi-Fi Router
Wi-Fi[9]	$5/Month (Includes Gateway)	Included
Enhanced Wi-Fi	$3/Mo. Wi-Fi Extenders	$10/Mo. (Whole home)
Monthly Fees with Basic Wi-Fi	$74.99	$80.00
Monthly Rate after Promo	$124.99	Not Available
Wireless/Mobile Promotions	1 unlimited mobile line for 12 months.	1G services is $60/Mo. w/eligible wireless service
Monthly Fees with Basic Wi-Fi after wireless discount[10]	$34.99 (One Year)	$60.00
Service Activation	$24.99	None
Installation	$24.99 (Self Install Kit)	$99 – Waived - Professional Install

Table 5 – Spectrum and AT&T 300mbps service comparison

1Gbps Monthly Fee	$69.99	$80.00
Wi-Fi add-on (Basic)	$5.00	$0.00
Per Month	$74.99	$80.00

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[8] Monthly Automatic Electronic Payments required.

[9] A significant difference is the customer premises equipment deployment scenarios. Spectrum allows customers to connect third-party Wi-Fi routers to their broadband modem. Whereas AT&T and Frontier provide a single CPE device that includes the Wi-Fi router.

[10] In the last few years, Spectrum and Comcast have offered national 4G and 5G mobile services. They are a mobile virtual network operator (MVNO) that wholesales the big national Mobile Network Operators (MNO) wireless network. Spectrum offers one mobile line per subscriber for one year. This is essentially a $45/month subsidy from Spectrum for 12 months. AT&T is also a national MNO and offers Fiber / Wireless subscribers a $20/month discount when bundling.

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Service Activation	$24.99	$0.00
Installation	$24.99	$0.00
Basic Wi-Fi		
First Month	$124.97	$80.00
Month 2-12	$74.99	$80.00
Month 13+	$74.99	$80.00
First 12-Month Totals	$949.86	$960.00
With 5G Mobile Tie-in		
5G Mobile Discount per month	$40.00	$20.00
Time	12 Months	No time limit
First Month	$84.97	$60.00
Month 2-12	$34.99	$60.00
Month 13+	$74.99	$60.00
First 12-Month Totals	$469.86	$720.00

Note: These prices are accurate where the companies have an existing network. If a location needs network construction to receive service, such as a commercial or industrial location or another remote location that is not adjacent to an existing network, build costs vary. Different service prices, types, and contract terms lengths may be offered to cover the cost of the construction. These installations and service offerings are custom and handled on a case-by-case basis making it difficult to generalize about the cost to connect a given location.

Fixed Wireless Access (FWA)

In recent years, mobile network operators (MNO), T-Mobile and Verizon have started offering internet access to homes and businesses using their 5G networks. Data rates will depend on several parameters including distance from the tower and foliage density.
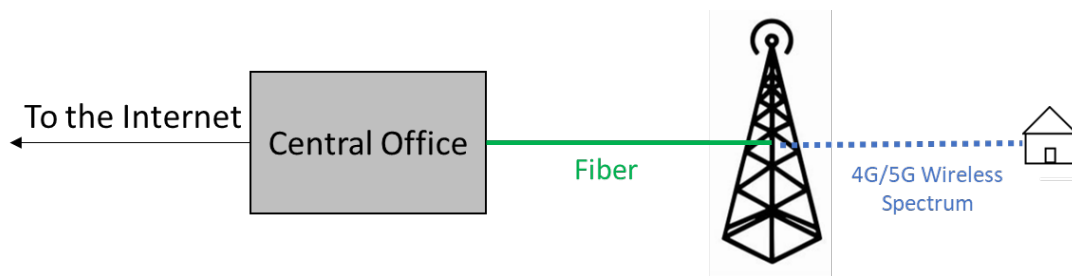
Figure 8 - Fixed Wireless Network Illustration

The concept of wireless internet access is not new, and it is widely used in rural environments. What has changed is the impact the MNOs are having in denser urban and suburban markets. T-Mobile is the most aggressive in marketing its FWA services. Nationally, they have added over 2 million FWA customers in their first year

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since the product launched. Some residences and businesses will use FWA as a backup to their primary wireline connections.

Figure 9 and Figure 10 show the FWA coverage by T-Mobile and Verizon. These figures show the coverage of at least 25 Mbps / 3 Mbps with at least 50% of addresses able to receive that data rate.

T-Mobile

T-Mobile provides 5G fixed wireless access 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 1-182 Mbps and will vary according to location, time of the day, weather, and other factors.

Table 6 - T-Mobile's Published Internet Service Offerings in Carson

Package	Type of Connection	Download Speed	MRC	MRC per Mbps18 F18F[i]	Notes
5G Home Internet	Fixed Wireless	182 Mbps MAX	$50.00	$0.27	Unlimited Data, No Annual Contract

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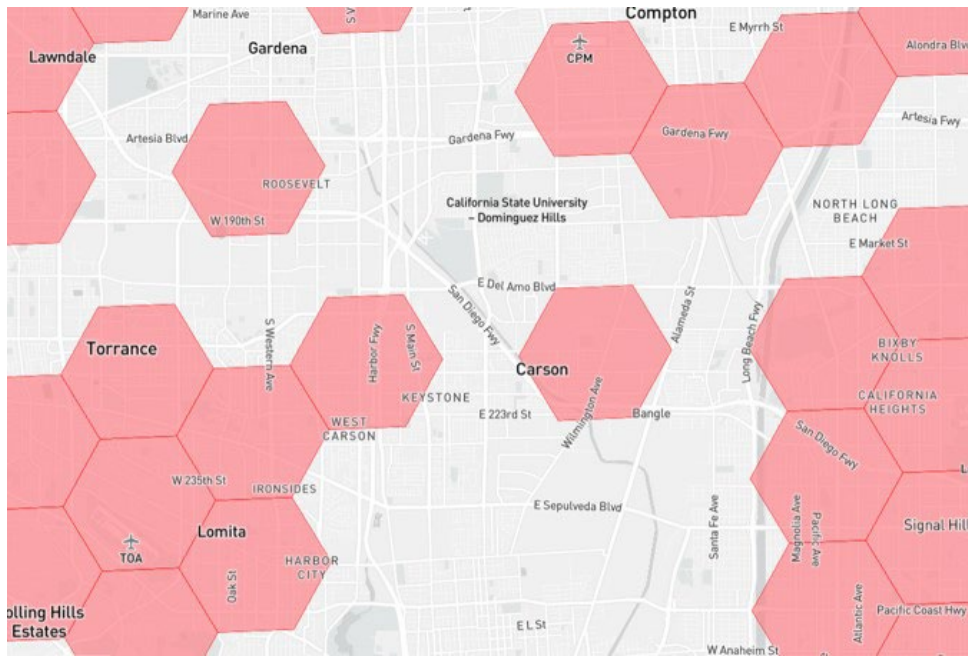
Figure 9 - T-Mobile FWA Areas with >50% Coverage and 25/3 Mbps or greater data rate

Verizon Wireless

In addition to citywide 5G coverage, Verizon offers a fixed wireless access (FWA) broadband service in the city. This uses the same infrastructure as their mobile services to connect homes and businesses to the internet. Verizon offers unlimited data and contract-free plans, but speeds will vary based on a location's distance to its network towers and real-time network traffic. Their offerings are shown in Table 7 and the estimated coverage of areas with at least 50% of the locations covered is shown in Figure 9.

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Table 7 - Verizon's Published Residential Internet Service Offerings in Carson

Package	Type of Connection	Download Speed[16]	MRC[17]	MRC per Mbps[18]	Notes
LTE Home Internet	Fixed Wireless	50 Mbps	$25	$0.50	Unlimited Data, No Annual Contract
5G Home	Fixed Wireless	300 Mbps	$60	$0.20	Unlimited Data, 10-year price guarantee
5G Home Plus	Fixed Wireless	300 Mbps	$80	$0.27	Unlimited Data, No Annual Contract, 10-year price guarantee. Gift cards, Cloud unlimited
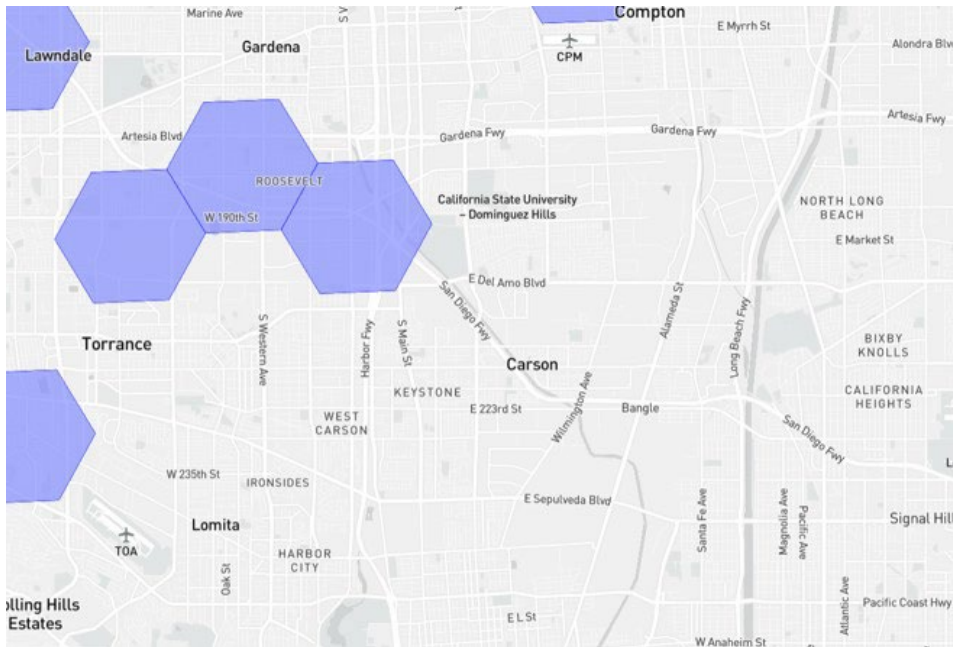
Figure 10 - Verizon FWA Areas with >50% Coverage and 25/3 Mbps or greater

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AT&T

AT&T has full Mobile 5G coverage in Carson. They are late to the Fixed Wireless Access market and have just started deploying and offering FWA services marketed as AT&T Internet Air in parts of the country including Carson. They have just begun steering customers away from their DSL offerings to their FWA internet service offering in the early months of 2024.

Satellite Internet

Historically, there are two satellite internet companies servicing the entire continental USA; HughesNet and ViaSat. These are based on geosynchronous satellites (GEO) that orbit ~23,000 miles above the Earth. Even though the signals travel at the speed of light, the 23,000 miles up and 23,000 miles down adds substantial latencies (600-700 milliseconds) and signal degradations that minimize the effective bitrates.

There are at least two Low Earth Orbit Satellites (LEO) constellations being deployed today. One is Starlink from SpaceX Corporation and the other is a UK-based consortia called OneWeb. These satellites orbit the earth at altitudes of about 350-500 miles. Thus, latencies have been reduced to 30-50 milliseconds from 600-700 milliseconds latencies of the GEO offerings. Users typically see data rates of 50-200 Mbps download and 10-20 Mbps upload and are capped at 1Tb of data throughput per month.

GEO or LEO satellite is not considered a broadband service or as a viable primary option for urban and suburban users as the total number of users in a given geographic area is capped. However, they could be considered as a redundant backup link for the city government, businesses, and residences.

5G Coverage and Capacity

The FCC Broadband Map includes four 5G datasets. They are based on whether the receiver is in-vehicle and mobile or outdoor and stationary. There are two data rates, 7Mbps downstream and 1 Mbps upstream, and 35 Mbps downstream and 5 Mbps upstream. We use the outdoor maps with at least 50% coverage for our analysis as it provides an indication to the state of the MNO's 5G densification plans.

These coverage maps are based on *Propagation Modelling* using a common set of parameters for consistency purposes. The coverage estimates show where a user should be able to establish a wireless connection and achieve certain upstream and downstream data rates.

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A user's ability to connect, and to achieve these data rates, depends on numerous location-specific parameters such as the "light-of-sight' to the antenna and the number of active users on cell site. These performance parameters do not apply to indoor usage.

The Figures below[11] show where each of the three national Mobile Network Operators (MNOs) cover at least 50% of the locations with the specified data rates. The MNO's coverage and capacity are related to the number and location of their macro (Towers) and small cell sites and the radio frequency (RF) spectrum they use.

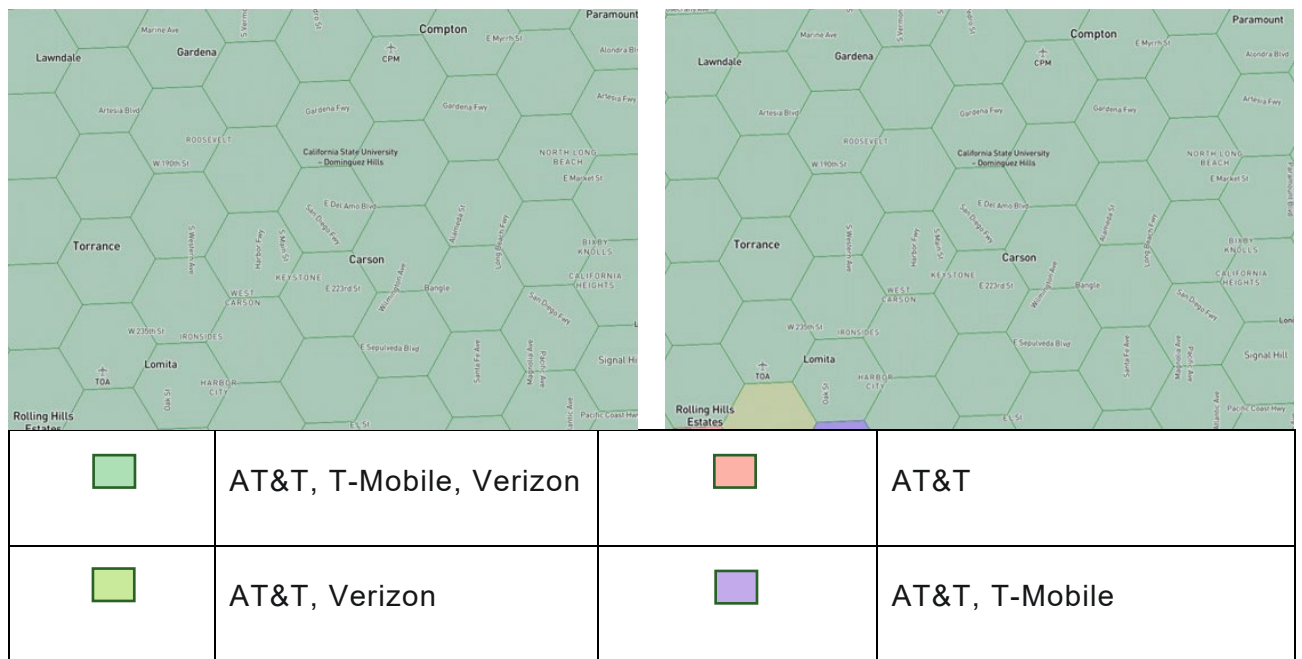|				
🟩	AT&T, T-Mobile, Verizon		🟥	AT&T
🟩	AT&T, Verizon		🟪	AT&T, T-Mobile

Figure 15 - Outdoor Stationary 7/1 Mbps >50% Coverage   *Figure 14 - Outdoor Stationary 35/3 Mbps >50% Coverage*

3.4 Summary of Findings

The City of Carson is considered served by state and federal definitions in terms of speeds and availability. Pricing is aligned with cities of similar size. The challenge

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[11] Source: FCC Broadband Map

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identified is that only 25% of the City has competitive wireline service offerings available – areas served by both cable and fiber. While DSL and FWA services are offered, at this time, neither offer a true broadband competitor to cable or fiber. A single gigabit option in 75% of the city creates a defacto uncompetitive market where residents only have one option for modern broadband download speeds and often no option for substantial upload speeds. With no true competition, prices will rise over time while service quality and satisfaction often erode. While technology upgrades in Cable and FWA and additional fiber investment may alleviate some of these challenges in the next months and years, if and when these improvements will come is an unknown.

The city can get in touch with the private providers to encourage them to accelerate their investments and upgrade schedules within the City of Carson but there is little history indicating this will be effective. More aggressive tactics for encouraging investment include recruiting a competitive fiber ISP to begin building in the city or build and offer services over public fiber infrastructure directly or with a private partner.

The city has taken initial steps to offer services directly or with a partner through a California Public Utilities Commission (CPUC) Federal Funding Account (FFA) grant application. This network is designed to bring fiber services to the unserved in central Carson. AT&T has applied for the same grant and indicates that, if awarded, funds will be used to upgrade fiber in parts of LA county including selected areas of the City of Carson shown to be underserved by the CPUC.

In summary, residents of the City of Carson have access to a number of internet services, at least one of which qualifies as Broadband Internet. Without the robust competitive broadband environment enjoyed by many neighboring cities, Carson will remain a less attractive option for remote workers and businesses that require substantial broadband access. With the exponential growth of demand for cloud-based services and the proliferation of high bandwidth residential and business applications, this competitive gap between Carson and neighboring cities will continue to grow. Spectrum will upgrade to DOCSIS 4.0 nationally, but they have a huge footprint and will prioritize competitive areas. AT&T may upgrade DSL areas within the City to fiber but that could be spread out over many years. The availability of fiber for the business market is also limited. Without wide-scale fiber deployment, businesses must often pay for the fiber lateral construction, sign long-term agreements with a single provider or choose a location, perhaps outside the city, with better infrastructure availability.   Thus, the City should explore a wide array of policies to stimulate competition for business and residential internet service expansion and upgrade.

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4. Needs Assessment

ENTRUST evaluated the needs of the community through several lenses and data sources, looking at existing indicators of need, a community survey, and direct outreach to stakeholders and community organizations to understand how technology and broadband either assists – or challenges – Carson's economic opportunities and quality of place.

Data and maps from the American Community Survey (ACS), U.S. Census, California Public Utilities Commission (CPUC), and other federal databases were used to evaluate Carson's 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. ENTRUST also conducted community stakeholder meetings and focus groups to acquire first-hand accounts.

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 at minimum speeds of 25 Mbps download and 3 Mbps upload; the commission defines "under-served" as locations that cannot access minimum broadband speeds of at least 100 Mbps download and 25 Mbps upload. FCC maps show limited locations of un- or underserved within City limits. This definition and map are critical for determining federal broadband grant eligibility.

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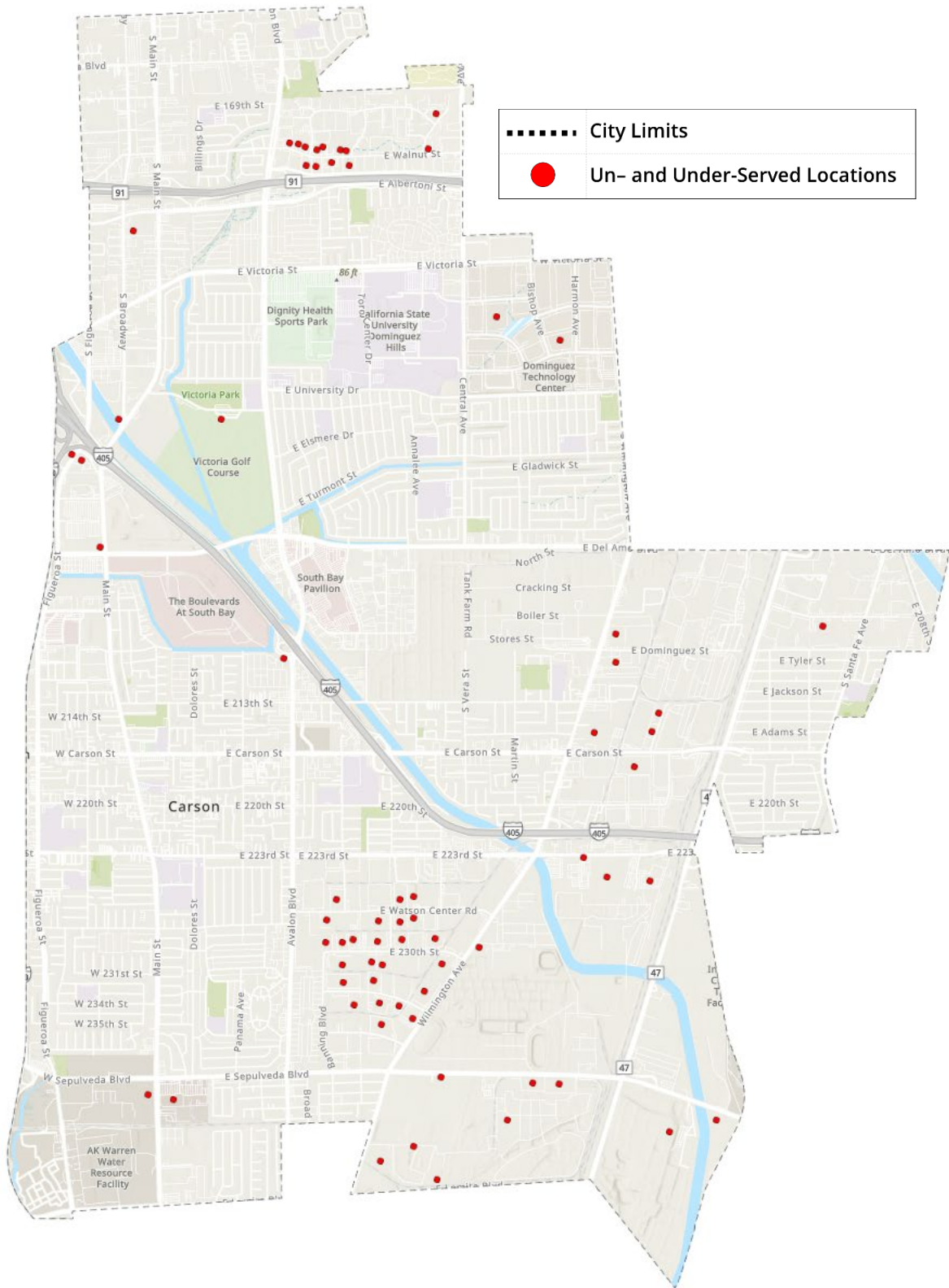
Figure 16 – FCC Defined Un-served and Under-served Locations[12]

EXHIBIT NO. 1

However, the State of California and the CPUC use a higher standard: although the State uses the same definition of unserved as less than 25 Mbps and less than 100 Mbps as underserved, they distinguish between copper and fiber, correctly recognizing the extremely limited capacity of legacy copper telephone lines (Digital Subscriber Line, or DSL) which typically cannot meet the maximum 50-75 Mbps advertised speeds. California defines any location with exclusive DSL technology as "unserved" regardless of what speeds the incumbent provider claims. This expands grant funding eligibility to more locations, as shown in the California Public Utility Commission (CPUC) map in Figure 23.

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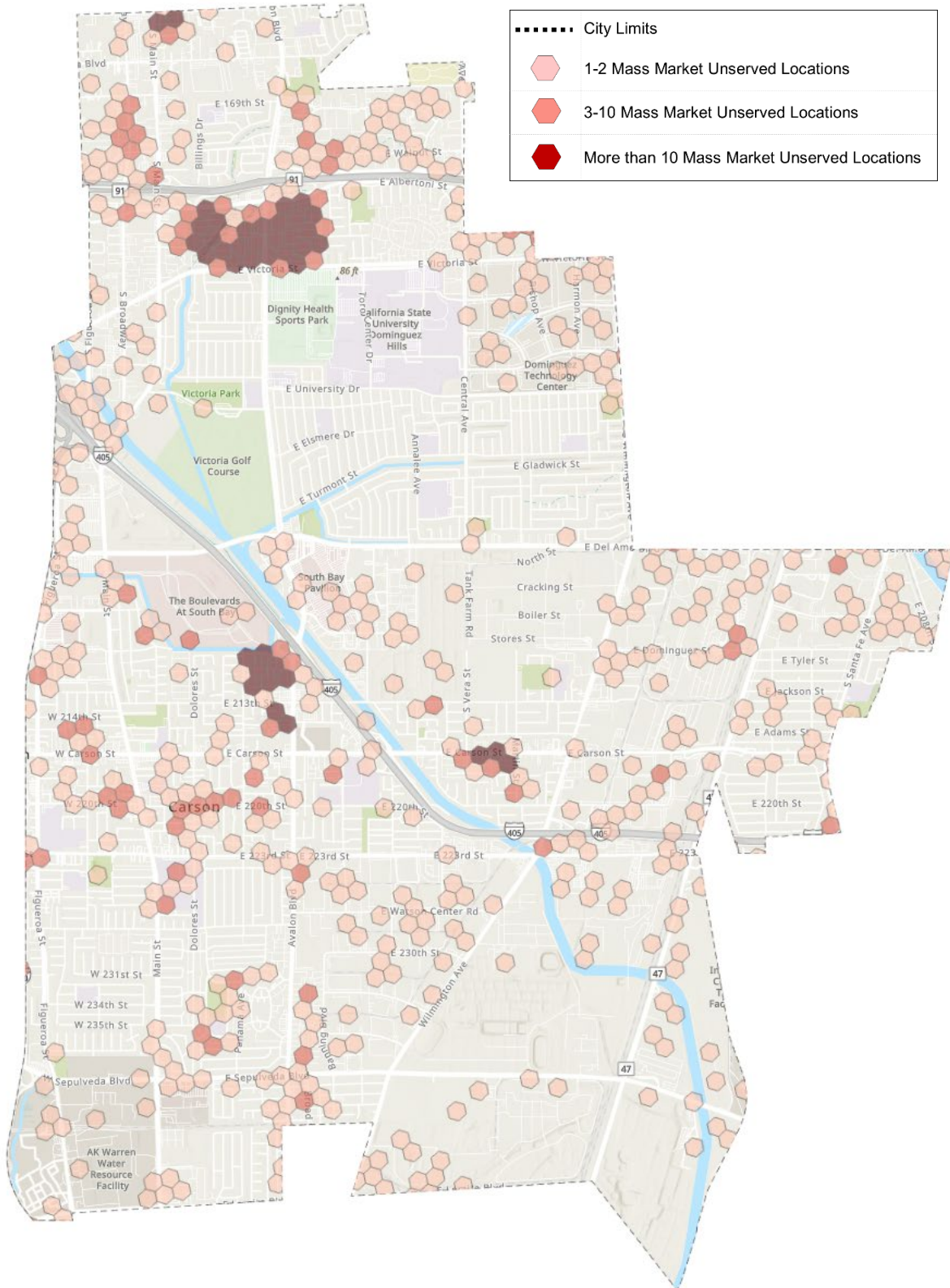
Figure 17 - CPUC Defined Un-Served Locations[13]

The CPUC map in Figure 23 was the primary eligibility map designated by the State of California for the Senate Bill 156 Last Mile grant program, and was the basis for

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the City's Last Mile Federal Funding Account (FFA) grant application that the City submitted in September 2023.

The FCC and CPUC maps both identify unserved addresses based solely on whether any ISP carrier is physically capable of providing service – it does not consider individual household constraints or barriers if/when service is able to be provided. The unserved appear to be distributed throughout the city without strong correlations to lower income areas.
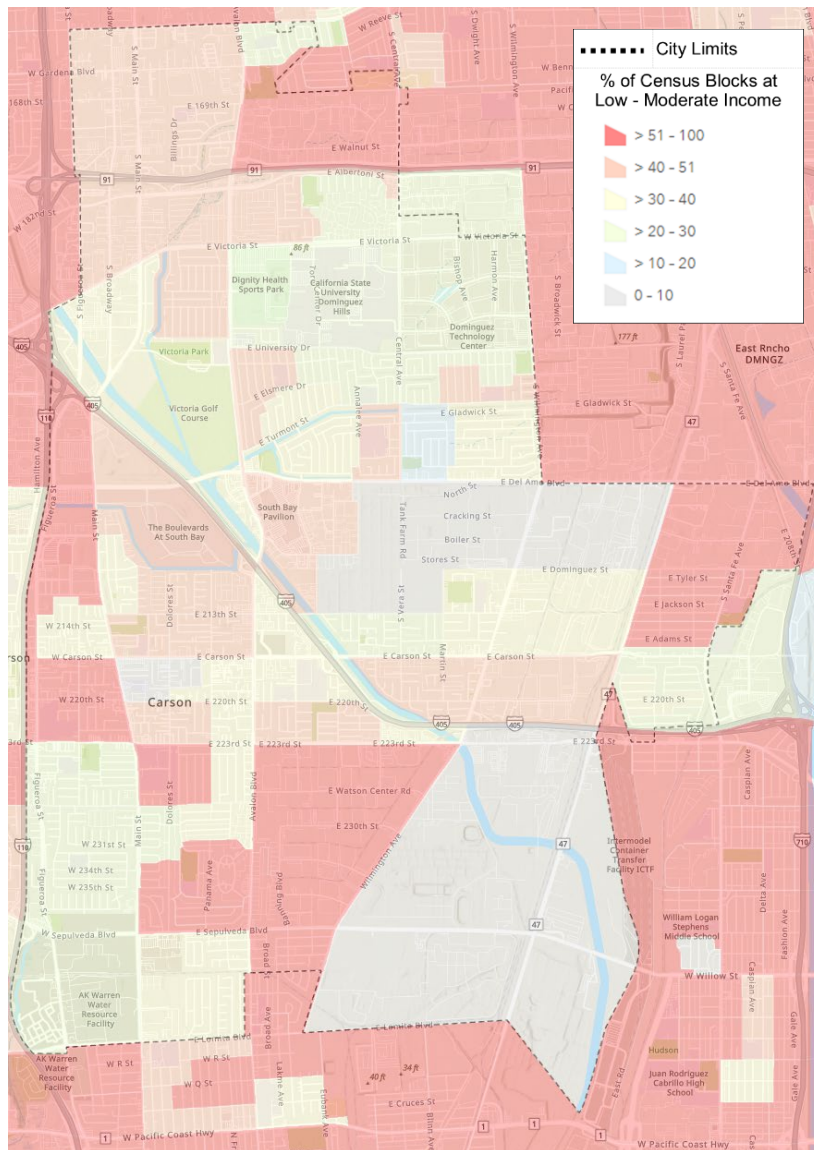
Figure 18 - HUD designated Low to Moderate Income Census Blocks[14]

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

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[14] Source: HUD Low to Moderate Income Populations Data

EXHIBIT NO. 1

often readily apparent or accessible from the carriers' sales websites, which contributes to a low participation rate.

Table 8 - Affordable Connectivity Program (ACP) Participation[15]

	Eligible Households	Participating Households	% Participation
United States	51.6 million	22.5 million	43%
California	5.8 million	2.8 million	47%
Carson	11,467	6862	60%

Carson's ACP participation rate is above the national average. The program has identified 11,467eligible households within the City. 6,862 households have been receiving their ACP discount while 4,605 elligible households are not participating.. Carson has higher than average participation indicating greater awareness of the program.

Perversely, this higher level of participation in this program means that as ACP funds are exhausted in May of 2024, 25% of households in Carson may have trouble paying their internet bills starting right now. There are state and federal efforts underway to provide additional funding to extend the program, but none have a clear path forward as of the publication of this study.

4.2 Community Survey

The City promoted an online community survey developed by ENTRUST to help assess broadband needs, experience, satisfaction, costs, and speeds. The survey also included an embedded speed test that allowed respondents to automatically test and record their actual download and upload speeds.

The survey was active from October 9, 2023, through January 31, 2024, and received 91 responses. Not all respondents completed the entire survey. The level of community engagement on this survey is too low to consider it representative of the population as a whole. As with most online convenience surveys, the sample is not randomized and thus some populations tended to be over-represented.

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

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Respondents were split relatively evenly between residents and businesses/organization.

Spectrum's cable internet service was the most common provider among respondents.
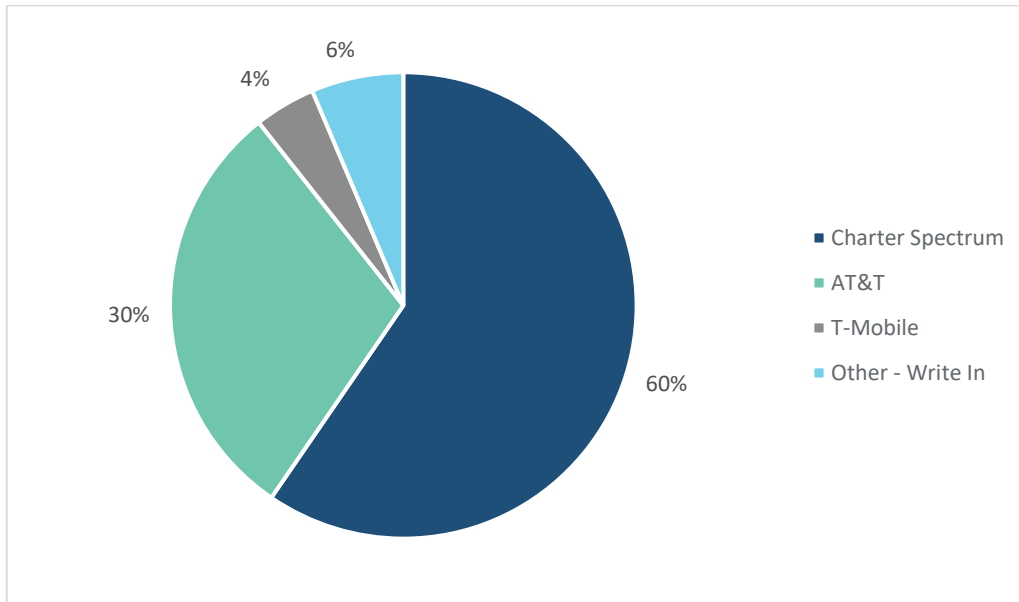
Figure 19 - Internet Service Provider (ISP) Among Survey Respondents (n=87)

Carson reflects the national shift to "cut the cord," with 35% reporting they only have basic internet access and don't subscribe to any cable television or voice/telephone services.

The average Carson respondent spends $91 per month for their internet subscription, or an average of about $ .45 per megabit (MB). This rate per MB is higher than what is expected for an urban city, where rates per MB should be closer to $0.25-0.30 per MB. However, subscribers who purchase lower-bandwidth packages with advertised speeds at or below 100 Mbps pay more than four times more per MB than those customers who purchase higher-end packages of 100+ Mbps. 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. Carson residents subscribe largely to slower internet service packages.

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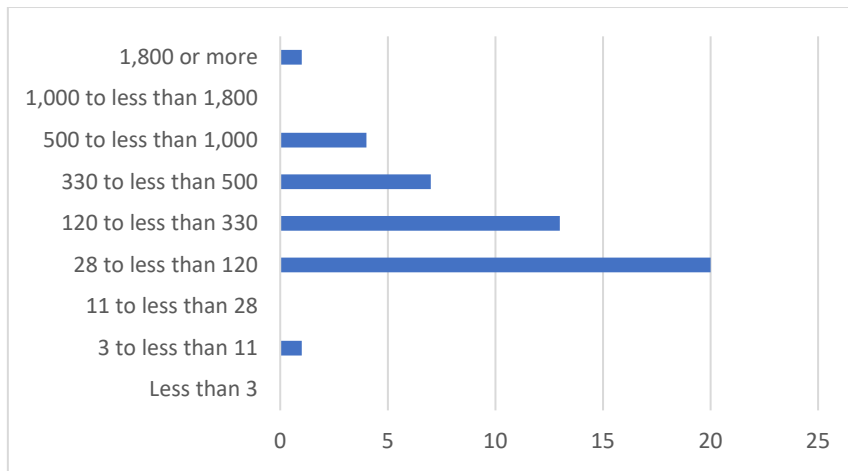
Figure 20 - Internet speeds

The under-served, over-charged segment of Carson was visible elsewhere in the survey, with more than one-third of all respondents noting they were dissatisfied with their existing service.
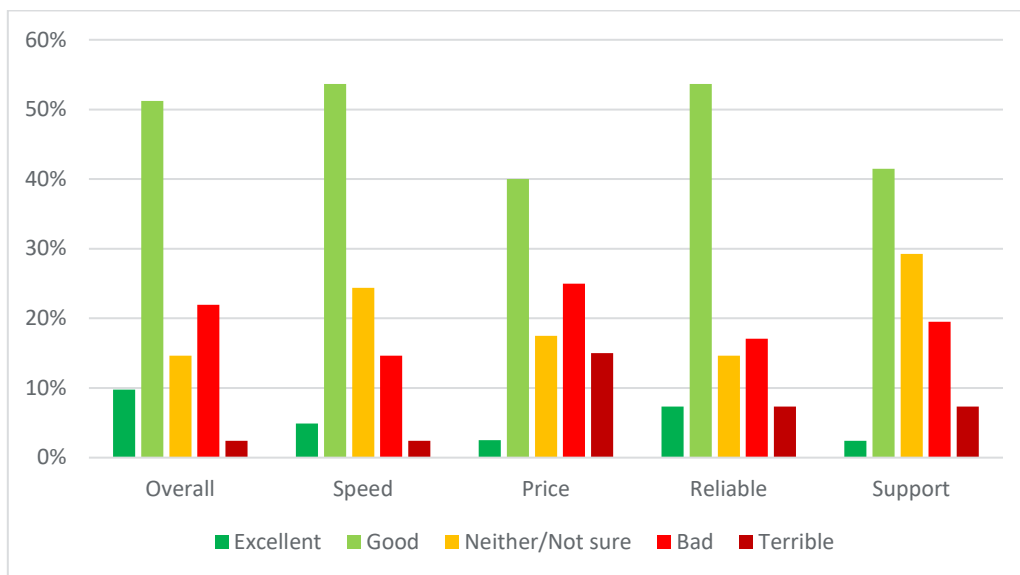
Figure 21 - Satisfaction with Broadband Service (n=63)

The purposes for which households use the internet were wide-ranging (*Figure 31*), but education stood out as the most common, with more than 80% reporting daily or regular use for purposes of education, e-learning, or training.

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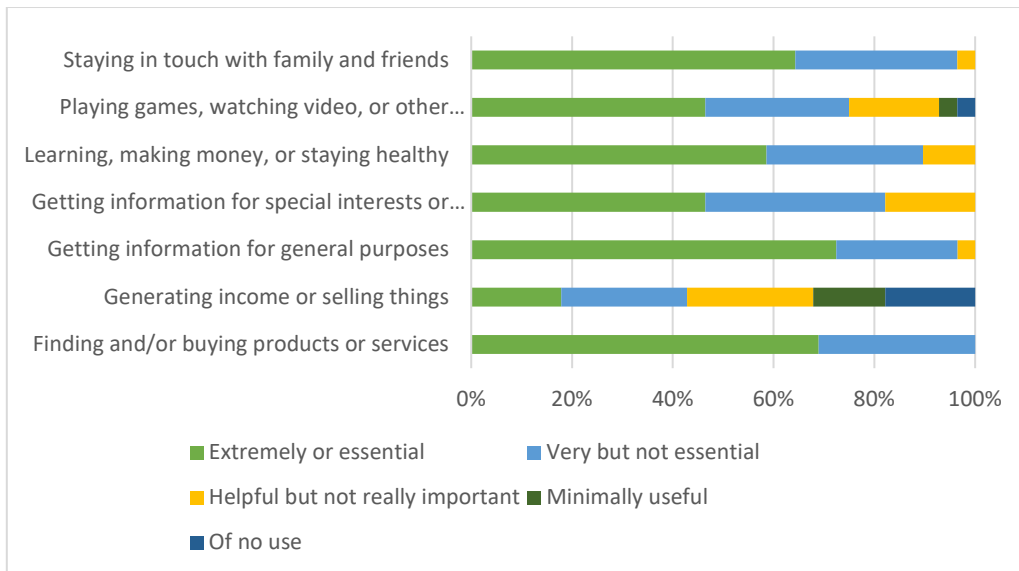
Figure 22 - Internet Uses

Business and organizational respondents demonstrated the value of internet speed and cost for business and when considering site location; 57% of businesses stated they would move to a new location with comparable business characteristics if it offered faster and better priced internet connectivity.

4.3 Stakeholder Focus Groups

ENTRUST and the City held several focus groups for stakeholders in December 2023 and January 2024 to gain firsthand information about the broadband experience, needs, and challenges for the community. These focus groups were divided among interest areas and included:

- Public Safety
- Transportation
- Infrastructure and Utilities
- Social Services and Wellness
- Business, Commerce, and Industry
- Education and Non-profits

The City invited key stakeholders and had participation from 14 organizations; The information below is directly from the focus group participants and does not necessarily represent ENTRUST's recommendations or opinions.

Broadband as a Cornerstone for Community Resilience

EXHIBIT NO. 1

The focus groups underscored broadband connectivity's pivotal role in enhancing emergency preparedness and public safety. The need for a resilient, redundant communication network is imperative, emphasizing the significance of broadband in ensuring seamless coordination during emergencies and routine operations alike.

Economic and Educational Advancement

The insights from the Business, Commerce, and Industry, as well as the Community Information and Education focus groups, reveal a shared recognition of broadband as a critical enabler for economic development and educational opportunities. The discussions suggest a strong call for strategic, collaborative efforts to address connectivity challenges, with the City of Carson positioned as a pivotal partner in fostering a technology-enabled community.

Key concepts identified:

- Critical role of connectivity to support a variety of learning styles and modalities.
- Necessity to support student connectivity at home.
- The usefulness of programs like ACP and The Digital Equity Act to provide devices and services to Boys and Girls Club students.
- The importance of business and ISP collaboration for a good user experience at Dignity Health Sports Park.
- Interest in cost-sharing initiatives and public-private partnerships.

Infrastructure Modernization and Digital Inclusion

The Infrastructure and Utilities focus group highlighted the importance of modernizing physical infrastructure to support digital connectivity, as well as emphasizing equitable access to broadband planning as advantageous to all stakeholders. The dialogue suggests an evolving relationship between the city and local organizations, moving towards collaborative efforts to enhance technological infrastructure and bridge the digital divide.

Key initiatives identified:

- Focus on Cybersecurity for regional utilities.
- Existing collaboration between water and sanitation utilities for connectivity
- Opportunities around Metro Water's multi-billion-dollar treatment plant over the next 3-5 years.
- Spectrum - The impacts of DOCSIS 4.0 on cable speeds in the future.
- AT&T – continued investment in Carson.

EXHIBIT NO. 1

- Alternative low-cost programs from ISPs.

Public Transportation and Environmental Sustainability

Insights from the Transit and Transportation focus group emphasize the integration of digital solutions to improve service delivery and user experience, alongside a commitment to environmental sustainability. The city's role in supporting the development of digital transit solutions and advocating for green transportation initiatives reflects a broader trend toward sustainable urban planning.

Key Initiatives identified:

- Incorporating Transit Access Pass (TAP) for use across regional transit partners.
- Computer Assisted Driving/ Automated Vehicle Location (CAD/AVL) systems.
- QR codes at strategic locations to access real-time web-based transit information.
- Transition to EV Bus fleet.

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Outreach Efforts

- Senior Information and Resources Fair on 9/18/2023
- Carson411 interview / Facebook post
- City Facebook posts (weekly)

EXHIBIT NO. 1

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- City webpage
- Carson Report – Printed publication
    - Mailed to approximately 25,000 households per quarter.
        - Fall 2023 edition (PG. 24) - CR_CSG_Fall_2023_R1.pdf (carson.ca.us)
        - Winter 2023 edition (PG.16) - CR_CSG_Winter2023-2024.pdf (carson.ca.us)

- Distribute material
    - Grab & Go lunch (reach 200)
    - YMCA in-person lunch (reach 250)
    - Women's conference (reach 700 flyers printed and distributed to all attendees)
    - An informational pack including an interoffice memo and flyers was provided to all City Commissions.

- In-person Meetings
    - Utility Coordination Meeting 9/28/2023
    - Environmental Commission 10/4/2023
    - Economic Development Commission 10/5/2023
        - The Chamber sent out an email blast using content I shared with them.
    - Senior Citizen Advisory Commission Subcommittee on 10/9/2023

Focus Group Participants

Organization	Title
Cal State Dominguez Hills	VP of Operations
LA County Sanitation Districts	Supervising Engineer
Holly Mitchell's Office, Carson	Assistant Director of Engagement
LA Sheriff's Dept.	Sergeant
LAC Fire Dept.	Assistant Fire Chief
AT&T	External Affairs Lead
Bankruptcy Law Center of Northern CA	Resident, Legal Assistant

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Flowing Ministries of Hope, Non-Profit	Minister of Prayer
Boys and Girls Club of Carson	Director of Strategic Partnerships
Metropolitan Water District of SOCAL	Network Systems Manager
City of Carson	Transportation Manager
Cal State Dominguez Hills	Operations Manager, Workforce Integration
AT&T	Public Works Coordinator
Cal State Dominguez Hills	Director of Workforce Integration
Carson Chamber of Commerce	Vice Chair of Special Events
AT&T	External Affairs
AT&T	Associate Director for LA
City of Carson	Emergency Services Manager
LA Sheriff's Dept.	Service Area Lieutenant
City of Carson	Public Safety Supervisor
LA Sheriff's Dept.	Deputy
City of Carson	Emergency Management Specialist
Charter Spectrum	Director of Government Affairs
Small Business	Owner

4.4 Summary of Findings

Carson residents aren't getting the broadband value they are paying for.

More than one out of three Carson residents are dissatisfied with their current broadband service, and the survey results indicate some of the reasons why. Many residential subscribers are actually receiving just 25% of the advertised speeds for which they believed they purchased. But perhaps more telling is the gross disparity between what residents pay per MB when distinguishing between the tiers of broadband packages purchased. Residents who subscribe to packages advertised at greater than 100 Mbps download pay an average of $0.31 per MB; but residents who subscribe to lower tiers of less than 100 Mbps pay $1.28 per MB. This disparity contributes to the Digital Divide and requires that households that can least afford to pay for internet are paying much higher rates. More true fiber-to-the-home competitors in the market will increase not only the speeds – but at economical rates for all.

The City shows eligibility for state and federal broadband grants.

CPUC and FCC data and maps show a significant number of un- and under-served households in Carson that are eligible for state and federal broadband grants. The City can explore the following existing grant opportunities, with more grant programs expected to be released in the coming months:

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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 Senate Bill 156 increased funding, modified programs, and created new subaccounts:

Broadband Infrastructure Account **-** Subsidizes the cost of middle-mile and last-mile infrastructure to expand the state's broadband network.

Public Housing Account **-** Grants and loans to expand broadband access to publicly supported housing developments, and other housing developments or mobile-home parks with low-income residents.

Broadband Adoption Account **-** Increases 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.

Infrastructure Investment and Jobs Act

The most recent Federal broadband funding programs arise from the Infrastructure Investment and Jobs Act (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. In June 2023, the NTIA announced state allocations of BEAD funds based on the FCC broadband mapping, with the State of California receiving an allocation of $1.8 billion.

The California Public Utilities Commission (CPUC) is administering the sub-grants in the state and has an open rulemaking proceeding[16] to determine the rules for CPUC sub-grants under federal rules administered by the NTIA. More information is anticipated by Summer 2024.

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

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[16] 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.

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are an eligible expense for these funds. EDA grants typically tie eligibility and competitive scoring criteria to specific job creation or retention, making key future 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.

A collaborative path forward

Across all focus groups, the necessity for ongoing dialogue, strategic planning, and collaborative action emerged as central themes. The City of Carson is called upon to lead these efforts, leveraging its unique position to coordinate among diverse stakeholders, drive technological adoption, and ensure that the benefits of broadband connectivity are universally accessible.

5. Gap Analysis

5.1 Key Indicators

Carson's economic sectors – especially industrial, manufacturing, and logistics areas – need fiber connectivity to sustain their growth.

Businesses from some of Carson's largest economic drivers were emphatic about the need for reliable, high-speed fiber connectivity. Comments indicate that prohibitive costs to extend fiber into business and industrial areas are leading companies to choose wireless or satellite products as a last resort.

More critically, however, is that the study indicates that existing business broadband services are overpriced, unreliable, and difficult to connect to.

Digital inequities put the City at risk for division along socio-economic and digital lines.

This has been at status quo when it comes to high-speed broadband: AT&T is deploying fiber-to-the-home and competing with Spectrum's gigabit service.

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However, 75% of the city has only one choice for broadband speeds – Spectrum cable service, which has much lower overall download speeds than advertised, and cannot exceed 35 Mbps upload. AT&T says more fiber neighborhoods are coming but did not share timelines.

If it persists, digital inequity in Carson will exacerbate socio-economic differences, with lower speeds, higher prices, and no competition ultimately impacting household income, education levels and achievement, and healthcare access.

ACP eligibility indicates widespread affordability challenges.

Nearly 50% of households in Carson are eligible to pay lower prices for their internet service. With the end of this affordability program within the next few months, many Carson families may no longer be able to afford their internet service further exacerbating the digital divide.

5.2 Digital Divide

Digital Divide is the division between households, individuals, and businesses where there are disparities in access to the internet. The causes of the Digital Divide vary, and solutions should be tailored to not only a specific City, but even to individual communities. There are five common causes of the Digital Divide:

1) Affordable Internet Access

The cost of internet access varies by location and by the provider. Most cities have areas that are economically distressed and are comprised of households that do not earn enough income to support adequate broadband services. Not being able to afford internet access is an issue by itself; however, this can lead to several secondary impacts and a downward spiral for these households, as the internet is critical for finding gainful employment, participation in key educational activities, and accessing healthcare. The pandemic highlighted and pushed forward the online nature of the world economy, and forced many activities that were normally done in person to be done online, including banking, health care, distance learning, and shopping. When households are unable to partake in these activities because they don't have internet access, the digital divide actually widens.

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2) No access to Technology Devices

In order to access the internet, an individual must use a device, smartphone, tablet, computer, etc. These devices can be expensive, and unlike the monthly subscription cost of internet access, devices require a significant up-front investment of hundreds of dollars. Many households simply cannot afford these devices, especially when technology advancements make devices obsolete after a couple of years.

3) Digital Literacy

Many households and individuals have internet access and devices to use but lack Digital Literacy (the knowledge and technical skills to access and use the internet). This issue is particularly pronounced among older and low-income households.

4) Geographic Limitations to Broadband

Incumbent providers prefer to build in areas of high density; areas where the houses, multi-dwelling units, or businesses are too far apart making it difficult for private companies to achieve a return on investment in the short periods of time they seek to repay capital. This results in areas with low density – particularly semi-rural communities like the French Camp area – having a lack of private infrastructure and, thus, insufficient internet services.

5) Language barriers

Many households speak English as a second language, but many resources – particularly those centered around technology – are not accessible without strong English skills.

5.3 Centralizing Digital Resources

The City can provide assistance and leadership in promoting broadband access by hosting a comprehensive, searchable and regularly updated platform on a City URL that residents and businesses can use to access a wide array of digital resources.

The City could work with a web developer to create a portal for a comprehensive resource platform with the ability to search and access the full menu of digital resources, including but not limited to:

- Broadband Service Provider search/comparisons, allowing users to compare pricing, speed tiers, and service area maps.
- Mobile phone providers and coverage maps
- FCC Broadband Map

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- Affordable Connectivity Program (ACP) and other low-cost programs
- Digital navigators
- Device access, including public Wi-Fi hotspots, public computers, and low-cost/refurbished donated devices.
- Digital job training programs
- Employment search assistance, including remove/virtual interviews and applications.
- Library computer lab hours and locations

In order to maximize the portal's profile, recognition, and community trust, the City should consider hosting the portal on a City URL and ensure that there are resources to keep the portal updated with new information.

The City could seek grant funding to assist with developing, operating, and maintaining a digital access portal through the California Advanced Services Fund (CASF) Broadband Adoption Account (see Section 4.4).

A suggested Product Requirement Document for building the digital portal is included in Appendix A.

5.4 Formalize Existing Processes

The City of Carson has undertaken limited conduit placement when trenches or other public excavation projects are underway, adding new assets at a fraction of the typical cost. The City could build and expand this effort through a formalized and coordinated utility coordination program.

Expansion of fiber networks can be done most cost-effectively through coordinating excavation work within the public ROW, most often with public and private utilities (power, water, wastewater, gas, telephone, cable, internet, etc.). Fiber networks can be built incrementally and opportunistically as excavation takes place for other projects, adding conduit and/or fiber cable at a fraction of the cost.

Coordination requires advanced planning, an appointed "curator" who collects, organizes, manages, documents, and shares the various planned projects within the ROW, and cooperation from the various public and private entities that regularly operate in the public sphere. All participating parties – including private ISPs, water, gas/electricity, and cable – will benefit from an effective utility coordination program.

Utility Coordination, Joint Trench and "Dig Once"

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

EXHIBIT NO. 1

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.

Additionally, a formalized, planned process will allow for conduit and fiber to be integrated into other projects early in the planning stages, allowing for assets to be included in as-builts and documented, mapped, and recorded in geo-coded formats.

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 while trenches or streets are opened up.

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 utilities and telecommunications providers so they can similarly avail of the opportunity to cost-effectively expand their networks.

Effective and successful joint trenching/utility coordination programs are backed by a strong municipal code that requires cooperation among utilities and the City[17] – 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.

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 special projects and IT in entitlement application reviews, or a city-wide ordinance requiring broadband infrastructure for development projects would afford the City more opportunities to identify broadband opportunities within private development projects.

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 broadband services within the community.

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

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Technology Enterprise 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 a fund in the early stages helps plan strategically for the years to come when the 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 resources 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.

5.5 Summary of Findings

Carson's growing industrial and commercial sector requires reliable, high-speed fiber connectivity to continue to thrive and expand, particularly in the southeastern industrial area and the Dominguez Technology Center to the Northeast where existing services are inadequate, frequently suffer from outages, and/or delay business operations waiting for new installation.

Businesses aren't the only sector in Carson that is not receiving adequate broadband service. 75% of the city is served by the defacto cable monopoly, with no choice for consumers and no market competition that helps keep prices down and service levels improving.

The Digital Divide – inequitable access or use of digital resources - is common in many cities, but it is rarely visible to the eye. The unserved are spread throughout the city with concentrations in the Colony Cove, Carson Harbor Village and Avalon Mobile Estates, north of City hall near S. Avalon and E. 213th St.

The City can help foster digital equity by centralizing resources, such as a city-hosted website where residents can search, find, and access broadband providers, get price quotes, find computer and job training courses, locate local public Wi-Fi hotspots, and access refurbished technology devices.

Internally, the City can improve coordination between utility providers to create opportunities for themselves and others to install conduit at the lowest possible price. Formalizing the City's current joint trenching practices through a formal City ordinance, City coordination/curation, and implementing broadband requirements through the land entitlement processes, will further enhance the breadth, and reach of existing City practices.

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Prioritizing the build out of the city backbone network will improve their own connectivity, expand the city's smart city opportunities while creating a technical foundation to build from as the city works to address the digital divide.

EXHIBIT NO. 1

6. Conceptual Network Design

ENTRUST developed two Conceptual Network Designs based on priorities identified by the City. The first design serves to both connect city facilities and support city services, while expanding fiber infrastructure that could be concurrently used to improve community access to broadband. The second design contemplates a full fiber to the premise network deployed throughout the city. ENTRUST understands the resource and funding constraints faced by many cities and designed the first conceptual network to maximize grant eligibility and reach the highest possible number of residents. The second concept network was undertaken to give the city a sense of the investment that would be required to fully serve the city with new fiber infrastructure.

The conceptual network design is truly that – conceptual. It is not a full engineering study and does not account for specifics such as aerial vs. underground deployment, building entry locations, which side of the street a particular fiber cable is located, etc. The conceptual design is intended to provide a roadmap for the city, and specific projects undertaken should first complete a full engineering process that will conduct field surveys to verify existing data and assumptions to move the Conceptual Design to a High-Level Design (30% HLD), to a Low-Level Design (60% LLD), and ultimately to a Final Design (90%).

Separate from Entrust's effort, the city has proposed a grant funded network under the CPUC's FFA grant program to serve identified unserved residents within certain areas of the city. If the city is successful with this grant application, the first conceptual design routes should be reviewed and incorporated into the grant funded network wherever possible.

ENTRUST assessed the Carson area for existing public and private broadband assets and infrastructure that could be used, leased, shared, or otherwise leveraged to develop and construct a functional, yet cost-effective broadband network. This included surveying and mapping several data sources available for use in the region, including public infrastructure, buildings, and/or facilities, conduit and fiber networks, communications towers, streetlights, traffic signals, state-wide middle-mile networks, and private telecom assets, including middle-mile networks and data centers.

The City identified public facilities to be connected to the network. ENTRUST then designed a backbone fiber optic network in a loop architecture leveraging existing conduit, fiber, and the traffic signaling network, focusing on the City priority sites. The loop design ensures uninterrupted, redundant services across the City so that no single point is vulnerable to a wide network outage. The Concept Design does not account for how the backbone is deployed (e.g., aerial vs. underground), which can have significant impacts of construction cost estimates. Service drops/laterals to designated sites are estimates only; a full design engineering of the network would identify the specific points of entry for buildings and facilities and detail the additional footage for drops/laterals.

EXHIBIT NO. 1

6.1 Concept Design

The conceptual network design would connect the 57 identified City facilities and community anchor institutions to a City-wide ring network (Figure 32). The city can interconnect these facilities to strategically build out its broadband infrastructure, ensuring equitable access, fostering community engagement, improving administrative efficiency, and enhancing critical services.

The Conceptual Network Design proposes a backbone network of 20 miles that would utilize the 1.2 miles of existing city fiber, while adding 5 miles of new fiber in existing city traffic conduit, installing 14 miles of new underground conduit and fiber, and an estimated 2 miles of service drops to designated sites. The conceptual design also includes interconnectivity at two points with the California Middle-Mile Initiative (MMBI), the planned state-wide middle-mile project, to ensure regional interconnectivity and route redundancy. Most critically, the concept network ensures uninterrupted service through a redundant loop architecture and flexibility for future growth.

EXHIBIT NO. 1

Figure 23 – Simplified Conceptual City Backbone Network

■	City Backbone Network	Icons	City Sites
★	MMBI Connection		

This conceptual network design deploys a redundant fiber ring around the city. The routing utilizes existing city fiber and conduit wherever possible. This network could be used to provide baseline connectivity for any number of smart city applications, including internet service to City facilities and other anchor institutions. The network could be utilized to provide commercial internet services to businesses along the

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route as well as connectivity to 5G sites and could serve as a backbone network for extending laterals into commercial and industrial areas with poor connectivity.
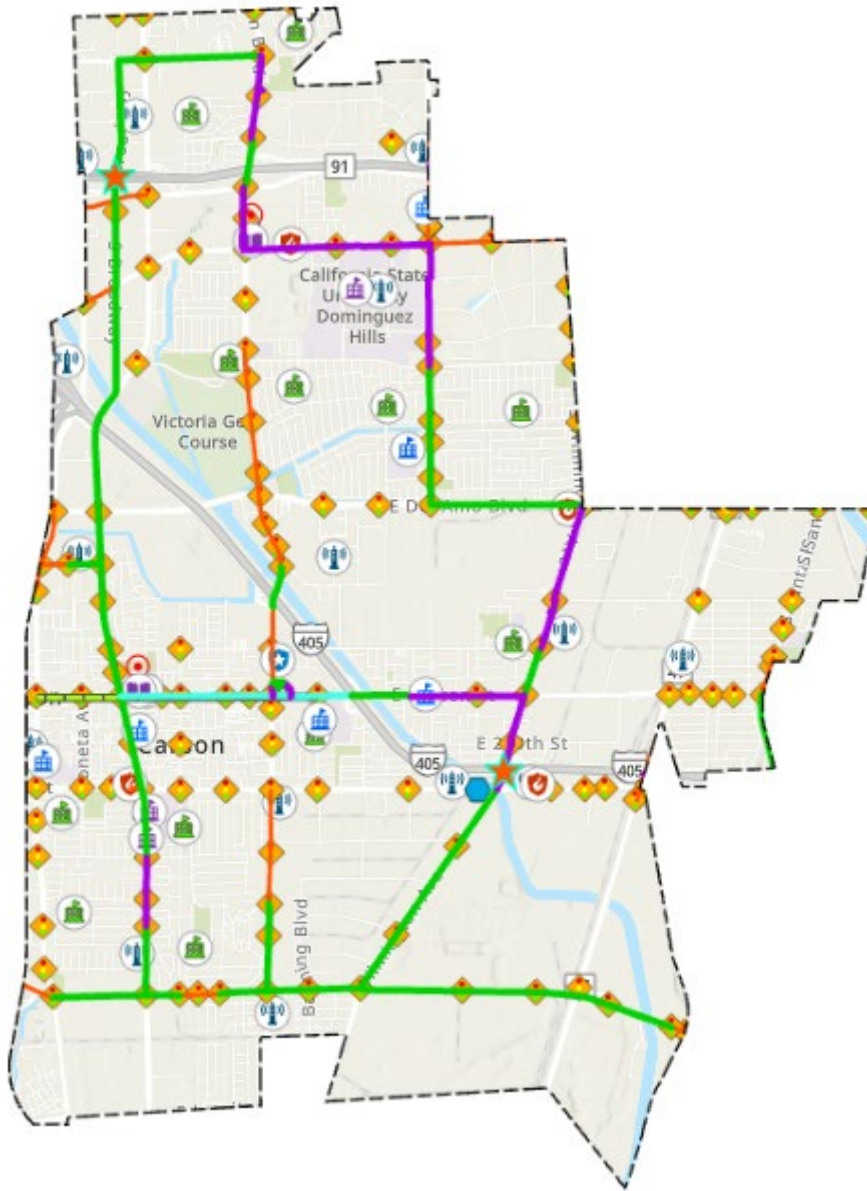

Figure 24 - Conceptual Backbone Routing Explained

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―	Existing City Conduit and Fiber	―	New Conduit and Fiber
★	MMBI Connection	―	Upgrade Traffic Conduit
◆	Traffic Signal	―	Future Traffic Conduit Upgrade
▢	Pilot Commercial Areas	Icons	City and Other Sites

To further illustrate why the network route is as suggested, some further detail is needed. The proposed new backbone construction is depicted in green and connect with the existing city fiber network (shown in teal) and would be constructed of either two 2" conduits if deployed underground at 36 inches below the surface, filled with a 288-count fiber-optic cable, or a single 288-strand cable if aerial on existing utility poles or conduit- capable of meeting future demand. Portions of the backbone, shown in purple, would pull fiber through existing traffic signal conduit. Additional network sections shown in orange represent potential network laterals utilizing existing traffic conduit. New underground laterals and service drops are assumed to be a single 2" conduit with a 24-count fiber cable, or a single 24-count cable drop if aerial. MMBI interconnect points are represented by a star icon.

This map shows the thinking behind this concept design. A substantial number of traffic signals receive upgraded connectivity. Additional facilities including fire stations, schools, libraries, and cell towers are shown in close proximity to the route and could connect. Two suggested pilot areas for commercial pilot projects are shown as well.

As you can see, the network passes close to all city and anchor priority sites, commercial areas with demonstrated needs while leveraging existing traffic network conduit and existing city fiber.

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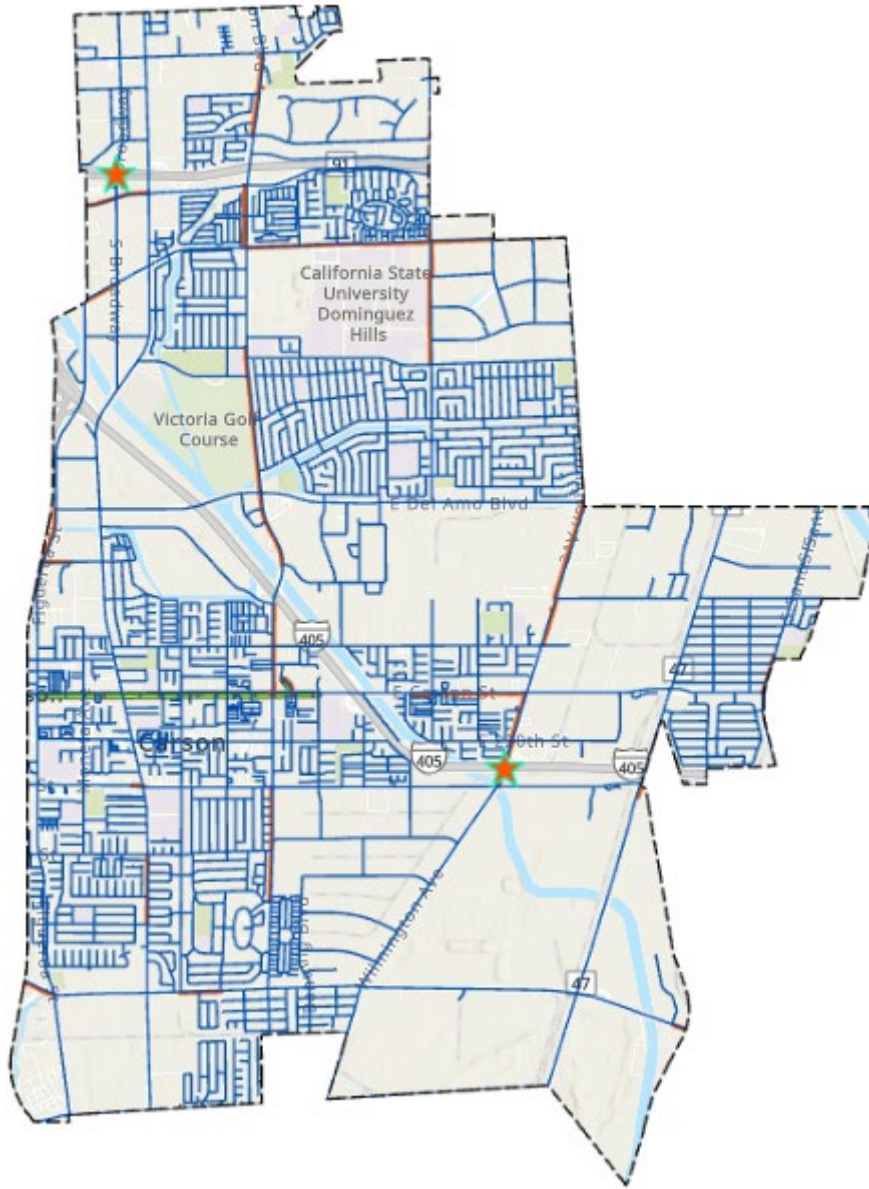
Figure 25 - FTTH conceptual design

Concept 2 is a complete fiber to the home network. This 88-mile underground fiber network provides connectivity to 26,000 residences and passes through all business and most industrial corridors. Entrust designed this network and conducted a limited financial feasibility analysis to give the city a sense of the investment required to fully solve the broadband problem in Carson.

6.2 Phased Implementation Plan

Networks are rarely built all at once. Cities determine public policy goals to be met by the construction of the network and then begin working on these goals. A typical

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phasing plan will reach city facilities first to serve the goal of improving city capacity to serve their constituents, driving down op ex costs by replacing leased services and creating opportunities for smart city application deployment all along the network routes. Next, a city can extend the network to reach non-city anchor institutions such as schools, governmental facilities, and community centers. With public facilities well connected, the next priority could be extending network into a business park, industrial area, or residential neighborhood. Having city assets available can attract an ISP to lease those assets to bring new services to the area, increasing competition and economic vitality. Alternatively, anywhere along this network, the city could decide to start providing services to businesses or residents.

A key point to keep in mind is that broadband deployment works best when paired with another project: When the city decides to build, opportunities to leverage other projects such as traffic signal upgrades, open trenches for utility replacement, street replacement and similar should be considered.

The city of Carson should review the site lists, public priorities, grant funding options and existing CIP projects for guidance on where opportunities exist today to deploy a phase of your broadband backbone.

6.3 Construction Costs Estimates

Concept 1 – City backbone has an estimated construction cost of $12.1 million. This includes estimated design, engineering, and permitting costs to build 14 miles of new underground fiber and conduit, upgrading 5 miles of existing traffic conduit with fiber cable, and upgrading 1.3 miles of existing fiber cable. Network, power, and data center equipment would be additional and typically covered by existing IT budgets. Laterals to other anchor institutions would be paid by those entities. Partnering with multiple agencies on grant requests will improve the likelihood of grant success.

Concept 2- Fiber to the Home has an estimated construction cost of $88 million for the core network and laterals. An additional $11.8 million for drops and $12.3 million in startup costs bring the total cost to turn up a fiber to the home network across the city of Carson to $112 million. Costs for the Conceptual Designs are conservative estimates based on existing market conditions and would be further refined upon completing design engineering and putting the project out for a public bid.

The design engineering and field surveying process for future phases would verify and record all existing assets and could uncover additional assets that could reduce the need for some of the new construction, or identify cost-effective strategies, thereby lowering the total overall construction costs.

Construction costs can be even further reduced through effective utility coordination, implementing a dig once/joint trench program, aligning broadband expansion projects with other major CIP projects, particularly those with excavation in the City right-of-way (ROW) or partnering with a private ISP to share build out costs. The labor

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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 Summary of Findings

Conceptual Design One, city backbone, would deploy 14 route miles of new fiber optic network to connect public and community anchor sites as identified and prioritized by the City. The design builds from the City's existing 1.2-mile fiber backbone, utilizes 5 miles of upgraded existing City traffic conduit and, through a phased approach, would expand the City's network to more than 20 total miles.

The phasing will be determined through city prioritization of the most critical City sites first, along with the CPUC-designated "unserved" households targeted with the City's September 2023 California Federal Funding Account grant application. Phases can be built incrementally or broken down into sub-phases, using opportunistic joint trenching with other utility or development projects.

Conceptual Design Two, Fiber to the Home, would deploy a citywide 88-mile network of new underground fiber and conduit.

Once completed, the network would pass all 26,000 residences and 3,400 businesses that could reasonably be connected to the network as paid retail subscribers for internet service. This potential customer base would offer a revenue stream that could attract an existing ISP and bring private investment to the City that could further expand the network or build out the phases with private capital.

EXHIBIT NO. 1

7. Business Model Evaluation

Cities are realizing the importance of next-generation broadband services to support the future of their communities. Evidence demonstrates that broadband services have a net positive economic and social impact to communities by enhancing competitiveness, workforce development, educational capabilities, municipal operations, and smart city deployment.
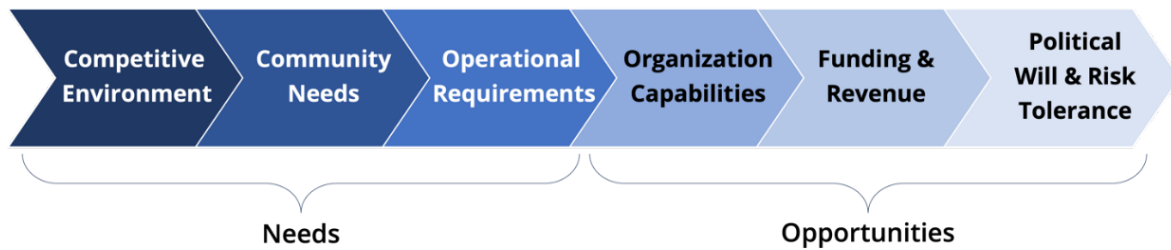
Figure 26 - Factors to Consider when Choosing a Broadband Business Model

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 Carson has numerous options – from a laissez-faire, public policy-only approach all the way across the spectrum to a full retail internet business.

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 based on their contributions, and (c) one partner does not pay another; there are few or limited transactions between partners.
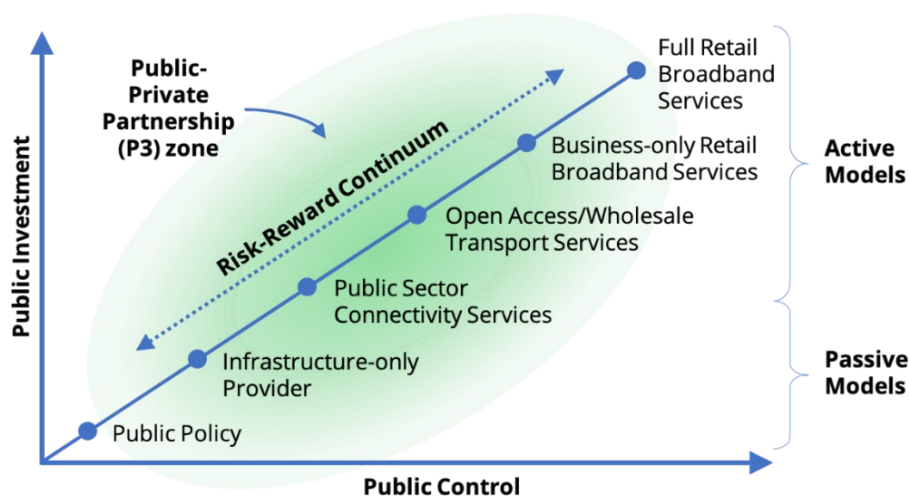
Figure 27 - Broadband Business Models

EXHIBIT NO. 1

7.1 Business Model Options

Public Policy Only

The municipality utilizes its public policy tools to influence how broadband services are likely to develop in its community. Public policies are shaped to streamline the processes of designing, constructing, and managing broadband infrastructure in a local government's jurisdiction. 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. This option is not considered a true business model but does impact the local broadband environment and is therefore included as one option.

The key to successful policy development and implementation is inter-departmental coordination and communicating the shortcomings in current practices and policies. With a better understanding of interdependent responsibilities, policies can be improved. In addition, changes often come with an associated cost, so municipality will often need to establish a fund to assist in the early adoption of certain policies.

Public Services Provider

Public services providers 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. The majority of these anchors require substantial connectivity and often, the local government's network can provide higher capacity at lower costs than these organizations are able to obtain in the commercial market.

Infrastructure Provider

Cities that provide conduit and dark fiber services to local organizations are generally considered infrastructure providers. They lease these assets to community organizations, businesses, and broadband providers. These organizations use municipal fiber to connect to one another and to data centers to reach the Internet, cloud services, and other content networks. Many municipal providers who have deployed these services began by building their own fiber networks to serve purely municipal functions. As their networks grew, they realized that these networks could provide access to local organizations needing fiber connectivity.

Dark fiber is the core product of most infrastructure providers and is generally utilized by businesses and community anchor organizations in order to reduce their telecommunication expenses and achieve higher bandwidth speeds. Typically, dark fiber strands are leased using a simple mileage-based price calculation to the end user. However, customers may require new construction to reach their facilities,

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resulting in construction costs to be incurred by the municipality and which will be charged back to customers to allow the municipality to recoup its investment.

Open-Access Provider

Local governments that adopt the open-access model generally own substantial fiber-optic networks in their communities. Open-access allows these local governments to "light" the fiber and equip the network with the electronics necessary to establish a transport circuit to interconnect service providers with the local network.

The concept of open access enables competition among service providers 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. Service providers lease access to the network based on the amount of bandwidth required by the end customer and an established standard rate structure and terms of service. Open-access networks generally charge wholesale rates to retail broadband providers. They publish rates for competitive service providers, charging a monthly recurring fee based on bandwidth of the service utilized or a flat fixed fee per month. Services offered may include Internet, telephone, data connectivity (transport), and dark fiber.

Municipal Retail Provider – Business Only

A common goal for municipalities that deploy broadband networks is to support local economic development needs. Local governments equip their business and industrial districts with fiber infrastructure through which they can provide cost effective, high-speed Internet and other data services to local customers.

Municipal business providers offer competitively priced Internet and communication services that are generally very competitive in the small and medium business market against other provider offerings. They compete on both price and quality, generally focused on the following value proposition, all at a lower monthly cost:

- Higher bandwidth, scalable to Gigabit speeds
- Symmetrical service, the same upload and download
- Higher quality fiber connections with less downtime and a stronger service level agreement
- Responsive local customer service

EXHIBIT NO. 1

Municipal Retail Provider – Full Residential & Business Services

Municipalities that provide end user services to residential and business customers are considered retail service providers. Most commonly, local governments offer triple-play services consisting of phone, television, and Internet services, essentially becoming an equal competitor to incumbent cable and broadband providers. As a retail provider, the organization is responsible for a significant number of operational functions, including management of retail services, network operations, billing, provisioning, network construction, and general management.

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? 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 business models in the middle of the continuum (Figure 36) accommodate, but don't necessitate, a P3. 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.

7.2 Financial Analysis

The following financial analysis evaluates the estimated operational revenues and expenses, as well as the necessary start-up capital required if the City were to monetize its current and/or future publicly-owned fiber optic network by selling retail

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subscriber data services to residents and businesses – either as a stand-alone public enterprise, or through a public-private partnership (P3) with a qualified ISP.

This analysis is intended to assist the City in understanding the costs of monetizing a public asset, the value proposition of a private partner, where there is an existing need to attract private capital, and how revenues can be leveraged in negotiations to secure the best position for the City. This memo is not a business plan or feasibility study and is not intended as a definitive financial statement or pro forma. Rather, it is intended as a tool to ensure the City has an overview of the potential revenues and expenses and the impacts of different business model approaches.

It is important to note that while Conceptual Design One was designed to interconnect critical City assets for improved City communications, the analysis does <u>not</u> consider or estimate the critical value of those connections for improved municipal operations, cost savings and efficiencies, implementation of smart city devices, quality of place, attracting private investment, supporting economic development, or other broadband enhancements that can be realized through a robust public fiber network. While Conceptual Design One could be utilized to provide internet service to a limited number of businesses and commercial customers, this could be accomplished on an incremental basis with negligible additional costs beyond the city's cost of construction.

The analysis shown here is based the Conceptual Design Two, as outlined in Section 6.2.

Entrust estimated potential revenues and operating expenses, as well as enterprise start-up capital expenses required to connect and serve retail customers, such as customer equipment, installation, and networking equipment. Notably, these start-up capital expenses are *separate from network backbone and plant construction* that would be necessary to construct the conceptual design.

These operational and capital estimates were driven from a passings/buffer analysis of the total number of serviceable addresses within 175 feet of the conceptual backbone – a distance that can reasonably be connected via a standard service drop and customer premises installation. Business and Residential address counts were provided by the city.

Table 91 – Estimated Subscribers at 30% take rate

Phase	Residences	Businesses
FTTH		
Total	26095	3405
30%	7829	1021

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The financial analysis made several industry-standard assumptions that took a conservative – yet realistic – approach:

<u>Assumptions:</u>

- 30% take rate
- $60/month for symmetrical 1 Gbps residential service
- $125/month for symmetrical 1 Gbps business service
- Network maintenance = 5% of network value
- Interest rate = 6%
- Staffing levels assume new, stand-alone enterprise and use fully-loaded costs
- <u>Excludes</u> the Phase 1 backbone network construction costs.

Modifications and changes to these assumptions that could be achieved through specific business model approaches are discussed below.

New stand-alone broadband enterprises require significant direct costs to deliver services, as well as a minimum level of staffing and industry expertise. Some municipalities – particularly ones that already operate an electric utility – may already have some of the support staff and infrastructure in place that can be leveraged for a broadband enterprise, such as billing support and software, fleet vehicles and maintenance, and even field staff. However, broadband typically has specific requirements with respect to equipment and technical expertise and is prohibited from being subsidized by any electric utility, which means new staff and assets specifically for broadband must be acquired.

The City of Carson has expressed it does have some capacity and interest in assuming control of a stand-alone enterprise; however, examining the anticipated revenues and expenses of such an endeavor can give the City a realistic understanding of the risks and investment needed to transform a public fiber network into a functioning, competitive retail broadband enterprise. Most of the cost drivers, staffing needs, and equipment listed in these estimates will be required whether the network is operated directly by the City or by a private ISP through a P3.

The analysis assessed the build-out of a complete fiber to the home network.

The model assumes retail subscriber levels stabilize after 5 years, with 30% of all passings subscribing for retail internet service. That translates to 7829 residential customers and 1021 business customers, and results in approximately $7.4 million in annual gross revenues.

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However, the requisite staffing and annual direct expenses to operate a retail network of that size are estimated at $7.1 million, broken down into various cost drivers as shown in Figure 28.
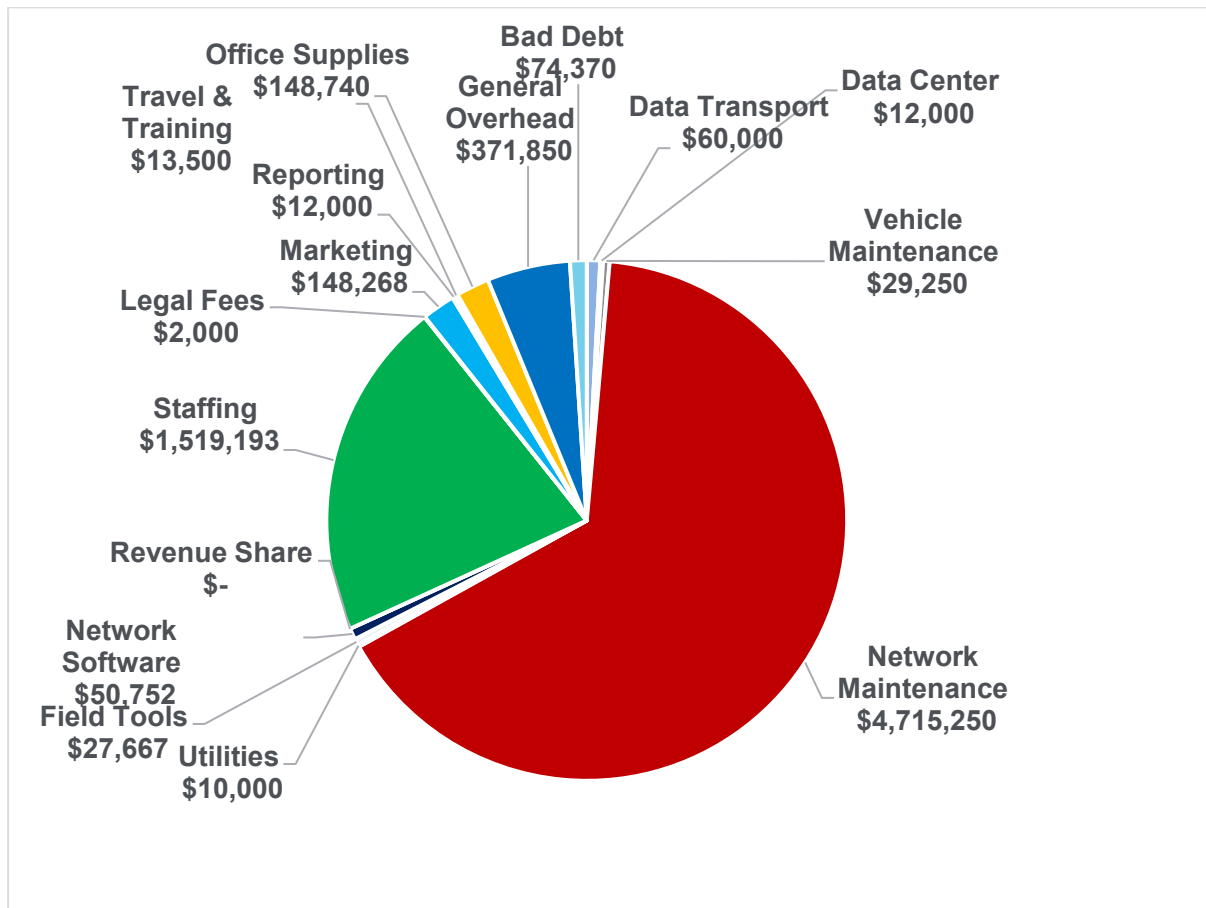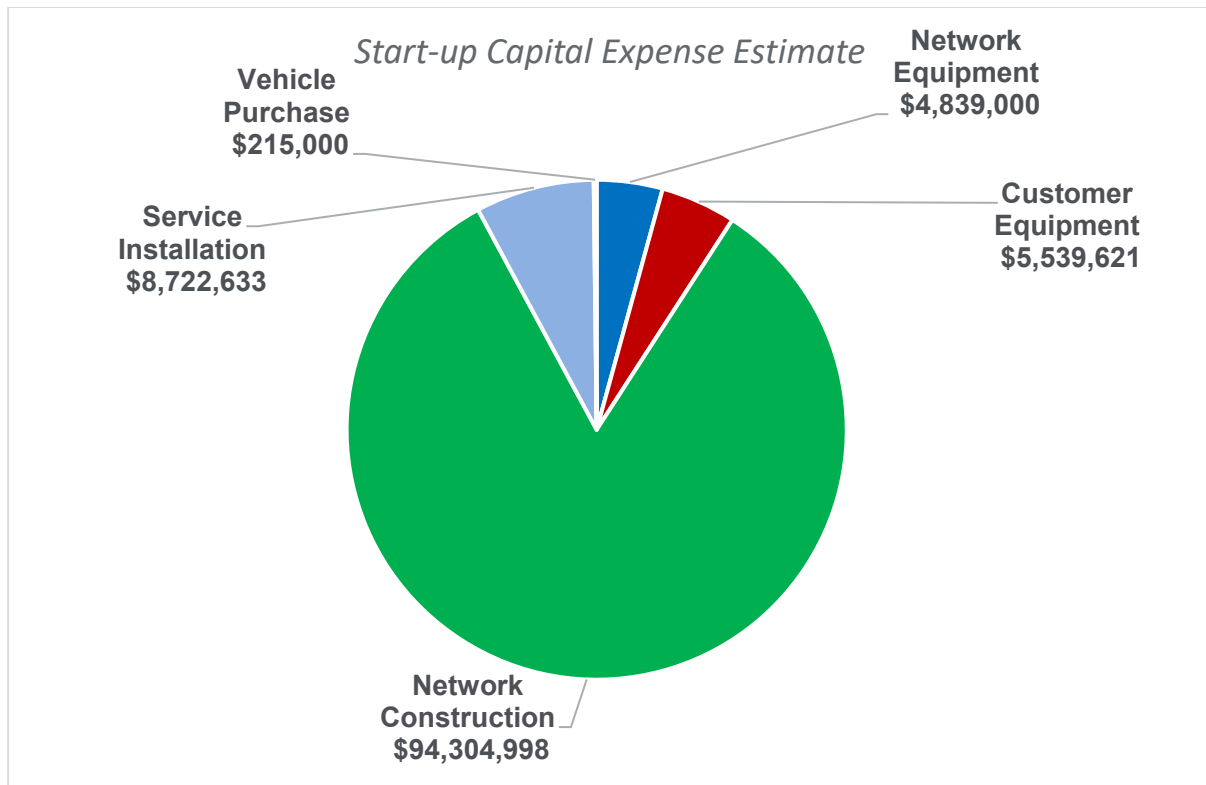

Figure 28 - operating expenses

Start-up funding required speaks to the need for additional investment in the City's network in order to transform it into a functional, sustainable retail subscriber network – capital that could be secured through debt, a General Fund loan/subsidy, or private investment.

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Start-up Capital Expense Estimate

Vehicle Purchase $215,000
Network Equipment $4,839,000
Service Installation $8,722,633
Customer Equipment $5,539,621
Network Construction $94,304,998

Soliciting a public-private partnership (P3) with a qualified ISP is one approach that can significantly reduce annual expenses by taking advantage of existing ISP operations, staffing, and experience. It is difficult to gauge the level of cost savings that individual ISPs can realize without access to proprietary financial data, but some general assumptions can be made.

ISPs typically already have many of the support staff already in place for other neighboring markets (billing, network operations and engineering, etc.), and can share these costs across multiple markets, thus eliminating the need for new hires. An ISP that is already working within the Los Angeles region may be able to reduce the annual staffing costs shown in Figure 38 by as much as 50-70%.

Additionally, ISPs have standard operating procedures and processes, and often have many of the technical field staff already in place, which can significantly reduce the costs of ongoing network maintenance by as much as 50-70%.

There are many opportunities within the projected operational expenses for additional cost savings, and many of these hinge on the individual ISP and their unique existing markets, equipment, staff, and resources. Further cost-reduction strategies could be identified through detailed negotiations and analysis in coordination with the City's selected ISP partner.

If the City were to enter into P3 negotiations with an ISP solely on this scenario, both sides would need to be creative and innovative to identify how to further reduce operating expenses and how to fund/recoup any start-up capital investment

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required. This could involve working with the ISP to evaluate all the expenses in greater detail, identifying potential synergies between the ISPs current operations and new markets in Carson, and evaluating different growth models and timelines to spread costs out over longer periods.

7.3 Summary of Findings

The conceptual fiber to the home network in Carson does not indicate it is a candidate for a new, stand-alone broadband enterprise, with estimated operational expenses outpacing revenues and no means by which to cover any debt service or return on investment. However, the model does show a modest positive cashflow at a 30% take rate if built out city wide. If the city can find grant funds to cover the initial capital costs, this option may be viable.

Another alternative is to grow the network slowly and opportunistically, leveraging existing assets to offer limited commercial services now, leaning on other CIP to install conduit and fiber for traffic or public safety projects that could be utilized for broadband as well. This limits build costs and avoids the financial risks of borrowing to build the network all at once. Other cities have had success with slowly rolling out a network over 10-15 years and avoided taking on debt to do so. If the City were to stand up this network incrementally by beginning with a portion of the network funded by a potential FFA grant award, a pilot program could be undertaken to test out the viability of operating a fiber to the home network without committing to serving the city as a whole.

The middle path that limits the cities financial risk and brings other financial and technical resources to bear on the challenges in the negotiation of a public-private partnership with a qualified ISP. The city grants access to rights-of-way, conduit, fiber and partners with the ISP to seek public grant funding. The ISP contributes existing private resources, including support, billing, and administrative staff, as well as network maintenance crews, trucks, and fiber splicing equipment that is shared across multiple markets. A private partner could reduce the city's share of the estimated annual OPEX by as much as 50-70% and may provide capital funding for some of the infrastructure and drops to homes and businesses. Public/private partnerships are a good tradeoff between control and idea either way as it further limits the city's financial exposure.

Staffing typically is front-loaded on new enterprises, since full-time equivalents does not increase unit-for-unit with customer growth, but rather has a minimum level of staffing required – whether there's one customer or 100. Existing ISPs can typically

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share staff across multiple markets and create an economy of scale, especially for billing, customer support, management, and network engineering.

Network maintenance costs are typically driven by the size (length) of a fiber network. Maintenance requires a level of expertise and on-call technicians to be able to maintain and conduct repairs; existing ISPs again can share these costs across multiple markets and drastically reduce this annual operational expense.

There are other operational and capital expenses that can be reduced through negotiations with an experienced ISP, as each company offers different and unique value propositions and may have secured different price points for critical equipment or contracted services. These should be explored in greater detail during confidential negotiations with a qualified ISP.

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8. Key Recommendations

1) Expand the City fiber network to improve public services connectivity and expand community broadband access opportunities.

The City can expand its existing network into a carrier-grade redundant backbone capable of both connecting City and public institutions and enabling competitive, reliable retail internet services to the community and businesses at an estimated construction cost of $12.5 million.

2) Solicit & negotiate a Public Private Partnership that creates an economy of scale in Carson.

The financial projections for the conceptual FTTH network in Carson indicate that operational expenses outpace revenues and do not provide a path to cover the debt service needed to build the network all at once. However, an innovative public-private partnership model could prove successful, combining private resources and capital in exchange for rights to monetize the City's fiber network and sell retail internet services to residential and business subscribers. Success is more likely with an incremental build out targeting lower competition areas that lack fiber today.

Negotiating a public-private partnership with a qualified ISP could leverage existing private resources – specifically support, billing, and administrative staff, as well as network maintenance crews shared across multiple markets. In addition to reducing expenses, an innovative P3 partner could help in securing other grants that could help cover some or all of the 13 additional miles of backbone needed for Phases 2 & 3, further reducing the need for debt and/or a return on investment.

3) Go Fast and Slow

It will take time and money for the city to deploy a fiber network. Some citizens and businesses won't be able to wait for fiber. Two pilot programs should be explored:

Residential and Small Business: Hotspot Loaner program To get people up on the internet quickly, the city can purchase hotspots from one or more of the FWA ISPs and provide them at low or no cost to those in need. Libraries have been checking out hotspots to card holders successfully for many years. A pilot project with 100 hotspots would cost less than $80,000 annually to purchase the devices and pay for the cost of the service. This would be most easily accomplished through a grant program where funding is paid directly to the FWA provider, and the client simply visit a commercial outlet to pick up their device. A contract to a local IT services company or the local library are other alternatives for managing this program.

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Business and Industry: Coordinate multiple parties to share fiber extension costs. Some of Carson's industrial and commercial areas have limited internet availability. The costs to lease or extend service into these areas can be prohibitive. The city could act as a coordinator, helping businesses that are near each other share the costs to lease fiber or extend service to a neighborhood or block. The city could hire a broadband coordinator or a contractor to offer this service.

4) Formalize existing City processes to maximize CIP and utility coordination and memorialize dedication of new public assets in developer agreements.

The City has, informally and on a limited basis, been following broadband best practices for years – installing conduit and fiber through joint utility or excavation projects when costs can be shared across multiple projects.

This process has been ad-hoc and opportunities have not been fully realized. Effective coordination on all projects that require excavation will ensure that all utilities—public and private—can economically expand their broadband footprint in Carson. The City can incrementally and opportunistically build its own fiber network, connect key City facilities, and enable Smart City applications. At the same time, it can make it more economical for private broadband providers to make larger investments in Carson and improve services for residents and businesses.

Effective joint build and utility coordination requires a "dig once" ordinance, a strong road moratorium, a curated master project list that aggregates all public and private excavation work in the public right-of-way, and organized, regular meetings between the various agencies and utilities. Development agreements for new projects can apply conditions to entitlements early in the process that ensure broadband is treated as other utilities and installed for public benefit.

5) Bridge the Digital Divide in Carson by centralizing digital resources.

The City can start the process of bridging the Digital Divide by building and maintaining a digital resource website, hosted on a City URL. The resource database would allow residents and businesses to easily compare internet carriers, plans, pricing, comparisons unique to their home or business, search and identify relevant digital resources such as job trainings, digital navigators, telehealth assistance, and refurbished devices, and share broadband resources and best practices. Building this website could be eligible for grant funding through the CASF Broadband Adoption Account.

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6) Pursue state and federal broadband grants to address at-need areas of the City.

CPUC and FCC data and maps show a significant number of un- and under-served households in Carson that are eligible for state and federal broadband grants. The city is already pursuing this option through its FFA grant application. The grant opportunities listed below should be pursued by the city.

California Advanced Services Fund (CASF)

Broadband Infrastructure Account **-** Subsidizes the cost of middle-mile and last-mile infrastructure to expand the state's broadband network.

Public Housing Account **-** Grants and loans to expand broadband access to publicly supported housing developments, and other housing developments or mobile-home parks with low-income residents.

Broadband Adoption Account **-** Increases publicly available or after-school broadband access and digital inclusion, such as digital literacy training programs are eligible to apply for grants. Targets communities with limited broadband adoption, including low-income communities, senior citizen communities, and communities facing socioeconomic barriers to broadband adoption.

Infrastructure Investment and Jobs Act

In June 2023, the NTIA announced state allocations of funds based on the FCC broadband mapping, with the State of California receiving an allocation of $1.8 billion.

The California Public Utilities Commission (CPUC) administers the sub-grants in the state and has an open rulemaking proceeding to determine the rules for CPUC sub-grants under federal rules administered by the NTIA. More information is anticipated by Summer 2024.

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 future development sites or zones prime candidates for EDA funding where high-speed broadband could help attract or retain key employers.

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7) Leverage the City's inventory of street light poles to expand wireless coverage, speeds, & services.

The City has an expansive inventory of more than 9100 streetlights which can be leased to private cellular companies to locate small cell antennas and equipment. Improving cellular and wireless coverage and speeds can also provide more high-speed competition in areas underserved by the incumbent ISPs. Lease revenues for these poles could be dedicated to fund future City network expansion, joint trenching opportunities, installation of smart city devices, or other technology upgrades.

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Appendix A: Digital Resource Portal Product Requirement Document

This document defines the requirements for a Broadband Service Finder System based on the city's website infrastructure.

1. Goals
   a. To provide residents and local businesses a simple method to identify available broadband providers at their location.
   b. To provide a simple method to direct users to ISPs websites.
   c. To leverage existing city IT and communication infrastructure.
   d. To leverage public data sources (e.g., FCC).
   e. To facilitate residents access to the Federal Affordable Connectivity Program (ACP).

2. System Description
   a. The *ISP Locator* is an easy-to-use web-based application that will enable residents and businesses to identify what ISPs serve their location.
   b. The ISP Locator will be integrated into the city's current web site infrastructure.
      i. The ISP Locator shall be viewable and useable on desktops, laptops, and mobile devices.
      ii. Standard and customary web protocols should be used.
      iii. The city will determine the placement of the ISP Locator within the City's website hierarchy.
   c. External Components of the end-to-end system include:
      i. FCC Broadband Map
      ii. Link to FCC ACP Home Page
      iii. Links to ISP Residential and Business Home Pages
   d. System Component Diagram

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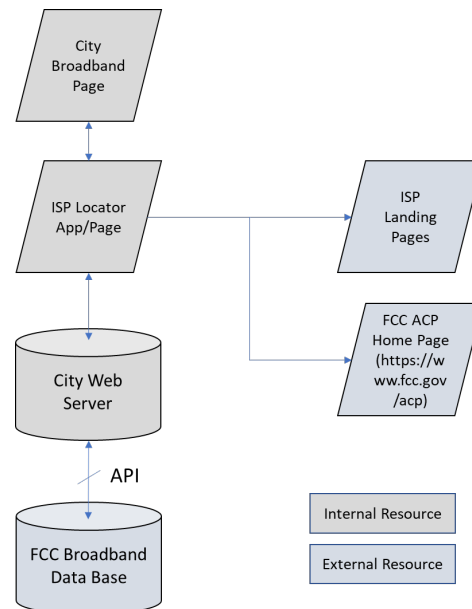
3. System Operations (See Figure Below)
   a.   The city's web team will create the user interface / user experience (UI/UX) of the Broadband Page.
        i.   This includes page layout, colors, fonts, menus, clickable icons, etc.
    b. The following assumes the desired language has been selected.
    c. There will be two primary user options. One for BUSINESSES and one for RESIDENCES
        i.   Selection via a drop-down menu or clickable icons is at the discretion of the city.
    d. If "RESIDENCE" is selected, the system will display an ACP Note (See below). If the user is interested in more details, the system will open a new TAB and direct them to the FCC's ACP page.
        i.   If they are not interested, they will be directed to the Enter Address Field.
    e. Upon entering an address, the SYSTEM will query the FCC broadband map for a list of service providers at that location.
        i.   The FCC Map and ISP websites differentiate between residences and businesses so the business/residential designation must be carried forward.
    f. The SYSTEM will then display the ISP LOGOs and company description, including technology used.
        i.   It is not recommended that data rates or prices are included on the City's website. These frequently change and direct comparisons are challenging due to hidden fees, terms of contracts, data caps and other nuances.
    g. When the user clicks the ISP specific action button, the SYSTEM will:
        i.   Open a new tab.
        ii. Enter in the URL for the ISPs appropriate landing page from 6.b.iii.

        iii. If possible, the SYSTEM will automatically enter the user provided address into the ISPs website.

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4. System Operations Flow Diagram
    a.
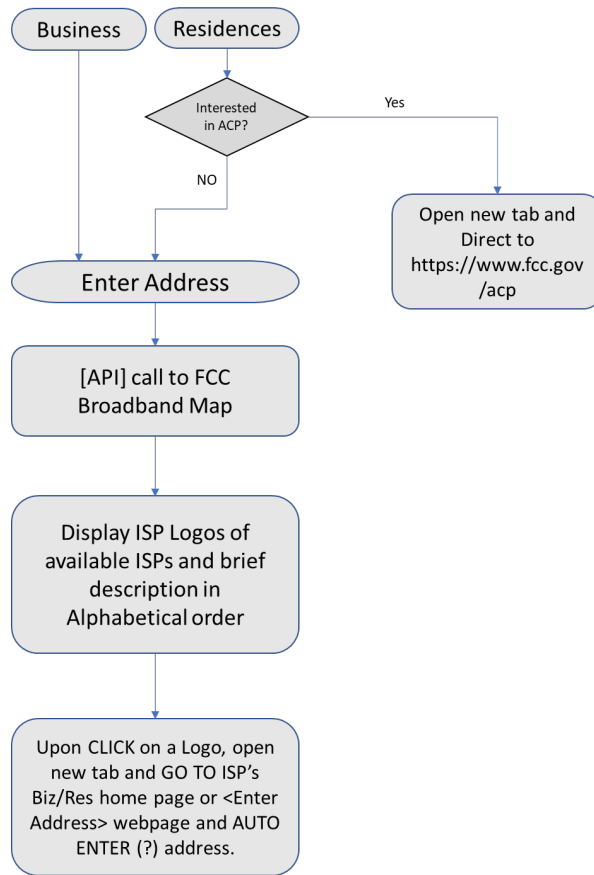
5. ACP Note
    a. The Affordable Connectivity Program is….[add relevant text]

        6.
7. City Responsibilities
    a. The city will determine where the **ISP Locator** will reside in the website structure.
    b. The city will be responsible for the "Look & Feel" of the **ISP Locator**
        i. Consideration should be given to the variety of colors and shapes of the ISP logos, so all logos are properly and fairly displayed.
    c. The city will be responsible for directing users to the **ISP Locator**.

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      d.   The city is responsible for language selection mechanism to direct users to the appropriate page in the desired language.

      e.   The city will need access to the **FCC Broadband Map** database.

          i.   A preferred method would be a dynamic real-time interface to the FCC Broadband Mapping Data.

             1.   If there is an API (Application Programming Interface) to the FCC database, it should be used for address specific queries.

          ii.   In the API does not exist, the data can be downloaded and stored on a city managed server.

             1.   A city resources would need to monitor the FCC for period updates.

      f.   Address specific pricing and service availability will be left to the ISPs.

          i.   The city's Broadband Page will not display ISP prices or services.

8.   Working With ISPs

      a.   The city should contact the ISPs and inform them of the plan to establish the Broadband Page. They city should give them the opportunity to participate and provide their own input.

      b.   ISP Requested Input

          i.   Logo (Format and Size (Mb) TBD City's Web Manager)

          ii.   Description of offering (Maximum Length (# of characters TBD City's Web Manager))

             1.   Suggested maximum length: between 50- and 100-characters including spaces.

             2.   One description per language.

                a.   If the city requires multiple languages, we recommend having the ISP provide the translation(s).

          iii.   URLs of the RESIDENTIAL and BUSINESS landing pages.

9.   Enhancements for the BROADBAND PAGE

      a.   Display links to public and private Digital Literacy Resources in the city.

          i.   Examples:

             1.   library computer locations & hours

             2.   Nonprofits that offer computer skills trainings/job interview trainings/resume assistance

             3.   courses/classes on computer training

             4.   refurbished device sales

             5.   fixed Wi-Fi hotspots location (city locations, library, public spaces)

10. Supporting Material

      a.   FCC Broadband Map sample return from ADDRESS QUERY

      b.   Address: Mariners Drive, Carson, CA 95330

                          c.

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Appendix B: Community Survey Results

Responses
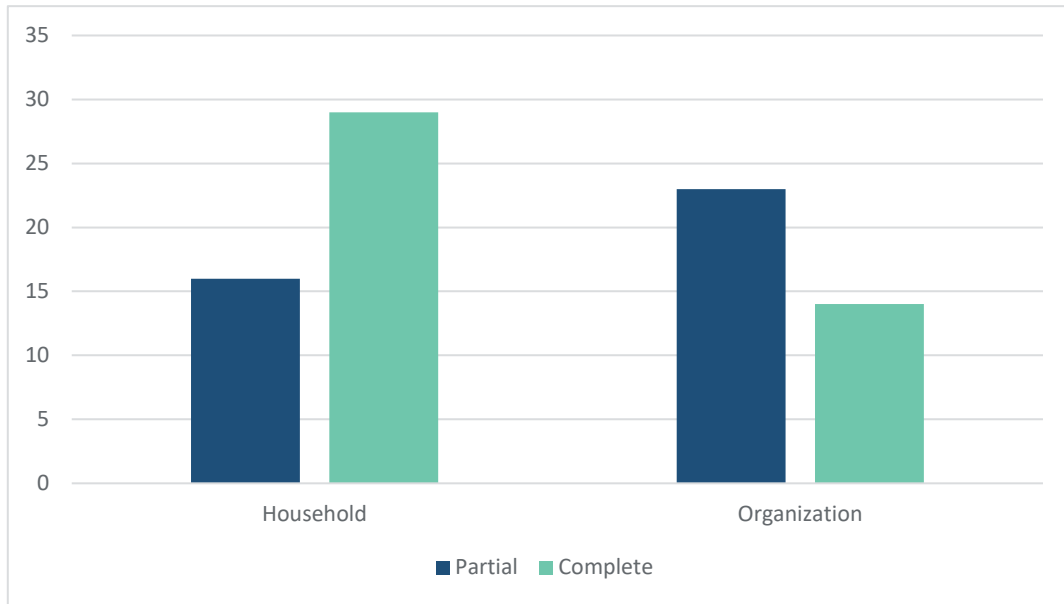
*Figure **Error! Main Document Only.** - The number of responses by completeness and location type*

	Census	Survey Responses
Number of Households	TBD	45
Average Family/Household Size	TBD	3.6
Median Age	TBD	43.5

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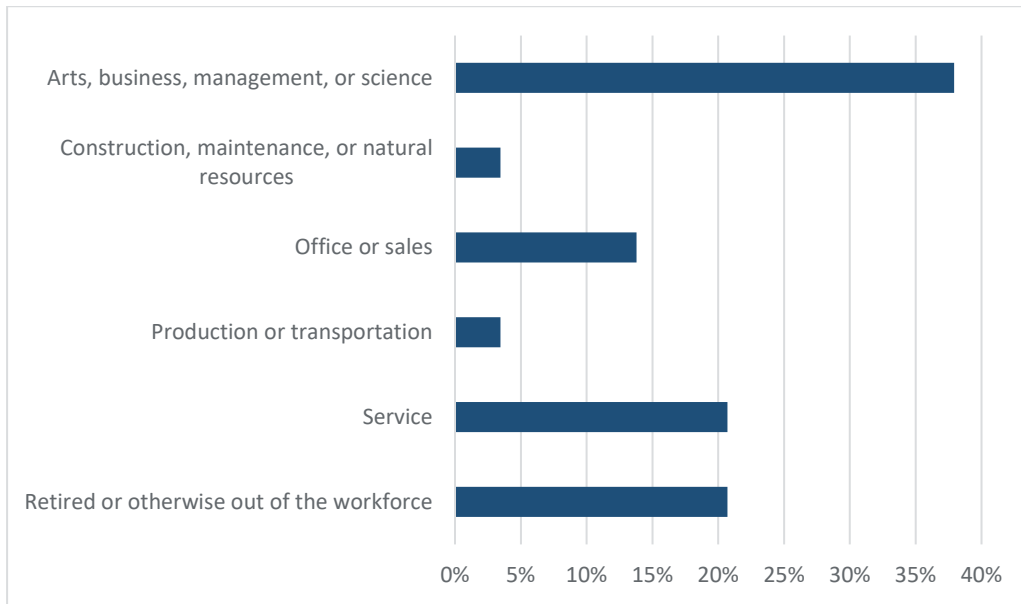
Figure **Error! Main Document Only.** - Occupation by percentage of the population and X survey respondents
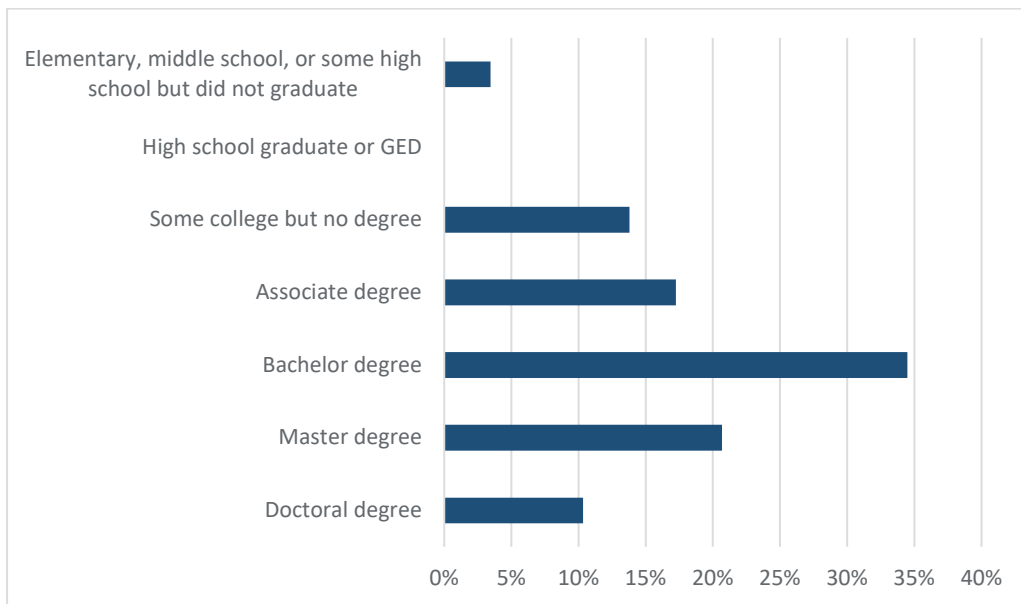
Figure **Error! Main Document Only.** - Level educational achievement by percentage of the population X survey respondents

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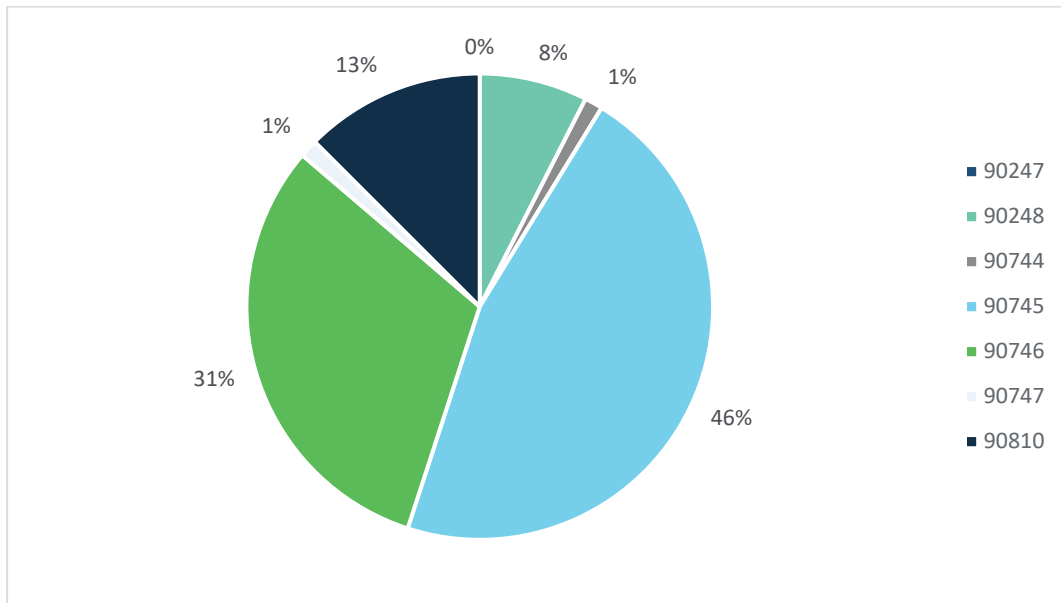
*Figure **Error! Main Document Only.** - Zip codes by percentage of responses*

*Table **Error! Main Document Only.** - Zip code areas with survey responses compared*

Zip	Responses	Area	Population	Households	MHI
90247	0				
90248	6				
90744	1				
90745	37				
90746	25				

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90747	1
90810	10

Table **Error! Main Document Only.** - *Number of responses, sites, and employees by economic sector*

		Sites		Employees	
Sector	Responses	Local	Total	Local	Total
Educational Services	1	1	1	3	3
Health Care and Social Assistance	2	4	4	42	42
Management of Companies and Enterprises	1	1	5	7	300
Manufacturing	2	2	2	20	20
Professional, Scientific, and Technical Services	1	1	1	6	8
Retail Trade	1	1	1	1	1

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| Transportation and Warehousing | 2 | 2 | 3 | 29 | 35 |
| Wholesale Trade | 3 | 4 | 4 | 31 | 31 |

Internet Services
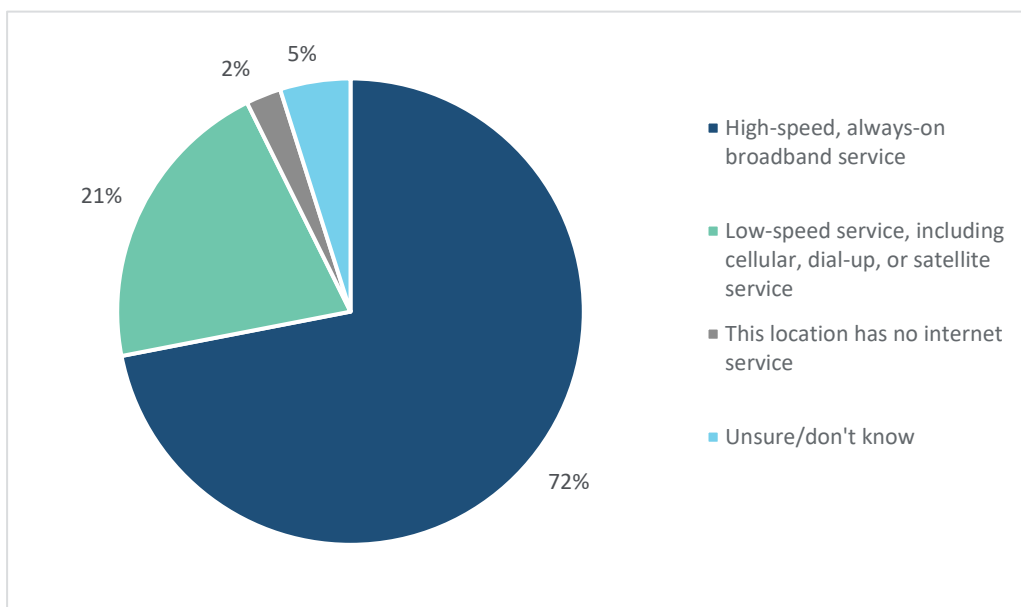
*Figure **Error! Main Document Only.** - Type of internet service by percentage of X responses*

Type of internet service for X responses by geographic location

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Connection Performance and Costs
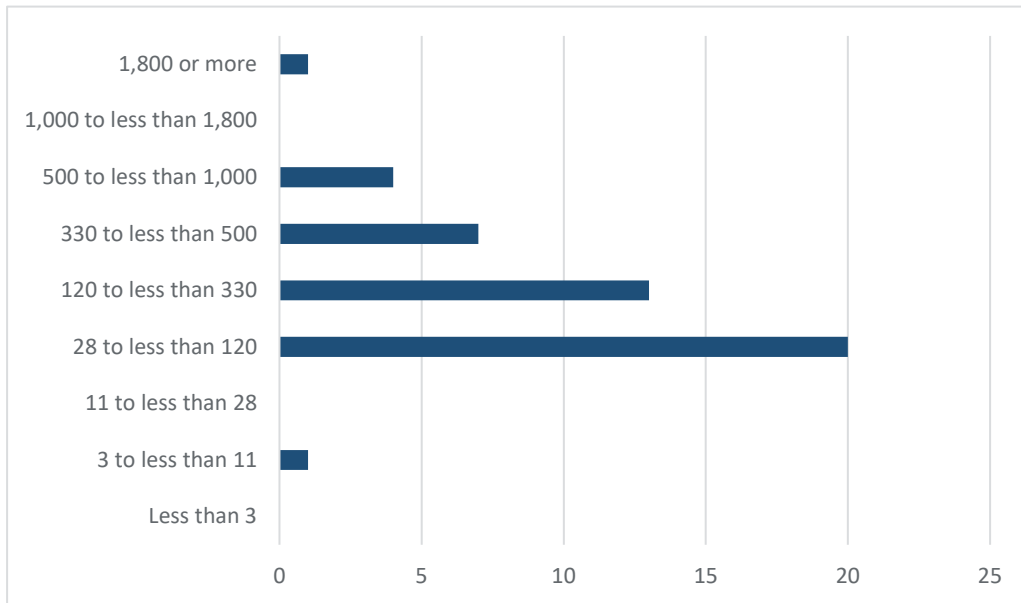
*Figure **Error! Main Document Only.** - Percentage of X responses by throughput ranges*

Connection Type	MRC	Latency	Thruput	MRC/Mbps
High-speed, always-on broadband service	72.0%	149.08	14.98	262.68	0.57
Low-speed service, including cellular, dial-	20.7%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

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up, or satellite service					
Unsure/don't know	4.9%	84.00	14.00	63.05	1.33

Geographic locations of X responses by aggregate throughput

Locations of high- and low-speed responses

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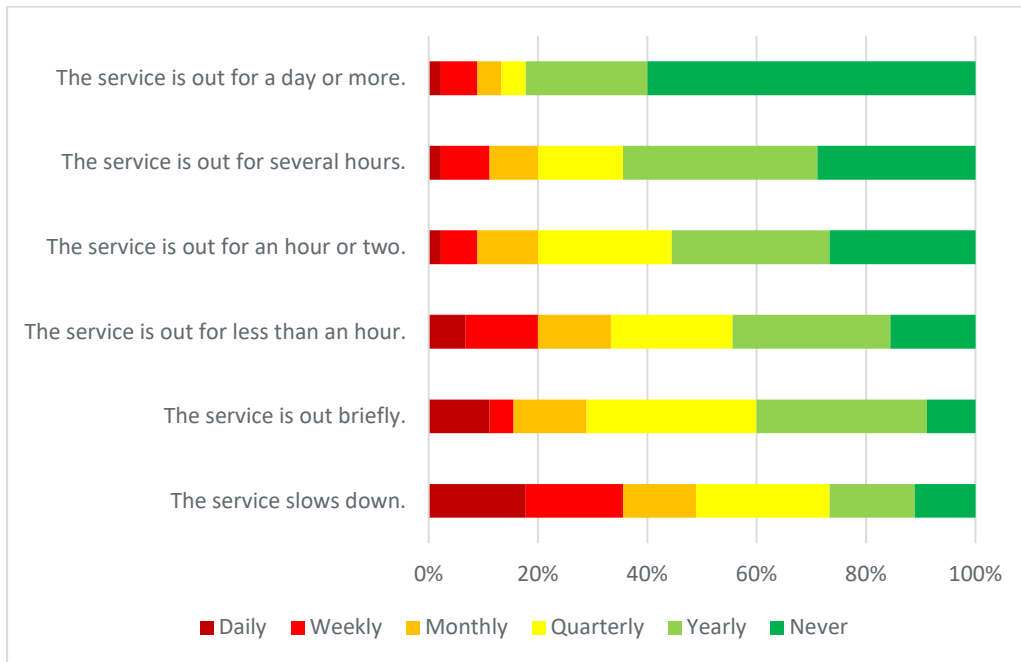
*Figure **Error! Main Document Only.** - Perceptions of service reliability as a percentage of X responses*

Internet Service Provider and Costs

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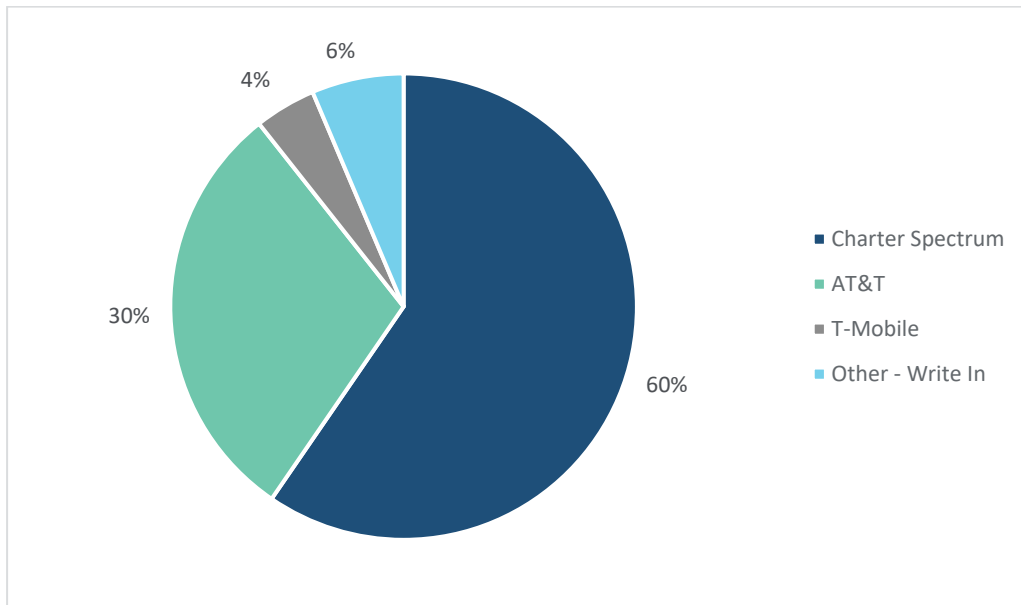
*Figure **Error! Main Document Only.** - Internet service provider by percentage of X responses*

Number and percentage of responses by provider

	Monthly Recurring Costs (MRC)			Performance	
Provider	All services	Internet Only	Per Mbps	Latency	Throughput
Charter Spectrum	$160.74	$105.22	$0.41	10.6	254.3

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AT&T	$393.33		$257.75	$0.92	18.6	280.8
T-Mobile	$150.00		$50.00	$0.42	44.0	118.1
Other - Write In	$68.33		$51.67	$0.32	19.7	159.4
All	$223.05		$144.20	$0.58	14.9	249.7

*Figure **Error! Main Document Only.** - Number of services taken by percentage of X responses.*
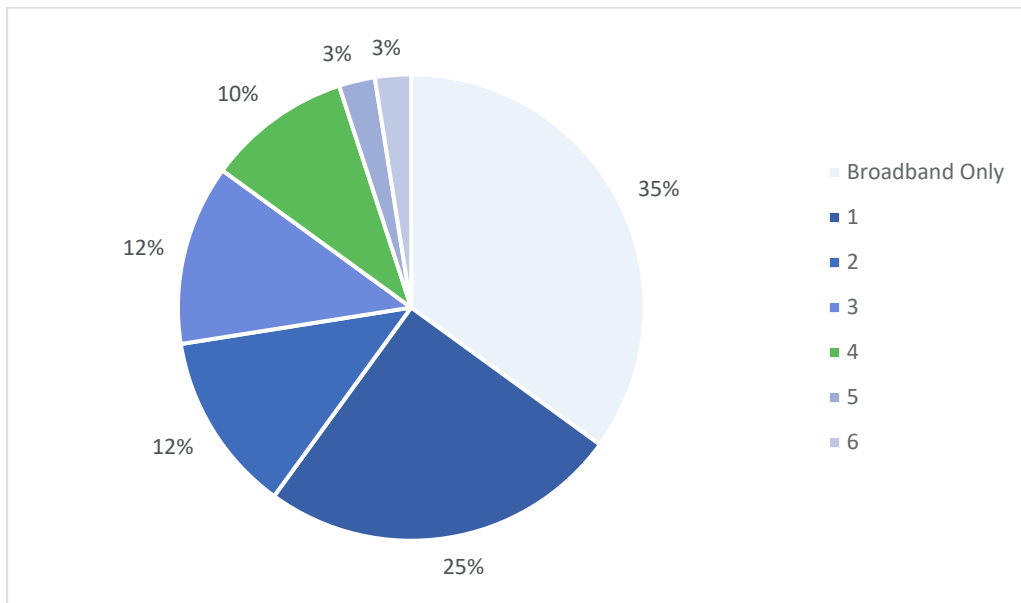
Monthly recurring cost statistics for all services and broadband only completed

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	Count	Max	Mean	Median	Mode	Min
All Services	40	$1,670	$223	$120	$120	$1
Broadband Only	40	$1,670	$144	$86	$90	$25

Appendix C: Community Focus Group Results

Methodology

The Entrust team worked with the City of Carson team during Fall of 2023 to identify the full range of community stakeholders. Generally, stakeholders are anyone who has an interest in the success (or failure) of an initiative, organization, or project. For broadband planning, we consider stakeholders to organizations in an area, particularly those that serve and support local businesses and residents. A list of these types of major organizations, including their representatives' contact information, was developed by the Carson team and supplemented by the Entrust team. For practical purposes, we narrowed these down to 7 groups for which we convened online focus groups:

- Emergency Preparedness and Public Safety, December 14, 2023
- Transit and Transportation, December 18, 2023
- Infrastructure and Utilities, January 5, 2024
- Social Support and Wellness, January 8, 2024
- Business, Commerce, and Industry, January 8, 2024
- Public Safety and Emergency Services, January 11, 2024
- Community Information and Education, January 11, 2024

The focus groups were scheduled several weeks in advance. Stakeholder representatives were contacted via email from the City of Carson's administrative offices to request their participation. They were then invited to the relevant focus group via email. Those stakeholder representatives that could not attend were offered the options of (a) attending a different

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session, (b) having a one-on-one online interview, or (c) sending an associate. Most chose to send an associate, some opted for interviews, and some simply did not respond.
Entrust led the focus groups and took notes on the discussions, which generally covered:
1. Current connectivity, including any issues or problems
2. Connectivity needs of clients, customers, members, and partners
3. Goals and plans for the near future, including upgrades, that would impact connectivity needs
4. Major issues and trends expected to impact operations and technology requirements
5. The County's potential role in increasing broadband availability and improving performance

We also asked participants who else should be asked for input and requested their assistance promoting the City of Carson speed test survey. By the end of the process, we got input from representatives and organizations, including the various public agencies. *The information below is directly from stakeholder representatives. The results do not represent the opinions or views of Entrust or the City of Carson.*

Results

Emergency Preparedness and Public Safety

Participants in this session included representatives from the LA County Sherriff's Office, LA County Fire Department and The Boys & Girls Club of Carson. Based on the insights from the recent meeting, emergency preparedness in Carson hinges on the effective management of new connectivity initiatives, redundancy in communication systems, and adoption of new and emerging technologies. The format that emerged transformed itself into three discussions on three focused areas including, current connectivity, short term initiatives, and long term goals that essentially encompassed major issues and trends.

Current Connectivity

The LA County Sheriff's Office demonstrates the importance of robust connectivity infrastructure in supporting emergency preparedness. Through its self-described "Class 1 Network" spanning the county, and including multiple buildings in Carson, the Sheriff's Office ensures seamless communication among patrol units, dispatch centers, and administrative offices. This network, managed by the Communications & Fleet Management Bureau, utilizes a combination of fiber optics and cellular technology to facilitate real-time data transmission and coordination during operations. The Sheriff's Department's reliance on a redundant and robust network underscores its commitment to maintaining high standards of connectivity to

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support critical public safety functions.

Similarly, the LA County Fire Department relies on a comprehensive network architecture to coordinate emergency response efforts across Carson. With four county fire stations within Carson seamlessly integrated into a broader network of 200 stations, the department can swiftly deploy resources and personnel to address any contingency. Managed by the Internal Services Division, this network prioritizes reliability and redundancy to ensure uninterrupted communication, especially in high-stakes scenarios where real-time information can make a difference. Challenges related to limited internet access at its stations due to security concerns, highlight the need for innovative solutions to bridge connectivity gaps and enhance situational awareness for first responders.

The Boys and Girls Club in Carson leverages connectivity to enhance safety and community engagement initiatives. Relying on Charter Spectrum for broadband connectivity, and outsourcing IT security services, the club ensures a secure and reliable internet connection for its operations. Moreover, initiatives such as installing surveillance cameras and participating in digital equity programs demonstrate the club's commitment to progressive technology solutions for social improvement. However, persistent challenges related to connectivity and cybersecurity underscore the importance of ongoing collaboration with local stakeholders to address emerging threats and vulnerabilities effectively.

Short Term Initiatives

In the short term, the LA County Sheriff's Office is focused on expanding its automated license plate recognition (ALPR) systems to enhance law enforcement capabilities in Carson. This includes deploying fixed and mobile ALPR units to strategic locations to monitor vehicle movements and identify potential threats. The recent expansion of ALPR systems in December 2023 reflects the department's proactive approach to leveraging technology for crime prevention and public safety. Approximately 80 locations, both fixed and mobile, are now in place within Carson. Additionally, the exploration of additional closed-circuit television (CCTV) systems highlights the department's commitment to enhancing surveillance capabilities to address evolving security challenges effectively.

The LA County Fire Department's short-term initiatives center on improving communication and training protocols to enhance emergency response capabilities. By training teams on new communication plans as part of the LA Regional Interoperable Communications System (LA RICS), the department aims to ensure seamless interoperability among different agencies during emergencies. Furthermore, initiatives aimed at community engagement, such as workshops and partnerships with local organizations, underscore the department's commitment to fostering stronger ties with the community and promoting a culture of safety and preparedness.

The Boys and Girls Club in Carson is actively engaged in short-term initiatives aimed at leveraging technology to enhance safety and community engagement. The club has implemented initiatives such as installing surveillance cameras for safety purposes and participating in digital equity programs to advocate for additional connectivity in the community.

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Outreach to the community continues through traditional social media channels as well as LAUSD message blasts. These efforts demonstrate the club's proactive approach to utilizing technology for social good and enhancing the overall well-being Carson residents.

Long Term Goals

Looking ahead, the LA County Sheriff's Office aims to sustainably integrate technology into its operations to enhance transparency, accountability, and community outreach efforts. Building upon its successful implementation of body camera systems, the department seeks to further expand its technological capabilities by integrating mobile devices for improved communication and documentation. By leveraging additional advanced applications and training, the department aims to enhance its predictive policing capabilities and optimize resource allocation for maximum efficiency. Additionally, the Sheriff's Office is committed to fostering stronger partnerships with local community organizations, such as the Boys and Girls Club, to collaboratively address public safety concerns and promote a safer environment for all residents.

Similarly, the LA County Fire Department envisions leveraging technology to enhance data collection capabilities and streamline operational processes in the long term. Digital inspection process documentation for defensible space and considerations will be implemented as a standard in the future utilizing hand held devices. Building upon its transition to county-owned cell phones as part of standard operating redundancy, the department aims to implement cloud-based solutions for data management to improve resource allocation and response times during emergencies. Furthermore, the department plans to invest in advanced training programs and equipment to enhance firefighter safety and operational effectiveness. By embracing emerging technologies and best practices, the Fire Department seeks to adapt to evolving community needs and maintain its position as a trusted leader in emergency response and preparedness.

Additionally, the Boys and Girls Club aims to continue leveraging technology to enhance its community outreach and educational initiatives in the long term. Building upon its current efforts, the club seeks to expand its digital literacy programs and provide access to educational resources for underserved youth in Carson. Moreover, the club plans to explore innovative partnerships with local schools, businesses, and government agencies to promote educational enrichment and skill development among its members. By investing in technology and educational resources, the Boys and Girls Club aims to empower youth and foster positive social impact within the Carson community.

Transit and Transportation

The recent focus group meeting that included critical input from Public Transportation and other stakeholders, revealing several areas for improvement within Carson's public transportation system. The discussions pinpointed not only current operational challenges but also strategic opportunities for enhancing service delivery through technology, with an emphasis on user experience, accessibility, and environmental sustainability. The discussion

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focused on current connectivity, short-term initiatives, long-term goals, major issues and trends, and the city's role in broadband development and support.

Current Connectivity

Carson's public transportation system currently grapples with several significant challenges that hinder its efficiency and user satisfaction. Commuters face difficulties due to the unavailability of real-time transit information, leading to inconvenience, especially when unexpected service disruptions occur. The city's existing digital platforms for transit information fall short of meeting user expectations for ease of use and comprehensive functionality. This shortfall has contributed to a growing preference among users for more streamlined, integrated access to transportation information, moving away from multiple, disparate app solutions. The effectiveness of Carson's communication strategies in disseminating timely updates about schedule changes and detours has been another area of concern, indicating a need for more responsive and efficient information-sharing mechanisms.

Short-Term Initiatives

In addressing these immediate challenges, Carson is undertaking several initiatives aimed at rapidly improving the commuter experience. A priority initiative for Public Transportation will be the purchase of four (4) EV buses within Carson which will become the center-point for additional initiatives such as Computer Assisted Driving/ Automated Vehicle Location (CAD/AVL) systems. Also key among these initiatives is the upgrade of the city's web-based information platform, enhancing its capabilities to offer extensive, real-time transit data in an intuitive format. The introduction of QR codes at strategic transit locations will facilitate seamless access to this platform, simplifying information retrieval for commuters. An awareness campaign is also planned to boost the visibility and adoption of these new digital tools. Initiating pilot programs for real-time updates on select transit routes, coupled with a feedback collection feature on the platform, will enable Carson to refine its offerings based on direct user input.

Long-Term Goals

Looking to the future, Carson aspires to fully integrate its public transportation system with advanced digital solutions and sustainable practices. Central to this vision is the seamless incorporation of the Transit Access Pass (TAP) system across all transit services, ensuring effortless fare payment and a smoother travel experience for all users. The city also recognizes the importance of catering to the diverse needs of its population, including seniors, by expanding accessible on-demand transportation services. The transition to an electric vehicle (EV) bus fleet underscores Carson's commitment to environmental stewardship, aligning with broader sustainability objectives.

Major Issues and Trends

The dialogue from the focus group underscored a notable disinterest among Carson's

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ridership in onboard WiFi services, suggesting that passengers prioritize reliable and efficient transit services over such amenities. Additionally, the city's strategic shift towards a web-based platform, as opposed to developing a standalone app, reflects learnings from other communities like Long Beach, where app-centric approaches have not met customer expectations. This pivot to utilizing QR codes that integrate with browsers on smartphones exemplifies Carson's adaptive strategy to leverage technology in a way that directly responds to user preferences and industry trends.

The Role of the City of Carson

The City of Carson is pivotal in facilitating these transformative efforts, championing the adoption of technology to enhance public transit services while also advocating for sustainability. The initiative to integrate electric vehicle buses into the transit fleet exemplifies Carson's proactive approach to environmental responsibility. Through community engagement and feedback, the city ensures that its transportation policies and initiatives are reflective of and responsive to the needs of its residents, paving the way for a more connected, sustainable, and user-focused public transportation system. By focusing on immediate improvements and embracing a future-oriented perspective, Carson is set to enhance the accessibility, reliability, and sustainability of its public transit services, ensuring they meet the evolving demands of the community.

Infrastructure and Utilities

Participants in this session included representatives from AT&T, The Southern California Water District (Metropolitan Water),, LA County Sanitation Department (LA County Sanitation), Floyd Ministries of Hope and California State University Dominguez Hills (CSUDH). Two major topics dominated the discussion. AT&T's representatives reflected a strategic approach to maintaining and expanding their network infrastructure in Carson, with an emphasis on collaboration with the city to address connectivity needs. Meanwhile, the LA County Sanitation and the Metropolitan Water collaboration for the upcoming advanced water treatment facility project will likely serve as a catalyst for further enhancements in their network infrastructure, reflecting broader trends in the utilities sector towards greater digitalization and cybersecurity.

Current Connectivity

AT&T emphasized their extensive network infrastructure within the City of Carson, highlighting a solid foundation of fiber connectivity supporting both residential and commercial areas. They mentioned the completion of various projects aimed at enhancing high-speed internet access across the community, indicating an ongoing effort to improve connectivity within the city.

The discussion from representatives of the Los Angeles County Sanitation District and the Metropolitan Water District of Southern California focused on their current and future connectivity needs, particularly in the context of their operational facilities and upcoming projects. They highlighted the importance of reliable and redundant network infrastructure for

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their operational facilities. This includes the critical need for connectivity to monitor and manage wastewater treatment processes and water distribution systems. The reliance on telecommunications companies for fiber connections was mentioned, indicating a complex network infrastructure that supports their day-to-day operations.

Short-term Initiatives

For AT&T there was a mention of wrapping up current projects in Carson, with an emphasis on high-speed internet development for the community. However, specific details on short-term initiatives or plans for expanding or upgrading their network in the immediate future were not elaborated upon during the discussion.

For the LA County Sanitation and Metropolitan Water the immediate focus appears to be on the new advanced water treatment facility project. The two-billion-dollar project underscores the necessity for enhanced connectivity solutions to support the sophisticated operations of modern water treatment technologies. The planning and initial stages of this project likely involve assessing current network infrastructure and identifying requirements for expanded bandwidth and improved reliability to support the facility's operations.

Long-term Goals and Priorities

While detailed long-term goals were not explicitly outlined, the conversation hinted at AT&T's continued focus on enhancing their network infrastructure in Carson. The discussion of potential future projects, contingent on internal meetings and budget considerations, suggests that AT&T is evaluating its strategic priorities within the city, possibly including further fiber expansion and upgrading existing infrastructure to support advanced broadband services.

Although LA County Sanitation and Metropolitan Water did not mention long-term technology investment priorities, the ongoing and future infrastructure projects imply a continuous need for upgrading and expanding their network infrastructure. The emphasis on redundancy and cyber protection measures indicates a long-term commitment to ensuring the resilience and security of their operational networks. Balancing the growing demand for bandwidth with cost considerations and cybersecurity concerns will be a significant focus.

Major Issues and Trends

The representatives did not delve deeply into specific issues or trends affecting AT&T directly. However, the broader context of the conversation, including the mention of a last-mile grant application and the ongoing push towards fiber optic and potentially 5G technologies, indicates AT&T's awareness and involvement in addressing connectivity gaps and preparing for future technological advancements in telecommunications.

For both Metropolitan Water and LA County Sanitation, Cybersecurity emerged as a major issue, reflecting a broader trend in critical infrastructure sectors towards bolstering defenses

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against cyber threats. The discussion points to an ongoing effort to share best practices with peers and learn from industry trends to enhance their cyber resilience. The move towards more connected and technologically advanced water treatment facilities also highlights a trend towards digitalization in the utilities sector.

Role of the City of Carson

AT&T expressed a keen interest in partnering with the City of Carson to expand modern broadband access. They highlighted their goal of bringing advanced broadband services to the city's residents and businesses, suggesting a collaborative approach with the city to identify and target areas in need of improved connectivity. The mention of a grant application for expanding broadband infrastructure further underscores AT&T's commitment to working alongside municipal efforts to enhance digital equity and access in Carson.

While the role of the City of Carson was not explicitly discussed in the context of connectivity between Metropolitan Water and LA County Sanitation, the city's involvement in supporting the infrastructure projects, either through planning, coordination, or facilitation of necessary utilities and services, was inferred. The city's potential involvement in facilitating or supporting the build-out of fiber infrastructure to enhance connectivity for these projects may be a critical factor in their successful implementation of their joint multi-billion-dollar water treatment plant.

Social Support and Wellness

This particular focus group session faced challenges in attendance. While originally eleven respondents registered to participate, only representatives from the LA County Sheriff's Department and LA County Supervisor Holly Mitchell's Office were present for the actual meeting. Given the importance of broad stakeholder engagement for comprehensive discussions on social support and wellness, it was decided to postpone this particular meeting. to provide an opportunity for a wider range of attendees to participate in future sessions, ensuring diverse perspectives and contributions.

Business, Commerce, and Industry

The discussions from the Business Commerce and Industry Focus Group meeting included participants from Dignity Health Sports Park, Cal State University Dominguez Hills (CSUDH), representatives from LA County Supervisor Holly Mitchell's Office, and representatives from the Boys and Girls Club of Carson. Details from the focus group meeting reveal a deep-seated recognition of the critical role that connectivity and technology play in supporting the missions of diverse organizations within Carson. There was a clear call for strategic, collaborative efforts to address current challenges and prepare for future needs, with the City of Carson positioned as a pivotal partner in these endeavors. The discussion focused on current connectivity, short-term initiatives, long-term goals, major issues and trends, and the city's role in broadband

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development and support.

Current Connectivity

Representatives from Dignity Health Sports Park operate with an existing commercial Distributed Antenna System (DAS System) operating on twenty-five (25) separate nodes to provide extended area coverage. Its primary purpose is to provide focused coverage for guests to the facility. The conversation highlighted the challenges of maintaining high-quality wireless connectivity in the face of fluctuating event attendance, emphasizing the need for a scalable and resilient network infrastructure to support both peak times and everyday operations. This included shared anecdotes of past events where connectivity issues led to operational hiccups, underscoring the importance of reliability in digital infrastructure for enhancing guest experiences.

Representatives from CSUDH referenced the disparity in digital access among students and faculty, stressing the critical role of connectivity in supporting diverse learning modalities. Specific areas on campus where connectivity was particularly weak were noted, affecting the delivery of educational content and student engagement. Further concern was noted over shared operational challenges related to campus-wide event management emphasizing operational dependency on reliable connectivity.

The Boys and Girls Club discussed the pivotal role of stable internet access in delivering educational programs to youth, especially during remote learning period. Also noted were challenges faced due to inconsistent connectivity in residential areas, advocating for city-supported initiatives to bridge the digital divide for younger residents.

Representatives from LA County Supervisor's office noted support for digital equity and support for ensuring connectivity for all.

Short-Term Initiatives and Plans

Expanding on the brief mention of upcoming technological enhancements, Dignity Health Sports Park elaborated on the desire for commercial partners to upgrade to 5g from LTE on site, to upgrade existing key areas, and introduce more robust technology capabilities and network management tools to better handle event-driven demand surges.

Members from CSUDH discussed the imminent rollout of new learning management systems, and digital collaboration tools with community partners, referencing programs such as the Affordable Connectivity Program (ACP) and Digital Equity Act Programs to promote broadband access and digital equity for all. The Boys and Girls Club outlined routine workshops aimed at improving digital literacy among club members and their families, coupled

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with efforts to procure grant-funded hardware for home use.

Long-Term Goals and Priorities

The discussion here revolved around establishing a city-wide digital infrastructure blueprint that aligns with future growth projections, environmental sustainability goals, and the evolving technological landscape. Participants expressed a desire for a comprehensive strategy that includes public-private partnerships, investment in next-generation technologies, and a focus on inclusivity and access to additional grant opportunities, as well as impacts of disinvestment in the community on near term accessibility to next generation technology (like AI).

Major Issues and Trends

The conversation highlighted a consensus on the accelerating pace of digital transformation and the imperative to keep up with technological advancements. Issues such as, Public Private Partnerships (P3), cost sharing initiatives, and the integration advanced technologies into public spaces and educational environments were identified as key areas of focus.

Role of the City of Carson

Remarks about the city's commitment to being a proactive partner were met with enthusiasm. Participants outlined specific ways the city could support their goals, from facilitating access to funding and resources to leading community engagement efforts to gather input on technology needs. There was a strong emphasis on collaboration, with the city seen as a central figure in coordinating efforts to enhance connectivity and technology access.

Community Information and Education

Participants in this session included representatives from the City of Carson, Charter Spectrum and the LA County Sherriff's office. The original intent of this focus group was to focus on school districts, nonprofits, and organizations involved in community-facing and educational work. It appeared that many of this focus group's intended audience was unable to participate in this particular session, but rather had previously attended other group sessions which were at a more convenient time to their individual schedules. As a result, the decision was made to pivot the discussion more closely to the attendees' interests, contrasting it with previous sessions. The overall discussion emphasizes the importance of aligning technological upgrades with community needs and ensuring stakeholders are informed and engaged in the process. Several topics emerged as the focus of the group including, DOCSIS 4.0 and connectivity upgrades, The ACP program, service expansion into industrial areas, and

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the role of the City of Carson.

DOCSIS 4.0 and Connectivity Upgrades

Charter Spectrum discussed DOCSIS 4.0, an upcoming upgrade to the data over cable service interface specification, which promises to deliver multi-gigabit internet speeds with symmetrical upload and download capabilities. Although a specific rollout schedule wasn't available, the anticipation for improved infrastructure to support such speeds was evident. This upgrade is seen as a significant step towards enhancing broadband connectivity within the City of Carson, addressing both current and future connectivity needs for local businesses, educational institutions, and residential users. The transition to DOCSIS 4.0 could dramatically improve internet service quality, enabling more robust digital operations and online learning capabilities. However, the timeline and impact on existing services remain unclear.

Affordable Connectivity Program (ACP)

The ACP's potential discontinuation and its impact on Charter Spectrum's customers was a point of concern. The program offers low-cost broadband to qualifying households, playing a crucial role in ensuring internet accessibility. Despite the lack of detailed future plans for the ACP, its significance in supporting low-income families and enhancing digital inclusion was highlighted. The discontinuation of ACP could affect many Carson residents, potentially increasing the digital divide. It underscores the need for local government and service providers to find alternative solutions or advocate for the continuation of such federal programs to maintain or improve internet accessibility.

Service Expansion to Industrial Areas

The conversation touched on the challenges and considerations for extending broadband services to industrial areas of Carson. Factors such as the cost of infrastructure development, potential collaboration with the city for funding or support, and the equitable distribution of service were discussed. The dialogue reflected a broader concern about how to best support commercial zones and foster economic development through improved connectivity. Expanding service to industrial parks and commercial areas is critical for economic development and competitiveness. It involves navigating financial, logistical, and regulatory challenges but is essential for supporting businesses and attracting new investment to the city.

Role of the City of Carson

The discussion often circled back to the role of the City of Carson in facilitating broadband expansion and improving connectivity. Suggestions included leveraging city infrastructure for technological upgrades, collaborating with service providers for equitable service distribution, and possibly supporting the deployment of advanced networks. The general consensus was that the city's proactive involvement in broadband development is crucial for addressing connectivity disparities, supporting local businesses, and enhancing the quality of life for

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residents. It requires strategic planning, partnerships with service providers, and potentially exploring innovative funding mechanisms.

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