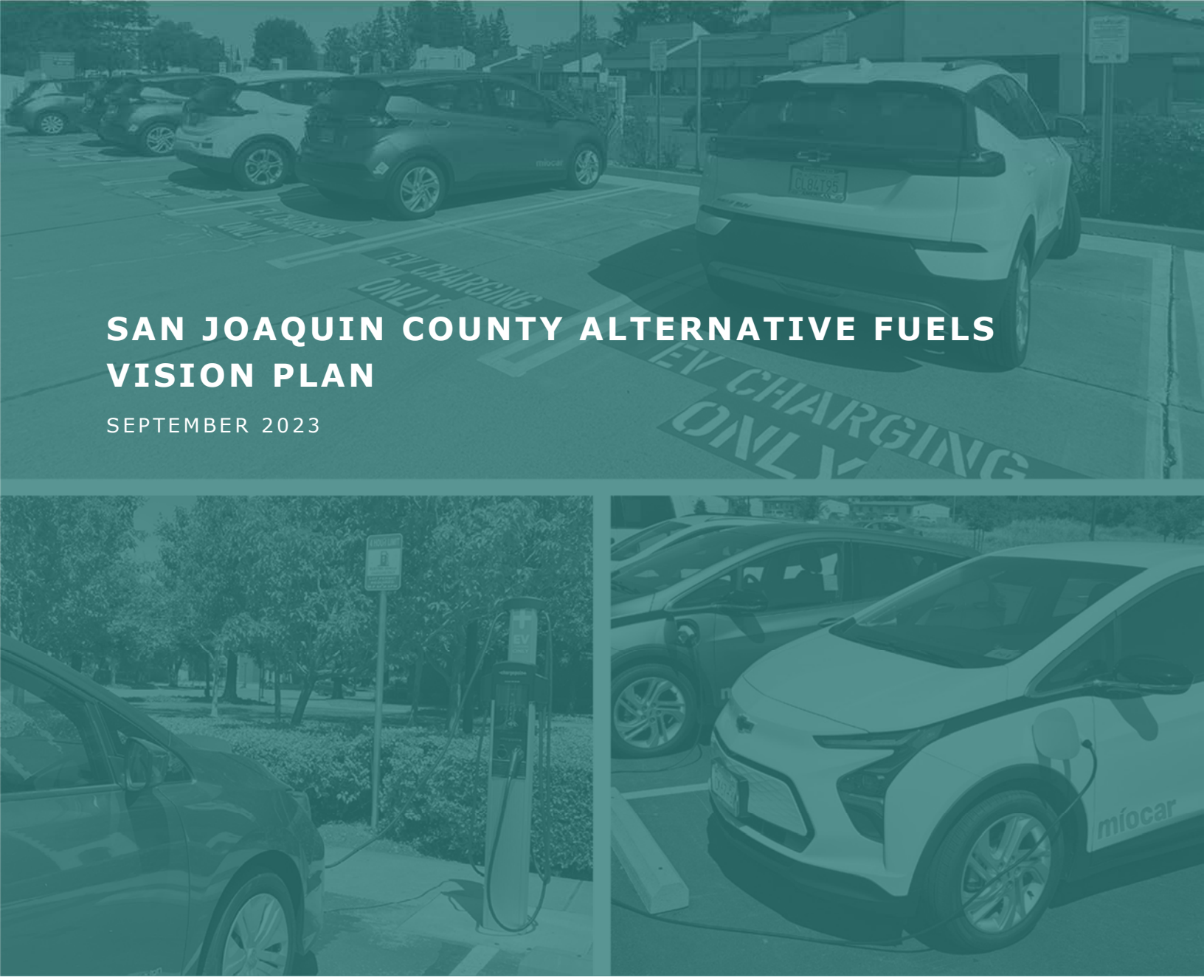

SAN JOAQUIN COUNTY ALTERNATIVE FUELS VISION PLAN

SEPTEMBER 2023

PREPARED FOR:

SAN JOAQUIN COUNCIL OF GOVERNMENTS

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SUMMARY OF ACRONYMS

AC	Alternating Current
AFDC	Alternative Fuels Data Center
AFVP	Alternative Fuels Vision Plan
BTU	British Thermal Units
CARB	California Air Resources Board
CCS	Combined Charging System
CDFA	California Department of Food and Agriculture
CEC	California Energy Commission
CFI	Charging and Fueling Infrastructure
CNG	Compressed Natural Gas
DC	Direct Current
DCFC	DC Fast Charger
DOE	Department of Energy
EV	Electric Vehicle
EVSE	Electric Vehicle Supply Equipment
FCEV	Fuel Cell Electric Vehicle
FHWA	Federal Highway Administration
ICCT	International Council on Clean Transportation
L2	Level 2 Charger
L3	Level 3 (DCFC) Charger
LNG	Liquified Natural Gas
LPG	Liquified Petroleum Gas
MCS	Megawatt Charging System
NACS	North American Charging Standard (Tesla)
NCPA	Northern California Power Alliance
NEVI	National Electric Vehicle Infrastructure
NREL	National Renewable Energy Laboratory
PHEV	Plug-in Hybrid Electric Vehicles
RNG	Renewable Natural Gas
SJCOG	San Joaquin Council of Governments
ZEB	Zero Emission Bus
ZEV	Zero Emission Vehicle

STUDY OVERVIEW

BACKGROUND

The San Joaquin Council of Governments (SJCOG) seeks to facilitate the use of, and access to, alternative fuels in San Joaquin County. To support this goal, the EV, and Alternative Fuels Vision Plan (AFVP) will include a County-wide inventory of infrastructure for charging EVs and fueling stations for vehicles powered by hydrogen, propane, Liquified and Compressed Natural Gas (LNG and CNG) and identify clean fueling infrastructure opportunities along major freight corridors and other regionally significant roadways.

STUDY OBJECTIVES

Objectives of the AFVP in San Joaquin County include:

- Assess existing alternative fuel infrastructure networks and coverage within San Joaquin County. This includes intra-city as well as unincorporated rural areas between cities that experience significant interregional travel and goods movement.
- Identify key challenges, gaps, and barriers to alternative fuel vehicle operations for travelers including long-distance commuters; freight, and other users as determined through input solicited from key stakeholders.
- Identify existing equity issues to access alternative fuel stations and ensure infrastructure improvements and investments will be equitable and accessible to all users including traditionally underserved populations.
- Recommend infrastructure improvements and related investments, policies, and implementation strategies to promote alternative fuel adoption through charging and alternative fuel infrastructure investments based on analysis and stakeholder input. The recommended improvements will contribute to quantifiable on-road mobile source GHG emission reductions that can be justifiably credited towards climate action planning efforts including SJCOG's SB 375 GHG emission reduction targets established by the California Air Resources Board (CARB) and align with California's pending Advanced Clean Fleet regulation.
- Identify any programs and incentives as well as provide potential funding opportunities. This includes ensuring that the AFVP meets all the requirements of FHWA's Alternative Fuels Corridor Program designation for all alternative fuels.

EXECUTIVE SUMMARY

The SJCOG Alternative Fuels Vision Plan (AFVP) is a comprehensive plan including a County-wide inventory of alternative fuel infrastructure, with a specific focus on charging stations for electric vehicles (EVs). By identifying opportunities for clean fueling infrastructure and providing recommendations for supporting the clean transportation transition, the AFVP seeks to foster a more sustainable and environmentally friendly transportation network.

This report consists of the following content:

- **Chapter 1**: Summary and descriptions of alternative fuel types.
- **Chapter 2**: Review of existing conditions in San Joaquin County as it relates to alternative fuel infrastructure.
- **Chapter 3**: Overview of community engagement completed to inform this study.
- **Chapter 4**: Discussion of impacts on equity, barriers, and recommendations for an equitable transition to zero-emission transportation.
- **Chapter 5**: Review of drivers pushing medium and heavy-duty vehicle electrification, explanations of charging options, and relevant studies happening now.
- **Chapter 6**: Analysis and recommendations based on the findings of this study.
- **Appendices** include funding opportunities, a summary of relevant regulations, an in-depth outreach report, examples of outreach materials, study gap analysis and methodology, and top twenty site prioritization by rank.

ALTERNATIVE FUEL TYPES

Chapter 1 of this plan provides an overview of various alternative transportation fuels and their delivery methods to vehicles, including electricity, hydrogen, propane, liquified, and compressed natural gas (LNG and CNG). The most common zero-emission alternative fuels for transportation today include electricity and hydrogen. Electricity can be produced from various sources and vehicles can be fueled at charging stations. Hydrogen vehicles emit only water vapor as exhaust and can be refueled at hydrogen stations similarly to how fossil fuel-powered vehicles use gas stations. Clean-burning alternative fuels with lower carbon footprints include LPG, LNG & CNG, and RNG.

EXISTING CONDITIONS

Chapter 2 of this report outlines the availability of existing alternative fuel infrastructure in San Joaquin County. Within one mile of freeway interchanges and highway access points, there are a total of 201 publicly accessible EV chargers. The majority of these can be found in cities, with Stockton having the highest number of public EV chargers. Lodi and Manteca follow with the second and third-highest numbers, respectively. Additionally, Stockton and Lathrop have the most alternative fueling stations, such as Compressed Natural Gas (CNG) and Liquefied Petroleum Gas (LPG). While there are 24 publicly accessible EV chargers in unincorporated areas, no other alternative fueling stations were found in these regions. San Joaquin County does not have any Hydrogen fueling stations currently.

DC Fast Chargers have been strategically installed along major travel routes for long-distance travel. Tesla is the most prevalent charging network, but NACS may become the new standard, making all chargers usable by newer non-Tesla EVs. There are also 41 non-networked chargers available. **Figure 1** shows the location of alternative fuel stations across the County as well as an overlay of Justice40 and CalEnviroScreen which will be discussed in the Equity section.

COMMUNITY ENGAGEMENT

Chapter 3 of this report summarizes the outreach conducted as part of the development of the Alternative Fuels Vision Plan. These efforts included stakeholder meetings, public workshops, and a survey, to address potential barriers to transitioning to alternative fuel vehicles. Stakeholders discussed topics such as equity and charging infrastructure, and the community provided feedback through a social pinpoint comment map. The outreach efforts showed the community's strong interest in expanding electric vehicle accessibility and alternative fuel options in San Joaquin County.

ADDRESSING EQUITY

Chapter 4 of this report addresses equity in San Joaquin County identifying gaps, and barriers to the clean transportation transition for disadvantaged communities and provides recommendations. The Alternative Fuels Vision Plan aims to support the transition to clean transportation in an equitable way, recognizing that improvements in air quality alone can have a significant positive impact on frontline communities disproportionately affected by traffic pollution. Simultaneously, this plan seeks to increase access to clean transportation for these communities. As a first step, this report identified disparities in the distribution of charging and alternative fuel stations for disadvantaged communities in San Joaquin County.

To evaluate baseline conditions, CalEnviroScreen and Justice40 have been utilized to identify disadvantaged communities in the county. The overlay of areas identified by these tools allowed for a comprehensive understanding of the spatial distribution of disadvantaged communities and existing alternative fuel infrastructure. It’s particularly important to support communities with large concentrations of multifamily housing, as these residents typically do not have the ability to install their electric vehicle (EV) chargers. For this reason, **Chapter 4** also includes maps identifying concentrations of multi-family housing across San Joaquin County in relation to existing alternative fuel infrastructure and disadvantaged communities. Nearly half of San Joaquin County falls into one or both CalEnviroScreen and Justice40-identified communities as seen in **Figure 1**. However, installing chargers alone won't address the barriers faced by disadvantaged drivers.

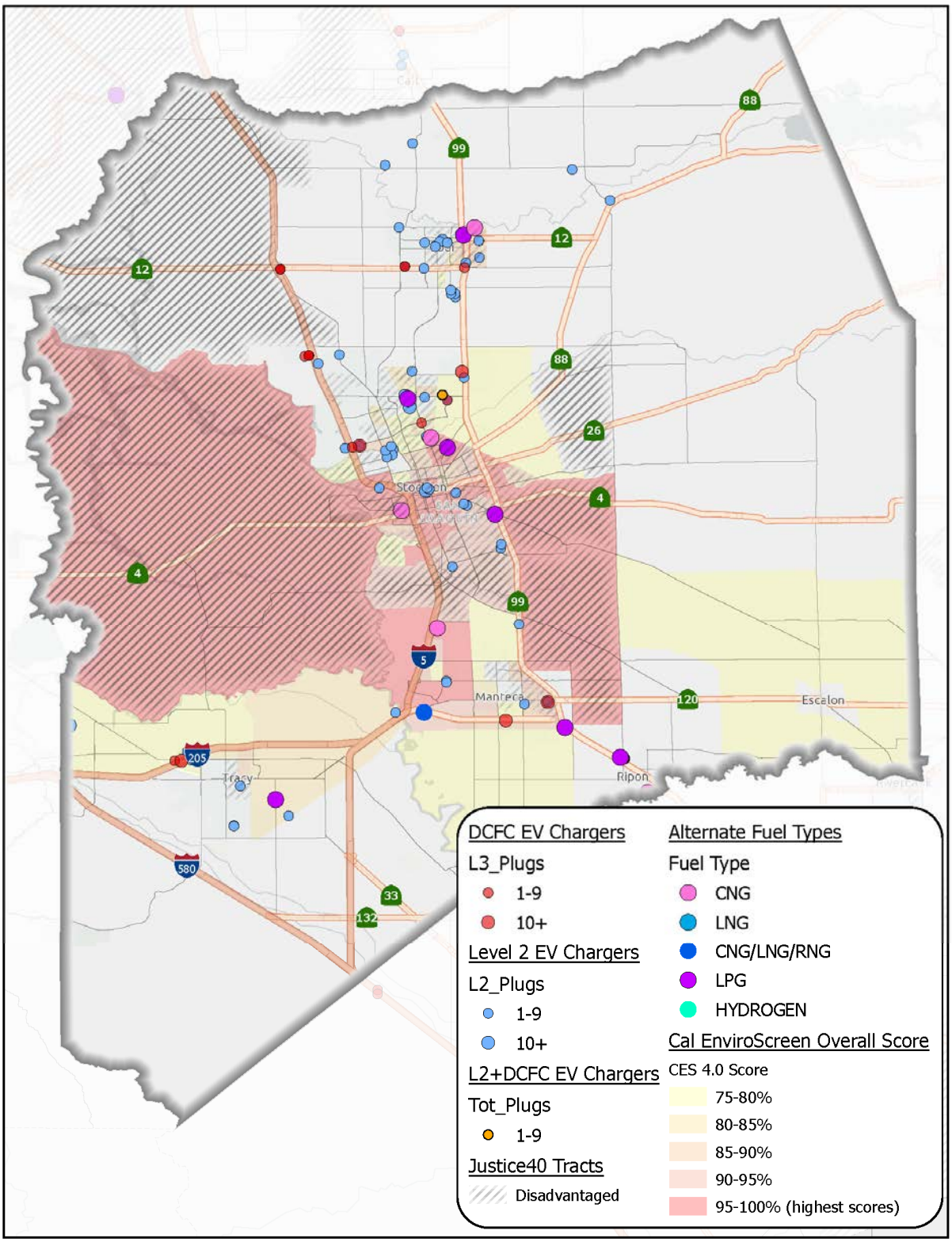


FIGURE 1: EXISTING ALTERNATIVE FUEL STATION LOCATIONS WITH JUSTICE40 AND CALENVIROSCREEN OVERLAY

Sources: Alternative Fuels Data Center, PlugShare, CalEnviroScreen, and Justice 40

MEDIUM AND HEAVY-DUTY ELECTRIFICATION

Chapter 5 addresses Medium and Heavy-duty electrification in San Joaquin County. As more vans, trucks, and buses using zero-emission propulsion systems like batteries and hydrogen have come onto the market, the transition of Medium and Heavy-Duty vehicles from diesel to clean fuels is quickly becoming a reality. This transition has been greatly motivated by funding incentives and regulations. In California, three particularly aggressive zero-emission fleet regulations will drive market transformation in this sector in the coming years:

- Advanced Clean Trucks (ACT) Regulation
- Advanced Clean Fleet (ACF) regulation
- Innovative Clean Transit (ICT) regulation

To support this transition, the state of California also provides funding opportunities discussed in **Chapter 5**. This chapter also includes a discussion of depot and on-route charging, for trucks, transit and school buses, freight routes in San Joaquin County, hydrogen fueling, and relevant ongoing studies, plans, and projects related to medium and heavy-duty charging or fueling infrastructure along freight corridors within the county.

ANALYSIS AND RECOMMENDATIONS

Chapter 6 highlights the future needs and gaps in ZEV infrastructure for EV charging and hydrogen stations to promote the adoption of zero-emission vehicles (ZEVs) in San Joaquin County. This includes an assessment of the anticipated rate of ZEV adoption until 2030, a gap analysis to pinpoint regions lacking sufficient ZEV infrastructure, and a siting analysis to determine optimal installation locations. Lastly, the chapter identifies barriers to promoting alternative fuels in the county and proposed recommendations.

SITE RECOMMENDATIONS

Using the methodology described in **Appendix D**, a ranking of approximately one square mile of hexagonal areas has been created for San Joaquin County and each incorporated city. The top 20 locations have been identified and mapped in **Figure 2**.

To ensure equitable geospatial distribution and representation, additional areas have been identified to augment the top 20 rankings. These areas have been selected based on the top-ranking locations within each jurisdiction, including the incorporated cities and communities in unincorporated San Joaquin County. In total, 39 locations have been identified in **Figure 2**, including locations in each city and various unincorporated towns:

- **City of Escalon**
  - Adjacent to State Route 120 in downtown Escalon (Rank 76)
- **City of Lathrop**
  - Adjacent to Interstate 5 and West Lathrop Road (Rank 34)
  - Adjacent to Interstate 5 and East Louise Avenue (Rank 46)
  - Adjacent to interchange of Interstate 5 and State Route 120 (Rank 362)
- **City of Lodi**
  - Adjacent to State Route 99 and East Kettleman Lane (Rank 3)

    - Adjacent to State Route 99 and East Harney Lane (Rank 7)
    - Southwest of State Route 99 and East Victor Road (Rank 13)
    - Adjacent to West Kettleman Lane between South Lower Sacramento Road and South Ham Lane (Rank 14)
    - North of West Kettleman Lane between South Ham Lane and South Stockton Street (Rank 15)
- **City of Manteca**
    - Adjacent to State Route 120 and South Airport Way (Rank 6)
    - Adjacent to State Route 99 and East Yosemite Avenue (Rank 12)
    - Adjacent to the interchange of State Route 99 and State Route 120 (Rank 33)
    - Southwest of State Route 99 and Lathrop Road (Rank 49)
    - Near West Yosemite Avenue between South Airport Way and South Union Road (Rank 54)
    - Near Lathrop Road between South Airport Way and South Union Road (Rank 60)
- **City of Ripon**
    - State Route 99 at Jack Tone Road (Rank 1)
    - State Route 99 at Main Street (Rank 104)
- **City of Stockton**
    - Adjacent to State Route 4 and South Stanislaus Street (Rank 4)
    - Adjacent to East Hammer Lane and West Lane (Rank 5)
    - West of Interstate 5 and West Alpine Avenue/ Country Club Road (Rank 11)
    - West of Interstate 5 and Hammer Lane (Rank 16)
    - Adjacent to State Route 4 and South Filbert Street (Rank 18)
    - Downtown Stockton near Park Street and Center Street (Rank 25)
    - Adjacent to West Benjamin Holt Drive and North Pershing Avenue (Rank 47)
    - Adjacent to State Route 99 and Arch Road interchange (Rank 58)
- **City of Tracy**
    - Adjacent to Interstate 205 and West Grant Line Road (Rank 8)
    - Adjacent to Interstate 205 and Byron Road (Rank 10)
    - East of West Grant Line Road and North Tracy Boulevard (Rank 19)
    - Adjacent to Interstate 205 between North Tracy Blvd and West Grant Line Rd (Rank 29)
    - Adjacent to Interstate 205 and North MacArthur Drive (Rank 44)
- **Unincorporated County**
    - Flag City Interchange Interstate 5 at State Route 12 (Rank 9)
    - Garden Acres Adjacent to State Route 99 and State Route 4 (Rank 17)
    - Adjacent to State Route 120 and Austin Road (Rank 38)
    - Northeast of State Route 99 and Waterloo Road (Rank 39)
    - Adjacent to State Route 12 and Lower Sacramento Road (Rank 42)
    - Unincorporated Town of **Linden** (Rank 111)
    - Unincorporated Town of **Mountain House** (Rank 360)
    - Unincorporated Town of **Lockeford** (Rank 496)
    - Unincorporated Town of **Farmington** (Rank 538)

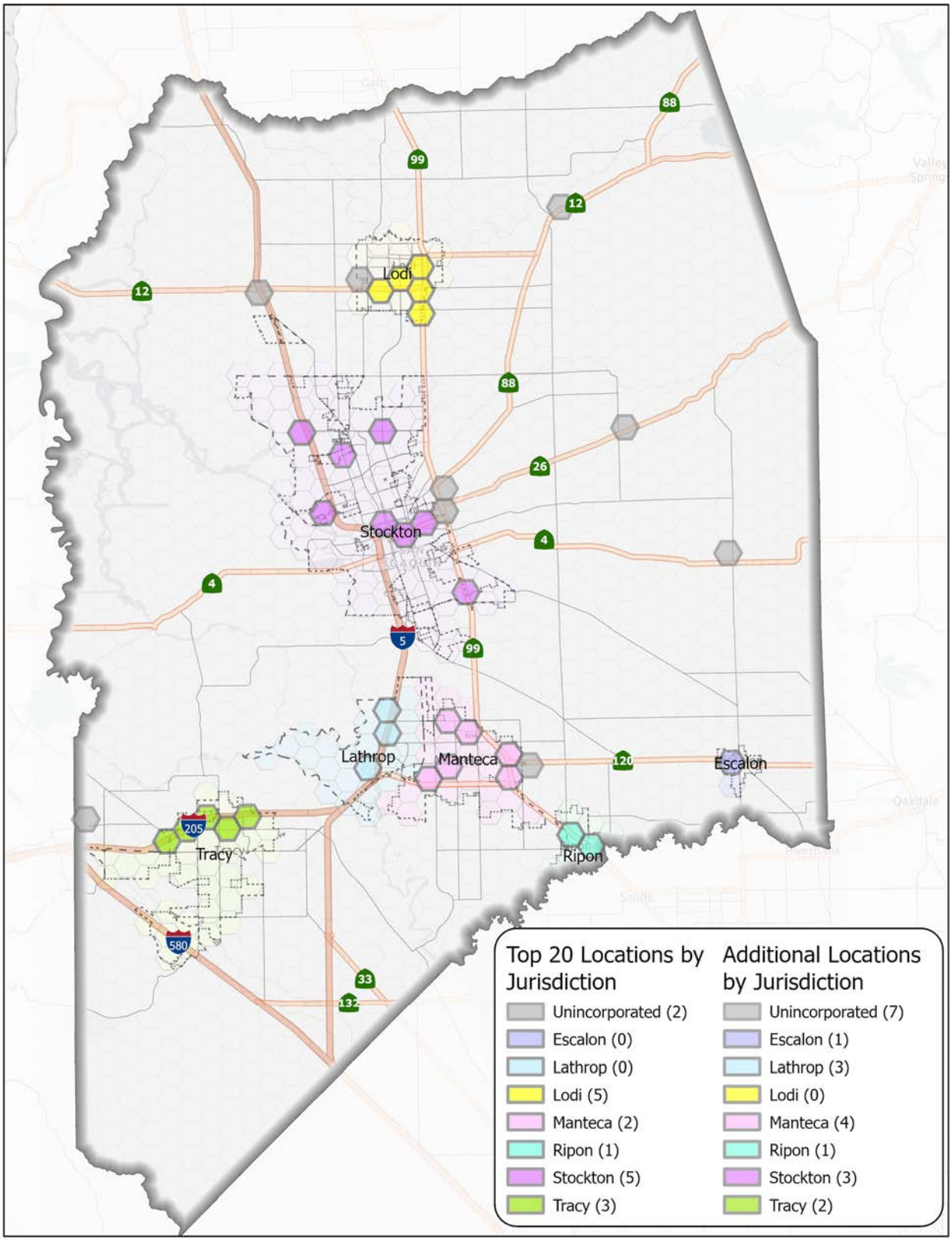


FIGURE 2: SITE PRIORITIZATION – ALL LOCATIONS

In addition to prioritizing locations for the installation of future alternative fuel infrastructure, several obstacles will need to be addressed to support the clean transportation transition. Through analysis of existing infrastructure gaps and community input, this report has identified the following barriers:

- Lack of charging infrastructure in key areas of the region
- Costs to install infrastructure
- Grid and transformer constraints to serve EV load
- Challenges in the permitting process
- The transition process for fleets
- Lack of awareness about ZEVs and available incentives
- Different payment systems for using EV chargers

To address these barriers, the Alternative Fuels Vision Plan includes the following recommendations for SJCOG and its member agencies:

- Coordinate cooperative transportation electrification planning in the region.
- Provide effective community engagement and workforce development.
- Install air quality sensors to monitor progress toward air pollution reduction along major roadways.
- Create a dashboard to track and present local data.
- Meet state of California requirements for streamlined permitting.
- Encourage home and workplace charging.
- Support fleet transitions

IMPLEMENTATION

To plan cost-effective investments in ZEV infrastructure, factors such as the location of disadvantaged communities and high-traffic areas should be considered. When placing EV chargers, also consider proximity to amenities, housing density, parking availability, visibility, safety, and electrical service capacity. Other considerations include lighting, security, signage, and protective measures. Once installed, charging infrastructure, the vehicles that use it, renewable energy and battery storage can enhance grid resiliency.

While the upfront costs for installing alternative fuel infrastructure can be considerable funding opportunities (**Appendix A)** exist federally, through the state of California as well as locally through utilities, and air districts. Revenue can also be generated through charging for the use of EV chargers as well as Low Carbon Fuel Standard credits when charging is metered.

Regulations for transitioning to ZEV and alternative fuels can be found in **Appendix B** and on the California Energy Codes and Standards website. Local agencies can support the transition by enforcing and adopting codes and requirements for new construction, such as making more parking spaces "EV-ready" or "EV Capable", which can help reduce future infrastructure costs.

CHAPTER 1: ALTERNATIVE FUELS SUMMARY

This chapter provides an overview of different types of alternative transportation fuels and their method of delivery to the vehicle including electricity, hydrogen, propane, liquified, and compressed natural gas (LNG and CNG).

ELECTRICITY

Electricity remains the most prevalent alternative fuel for batteries in light duty vehicles such as cars and trucks but can also be used in medium to heavy-duty vehicles such as vans, buses, and trucks for goods movement. Electricity can be produced from many different sources: Combustion of natural gas, renewable natural gas, coal, and plant material (biomass) as well as solar, wind, hydro, geothermal energy, and nuclear power. Depending on the source and generation method of the electricity, it may be high carbon, low carbon, zero carbon, or carbon negative. Electric vehicles (EVs) recharge their batteries at charging stations as seen in **Figure 3**, which can be a simple wall outlet or a specialized charging station, known as Electric Vehicle Supply Equipment (EVSE) at home, work, or a public location.

FIGURE 3: EV CHARGING

LEVEL 2 EVSE

The most common type of EVSE is known as a Level 2 charger, though, technically speaking, the charger is on board the EV to convert Alternating Current (AC) power to Direct Current (DC) for storage in the EV's battery. In that sense, Level 2 EVSE is the electrical supply that powers an EV's on-board charger. In general, Level 2 EVSE supplies 220-240 Volts of alternating current (AC) and is usually capable of delivering 6-12 kW of power, though some Level 2 EVSE can deliver up to 19.2 kW when supplied by 100amp circuits. Level 2 EVSE can typically add between 15 and 40 miles of range to an electric vehicle per hour of charge, depending on the amperage of the circuit and the charging capabilities of the vehicle. As illustrated in **Figure 4**, there are two main connector types for Level 2 EVSE. The most common is the J1772 connector, which is compatible with all current plug-in vehicles (although Tesla vehicles need to use an adapter). The less typical, but often faster, connector is the Tesla connector (recently given the name North American Charging Standard, or NACS, by Tesla). This connector is currently only compatible with Tesla vehicles, and there is currently no approved adapter to connect a Tesla charger to a non-Tesla vehicle, however, many vehicle manufacturers have indicated that they will be adopting the NACS plug in 2025. It should be noted, that while most Tesla Destination chargers (the kind currently deployed locally) have Tesla connectors, the company has recently started producing and selling destination chargers with J1772 connectors.

FIGURE 4: LEVEL 2 CHARGING CONNECTORS

FIGURE 5: LEVEL 2 EVSE AT A RETAIL STORE IN STOCKTON, CA

Source: PlugShare

Given that an EV with a depleted battery requires several hours or even overnight to recharge, drivers typically use Level 2 chargers for the two most common charging applications—residential and workplace charging. Residential charging typically takes place overnight while the EV is parked at the driver's home. The residential charger generally belongs to the owner of the home or property in the case of rentals, though some renters may use available 240v or even 120v (Level 1) outlets to plug in their own charger. Workplace charging occurs at the EV driver's place of employment with the charger provided by the employer or property owner/manager. The relatively long nightly parking (dwell) time for residential charging or daily dwell time for workplace charging makes this practical and convenient, and Level 2 charging can be provided at relatively low costs for many applications.

Hotels, restaurants, and other local destinations may provide Level 2 chargers operated by commercial charging networks for public use as a customer amenity, often providing free or low-cost charging for patrons such as the one shown in **Figure 5**. Many models of networked or smart Level 2 chargers are available that can be managed to provide

scheduled or reserved charging, automated load management or demand response functionality to avoid charging during peak power demand periods reducing the cost of electricity.

DC FAST (LEVEL 3) CHARGERS

As previously discussed, EVs have on-board chargers capable of slowly converting AC power to DC for storage. An EV can be charged faster directly though DC using powerful chargers sometimes referred to as Level 3 or simply DC Fast Chargers, (DCFC). These operate on 400+ volts and are currently capable of between 25kW and 350kW power output. These chargers can add anywhere between 60 miles to 500+ miles of range per hour of charge depending on the power supply, charger rating and EV's acceptance rate.

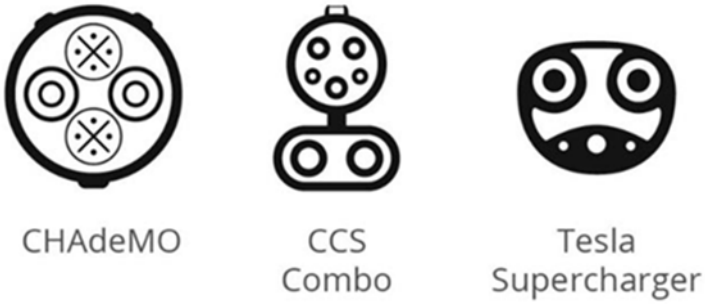


FIGURE 6: DCFC CONNECTORS

FIGURE 7: DCFC AT A RETAIL STORE IN TRACY, CA
Source: PlugShare

As illustrated in **Figure 6**, There are three main types of connectors associated with DC Fast chargers. The first, and oldest type of charging connector is the CHAdeMO connector. This connector was developed in Japan and is typically compatible with vehicles manufactured in Japan and some older European and North American EVs. Typically, CHAdeMO chargers operate at a maximum of 50 kW power. The second, and newest type of DCFC connector is the CCS COMBO connector (more commonly known as simply "CCS") consisting of AC connectors in the same pattern as the J1772 connector above two DC connectors. This connector was developed more recently in Europe and is compatible with most EVs produced in the past few years. (Newer Nissan models use CCS chargers, so CHAdeMO is expected to be replaced by CCS going forward.) CCS chargers deliver between 50kW to 350kW power output, making them capable of the fastest maximum charging speeds currently available to light duty EVs, depending on the vehicle being charged. It should be noted that lower capacity plug-in hybrid vehicles (PHEV) typically cannot use DCFC connectors. DCFC is the preferred charging technology for opportunity charging facilities serving travelers along freeway corridors and for the public when in need of a quick charge while performing short errands like shopping as illustrated in **Figure 7** and dining out. On a per-unit basis, DC Fast Chargers are far more expensive to purchase and install (including required

electrical service upgrades) than Level 2 chargers though they can charge far more EVs within the same amount of time. They are also more likely to incur demand charges from utilities and require more maintenance. Due to the higher capital and operations costs, users pay higher per-kWh charging costs in exchange for the convenience of much quicker charging speeds.

HIGH POWER DCFC

DC Fast Chargers that can deliver greater than 150 kW are considered "high power" chargers due to their ability to charge EVs at much faster rates than typical 50kW chargers commonly used for public EV charging. High power DC Fast Chargers have charging speeds ranging from 150 – 350kW, which allows a typical light-duty EV to charge to 80% in 35 minutes or less, depending on the EV's acceptance rate and charger's capability. With such rapid charging speeds, high power chargers are especially suitable for interregional travelers in need of a quick charge as well as for trucks and other heavy-duty EVs needing to charge large capacity batteries. For this reason, the National Electric Vehicle Infrastructure (NEVI) Formula Program requires that new chargers funded by the program will operate at a minimum of 150 kW. Since California's share from the NEVI Formula Program is estimated at $384 million over 5 years and significant additional discretionary Charging and Fueling Infrastructure (CFI) grant program funding will also be available, a major focus of this project will be planning for future high power charger deployment. Because of their much higher purchase and installation costs and power demands, it is generally more cost-effective to cluster high power chargers near major transportation corridors for convenient access.

TESLA DCFC/HIGH POWER CHARGERS

As with Level 2 chargers, Tesla has its own DCFC currently for exclusive use by Tesla vehicles. These use the same Tesla connector as on its Level 2 chargers shown previously. Tesla DCFC includes 72 kW "urban DC Fast chargers" as well as second (V2) and third (V3) generation high-power chargers branded as "Superchargers" that have maximum charging speeds up to 150 kW and 250 kW respectively. Many Tesla Superchargers are located within incorporated areas. As stated previously, Tesla has recently renamed their connector the North American Charging Standard (or NACS) and many vehicle manufacturers have indicated that they will be adopting the NACS plug in 2025.

MEGAWATT CHARGING SYSTEM (MCS)

An even more powerful charging standard called the Megawatt Charging System (MCS) is beginning to be deployed for the purpose of quickly charging medium and heavy duty EVs. CharIN, who also developed the popular Combined Charging System (CCS), is currently working on an MCS[1]. The proposed MCS would be rated to deliver up to 3.75 MW of direct current (DC) power and can be expected to become the worldwide standard charging system for medium- and heavy-duty commercial vehicles. The system, if established, could significantly reduce charging times to as little as 10-20 minutes, even for heavy-duty (Class 7 or 8) applications.

[1] Megawatt Charging System (MCS). https://www.charin.global/technology/mcs/ (accessed Aug. 04, 2022).

Heliox Energy, for example, has developed a 1 MW DCFC system, that allows for the charging of 6 vehicles simultaneously at varying power levels from 180 kW to 1 MW[2]. Heliox thus provides a high-end, future-proof charging solution that could become viable for medium- and heavy-duty fleets in the coming years. Such MW-level charging systems, however, require tremendous electrical capacity that is typically not present at any given site. Cost estimates are thus highly uncertain, but early future projects will provide more insight into the needs and issues associated with Megawatt-level charging.

HYDROGEN

Hydrogen can be used as a transportation fuel in cars, trucks, buses, material handling equipment, and emergency backup power systems. Most of the hydrogen in the United States is produced through a process called "steam-reforming" which uses high-temperature stream to extract hydrogen from natural gas[3]. This process produces what the industry refers to as "blue hydrogen". Hydrogen can also be produced using water and electricity in a process called electrolysis. While energy intensive, if renewable energy is used, carbon emissions will be avoided in its production and "green hydrogen" will be produced.

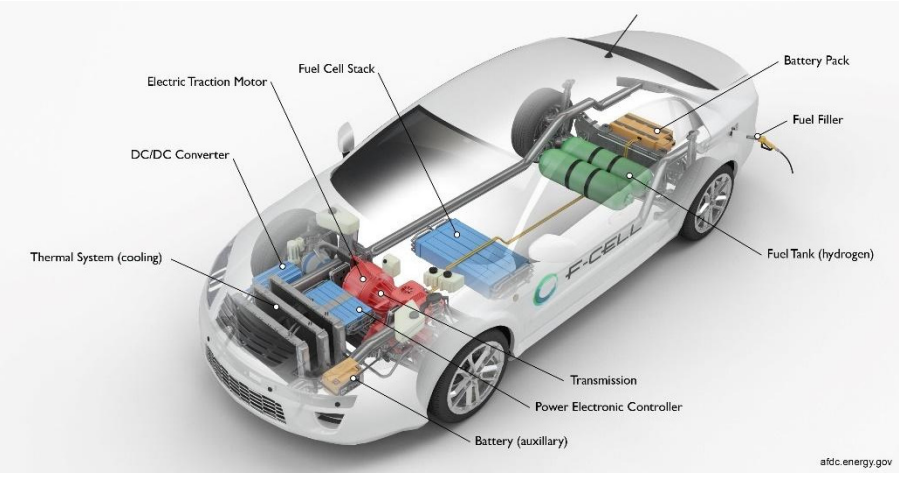


FIGURE 8: FUEL CELL ELECTRIC VEHICLE

Source: Alternative Fuels Data Center

Most hydrogen vehicles on the market today use fuel cells to convert hydrogen into electricity, technically making them electric vehicles. (**Figure 8**) For this reason they are referred to as Fuel Cell Electric Vehicles (FCEVs)[4]. While the carbon emissions associated with hydrogen will depend on its method of production, the vehicles using hydrogen as fuel only emit water vapor and warm air as exhaust. Most fuel cell vehicles use hydrogen as compressed gas, although bigger vehicles like ships and locomotives use liquid hydrogen. Hydrogen can also be used as a combustion fuel, however using hydrogen in this way is less efficient than in a fuel cell and produces tailpipe emissions. Vehicles fill their tanks at a hydrogen station or a dispenser at a station that sells several types of fuel.

[2] Megawatt Charging System (MCS) | Heliox. https://www.heliox-energy.com/megawatt-charging-system (accessed Aug. 04, 2022).

[3] Alternative Fuels Data Center, Department of Energy-Hydrogen Basics

[4] Alternative Fuels Data Center, Department of Energy-Fuel Cell Electric Vehicles

LIQUIFIED PETROLEUM GAS (LPG/PROPANE)

LPG, also known as "propane autogas" is an inexpensive, clean-burning alternative fuel for internal combustion engines. LPG has been used as a vehicle fuel for decades, mostly in buses, material handling equipment such as forklifts, and some cars and light trucks[5]. It is a byproduct from refining petroleum and has a significantly lower carbon footprint than gasoline and diesel. Renewable propane is a byproduct from the production of ethanol and biodiesel and can be carbon neutral or even carbon negative when its production prevents GHG emissions. Other tailpipe emissions are comparable to gasoline vehicles. LPG must be stored in pressurized tanks which are filled at LPG stations. While LPG has a higher octane than gasoline, it has a lower BTU (British Thermal Units) rating meaning it burns at a lower temperature. This results in more fuel being needed than a gasoline powered vehicle would require for the same driving distance[6].

FIGURE 9: NATURAL GAS FUELING STATION
Source: US Department of Energy

NATURAL GAS (LNG & CNG)

Natural gas is widely used in energy generation but can also be used as an alternative transportation fuel for combustion engines. Used mostly in trucks and buses; natural gas has fewer greenhouse gas emissions than gasoline and diesel. When made from renewable sources, like methane gas from landfills, wastewater treatment plants, and agricultural processes, it can be carbon negative.

Natural gas and renewable natural gas (called RNG) are sold as compressed gas (CNG) or as a liquid (LNG). LNG has a higher production and storage cost as it requires cryogenic tanks which limits its commercial use. Vehicles fill their tanks at an LNG or CNG station, which can be a stand-alone station[6] as seen in **Figure 9** or a dispenser at a station that sells several types of fuel. Although natural gas vehicles have been used for some time, only about two-tenths of 1% of natural gas in the United States is used as a transportation fuel[7].

GREEN HYDROGEN AND RENEWABLE NATURAL GAS PRODUCTION

Biogas can be a source of renewable natural gas (RNG) once processed to remove impurities. Biogas can also be "reformed" into hydrogen. Biogas comes from a variety of sources: landfills, digesters at wastewater treatment plants, livestock farms, food production facilities, and organic waste management operations. It's important that the biogas source is a large, consistent quantity. For example, seasonal crops are not a consistent quantity whereas manure from animal ranches can be more consistent.

[5] Alternative Fuels Data Center, Department of Energy-Propane Fuel Basics
[6] US Department of Energy, Alternative Fuels Data Center *Natural Gas Fuel Basics*
[7] Energy Information Administration

Current laws require that landfills and wastewater treatment plants contain their methane emissions. Some have waste-to-energy systems that capture the gas and burn it in a generator to produce electricity, which they then sell. Others "flare" the methane, burn it as it emerges from a pipe, which reduces GHGs by up to 98%. However, many of these collection systems leak methane. The Federal Government and State of California recently started research to quantify the leaking methane.

According to the U.S. EPA RNG project mapping tool, the RNG facilities closest to San Joaquin County are at the Altamont Landfill near Livermore and two dairy digesters in Ceres. The U.S. EPA's FLIGHT tool also displays data from large facilities that emit greenhouse gases. According to FLIGHT, potential sources of biogas for RNG and hydrogen in San Joaquin County are the Foothill Sanitary landfill, which produces 4.3MW of electricity by burning methane in generators. The North County Sanitary Landfill produces 93,473 metric tons of CO2 annually and has an active gas collection system that does not have excess capacity. Forward Landfill produces 104,480 metric tons of CO2 annually and has an active gas collection system with no excess capacity.

The California Air Resources Board (CARB) estimates that dairy and livestock produce half of California's methane emissions. Animal manure and urine is often directed to a lagoon; a large concrete basin that is exposed to the air. The waste eventually becomes a fluid. Microbes break down organic waste and create greenhouse gases like methane.

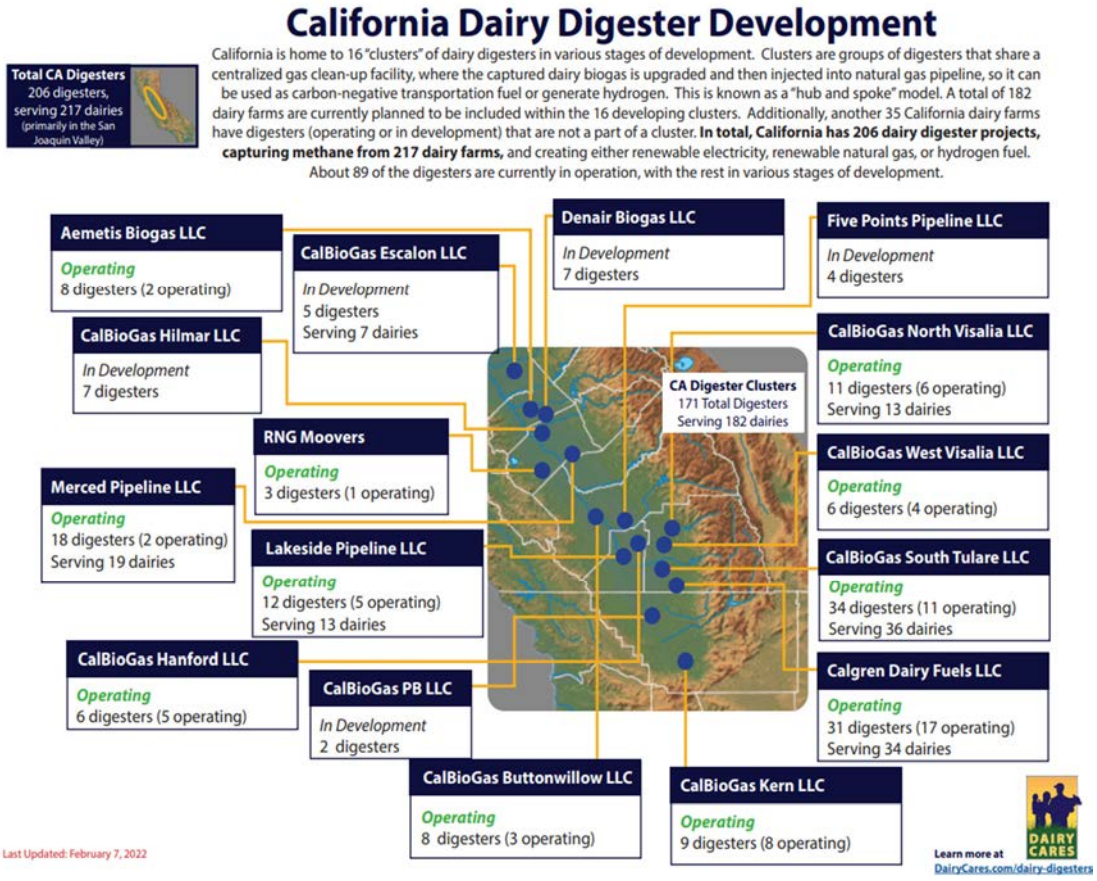


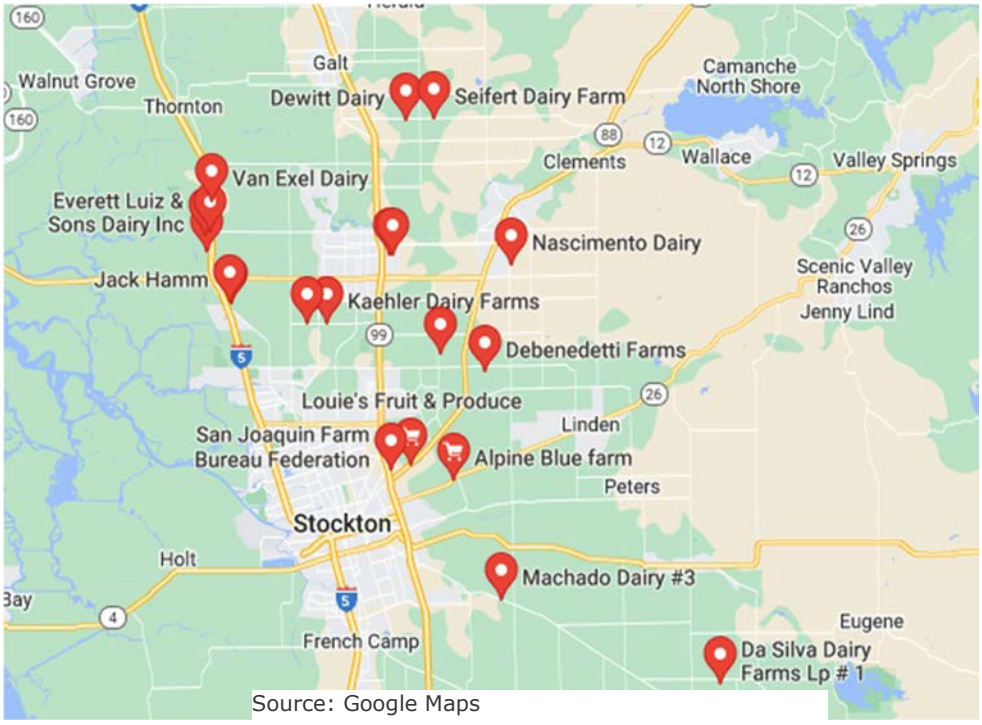
FIGURE 10: DAIRY CARES MAP OF DAIRY DIGESTERS IN CA

Source: Dairy Cares

Anaerobic digesters remove exposure to the air. The lagoon is covered, and the methane is trapped. As it accumulates, the gas is directed to a scrubber to remove the contaminates like sulfur, and the "upgraded" gas is directed to a pipeline. Most often, dairies are clustered so they can share a scrubber and connection to the pipeline. The Dairy Cares map[8] shown in **Figure 10**, shows the locations of the 217 dairy farms that have digesters. Most are in the San Joaquin Valley, but not in the county.

The California Department of Food and Agriculture (CDFA) administers a grant program to help dairies convert their lagoons to digesters. None of the dairies in San Joaquin County, shown in **Figure 9**, have been awarded a grant. CDFA does not release the names of applicants not awarded so it is unknown if any dairies in San Joaquin County have applied.

For natural gas generating facilities, The Northern California Power Alliance (NCPA) operates the Lodi Energy Center, a 225 MW facility at 12745 North Thornton Road.



Source: Google Maps

FIGURE 11. DAIRIES IN SAN JOAQUIN COUNTY

The California Energy Commission approved NPCA's two-phase plan to convert the plant from natural gas to a 45% blend of renewable hydrogen. NCPA proposes to produce hydrogen by electrolysis and store it as a liquid or in the natural gas pipeline. Because this project is in the early stages, it may be possible to coordinate with NCPA about producing hydrogen for an adjacent fueling station.

At the time of this writing, none of the companies that produce hydrogen or RNG have been approached about renewable fuel production in San Joaquin County but may be open to starting discussions with local methane producers.

[8] Dairy Cares Map-https://www.dairycares.com/_files/ugd/e8c369_b8e47af9d6e04bd4a417bb66f5825260.pdf

CHAPTER 2: EXISTING CONDITIONS SUMMARY

This section summarizes alternative fuel infrastructure available for the public within San Joaquin County and their location in relation to disadvantage populations.

ALTERNATIVE FUEL INFRASTRUCTURE LOCATIONS

Geographically, most existing EVSE are concentrated within the region's cities. EV Chargers can be found in far higher numbers than all other alternative fueling stations as seen in **Table 1** and **Figure 12**. Stockton has the largest number of EV chargers of any city in the study area; nearly 50% of total public chargers available county-wide. Lodi has the second most, and Manteca the third. Stockton and Lathrop both have the largest number of other alternative fueling stations at five each. This included CNG and LPG stations. There are currently a total of 24 publicly accessible EV chargers in unincorporated areas of San Joaquin County and no other alternative fueling stations. Ripon had the fewest number of chargers with only six and half as many other alternative fueling stations which include CNG and LPG. There were no Hydrogen fueling stations found in San Joaquin County.

ROUTES IN RELATION TO FUELING STATION LOCATIONS

According to the Alternative Fuels Data Center, there are currently a total of 201 publicly accessible EV chargers within one mile of freeway interchanges and highway access points within the study area. The majority of these existing public EV chargers, especially DC Fast chargers, are primarily clustered in commercial areas within the boundaries of incorporated cities. Public DC Fast chargers used by interregional travelers are generally located in publicly accessible parking lots close to retail and other amenities of potential interest to EV drivers. Most public Level 2 chargers are considered destination chargers (non-residential, non-workplace). These are typically located at public destinations such as retail centers, hotels, parks, or are co-located with DC Fast Chargers for use by drivers with more available time for charging.

Outside of inner-urban areas, public EV chargers are typically located along main travel corridors. A total of 84 Level 2 J1772 chargers and 6 Tesla chargers are located within one mile of state highways in San Joaquin County. Due to their ability to deliver electricity at a fast rate, DC Fast Chargers can usually be found in greater quantities near these traffic corridors where people are more likely to be traveling greater distances. San Joaquin County is no exception as 112 DC Fast Chargers can be found within one mile of state highways within the County: 22 being CCS, another 22 CHAdeMO with the greatest quantity being Tesla at 68.

SR 99 has the greatest number of Level 2 chargers with 31 J1772 and 1 Tesla, whereas I-5 has the greatest number of DC Fast Chargers with 30 (9 CCS, 9 CHAdeMO and 12 Tesla). I-205 has the second greatest number of DC Fast chargers with 24 but only four Level 2 chargers. SR 120 had the greatest number of Tesla fast chargers at 20 but zero CCS, CHAdeMO or J1772 chargers. State Routes 4, 12 and 88 have fewer than ten chargers each. State Routes 26, 33, 88 and I-580 had no chargers within one mile. **Table 2** includes a summary of chargers within one mile of state highways in San Joaquin County.

TABLE 1: EXISTING ALTERNATIVE FUEL STATIONS WITHIN SAN JOAQUIN CO. AND 5 MILE BUFFER

JURISDICTION	PUBLIC					PRIVATE	
	ELEC	CNG	LNG	RNG	LPG	ELEC	LPG
STOCKTON	133	1	-	-	3	36	-
LODI	47	-	-	-	1	-	-
MANTECA	38	-	-	-	1	-	-
TRACY	34	-	-	-	-	1	-
RIPON	6	2	-	-	1	-	-
LATHROP	8	2	2	1	-	-	-
UNINCORPORATED SAN JOAQUIN COUNTY	24	-	-	-	-	5	1
TOTAL SAN JOAQUIN COUNTY	**290**	**5**	**2**	**1**	**6**	**42**	**1**
SACRAMENTO CO	6	-	-	-	1	2	-
STANISLAUS CO	31	-	-	-	-	3	-
CONTRA COSTA CO	3	-	-	-	-	-	-
TOTAL 5-MILE BUFFER	**40**	**-**	**-**	**-**	**1**	**5**	**-**

Sources: Alternative Fuels Data Center (AFDC), PlugShare

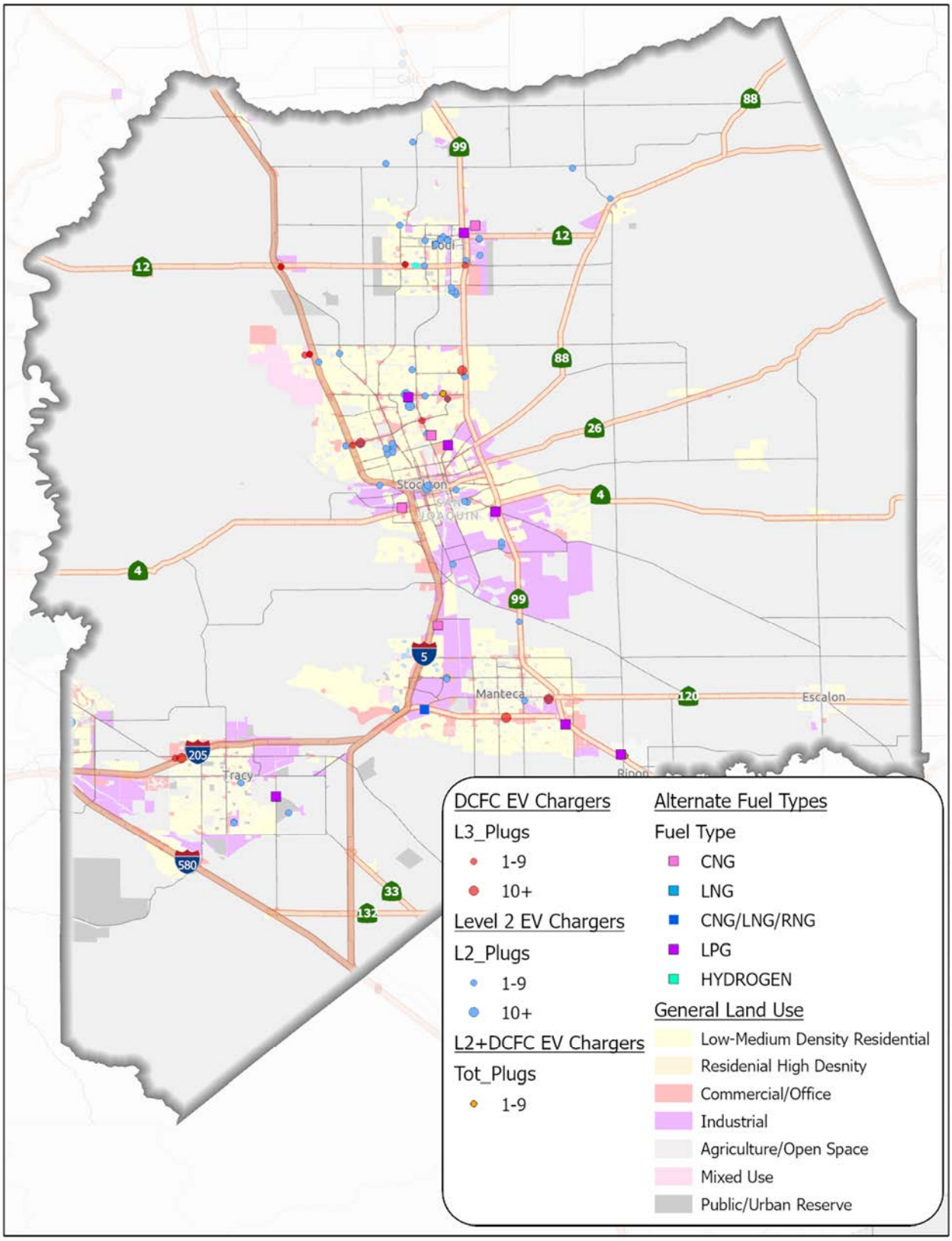


FIGURE 12: LOCATIONS OF ALTERNATIVE FUELING STATIONS WITHIN SAN JOAQUIN COUNTY

TABLE 2: EXISTING EV CHARGERS WITHIN SAN JOAQUIN COUNTY WITHIN 1 MILE OF STATE HIGHWAYS

PUBLIC CHARGERS WITHIN 1 MILE HIGHWAY BUFFER	LEVEL 2		DCFC			TOTAL
	J1772	TESLA	CCS	CHAdeMO	TESLA	
I-5	8	4	9	9	12	41
I-5 & SR 4	6	-	-	-	-	6
I-5 & SR 12	2	-	2	2	-	5
I-5 & SR 120	2	-	-	-	-	2
SR 99	31	1	4	4	12	51
SR 99 & SR 4	-	-	-	-	-	-
SR 99 & SR 12	18	-	1	1	-	20
SR 99 & SR 120	4	-	-	-	12	16
I-205	4	-	6	6	12	28
I-580	-	-	-	-	-	-
SR 4	1	-	-	-	-	1
SR 12	6	-	1	1	-	8
SR 12 & SR 88	-	1	-	-	-	1
SR 26	-	-	-	-	-	-
SR 33	-	-	-	-	-	-
SR 88	-	-	-	-	-	-
SR 120	2	-	-	-	20	22
TOTAL WITHIN 1 MILE BUFFER	**84**	**6**	**22**	**22**	**68**	**201**

Sources: Alternative Fuels Data Center, PlugShare

CHARGER TYPES

Level 2 chargers make up most existing chargers in San Joaquin County (**Table 3**). There are a total of 169 public chargers with J1772 ports and 13 Tesla Chargers. Within the 5-mile buffer around San Joaquin County, there are 19 public J1772 chargers and zero Tesla chargers. There are a total of 108 DC Fast Chargers within the county, the majority being Tesla at 68. Another 20 are CCS and another 20 are CHAdeMO. An additional 22 DC Fast chargers can be found in the 5-mile buffer around the county, the majority again being Tesla at 12, two being CCS and another five CHAdeMO.

TABLE 3: EXISTING EV CHARGERS WITHIN SAN JOAQUIN COUNTY & 5 MILE BUFFER BY TYPE

JURISDICTION	PUBLIC						PRIVATE	
	LEVEL 2		DCFC			TOTAL	LEVEL 2	TOTAL PUBLIC & PRIVATE
	J1772	TESLA	CCS	CHAdeMO	TESLA		J1772	
STOCKTON	89	4	8	9	24	133	36	169
LODI	41	2	2	2	-	47	-	47
MANTECA	6	-	-	-	32	38	-	38
TRACY	10	-	6	6	12	34	1	35
RIPON	2	-	2	2	-	6	-	6
LATHROP	5	2	1	-	-	8	-	8
UNINCORPORATED SAN JOAQUIN COUNTY	16	5	2	2	-	24	5	29
TOTAL SAN JOAQUIN COUNTY	**169**	**13**	**20**	**20**	**68**	**290**	**42**	**332**
SACRAMENTO CO	4	-	1	1	-	6	2	8
STANISLAUS CO	12	-	4	4	12	31	3	34
CONTRA COSTA CO	3	-	-	-	-	3	-	3
TOTAL 5-MILE BUFFER	**19**	**-**	**5**	**5**	**12**	**40**	**5**	**45**

CHARGING NETWORKS

Eight charging networks operate the 291 chargers within San Joaquin County which includes: ChargePoint, Tesla (including Tesla Destination), Shell Recharge Solutions (SRS, formerly Greenlots), EV Connect, SemaConnect, Electrify America, Blink and EVgo. Another 41 chargers within the county are non-networked meaning they essentially function like a 240v plug for an EV but do not have the capability of tracking usage or collecting payment. Of the 291 networked chargers in the county, Tesla chargers account for 83, meaning 208 chargers are usable for non-tesla vehicles. At the time of this writing, another 12 Tesla Superchargers are planned for later this year (2022) and four locations in 2022-2023 including Lodi, Lathrop, Tracy and Ripon.

Another 45 chargers are available in the 5-mile buffer around San Joaquin County, 12 of these being Tesla chargers. An additional 17 non-networked chargers are also available within this buffer. **Table 4** through **Table 6** includes summaries of existing EV chargers by network within San Joaquin County and the 5-mile buffer.

TABLE 4: NON-TESLA, NETWORKED EVSE WITHIN SAN JOAQUIN COUNTY AND 5-MI. BUFFER BY NETWORK PROVIDER

JURISDICTION	CHARGE POINT	SRS	EV CONNECT	SEMACONNECT	ELECTRIFY AMERICA	BLINK	EVGo	TOTAL
STOCKTON	26	43	34	2	8	7	-	120
LODI	28	-	2	1	-	-	-	31
MANTECA	6	-	-	-	-	-	-	6
TRACY	14	-	-	-	4	-	3	21
RIPON	-	-	6	-	-	-	-	6
LATHROP	3	-	3	-	-	-	-	6
UNINCORPORATED SAN JOAQUIN COUNTY	5	-	-	12	-	1	-	18
TOTAL SAN JOAQUIN COUNTY	**82**	**43**	**45**	**15**	**12**	**8**	**3**	**208**
SACRAMENTO CO	-	-	-	4	-	-	2	6
STANISLAUS CO	4	-	-	-	-	-	3	7
CONTRA COSTA CO	-	3	-	-	-	-	-	3
TOTAL 5 MILE BUFFER	**4**	**3**	**-**	**4**	**-**	**-**	**5**	**16**

Sources: Alternative Fuels Data Center (AFDC), PlugShare

TABLE 5: TESLA EVSE WITHIN SAN JOAQUIN COUNTY & 5-MI. BUFFER

JURISDICTION	TESLA	TESLA DESTINATION	TOTAL
STOCKTON	24	4	28
LODI	-	3	3
MANTECA	32	-	32
TRACY	12	-	12
RIPON	-	-	-
LATHROP	-	2	2
UNINCORPORATED SAN JOAQUIN COUNTY	-	6	6
TOTAL SAN JOAQUIN COUNTY	**68**	**15**	**83**
SACRAMENTO CO	-	4	4
STANISLAUS CO	12	-	12
CONTRA COSTA CO	-	-	-
TOTAL 5-MILE BUFFER	**12**	**4**	**16**

TABLE 6: NON-NETWORKED EVSE WITHIN SAN JOAQUIN COUNTY AND 5-MI. BUFFER

JURISDICTION	NON-NETWORKED
STOCKTON	21
LODI	13
MANTECA	-
TRACY	2
RIPON	-
LATHROP	-
UNINCORPORATED SAN JOAQUIN COUNTY	5
TOTAL SAN JOAQUIN COUNTY	**41**
SACRAMENTO CO	2
STANISLAUS CO	15
CONTRA COSTA CO	-
TOTAL 5-MILE BUFFER	**17**

CHAPTER 3: COMMUNITY ENGAGEMENT

As a part of developing the Alternative Fuels Vision Plan (AFVP) this project established a Technical Advisory Committee (TAC) and performed community outreach to community members and stakeholders about how this effort could be most effective.

This chapter summarizes the outreach efforts conducted for the SJCOG Alternative Fuels Vision Plan, a more in-depth report can be found in **Appendix C**. Outreach efforts began in July 2022 and are scheduled to be completed in 2023. Outreach efforts conducted to obtain input and feedback included:

- Stakeholder Meetings (4 meetings)
- TAC Meetings (2 meetings)
- Public Workshops (2 meetings)
- Social Pinpoint Site
- Stakeholder Survey

The following sections summarize the outreach conducted and the input received for each of these efforts.

STAKEHOLDER MEETINGS

The stakeholder list included relevant stakeholders within the study area. Four stakeholder meetings were conducted for this study on the following dates:

- June 30th, 2022
- August 16th, 2022
- August 17th, 2022
- October 3rd, 2022

JUNE 30TH, 2022: STAKEHOLDER MEETING #1

In June of 2022, the San Joaquin Council of Governments (SJCOG) held a kickoff meeting for the Alternative Fuels Vision Plan. The meeting aimed to gather industry-specific information and region-specific expertise from stakeholders. Of the 90 invited participants, 19 attended the virtual meeting, and included individuals from various organizations and agencies involved in fleet services, transportation, and environmental initiatives representing organizations including Caltrans, Catholic Charities Diocese of Stockton, the California Office of Planning and Research, and electric vehicle charging companies.

The meeting consisted of a three-part presentation to inform stakeholders about the current conditions, analysis, recommendations, funding, and implementation strategies related to alternative fuels.

During the stakeholder discussion, participants highlighted the value of learning from others' experiences, focusing on equity issues in different communities, and the importance of structured meetings with clear action items. Major themes discussed during the meeting included the

involvement of gas station and truck stop stakeholders in future meetings to facilitate the development of charging infrastructure. Participants also raised the accessibility of existing electric vehicle charging stations as a concern, noting some chargers were located on private property and not accessible to the public. The need for equity in outreach and installation of charging stations in various areas of the San Joaquin region was also emphasized. Participants made suggestions for utilizing warehouses and multifamily housing units for charging stations, as well as implementing signs on state highways to direct drivers to charging stations.

The next steps included stakeholders reviewing the presentation and providing additional questions or insights. Stakeholders were also invited to a second meeting and potential smaller industry-specific stakeholder meetings in the future.

AUGUST 16TH & 17TH, 2022: STAKEHOLDER MEETINGS 1&2-PRIVATE AND PUBLIC FLEETS

On August 16th and 17th, 2022, virtual stakeholder meetings took place for public and private fleet stakeholders operating within San Joaquin County. The purpose of the meeting included introducing the proposed SJCOG Alternative Fuels Vision Plan and gathering feedback on existing conditions. Representatives from various organizations attended the meeting, including Caltrans, the City of Tracy, San Joaquin County, the City of Stockton, the consultant team, and SJCOG.

Attendees received a six-part presentation about the Alternative Fuels Vision Plan, which covered the project's vision, goals, regulatory landscape for Zero Emission Vehicles (ZEV) and Alternative Fuel Vehicles (AFV) in California, and the existing conditions for ZEV and AFV infrastructure in San Joaquin County. The meeting aimed to initiate a discussion with stakeholders to gather their initial thoughts and ideas on the plan and how it should be developed to achieve its objectives.

The attendees were asked three key questions during these meetings:

1. The steps taken by the companies or agencies to shift towards alternative fuel vehicles, or any implementation plans in progress.
2. The barriers perceived by companies or agencies in adopting alternative fuel vehicles.
3. The ZEV infrastructure is required to promote alternative fuel vehicle adoption, locations with the most need, and the expected timeline.

While only a small number of attendees joined these meetings one stakeholder, Kevin Myose (County of San Joaquin Fleet Manager), provided valuable responses which have been summarized below:

The County of San Joaquin has been actively incorporating alternative fuel vehicles into its fleet, including Chevy Volts, small construction equipment, and a utility task vehicle. At the time of this meeting, they had 27 Level 2 chargers and 10 Level 1 chargers. With almost $2 million in funding from grants, they have heavily invested in alternative fuel vehicles and charging infrastructure.

Kevin noted that installing Level 2 chargers presented challenges due to the need for a transformer and power shutdown, but most construction costs were covered by grants. The current charging infrastructure is limited to fleet vehicles and not accessible to the public, but SJCOG and its member agencies may consider providing public charging options to meet grant requirements.

One of the barriers for wider adoption of alternative fuel vehicles Kevin noted, is that some fleet vehicles do not have viable alternative options, and the initial cost of alternative fuel vehicles can be

four times higher than traditional combustion engine vehicles. However, the successful adoption of renewable diesel in 2015 demonstrates the potential for easier implementation.

Kevin suggested that having more charging infrastructure available would encourage the public to purchase alternative fuel vehicles. He observed that employees' acceptance of alternative fuel vehicles increased when they used them for work, leading to personal purchases. To promote adoption, a suitable location would be a space with both fleet and employee charging, such as the AG center and public works for San Joaquin County. Providing charging infrastructure at work is believed to be the best way to encourage employees to adopt alternative fuel vehicles.

The meeting concluded with next steps for the SJCOG Alternative Fuels Vision Plan, which included further stakeholder engagement, soliciting additional feedback through surveys and interactive tools, and providing updates through the project website.

OCTOBER 3, 2022: HYDROGEN FUEL CELL WEBINAR

On October 3, 2022, Chris White from Frontier Energy and David Park presented a Hydrogen Fuel Cell Webinar to various stakeholders, including representatives from different organizations and agencies. A total of 44 individuals were invited, and 29 participants attended the webinar. The presentation aimed to introduce attendees to hydrogen fuel cell technology, emphasize the benefits of using hydrogen fuels, discuss funding opportunities, and explore the National Hydrogen Mobility Strategy. The intention of the webinar was more informational and did not include gathering feedback from attendees.

TAC MEETINGS

Two Technical Advisory Committee (TAC) meetings were held on June 24, 2022, and August 24, 2022, for the Alternative Fuel Vision Plan. Over 50 stakeholders from various organizations were invited, including electric vehicle charging companies, local jurisdictions, non-governmental organizations, regional and state government agencies, tribes, and trucking companies. Overall, the TAC meetings aimed to gather input from stakeholders and address their questions and concerns related to the Alternative Fuels Vision Plan.

During the TAC meetings, stakeholders were presented with a three-part presentation covering existing conditions related to travel behavior, alternative fueling infrastructure, and socioeconomic conditions. The presentation also included analysis and recommendations regarding potential strengths, opportunities, and barriers, as well as proposals for publicly owned EV chargers and alternative fuel stations. Funding sources, incentive programs, and an implementation strategy were also discussed.

Major themes that emerged during the TAC meetings included a discussion about the priorities of the study, specifically whether the focus was primarily on electric vehicles or also included other alternative fuel types like compressed fuel and renewable natural gas. Participants were also curious about the types of charging technologies that would be discussed in the vision plan, such as inductive charging and charging technology built into roadway infrastructure. Another topic of discussion was the location of charging infrastructure and whether the plan would recommend chargers in the public right of way or at private facilities and new developments.

PUBLIC WORKSHOP

Two public workshops for this study to update the public on the project's development and gather public input took place on August 30, 2022, and on December 7, 2022.

The August workshop was held both in person at the SJCOG Board Room office and virtually. Three participants attended in person, and ten attended virtually. The purpose of this workshop included introducing the community to the study, project team, project partners, and to provide an overview of the project goals, baseline existing conditions analysis, constraints, opportunities, and community outreach efforts. A Q&A session followed the presentation.

The December public workshop was conducted as a virtual online event. The primary goal for the workshop was to provide an additional opportunity for the community to ask questions. Attendees were presented the project goals, baseline conditions analysis, potential recommendations, funding opportunities, and next steps of the project, followed by a question-and-answer session. In both workshops, participants were encouraged to use the interactive social pinpoint comment map to highlight areas within San Joaquin County that need charging infrastructure.

Regarding public feedback, the Tracy Bike Life Group expressed the need for charging stations for electric bikes used during their group rides. Some Tribal Communities mentioned that they have charging stations, but they lack the necessary transformers for their vehicles. Participants suggested considering solar power in areas without grid support. A lead sales engineer raised challenges for alternative fuel sources, especially for apartment complexes adopting electric vehicle charges.

PROJECT WEBSITE

A project specific website (https://www.sjcog.org/615/Alternative-Fuels-Vision-Plan) shared the project overview, key objectives, project related documents, and a link to the social pinpoint comment map during the development of the Alternative Fuels Vision Plan. **Figure 13** shows a screenshot of the project website.

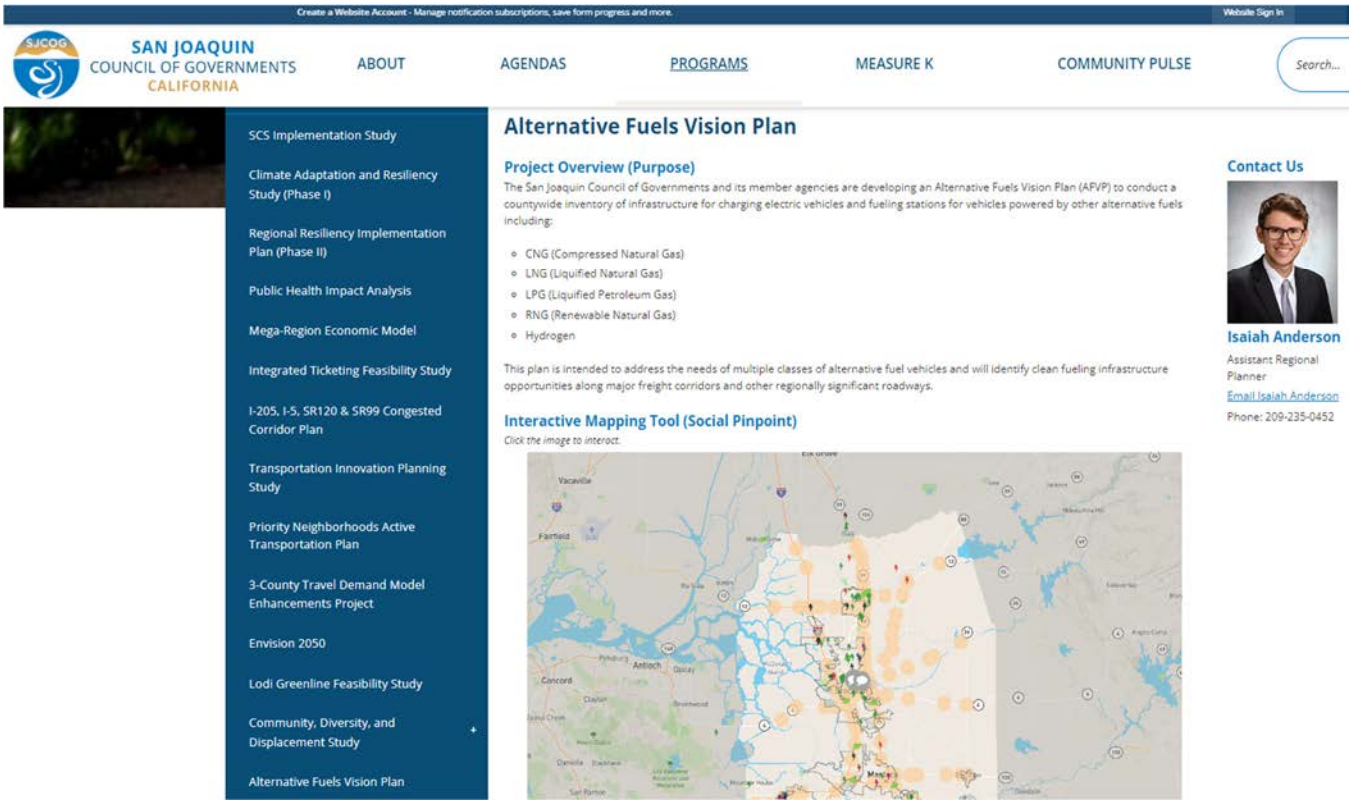


FIGURE 13: PROJECT WEBSITE

SOCIAL PINPOINT

Social Pinpoint, a digital engagement platform, informed the SJCOG AFVP by providing a platform to collect feedback from stakeholders and the public. The website launched in February of 2022, and remained open for comments until November of 2022. Over 500 participants visited the site, with 25 comments submitted on the interactive map (**Figure 14**). Users could provide location-specific comments and express their preferences through "like" or "dislike" for others' comments.

The comments received suggested various locations that needed charging infrastructure, including hospitals, high schools, libraries, city halls, and shopping malls. Specific suggestions for charger locations were also provided, such as airports, areas with restaurants, and colleges. The feedback highlighted the importance of considering chargers in places where large groups gather, and amenities are available for drivers during charging.

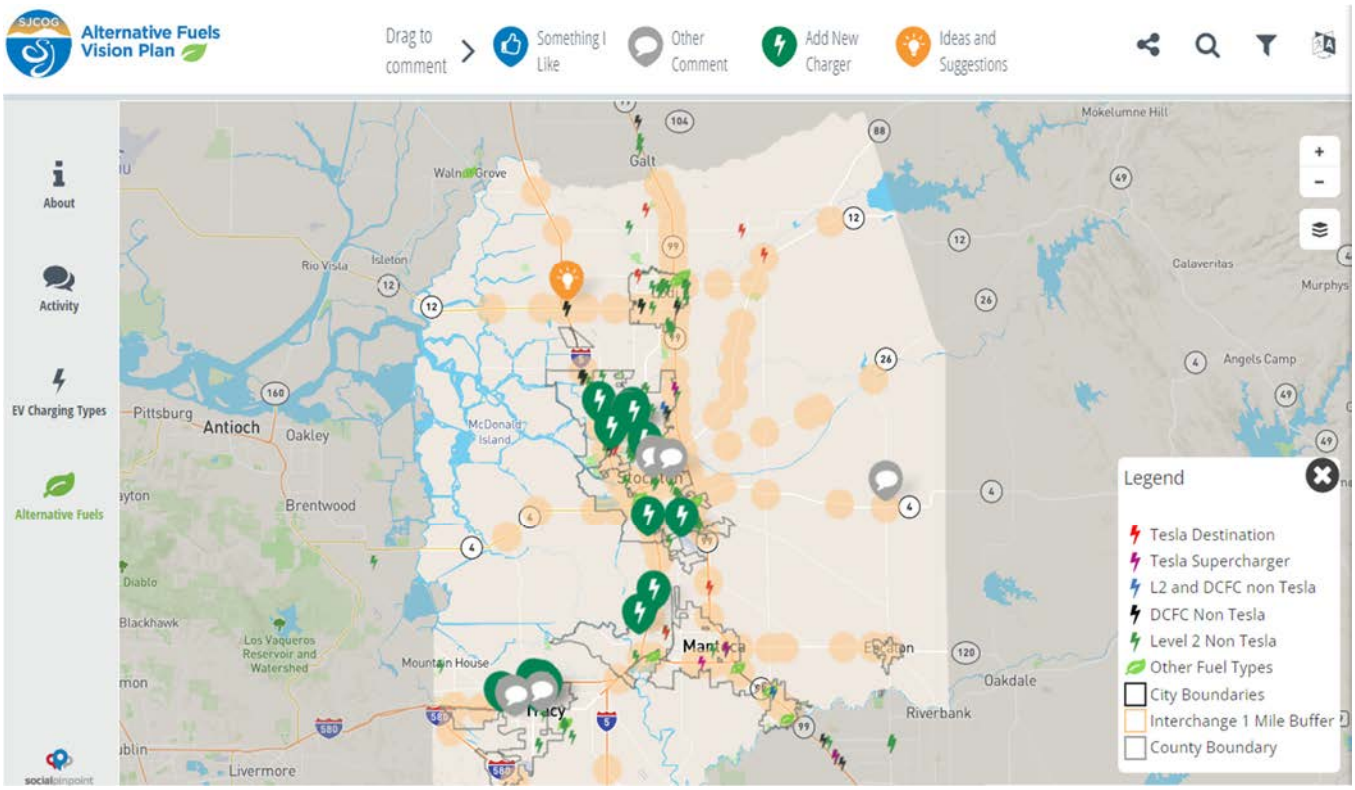


FIGURE 14: SCREENSHOT OF SJCOG SOCIAL PINPOINT SITE

The comments received suggested various locations that needed charging infrastructure, including hospitals, high schools, libraries, city halls, and shopping malls. Specific suggestions for charger locations were also provided, such as airports, areas with restaurants, and colleges. The feedback highlighted the importance of considering chargers in places where large groups gather, and amenities are available for drivers during charging.

Some comments also discussed existing chargers and the availability of alternative fuels in the area. For example, one comment mentioned the availability of E85 at a Shell station, while another highlighted the City of Lodi's upgrade to Level II ChargePoint EV stations. A full list of comment received can be found in **Appendix C**. Overall, the public feedback collected provided valuable insights into the need for charging infrastructure in various locations and indicated the community's interest in expanding EV accessibility in the region.

CHAPTER 4: ADDRESSING EQUITY

OVERVIEW

Social equity plays a crucial role in the Alternative Fuels Vision Plan, which aims to offer alternative fuel options to geographically underserved areas as well as socioeconomically underserved populations. Throughout the community engagement efforts conducted during the development of this plan, participants highlighted the need to ensure equity is a key consideration. A full report on community engagement for this project can be found in **Appendix 3**.

Commercial companies and EV charging networks have implemented the majority of publicly accessible alternative fueling infrastructure that exists today, primarily concentrating them in areas of high demand, with retail and other commercial activities and typically in cities. Tesla stands out as the dominant network in San Joaquin County, with ChargePoint being the second.

Unfortunately, these areas often do not overlap with disadvantaged communities. **Chapter 2** illustrates even more limited access to other alternative fueling stations in San Joaquin County and in the case of hydrogen, no access at all. This chapter will go beyond simple geograpic access and focus specifically on serving disadvantaged communities, residents of multifamily housing, and drivers without home charging in San Joaquin County.

AIR QUALITY IMPACTS

During the first shelter-in-place order in the nation due to the COVID-19 Pandemic, a study by UC Berkeley using carbon dioxide sensors across the Bay Area observed a 25% drop in carbon dioxide emissions due to a reduction in road traffic of nearly 50% as seen in **Figure 15** and **Figure 16**[9].

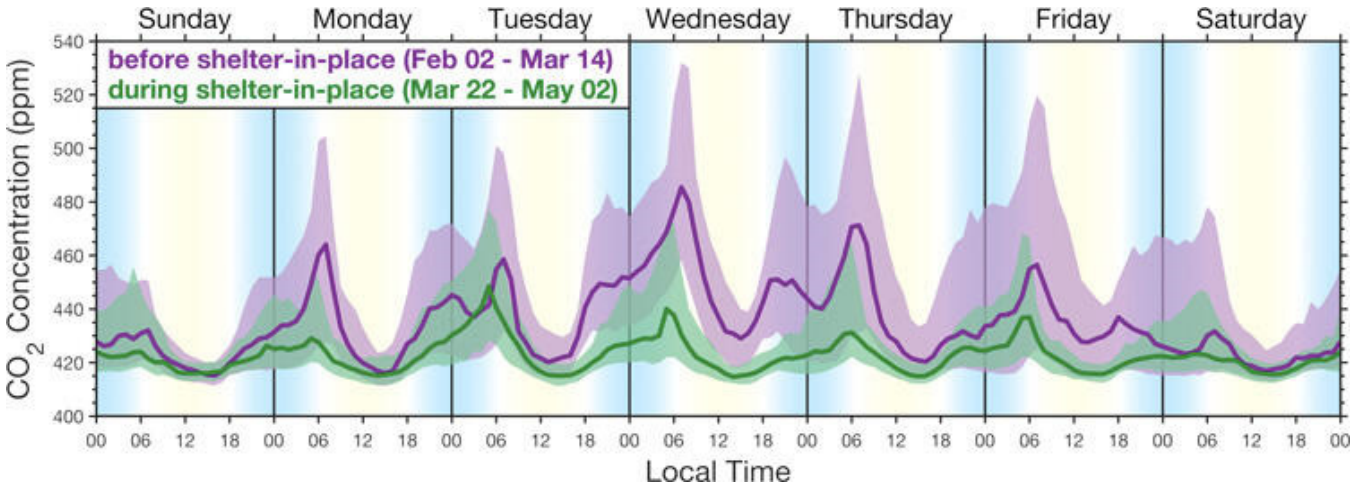


FIGURE 15: CO2 REDUCTION DURING COVID-19 SHELTER IN PLACE ORDER

Source: https://chemistry.berkeley.edu/news/drop-co2-emissions-during-pandemic-previews-world-electric-vehicles

[9] https://chemistry.berkeley.edu/news/drop-co2-emissions-during-pandemic-previews-world-electric-vehicles

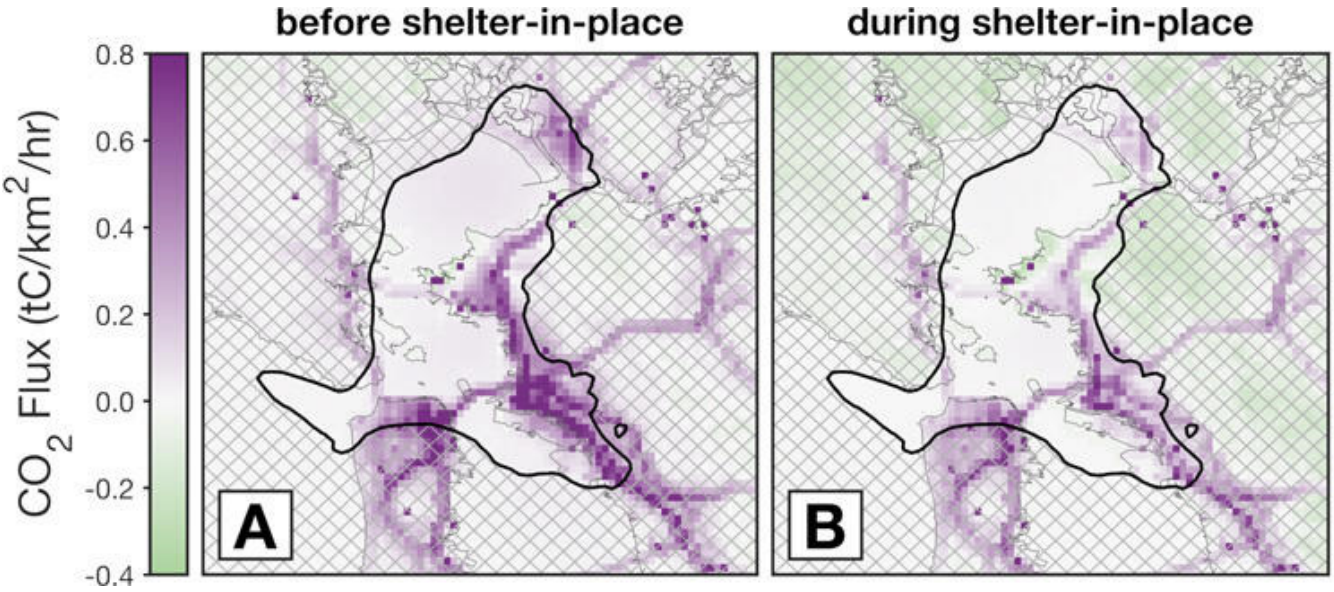


FIGURE 16: CO2 REDUCTION ALONG FREEWAYS DURING THE COVID-19 SHELTER IN PLACE ORDER

Source: https://chemistry.berkeley.edu/news/drop-co2-emissions-during-pandemic-previews-world-electric-vehicles

The author of the study, Ronald Cohen, drew a comparison between the reduced CO_2 levels observed and electric vehicles stating, "This is what it would look like for CO_2, if we electrified the vehicle fleet,"[5]. The study further noted the Environmental Justice (EJ) implications as low-income communities often experience the worst air quality due to the proximity of freeways and other polluting industries.

The existing conditions analysis found in **Chapter 2** of this report, includes a map of existing charging and alternative fuel stations, Justice40 designations that identify disadvantaged communities underserved and overburdened by pollution, and CalEnviroScreen which provides quantification of pollution burdens. As shown in **Figure 17**, much of San Joaquin falls within either CalEnviroScreen, Justice40, or both indicating the extent that disadvantaged communities have been overburdened by pollution in San Joaquin County. While the population centers of these areas do have charging and alternative fuel stations, much of the geographic area of disadvantaged communities do not.

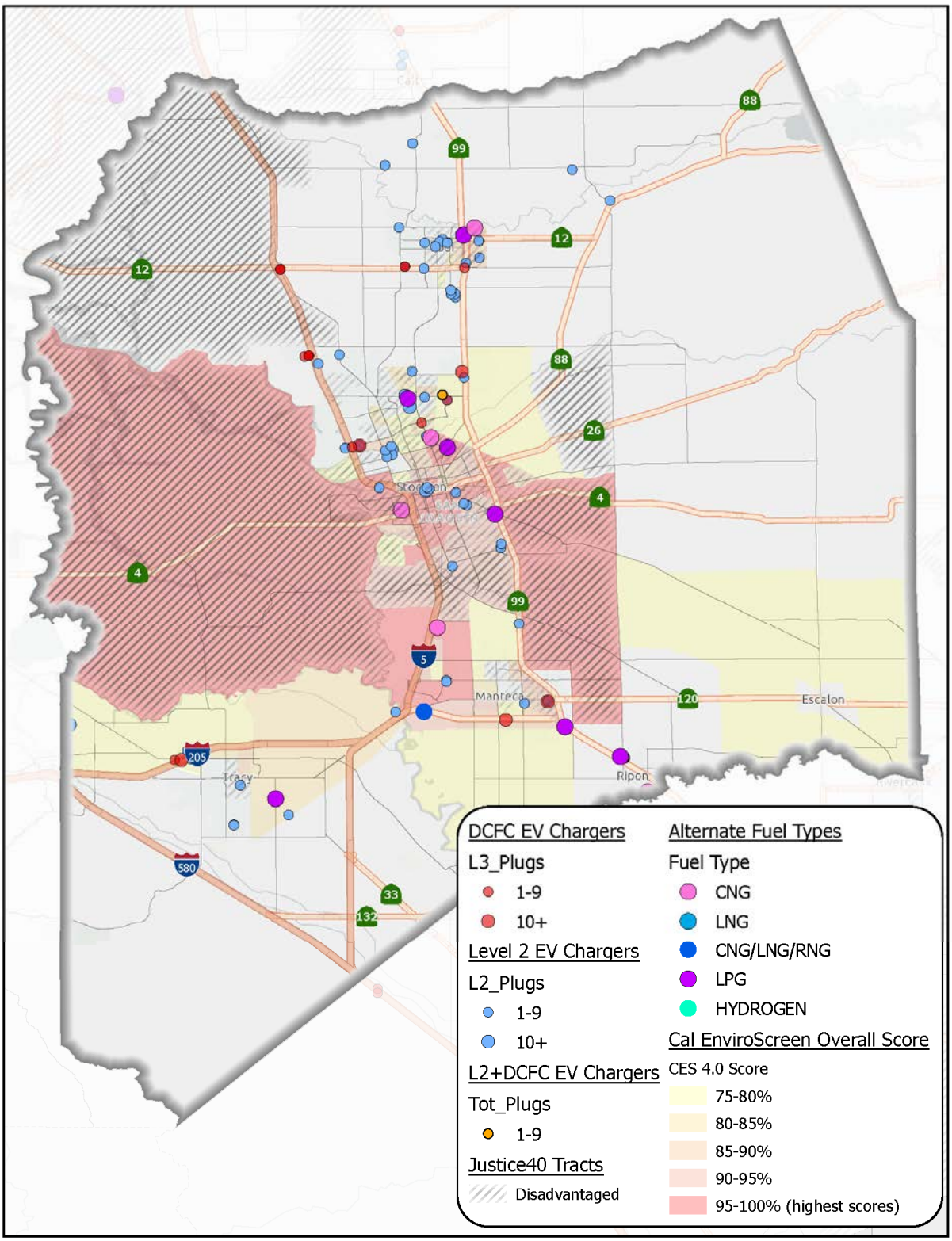


FIGURE 17: EXISTING ALTERNATIVE FUEL STATION LOCATIONS WITH JUSTICE40 AND CALENVIROSCREEN OVERLAY

EXISTING INFRASTRUCTURE FOR MULTIFAMILY & DISADVANTAGED COMMUNITIES

Given that high EV demand is the most influential factor when siting commercial charging infrastructure, disadvantaged communities have not typically been well served. The following provides an overview of the tools used to identify these communities in this report.

CALENVIROSCREEN AND JUSTICE 40

One way to evaluate baseline conditions is to compare existing charger locations with the geographic distribution of disadvantaged communities (DACs). The Department of Housing and Community Development designates census tracts in California with median household incomes at or below the threshold designated as low income or at or below 80 percent of the statewide median income as low-income communities. The following tools have been used to geographically identify disadvantaged communities in San Joaquin County:

- **CalEnviroScreen (CES)**: A tool developed and maintained by California's Office of Environmental Health Hazard Assessment (OEHHA) on behalf of the California Environmental Protection Agency (CalEPA), providing the public with a transparent assessment of pollution burdens and environmental and health vulnerabilities across California. It provides a relative (not absolute) quantification of pollution exposure and its impacts, as well as data on health and socioeconomic status, at a census tract level. The tool is now (since October 2021) available in Version 4.0.

- **Justice40**: The Justice40 Initiative was created by the Biden Administration to help deliver the benefits of federal investments in climate and clean energy to disadvantaged communities. As part of the initiative, the Climate and Economic Justice Screening Tool (CEJST) was released, which aims to identify DACs where residents are underserved and overburdened by pollution. Like CES, the tool uses census tracts for geographic granularity. The Justice40 framework provides a state-independent look at the spatial distribution of marginalized and disadvantaged communities.

- **Overlay of CalEnviroScreen and Justice40**: The overlay of areas identified by the two utilized tools as disadvantaged communities allow for a more comprehensive understanding of the spatial distribution of DACs. In doing so, the likelihood of dismissing an area identified as disadvantaged by either of the two tools can be minimized and thus capture the study area's DACs to a better extent.

As shown in **Figure 18 and Table 7** and **Table 8** nearly half the county falls into one or more of these DACs. However, simply installing more EVSE within these communities won't address the changing needs of disadvantaged drivers. While mapping DACs and existing charger locations provides important context for planning by identifying disparities, care should also be taken to meet this population where they are by installing chargers in locations frequented by these drivers.

TABLE 7: EXISTING EVSE WITHIN DISADVANTAGED COMMUNITIES IN SAN JOAQUIN COUNTY (PER CALENVIROSCREEN, HIGHEST % IS MOST VULNERABLE)

JURISDICTION	75-80%	80-85%	85-90%	90-95%	95-100%	TOTAL DAC	% OF TOTAL EVSE
STOCKTON	58	1	21	13	33	126	75%
LODI	-	-	14	-	-	14	30%
MANTECA	-	-	22	16	-	38	100%
TRACY	29	-	-	-	-	29	83%
RIPON	-	-	-	-	-	-	0%
LATHROP	-	2	-	1	5	8	100%
UNINCORPORATED SAN JOAQUIN COUNTY	14	5	-	-	-	19	66%
TOTAL SAN JOAQUIN COUNTY	**101**	**8**	**57**	**30**	**38**	**234**	**70%**

Sources: Alternative Fuels Data Center, PlugShare, CalEnviroScreen

TABLE 8: EXISTING EVSE WITHIN DISADVANTAGED COMMUNITIES IN SAN JOAQUIN COUNTY (PER JUSTICE40 AND CES)

JURISDICTION	CES 75%+	JUSTICE 40	BOTH	NEITHER	TOTAL
STOCKTON	126	94	92	41	126
LODI	14	14	14	33	14
MANTECA	38	18	18	-	38
TRACY	29	2	-	4	29
RIPON	-	-	-	6	-
LATHROP	8	-	-	-	8
UNINCORPORATED SAN JOAQUIN COUNTY	19	-	-	10	19
TOTAL SAN JOAQUIN COUNTY	**234**	**128**	**124**	**94**	**234**

Sources: Alternative Fuels Data Center, PlugShare, CalEnviroScreen and Justice 40

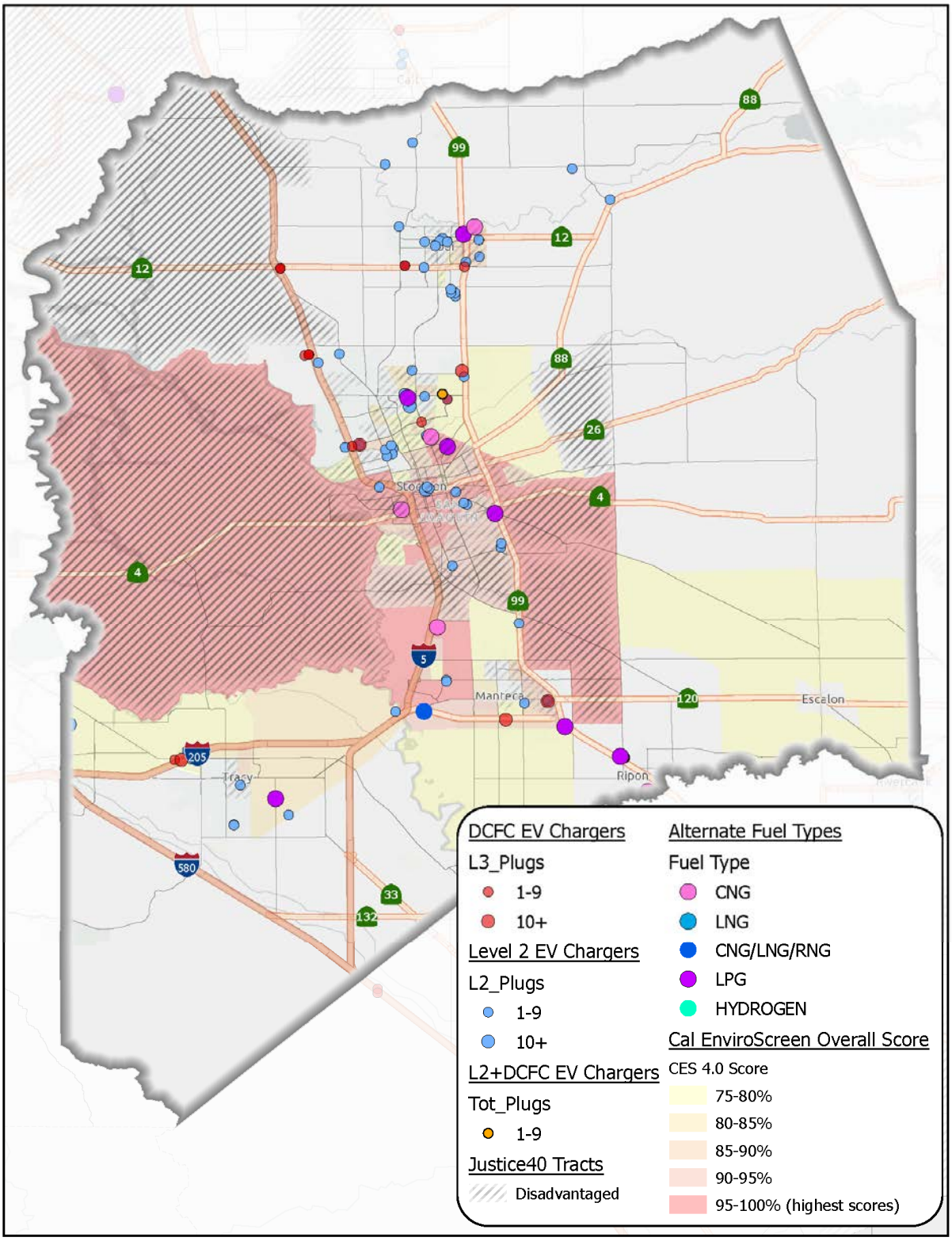


FIGURE 18: EXISTING ALTERNATIVE FUEL STATION LOCATIONS WITH JUSTICE40 AND CALENVIROSCREEN OVERLAY

Sources: Alternative Fuels Data Center, PlugShare, CalEnviroScreen and Justice 40

EXISTING EV CHARGING IN PROXIMITY TO MULTIFAMILY HOUSING

As illustrated by **Figure 19**, **Figure 20**, **Table 9** and **Table 10**, the cities of Lodi, Stockton, and Manteca stand out as having the highest concentration of multifamily households and population. In Stockton, multifamily housing accounts for 23% of the households and 17% of the population. In Lodi, multifamily housing accounts for 29% of households and 26% of the population, and in Manteca, multifamily housing accounts for 20% of households and 18% of the population. Countywide, multifamily housing accounts for 21% of total households and 16% of total population.

More than half of the multifamily households in Stockton are in disadvantaged communities per both CalEnviroScreen and Justice40. About 80% of the multifamily households in Lodi fall in either a CalEnviroScreen or Justice40 disadvantaged community, and about one-third are in both. In Manteca, about a quarter of the multifamily households are in both CalEnviroScreen and Justice40 identified disadvantaged communities. Countywide, over 50% of households and population fall within either CalEnviroScreen or Justice40 identified disadvantaged communities, while just under 40% of households fall within areas identified as both CalEnviroScreen and Justice40 identified disadvantaged communities.

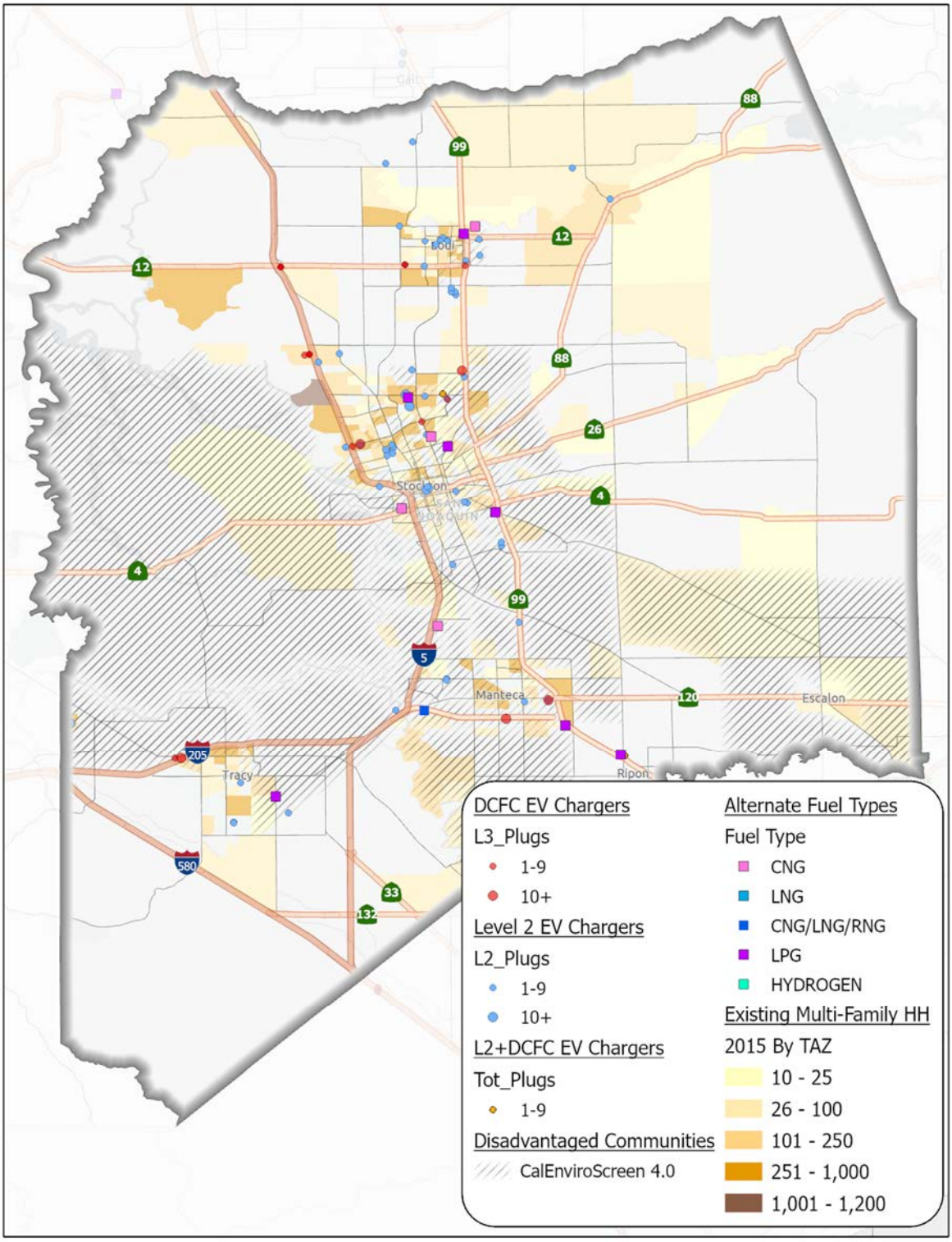


FIGURE 19: EXISTING ALTERNATIVE FUEL STATION LOCATIONS WITH MULTFAMILY HOUSING AND CALENVIROSCREEN 4.0 OVERLAYS

Sources: Alternative Fuels Data Center, PlugShare, CalEnviroScreen, San Joaquin Valley Model Improvement Plan, Phase 2 (VMIP2)

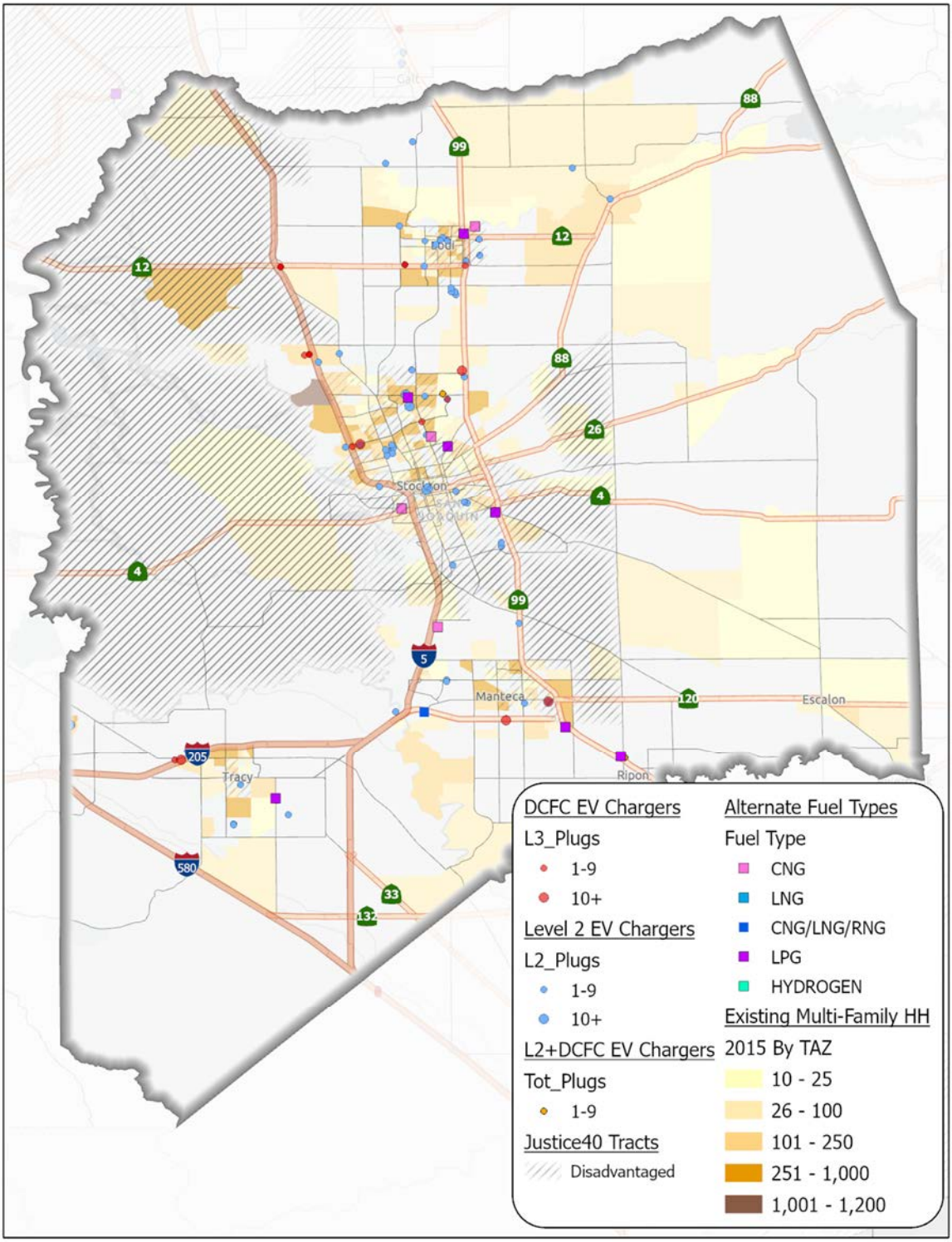


FIGURE 20: EXISTING ALTERNATIVE FUEL STATION LOCATIONS WITH MULTFAMILY HOUSING AND JUSTICE40 OVERLAYS

Sources: Alternative Fuels Data Center, PlugShare, Justice40, San Joaquin Valley Model Improvement Plan, Phase 2 (VMIP2)

TABLE 9: EXISTING MULTI-UNIT DWELLINGS (MUD) WITHIN DISADVANTAGED COMMUNITIES IN SAN JOAQUIN COUNTY (PER CALENVIROSCREEN AND JUSTICE40)

CITY	Multi-Unit Households				
	MUD HH	% of Total HH	CES 4.0	Justice 40	CES 4.0 +J40
Stockton	24,851	23%	16,217	18,432	13,779
Lodi	6,570	29%	1,977	3,441	1,977
Manteca	4,740	20%	3,246	1,744	1,520
Tracy	3,908	16%	1,840	0	0
Lathrop	351	6%	351	0	0
Escalon	260	11%	0	0	0
Unincorporated	4,130	14%	1,416	785	250
TOTAL SAN JOAQUIN COUNTY	**44,811**	**21%**	**25,046**	**24,403**	**17,525**
Percent of Total			**56%**	**54%**	**39%**

TABLE 10: EXISTING MULTI-UNIT POPULATION WITHIN DISADVANTAGED COMMUNITIES IN SAN JOAQUIN COUNTY (PER CALENVIROSCREEN AND JUSTICE40)

CITY	Multi-Unit Population				
	MUD Pop	% of Total Pop	CES 4.0	Justice 40	CES 4.0 +J40
Stockton	46,862	17%	29,760	34,125	24,832
Lodi	14,450	26%	4,347	7,569	4,347
Manteca	11,998	18%	8,207	4,397	3,826
Tracy	9,917	14%	4,669	0	0
Lathrop	890	6%	890	0	0
Escalon	573	9%	0	0	0
Unincorporated	9,175	12%	3,405	1,728	550
TOTAL SAN JOAQUIN COUNTY	**93,866**	**16%**	**51,279**	**47,818**	**33,555**
Percent of Total			**55%**	**51%**	**36%**

BARRIERS

As SJCOG and its member agencies work toward supporting the transition to electric vehicles and other alternative fuels, barriers will need to be addressed to achieve an equitable transition. The following section will detail the following barriers:

- The high up-front costs associated with purchasing electric vehicles
- A lack of charging infrastructure in disadvantaged areas
- Concerns about limited driving range
- Limited awareness about electric vehicles
- Potential impacts on public transit
- A lack of charging access for multifamily housing

HIGH UP-FRONT COSTS

In comparison with gasoline vehicles, the initial investment required to buy an electric or other zero-emission vehicle remains relatively high. This presents a notable barrier to widespread adoption, particularly for individuals and families with limited financial resources. Despite gradual price reductions in EVs, many households still find them financially unattainable. While incentives such as rebates, tax credits, and free parking or charging can be effective in encouraging EV adoption, not all communities offer these incentives. Without financial incentives, adoption may be slower, and low-income households may be unable to access the benefits of owning an EV. The cost to purchase and install an EV charger, even when an individual owns their home can also be a barrier. Limited incentives or subsidies exacerbate these cost barriers as does access to financing which can often be more difficult for low- and moderate-income households to obtain.

ACCESS TO CHARGING INFRASTRUCTURE

The existing conditions analysis and the community engagement completed for the AFV plan revealed inequities around access to electric vehicles as well as charging infrastructure. Community members and stakeholders seem to share the sentiment that limited access to charging disproportionately affects low-income communities and multifamily housing, contributing to transportation disparities. Findings from the existing conditions analysis also support this. Suggestions to resolve this included strategically locating chargers in public spaces, although concerns about affordability and maintenance also arose.

RANGE ANXIETY

Range anxiety, particularly in regions with limited or absent charging infrastructure, creates hesitancy among prospective buyers when considering an electric vehicle. San Joaquin County's expansive rural characteristics exacerbate this concern, heightening the perceived risk of being unable to locate a charging station when and where it is needed. This concern can deter individuals from embracing electric vehicles, as the fear of being stranded without the means to recharge becomes a significant deterrent.

EDUCATION AND AWARENESS

The lack of education and awareness about electric vehicles poses a significant obstacle to widespread adoption. This includes knowledge about the types of vehicles available, their functionality, driving range, refueling options, and incentives. This can lead to misconceptions and misunderstandings that discourage people from considering EVs as a viable option.

This can also hinder the development of the workforce necessary to support EVs. A lack of adequate training programs creates a knowledge gap among transportation sector workers. Mechanics and other professionals may not possess the necessary skills to effectively service and maintain electric vehicles and charging infrastructure, limiting their ability to support them.

Stakeholders and community members who participated in the community engagement effort for this project noted that common communication barriers that disproportionately impact disadvantaged communities such as literacy, limited access to technology, and language obstacles add an additional layer of complexity, further impeding the dissemination of information. Non-English speakers and individuals with limited English proficiency already face challenges in accessing essential information and resources hindering their ability to engage in the process of transitioning to zero-emission transportation.

IMPACTS TO PUBLIC TRANSIT

During outreach efforts for this project, participants raised concerns over how the prioritization of electric vehicles (EVs) will impact public transit. The Advanced Clean Transit (ACT) regulation implemented by the California Air Resources Board (CARB) significantly impacts transit agencies in California[10]. The ACT regulation aims to accelerate the adoption of zero-emission buses (ZEBs) in public transit fleets by requiring transit agencies to transition to ZEBs and setting specific milestones (see **Chapter 5** and **Appendix 2** for details)

Public transit is vital for affordable and accessible transportation, especially for low-income communities. However, if the prioritization of EVs is not accompanied by adequate support for electrifying public transportation, it could burden these agencies. Limited resources and infrastructure for electrifying bus fleets may lead to reduced service levels or delays in adopting cleaner technologies. Supporting public transportation agencies with incentives and assistance is essential for a successful transition. The ACT regulation does provide funding, grants, and technical assistance to support transit agencies in overcoming financial barriers and facilitating the procurement, operation, and maintenance of ZEBs[6] but additional support may be needed.

CHARGING FOR MULTIUNIT DWELLINGS AND DRIVERS WITHOUT HOME CHARGING

The community has strongly expressed a need for charging at multiunit dwellings (MUDs) in San Joaquin County. With more than 80% of EV charging occurring at home[11], not having access to home charging can represent a significant barrier to EV adoption as it can be difficult to find alternative charging options. Even when residents of multi-family properties have access to on-site parking, they

[10] California Air Resources Board (CARB). (n.d.). Advanced Clean Transit (ACT) Regulation. Retrieved from https://ww2.arb.ca.gov/our-work/programs/advanced-clean-transit

[11] US Dept. of Energy: https://www.energy.gov/eere/electricvehicles/charging-home

typically cannot modify the space to install EV charging. Building owners also often struggle to navigate EV charging options and resources for their buildings. Given that EV charging involves considerations for building types, resident composition, utility requirements, strategies to minimize capital costs and future-proof installations, electrical service, and panel capacity of the buildings, and funding options, providing EV charging can be a daunting task. These challenges will leave multi-family residents behind in the clean transportation transition if not addressed.

Property owners may be interested in installing charging but can hesitate to give up parking spaces, which isn't always an option for sites with limited parking. The amount of parking can be a limiting factor for many properties. Even when parking is available, the optimal location may not be located near the power source, which increases installation costs. Additionally, this type of charging infrastructure can be the most challenging to implement because it crosses multiple agency departments, regulations, and requirements.

Property owners often have concerns about the financial responsibility of owning charging stations, specifically networking fees, and maintenance. Rebate programs, as opposed to grants, also present a barrier to MUD property owners who are unable to pay upfront costs. Retrofitting older buildings in particular can incur prohibitively high costs. Many have questions if installing EV charging would add value to their property or may view installing EV charging as a necessity to keep up with tenant demands. Project timelines of working with the electric utility and any easements required can also be a common concern. In general, MUDs need more support during the installation process and typically take longer on average than public charging installations.

RECOMMENDATIONS

Chapter 6 (Analysis and Recommendations) provides recommendations to support the transition to alternative fuels in San Joaquin County. In addition to these, the following sections will provide recommendations specific to equity. This report can also be used as a starting point to delve deeper into the needs of disadvantaged communities and engage them further in the planning process.

Actions discussed in this chapter include:

- Making EVs more affordable and accessible by providing subsidies
- Increasing access to charging infrastructure
- Addressing range anxiety both through the addition of chargers and through education
- Providing effective community engagement in the languages and places used by disadvantaged populations
- Supporting public transportation in the transition to zero-emission buses to support those that do not drive or have a car
- Providing charging for residents living in multi-unit dwellings

MAKING EVS MORE AFFORDABLE AND ACCESSIBLE

To ensure equitable access to electric vehicles (EVs) for households with limited income, key financial measures should be implemented. These include expanding incentives like rebates, tax credits, or charging for EV owners in disadvantaged communities. Access to low-interest financing options specifically designed for EV purchases could also be targeted for households with limited income such as the Clean Vehicle Assistance Program administered by the Beneficial State Foundation (BSF) which

requires applicants to meet income, vehicle purchase requirements as well as, complete financing and technology training[12]. Supporting programs that provide affordable or free electric vehicle charging for low-income households can also be a way to continue making EVs more affordable even post-purchase. While SJCOG and its member agencies may or may not be able to directly provide these measures, they can be supported, and partnerships can be struck with those who can.

Making EVs and alternative fuel vehicles more accessible also doesn't also necessarily require ownership. The availability of electric vehicles through shared mobility programs, such as car-sharing and ridesharing services can be another way to make electric vehicles more accessible to disadvantaged communities. An example of this is the Miocar car-sharing service in Stockton launched by the SJCOG-led Stockton Mobility Collective (SMC) in April of 2023[13]. Miocar is a nonprofit focused on affordable transportation and only uses fully battery electric vehicles. Consideration of such programs and/or encouraging others by offering incentives to companies that deploy electric vehicles or partnering with shared mobility providers to offer discounted rates for low-income riders is recommended. SJCOG hopes to expand this EV carshare program throughout the San Joaquin region. As a pilot program, the SMC project and future Clean Mobility Options (CMO) project will monitor and take note of the utilization data to better serve the community in the future. For the CMO project, SJCOG is working with the City of Stockton and the Housing Authority for sites in Tracy and Thornton. If approved, this would be an expanded resource for those jurisdictions.

Electric car-sharing or shuttle services can also benefit migrant workers in San Joaquin County by providing affordable, flexible, and clean transportation options. Traditional transportation options can often be expensive or limited in rural areas. Car-sharing or shuttle services can be tailored to specific agricultural regions providing better access for workers than public transportation while reducing the need (and expense) for a personal vehicle. Collaboration with local communities and employers can enhance their effectiveness in serving these workers even further.

INCREASE ACCESS TO CHARGING INFRASTRUCTURE

Even with measures to make EVs more accessible to disadvantaged communities, limited access to charging can create added hardship. To support renters or those who cannot install their own charging, stations can be strategically located in disadvantaged communities, with limited charging infrastructure to fill gaps.

Findings from the community engagement efforts for this study also highlighted the importance of equitable access to charging infrastructure for both cars and e-bikes in areas where large groups congregate and where drivers can visit amenities such as restaurants while their vehicles charge. Commenters made suggestions for charger locations, including airports, malls, and college campuses. Commenters also emphasized the need for chargers in specific locations such as hospitals, high schools, and downtown areas. Additionally, commenters mentioned the need to consider e-bikes and connections to regional transportation options, which can serve those without a car. Small businesses could also be targeted for the installation of nearby chargers to provide an amenity that could increase foot traffic and benefit the local economy.

[12] https://ww2.arb.ca.gov/sites/default/files/movingca/vehiclefinancing.html

[13] https://www.sjcog.org/557/Carsharing-Services

Exploring innovative solutions like solar-powered charging stations can also be a solution for areas lacking grid support or to provide free charging. Though it should be noted that due to the low-energy density of solar generation charging speeds can be far slower than public DC Fast Chargers unless paired with battery storage which can only provide fast charging until the battery is depleted. Despite this limitation, this can still be a viable solution in areas where the electric utility infrastructure is constrained or very difficult/expensive to upgrade.

Addressing concerns over the retrofitting of older buildings with EV chargers by providing technical guidance and financial support is another measure that can provide vast benefits to the community. These benefits can go beyond electric vehicles and can also support the modernization of electrical systems for older buildings. This support could be provided through a local agency permitting offices, ideally in partnership with the local electric utility. Advocating for policies and regulations that mandate electric vehicle charging infrastructure in new and existing buildings can also utilize opportunities to install charging during the construction or remodeling phase helping to avoid retrofitting buildings later which can be more costly.

ADDRESS RANGE ANXIETY IN RURAL AREAS

The most direct solution to alleviating range anxiety is to increase the number of public charging stations available. This can be particularly important in rural areas of San Joaquin County to ease drivers' fears of getting stranded and to support agricultural areas. Even if a vehicle has adequate range for their journey, having chargers available provides a safety net for drivers.

Focusing on rural areas acknowledges the specific needs of drivers who may have limited charging opportunities due to geographical constraints. Collaborating with local jurisdictions, utility companies and private entities will be particularly important to identify optimal locations for charging stations, ensuring comprehensive coverage and accessibility.

Another recommendation that came as a result of public outreach for this study, is to improve signage and wayfinding systems to assist EV drivers in locating charging stations more easily. Clear and well-placed signage, standardized across regions, can guide drivers to nearby charging facilities. Additionally, implementing or directing people to advanced wayfinding systems, both offline and digital, will provide real-time information on the locations, availability, and accessibility of charging stations. By enhancing the visibility and usability of charging infrastructure, EV drivers can confidently navigate their routes, mitigating range anxiety.

Educating potential EV drivers about charging options available and using public awareness campaigns emphasizing increased driving ranges in newer EVs and the availability of growing charging networks can also play a pivotal role. Providing accurate information about charging methods, such as fast charging and home charging, will help dispel misconceptions and alleviate concerns about range limitations. Engaging with prospective buyers through targeted marketing efforts, online platforms, community events, and partnerships with automotive dealerships can effectively convey the benefits and viability of EVs increasing confidence in EV ownership. This is something SJCOG and its member agencies can take on themselves or through partnerships with advocacy groups or industry stakeholders.

EFFECTIVE COMMUNITY ENGAGEMENT

As discussed in the previous section, providing comprehensive information about electric vehicles to the public should be a priority in facilitating the transition to clean transportation. This can be especially true in communities with language barriers or limited access to technology as the information has less opportunity to reach them organically. Developing targeted messaging, hosting events in diverse neighborhoods, and creating multilingual resources and materials are highly recommended. Outreach strategies should also be tailored to the needs of specific communities. This could include partnering with community-based organizations to engage with traditionally underserved populations, hosting workshops in multiple languages, and leveraging social media to engage with a broader audience. These outreach efforts should inform residents about the cost savings of EVs including operation and maintenance as well as the availability of rebates, grants and tax savings, vehicle functionality, and environmental benefits. More accessible communication channels and comprehensive educational programs can help bridge the knowledge gap, answer questions, dispel misinformation, and empower individuals to make informed decisions about adopting EVs.

Community engagement can also help identify potential barriers to EV adoption faced by residents that SJCOG and its member agencies may not be aware of and inform the development of targeted solutions. This can help to build trust and support for transportation electrification efforts by demonstrating a commitment to ensuring that the transition will be equitable and inclusive. This can help reduce resistance to local efforts and promote buy-in from a wider range of stakeholders. Community engagement can also help to identify opportunities for collaboration and partnership. By engaging with community-based organizations and other stakeholders, SJCOG and its member agencies can build strong relationships that can facilitate the development of joint initiatives and programs. This can help to leverage existing resources and expertise, leading to more effective and efficient efforts.

The transition to zero-emission transportation will also require a skilled workforce to design, install, and maintain the necessary infrastructure as well as servicing alternative fuel vehicles. To support equitable transportation electrification, it is important to invest in workforce development programs that provide training and job opportunities to underserved and disadvantaged communities. This can include programs that train individuals to install and maintain electric vehicle charging infrastructure, repair, and service alternative fuel vehicles, and programs that provide job training and placement in the growing clean energy sector.

SUPPORT PUBLIC TRANSIT IN THE TRANSITION TO ZEBS

Chapter 5 discusses the clean transportation transition as it relates to medium and heavy-duty vehicles, which includes buses and other public transit. However, an equity lens should also be applied. Not everyone can or chooses to drive, making public transit incredibly important to address to ensure all residents will experience the benefits of clean transportation regardless of income level or lack of a personal vehicle.

As the adoption of ZEBs can reduce emissions and improve air quality in low-income and underserved communities which are typically more impacted by traffic pollution, SJCOG and its member agencies should work with the county's transit providers to prioritize the transition to ZEBs in these areas first. This could include working with transit agencies to develop plans for transitioning to zero-emission fleets ensuring adequate resources and infrastructure for a smooth transition. SJCOG and its member

agencies should also collaborate with transit agencies on grants and other funding applications to purchase ZEBs and install charging/fueling infrastructure and potentially to cover initial operation and maintenance costs. SJCOG and its member agencies should continue to assess the impact of the Innovative Clean Transit (ICT) regulation and consider further support measures as needed to mitigate potential challenges faced by transit agencies.

FIGURE 21: SAN JOAQUIN REGIONAL TRANSIT DISTRICT ELECTRIC BUS
Source: https://sanjoaquinrtd.com/local-1/

Steps should also be taken more directly to ensure transit riders from disadvantaged communities receive adequate support during the ZEB transition such as fair subsidies, expanded transit services and operating hours and seeking feedback from the community gain insights into their specific transportation needs. Finally, implementing last-mile solutions such as shuttle services and ride-hailing partnerships utilizing zero-emission vehicles can address coverage gaps in underserved areas.

CHARGING FOR MULTIUNIT DWELLINGS

Charging options will need to be provided for residents living in multiunit dwellings (MUD) and others without the ability to install home charging to promote equitable access to electric vehicles, especially for historically disadvantaged communities, a sentiment shared by Stakeholders, the TAC and community members during the development of the Alternative Fuels Vision Plan.

To identify opportunities to serve Disadvantaged Communities (DACs) and residents living in MUDs all these needs, DACs and MUDs have been identified in the gap analysis performed for this study which can be found earlier in this chapter and in **Chapter 6**. SJCOG and its member agencies may choose to prioritize the installation of charging infrastructure directly or through collaborative efforts with utilities and other partners. Targeted incentive programs, policies and streamlining processes for the installation of charging infrastructure in MUDs can also promote the addition of infrastructure

by others. Targeted programs should not only incentivize, but also support property managers and owners through the complicated process of installing chargers. The following sections will provide insight into different types of multifamily properties and their unique challenges, the different decision makers involved, how to address barriers, and considerations for designing a MUD specific program.

Types of Multifamily Properties and Their Challenges

The following section will provide an overview of general MUD types and the benefits and challenges typically encountered with each to help SJCOG and its member agencies navigate the MUD landscape.

Large Apartment Complexes

Benefits:

- May be easier technically, especially with newer buildings due to more updated electrical systems and capacity
- Consolidated/shared parking making installation of charging also consolidated meaning shorter conduit runs and less trenching or boring
- Newer buildings may already have electrical stubbed out to parking spaces for charging per code
- Transformers or electrical rooms may be close to parking
- These properties often have one designated decision-maker which can speed up the process

Challenges:

- Can be difficult to get *to* the decision-maker, particularly with large complexes owned by distant investors
- If charging is desired for every parking space, the electrical load may be very difficult to serve, and infrastructure very expensive

Smaller Apartment Complexes

Smaller apartment complexes include "plexes"; duplexes, tri-plexes, 4-plexes etcetera. Depending on the jurisdiction, these may not even be considered MUD as code often considers MUD as buildings with 5 or more units.

Benefits:

- Less power needed to serve residents
- Typically, one decision-maker you may be able to work with directly speeding up the process

Challenges:

- Often older buildings, or sometimes houses that have been converted which may be more likely to need infrastructure upgrades
- May not have a parking lot making locating chargers difficult

Condominiums

Benefits:

- On the technical side may be no different than a large or small apartment building

Challenges:

- Multiple decision-makers with a condo association or in some cases all residents making it more difficult to obtain approval and move quickly
- Most often residents desire charging for every parking space increasing cost and technical difficulty
- Deeded parking spaces often require that each resident be allowed to install charging. This can create capacity issues if not managed

Other Property Types

Inevitably, other property types will be encountered that do not fit into the previously discussed categories. This could include co-op living situations where residents live in individual, stand-alone homes but share parking resulting in a MUD-style parking situation with single-family home living. For these situations, finding unique solutions to meet the needs of residents, and providing power for chargers and installation configurations will be needed. It's recommended to work closely with residents/property decision-makers, the local electric utility, and the installer to find solutions in these situations.

Decision Makers

When developing strategies or programs to implement the installation of charging for MUDs, it's beneficial to understand the types of decision-makers involved and their motivations. Typically, this will be a property manager, owner, an HOA/Condo Association and/or residents.

Property Managers

The property manager may be a 'cheerleader' for installing EV charging, or they could be 'just doing their job'.

- Their job is to make sure units are rented, rent is collected, and repairs and upgrades happen. EV charging is likely far out of their realm of expertise, and they may just see it as another amenity they can offer to entice new tenants
- If they're a 'cheerleader' they may help push the owner to install chargers as an amenity to stay competitive
- Conversely, the owner may be pushing a property manager who is just doing their job but may not be an advocate for charging
- Property managers may have signing authority up to a certain amount, or no authority at all requiring owner involvement

Property Owners

Installations where the property owner is directly involved typically go the fastest as they are the ultimate decision-makers.

- Working directly with the property owner typically only occurs with smaller properties
- Large complexes may be owned by an investment firm. These firms are often not local and may even be located out of the country.

- Finding the actual owner of these properties may require researching county assessor listings through layers of LLC ownership. For example, one property may be owned by an LLC, which is then owned by another LLC, which is owned by an individual or trust.
- Ultimately, property owners are motivated to keep the property profitable and by opportunities to upgrade their property at a reduced cost

HOA/Condo Association

As mentioned previously, HOA/Condo Associations represent the most challenging decision-maker type due to the need for consensus at some level.

- Capital investments for the property often require board approval, this may be a majority or even unanimous
- Some even require *all* residents to approve of certain upgrades as costs will impact the whole community

Residents

Unfortunately, residents don't have as much influence as some may expect and are rarely decision-makers aside from those living in condominiums. Oftentimes the most power residents have is choosing to not renew their lease. Typically, once the decision maker for a MUD has settled on installing charging, they don't seek input from residents.

Ownership Models

A number of different ownership models, or even a combination can be used for EV chargers in MUDs. Which model will work best for a property depends on the different property types and desired level of involvement by the property owner or management:

- Chargers owned by **individual residents** for their own use, are most often seen with condos
  - Typically, desired with deeded or assigned spaces
  - Not the most efficient model as it's highly unlikely all chargers would be needed at once
  - The most expensive option due to the higher likelihood that utility upgrades will be needed to bring power to each space
- Chargers owned by the **MUD property** or **Condo Association** as a facility amenity
  - The property management ownership model works better for larger well-financed property management firms
- Owned by **third parties** that provide charging services to the community for a monthly or annual cost, this could even be the utility in some cases
  - The third-party ownership model works well for smaller property management firms

Charging Strategies

If electrical capacity is not an issue:

- Level two charger for every space
- Level one charger (120v outlet) for every space and shared level 2
- Shared level 2
- DCFC (not typically seen with MUD but it could be an option if the capacity exists)

If capacity is an issue:

- Level one chargers
- Level 2 chargers with load sharing or management
- If capacity is an issue for the building but not the area, local DCFC could serve the building

Maintenance

Having a plan for maintenance is incredibly important to ensuring chargers will continue to be in good working order and therefore useful to the residents of an MUD. If SJCOG provides funding for the installation of chargers in these properties, requirements related to maintenance are strongly encouraged. The approach will depend slightly on the ownership type:

- Chargers owned by the HOA or property:
  - Require a warranty to be purchased as a part of the program (and cover the cost in an incentive if possible)
  - Require a certain percentage of 'up-time' to ensure chargers continue to function
- Chargers owned by a third party:
  - Require the third party to maintain a certain amount of uptime and complete all repairs and maintenance
- If chargers are owned by SJCOG, its member agencies, or the County, they would of course have full control over maintenance which can streamline the process

Designing an Incentive

Aside from installing chargers directly, offering an incentive, either a grant or rebate can be the next best way to encourage the installation of chargers in MUDs. Incentives could include:

- Funding at a tiered level based on income, disadvantaged community status or other factors like air quality
  - This helps money go to the communities that most need it
  - This is generally a popular approach
- Working with the utility to cover the full cost of electrical infrastructure upgrades
  - Often the most expensive part, removing this barrier may be enough to encourage installation
- Combination of both or flat rate incentives

Whichever strategy is used, the incentives should be as easy as possible to understand:

  - Percentage of project costs with a cap
  - Flat dollar amount
  - Coverage of one part of the project in full or with a cap

  Try to limit combining these because the more complicated it gets, the more time (and administration costs) you will have to spend explaining the program

Addressing Hesitation or Resistance

Concerns about costs

- Equipment and installation costs are usually the most common concerns – especially in low-income areas. These costs include:
  - New electrical panel if capacity in the existing panel is not adequate
  - New electrical service if more capacity is needed
  - New transformer if significant electrical load will be added and the existing transformer is at or close to capacity
  - Trenching/boring for electrical conduit to bring power to the chargers
  - Charging equipment
- These costs should be directly addressed in incentives to ease the financial burden of installation
- Financial incentives and instructional support can also help alleviate concerns regarding networking fees and other financial implications, providing clear guidance and potential reimbursement options
- Alternative ownership models can also help spread costs. These will be discussed later in this chapter

Parking limitations

- Properties may not have enough parking
  - In these cases, it's best to deploy chargers in a central, shared location
- Properties may not have any parking
  - Solutions may include installing or providing incentives for charging in the vicinity
  - Installing chargers in the Right-of-Way could also be a solution, however, this is the most challenging installation due to the coordination needed across many different municipal departments
- Deeded or assigned parking spaces
  - This may require finding technical solutions to allow for charging in each space

Concerns about maintaining chargers

- Can be addressed with:
  - Different ownership models
  - Funding program requirements for warranties
  - For larger properties an on-site electrician may be able to maintain and repair chargers
  - 3rd party services and charging companies offering "charging as a service", essentially leasing chargers to MUDs can eliminate maintenance responsibilities

Questions about who will pay for the electricity used

Options for assigned parking spaces:

- Resident pays to have their own charger installed and it is sub-metered or connected to their unit's meter and are billed directly by the utility for electricity used.
- The property provides and installs the charger and charges a fee for use, a flat monthly fee, or rolls costs into rent. They may even include a cost recovery rate for the installation and network fees.

Examples for shared parking spaces:

- A flat fee can be added to the rent or HOA assessment to cover operating costs
- The EV driver can access a charger through a subscription service, ID or credit card
  - Costs can be allocated either directly to an EV owner's subscription service or to property management for periodic billing to the resident
- Charging service is provided by a third party under an agreement with a property manager, electricity could be included in the agreement or paid for by the property

General hesitation

It's beneficial to understand their motivations and speak their language:

- Discuss how this will provide an amenity to help keep them competitive
  - Which properties in the areas provide charging already?
- This is an opportunity to help them meet code changes
  - What local code will impact these properties? How can SJCOG help them meet code?
- Become a 'greener' property
  - Appealing to sustainably minded potential tenants
  - Offer them free publicity
- Assessing if it is worth the time to try and convince those who are still unsure may be needed

Lack of Knowledge

MUD owners and property managers are usually not EV charging subject matter experts and ultimately, it's not their job to be. SJCOG and its member agencies can help MUD owners and property managers with comprehensive support and guidance throughout the installation journey. Working with local jurisdictions to understand and streamline the permitting process and then assisting MUDs with this process can be particularly helpful. Partnering with electric utilities can also help facilitate the process, clarify project timelines, and address any concerns related to easements or other regulatory requirements.

Promoting Programs for MUD EV Charging

Whether SJOCG starts its own MUD EV Charging incentive program or wishes to promote existing funding opportunities, getting the word out is key. There are three main strategies to market MUD EV charging incentives:

- Utilizing contractors
  - Contractors or "trade allies" sell their services and therefore already do their own marketing. If they are made aware of available funding opportunities to help pay for the cost of EV chargers and/or installation, they will promote this as it makes their services more affordable and that much more attractive to their customers.
- Finding the clubs, groups or associations that attract MUD owners or property managers and talking with them about EV charging and available funding. These groups may include:
  - Investment firms
  - Property management forums or associations and firms
  - Real estate associations
  - Housing associations

- Using SJCOG's existing platforms and outlets to do traditional marketing which could include
  - Attending events and distributing flyers
  - Ads
  - Social media
  - Email lists
  - Web banners on the SJOCG website
  - Direct mail campaigns

Summary of MUD Recommendations

- Provide support to MUD property owners and managers walking them through the technical and administrative aspects of installing charging for their property
- Provide financial incentives for the installation of EV charging to MUDs
- Promote existing funding opportunities to MUDs (see **Appendix A**)
- While not ideal, installing charging in the vicinity of MUDs can provide an option for residents to charge nearby. **Figure 22** below provides a map of expected MUD growth in San Joaquin County along with existing EV charging. SJCOG could focus on filling in charging gaps in the areas of expected growth.

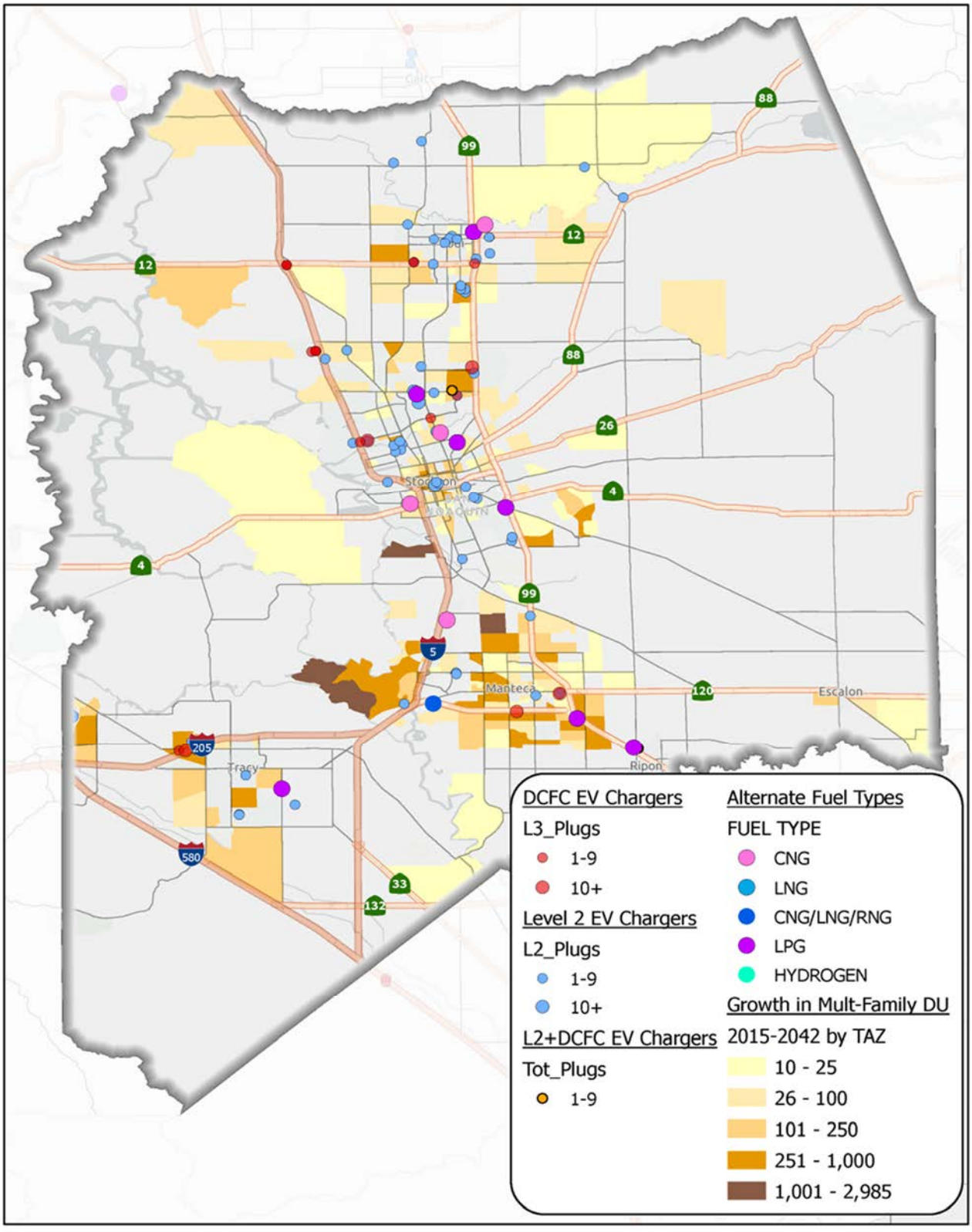


FIGURE 22: EXISTING CHARGER LOCATIONS WITH GROWTH IN MULTIFAMILY HOUSING OVERLAY

CHAPTER 5: MEDIUM AND HEAVY-DUTY ELECTRIFICATION

The transition of heavy-duty vehicles away from internal combustion engines primarily powered by diesel fuel to zero emissions propulsion systems primarily including battery and hydrogen fuel cell electric drivetrains is currently in the early stages. This transition is being facilitated by increasing models of zero-emissions vans, trucks, and buses, funding incentives, and regulatory mandates.

REGULATORY FRAMEWORK

The principal three regulations affecting the electrification of medium and heavy-duty vehicles in California include the Advanced Clean Trucks (ACT) regulation, Advanced Clean Fleets (ACF) regulation, and the Innovative Clean Transit (ICT) regulation. All three of these are relevant to the San Joaquin County Alternative Fuels Vision Plan because they mandate the electrification of trucks, vans, and buses operating in California. While the specific vehicle electrification mandates may not be directly relevant, the timeframe for electrification will be because it provides clarification on the deployment schedule for EV charging and hydrogen fueling infrastructure which will determine the demand for EV chargers and hydrogen fueling stations.

ADVANCED CLEAN TRUCKS REGULATION

The Advanced Clean Trucks (ACT) regulation is a manufacturer's Zero-Emission Vehicle (ZEV) sales requirement and a one-time reporting requirement for large entities and fleets. The ACT requires manufacturers who sell medium and heavy-duty vehicles to sell zero-emissions vehicles as an increasing percentage of their annual sales from 2024 to 2035. In addition, the ACT includes a reporting requirement for large fleets. The ACT regulation covers vehicles of weight Classes 2b through 8. This essentially impacts all trucks heavier than 8,500 pounds. By 2035, the ACT requirements will include:

- 55% of Class 2b – 3 truck sales must be zero emissions.
- 75% of Class 4 – 8 straight truck sales are zero emissions.
- 40% of truck tractor sales are zero-emissions.

Figure 23 shows the increasing percentages of ZEV sales required under the Advanced Clean Trucks regulation.

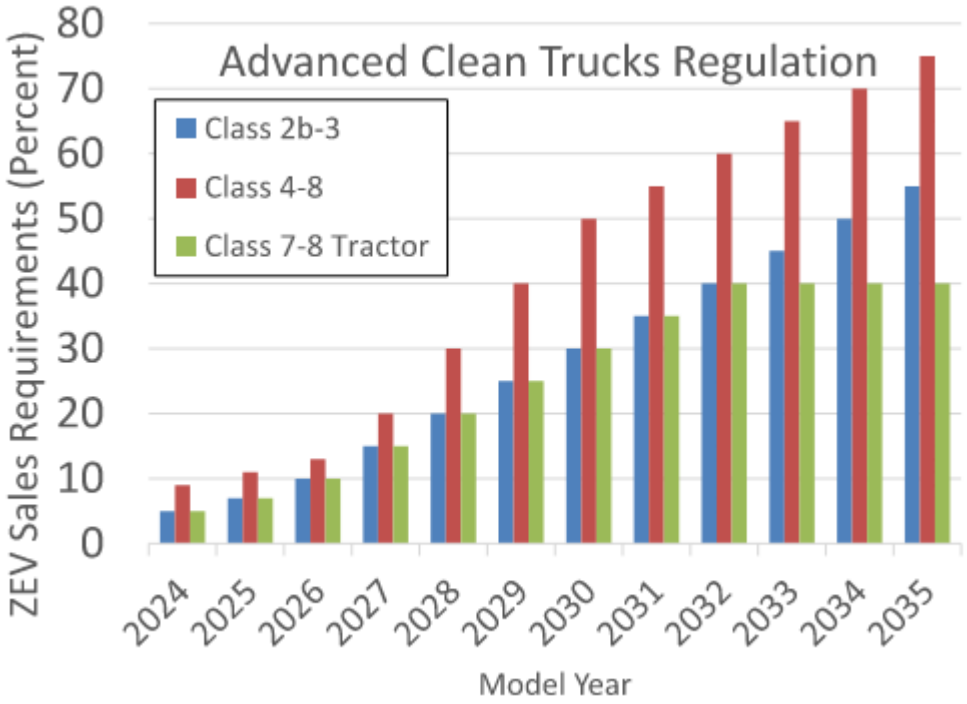


FIGURE 23: ADVANCED CLEAN TRUCKS ZEV SALES REQUIRMENTS

ADVANCED CLEAN FLEETS REGULATION

The most significant regulation impacting the transition to zero emissions medium and heavy-duty vehicle operations is California's Advanced Clean Fleets (ACF) Regulation, approved in April 2023. ACF applies to all but the smallest operators of medium and heavy-duty vehicle fleets operating on California's roads including both private companies and public agencies. Beginning in 2024, ACF mandates the transition away from internal combustion propulsion to zero emissions propulsion—either battery electric or fuel cell electric for vehicles exceeding a Gross Vehicle Weight Rating (GVWR) of 8,501 lbs. by 2042. This also includes on-road and off-road yard tractors and light-duty package delivery vehicles. The timeframe for implementation will depend on the fleet type and selected compliance pathway as explained in the following section.

High Priority and Federal Fleets

ACF prioritizes any entity with $50 million or more in annual revenue or that owns or controls 50 or more vehicles with at least one vehicle in California. ACF also applies to any federal agency that operates at least one vehicle in California. Such low thresholds mean that even many relatively small companies or agencies will need to comply, many of which may not even be large enough to operate their own charging infrastructure.

Compliance Pathway Alternatives

ACF offers two alternative pathways for high-priority and federal fleets to comply with the regulation: a Model Year Schedule and a ZEV Milestones Option, both of which seek to achieve 100% zero-emission fleet by specific deadlines for different classes of medium and heavy-duty vehicles.

Model Year Schedule: Under this pathway alternative, all medium and heavy-duty vehicles beyond their useful life must be removed from the fleet and all new vehicles must be BEV or FCEV beginning January 1, 2024.

ZEV Milestones Option: Under this pathway alternative, ZEV replacement schedules will be determined by specific vehicle groups, beginning with vans, box trucks, two-axle buses, and yard tractors which must be fully electrified by 2035 beginning in 2025 with 10% fleet electrification. Electrification of the next vehicle group consisting of work trucks, day cab tractors, and three-axle buses begins in 2027 with full electrification mandated by 2039. Finally, sleeper cabs tractors, and specialty vehicles begin electrification in 2030 with full electrification mandated by 2042.

Drayage Fleets

Of particular concern is ACF's requirements for drayage fleet electrification which applies to all Class 7 & Class 8 trucks operating at California intermodal seaports and railyards. Beginning on January 1, 2024, all *new* drayage trucks registered in the CARB Online System must be zero-emission, and *all* drayage trucks must be full zero-emissions by 2035. This is the same year vans, box trucks, two-axle buses, and yard tractors must be fully electrified meaning the provisioning of charging and fueling infrastructure for these vehicles should be a priority for SJCOG. Particularly as it often takes months or years to upgrade onsite electrical infrastructure to power large quantities of high-amperage DC Fast Chargers used by Class 7 & Class 8 electric drayage trucks.

Public Fleets

ACF also applies to medium and heavy-duty vehicles operated by cities, counties, special districts, and state agencies (i.e., entities with exempt plates from the DMV). Under the Model Year Schedule pathway alternative, 50% of medium and heavy-duty vehicle purchases from 2024 – 2026 must be ZEVs, and 100% of medium and heavy-duty vehicle purchases from 2027 and beyond must be ZEVs. Public agencies may instead opt for the ZEV Milestone Option until January 1, 2030, which may provide greater flexibility for compliance.

TRANSIT ELECTRIFICATION REGULATIONS

The California Air Resources Board (CARB) adopted the Innovative Clean Transit (ICT) regulation in December 2018. This regulation requires all public bus transit agencies in the state to gradually transition to a complete ZEB (Zero Emission Bus) fleet by 2040. This regulation is in accordance with preceding state policies SB375 and SB350. SB375, the Sustainable Communities, and Climate Protection Program, creates initiatives for increased development of transit-oriented communities, better-connected transportation, and active transportation. Relatedly, SB350 supports widespread transportation electrification through collaboration between CARB and the California Public Utilities Commission (CPUC).

ICT also states that all transit agencies are required to produce ZEB rollout plans that describe how each agency is planning to achieve a full transition to ZE fleets by 2040 as well as outlining reporting and record-keeping requirements. Specific elements required in the rollout plan include:

- A full explanation of how each transit agency will transition to ZEBs by 2040 without early retirement of conventional internal combustion engine buses.
- Identification of the ZEB technology each transit agency intends to deploy.
- How each transit agency will deploy ZEBs in disadvantaged communities.

- Identification of potential funding sources.
- A training plan and schedule for ZEB operators and maintenance staff.
- Schedules for bus purchase and lease options (including fuel type, number of buses, and bus type).
- Construction of associated facilities and infrastructure (including location, type of infrastructure, and timeline)

CARB defines large transit agencies as operating in "an urbanized area with a population of at least 200,000 as last published by the Bureau of Census before December 31, 2017, and has at least 100 buses in annual maximum service." Agencies that do not meet this definition are categorized as small transit agencies. The agencies in the SJCOG area, by the CARB definition, are considered small transit agencies.

The ICT regulation requires transit agencies to submit annual compliance reports from 2021 to 2050. The reports must include information on the agency's fleet, each bus owned or leased, ZEB mobility options, and renewable fuel usage. The first report must include data from December 31, 2017.

The total new ZEB purchases for the heavy-duty transit vehicles (traditional 35-ft. or 40-ft. buses unless otherwise stated) of small transit agencies for is 25% from 2026-2027 and then moves to 100% in 2029 and beyond. Specific vehicle types, such as motor coaches, cutaways, double-decker, and 60-ft. vehicles, are exempt from this purchase schedule until 2026 or later (dependent on Altoona testing being completed). Whereas large agencies are required to start purchasing ZEBs in 2023, small agencies are exempt until 2026, when 25% of new bus purchases must be zero emission.

INCENTIVES AND FUNDING

HYBRID AND ZERO EMISSION TRUCK AND BUS VOUCHER INCENTIVE PROJECT (HVIP)

The most significant funding opportunity for heavy-duty ZEVs is California's Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP), administered by the California Air Resources Board (CARB). HVIP accelerates commercialization by providing point-of-sale vouchers to make the upfront cost of hybrid and zero-emission trucks and buses more affordable. At the time of this writing, funding remains open for all vehicle types. The program features two annual funding rounds and provides a point-of-sale rebate for medium- and heavy-duty vehicles, including buses, school buses, refuse trucks, step vans, straight trucks, and tractors. The program website includes a list of all eligible vehicle models, including most of the market-ready medium- and heavy-duty EVs, and incentive amounts ranging from e.g., $120,000 for many Class 7 or 8 trucks up to $375,000 for some school bus models. [14]

CLEAN TRANSPORTATION PROGRAM

The California Energy Commission (CEC) approved $2.6 billion in funding to support the deployment of thousands of zero-emission trucks, school buses, and transit buses, prioritizing communities most impacted by pollution from medium- and heavy-duty vehicles. This funding includes over $2 billion

[14] https://californiahvip.org/

for zero-emission trucks and buses and off-road equipment including school buses, transit buses, and drayage trucks, $33 million for financing for small truck fleets transitioning to cleaner technologies, and $135 million for demonstration and pilot projects, including commercial harbor craft. Of particular relevance to the SJCOG is that funding covers tiered vouchers for small fleets while encouraging early adoption of zero-emission technologies and large-scale deployments of zero-emission trucks in disadvantaged communities.[15] ZEV Infrastructure Funding for 2022-2026 includes $1.7 billion for medium- and heavy-duty ZEV infrastructure, $90 million for hydrogen refueling infrastructure, $15 million for zero- and near-zero-carbon fuel production, and $15 million for low-carbon fuels.

TRANSIT & SCHOOL BUS ELECTRIFICATION

Both transit agencies and school districts operate bus fleets subject to the fleet electrification regulations previously discussed. **Table 11** shows the transit agencies serving San Joaquin County.

TABLE 11: TRANSIT OPERATIONS SERVING SAN JOAQUIN COUNTY

Transit Agency	Service Area Description
San Joaquin Regional Transit District	Local bus service for Stockton and regional connections between San Joaquin County, cities, Bay Area Rapid Transit (BART), Alameda County employment centers, and Sacramento
Lodi Grapeline	Local bus service for Lodi
TRACER	Local bus services for Tracy
Manteca Transit	Local bus service for Manteca
eTrans	Service between Escalon and Modesto's Vintage Faire Mall
Ripon Blossom Express Transit Services	Local bus service for Ripon and service to Modesto
Modesto Area Express	Commuter connections between Modesto and the Lathrop-Manteca ACE train station
South County Transit	Provides a connection between Lodi and Galt.
Amtrak Thruway Bus Routes	City-to-city bus service

TRANSIT CHARGING

Because transit agencies that operate battery buses depend on the availability of charging stations on a scheduled basis, transit agencies typically operate their own charging facilities. The two dominant modes of transit battery bus charging include depot charging and on-route charging.

[15] https://ww2.arb.ca.gov/news/carb-approves-historic-26-billion-investment-largest-date-clean-cars-trucks-mobility-options

Depot Charging: Most battery bus fleets operated by transit agencies are charged at fleet depots while parked overnight. This is when fleets have the longest available (dwell) time to charge while parked at depot facilities operated by the transit agency, typically the same depots where diesel fleets are fueled, washed, and maintained. The relatively long dwell times which occur between the times buses return to the depot from revenue service typically each night and their return to revenue service the next morning typically provide at least 6 hours of charging time, depending on the span of service for the fleet. Longer dwell times facilitate lower charging speeds or shared use of chargers by multiple battery electric buses on a rotating basis and can avoid the additional cost of demand charges by electrical utilities. Transit fleet charging speeds depend on the energy needs of the fleet and available dwell time, and multiple different charging systems are available including AC charging using J1772 connectors, DC Fast Chargers using CCS Combo connectors, overhead gantry mounted chargers, and wireless or inductive charging.

On-Route Charging: Battery bus charging facilities located along transit routes can be used to supplement depot charging, providing added range by charging while away from the depot. On-route chargers are typically located at transit passenger facilities like transit centers or other locations where buses layover between routes. Due to the limited dwell time available to buses during revenue service, on-route chargers need to provide a large amount of power in a limited amount of time, typically requiring high-power chargers. To minimize the time required to connect to chargers and minimize the physical footprint of on-route chargers, many transit agencies deploy overhead gantry-mounted chargers and wireless or inductive charging.

School Bus Electrification

As with transit electrification, school bus fleets typically rely on their own charging infrastructure. School bus fleet charging infrastructure is located within the fleet depot and school buses do not need or use on-route chargers because school buses have all day to layover which they do at the depot where chargers are installed. Because of the long dwell times both day and night, school buses can use lower speed chargers.

GOODS MOVEMENT

HEAVY DUTY ZEVS

Currently, there are more than 70 different models of zero-emission vans, trucks, and buses commercially available from several manufacturers. Most trucks and vans operate less than 100 miles per day and several zero-emission configurations are available to serve that need. As technology advances, zero-emission trucks will become suitable for more applications. Major truck manufacturers including Volvo, Daimler, Paccar, and Navistar as well as numerous smaller manufacturers and upfitters have begun electric truck production or have announced plans to introduce market-ready zero-emission trucks in the near future. Both Battery Electric and hydrogen fuel cell-powered vehicles qualify as ZEVs under ACT.

Battery Electric Vehicles: The Battery Electric Vehicle (BEV) is an electric-only vehicle powered by a propulsion battery, meaning that longer ranges require larger, heavier, and more costly batteries. The vehicle batteries are recharged using dedicated, recharging stations. Class 1-6 BEVs can use both AC level 2 and DC Fast Chargers however Class 7 and 8 heavy-duty BEVs lack on-board chargers and require DC chargers. Recharging the propulsion battery requires more time than refueling a Fuel Cell Electric Vehicle (FCEV) or internal combustion engine. One of the major disadvantages posed by

BEVs is purchase cost. Due to the cost of large batteries used for electric trucks, their purchase price is currently more than double the price of a comparable diesel-powered truck. Due to the weight, density, and cost of current battery technology, battery electric trucks are best suited for relatively short trips. For this reason, most truck manufacturers have focused on building box trucks for the delivery market, however, this will likely change as battery technology improves and more high-speed DC Fast Chargers for trucks are installed. These vehicles can operate in true zero-emissions mode making it relatively easy for them to obtain regulatory certification. Most major truck manufacturers are now building battery electric trucks up to class 8 including Tesla's semi with an estimated maximum range exceeding 450 miles, Freightliner's e-Cascadia equipped with up to 475 kWh batteries delivering up to 250 miles of range, Volvo's VNR electric Semi with 565 kW battery and 275 miles of range and Daimler's Mercedes-Benz e Actros with up to 310 miles of range.

Fuel Cell Electric Vehicles: Like the BEV, the FCEV is an electric-only vehicle. Instead of electricity stored in a battery, an FCEV is powered by a hydrogen fuel cell. Hydrogen fueling occurs at fueling facilities with dispensers that operate similarly to gasoline, diesel, or compressed gas which is much quicker than EV charging. Along with quicker fueling, hydrogen is a more efficient form of energy storage than electricity, allowing far greater driving range than battery-stored electricity for the same weight and volume. This allows for far fewer hydrogen fueling facilities since FCEVs can travel further between fueling than BEVs can between charging. The main disadvantage, however, is that the hydrogen fueling network is less mature with no equivalent of the existing electrical grid and far fewer existing fueling facilities. In addition, hydrogen fueling infrastructure is more expensive to build and operate than EV charging and hydrogen is currently far more expensive on a per kWh basis than electricity and will likely remain so for some time. Regardless, the range and fueling speed benefits of hydrogen have driven Volvo, Hyundai, Hyzon, Nikola, Toyota, and many other manufacturers to produce Fuel Cell Electric trucks.

FREIGHT ROUTES

TERMINAL ACCESS ROUTES

FIGURE 24: STAA TERMINAL ACCESS SIGN

The Surface Transportation Assistance Act (STAA) of 1982 permitted motor carrier operation of 48-foot and 53-foot semi-trailers on the national highway network and allowed states to permit these "STAA vehicles" on state and local routes as well. Designation of STAA routes is premised on engineering and safety standards (i.e., adequate footprint to accommodate truck turn radius requirements, gross vehicle weight, vertical clearance height, etc.). In California, Caltrans has been administering these laws and regulations. Noncompliant portions of state highways have been classified as such by Caltrans. Caltrans policy is to upgrade these non-compliant portions of state routes to full STAA design standards when major redesign or refurbishment occurs. For local county and city roadways, an application must be made to designate a specific route as a "terminal access" route before STAA vehicles are allowed. Terminal access routes are off the National Network and provide STAA truck access to businesses (i.e., called terminals) where goods originate, terminate, or are handled in the transportation process.

The overriding goal of the STAA network is to facilitate goods movement and connectivity between the local Terminal Routes network to the National Network (i.e., interstates, freeways, and highways). The designated STAA network (shown in **Figure 25**) is located throughout San Joaquin County. These include the National Network and Terminal Access Routes. Designated Terminal Access Routes include both state and locally-owned and maintained roadways. In San Joaquin County, I-580 connects the Port of Oakland to the Port of Stockton and the huge Union Pacific Lathrop Intermodal Facility. I-205 connects to I-580 as well as to Terminal Access Routes SR 4, SR 26, SR 88, and SR 120. These STAA routes are connected by local Terminal Access Routes including Jack Tone and Eight Mile Road. Much of this network is also designated as 65' CA Legal KPRA Advisory and the 65' California Legal Routes.

As shown in **Figure 25** below, Terminal Access Routes are appropriate locations for EV charging. And/or hydrogen fueling for trucks, especially near their intersections with major regional and interregional freight routes.

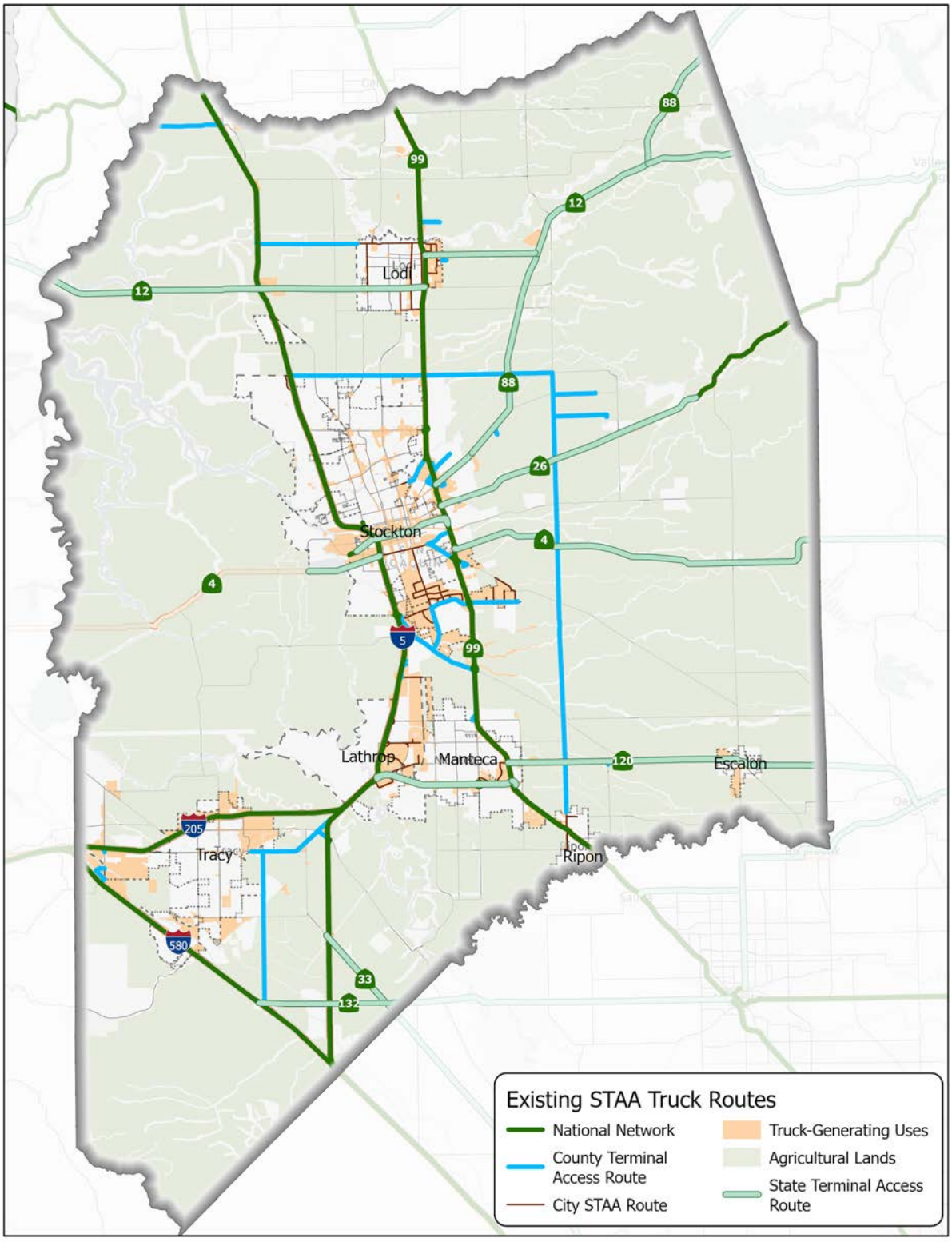


FIGURE 25: STAA TRUCK ROUTES

CHARGING OPTIONS

Fleet Hubs

Most trucks are domiciled at depot facilities or fleet hubs where they are stored and maintained when not being driven. As truck fleets electrify over the next decade in compliance with ACF, these facilities will be increasingly important for charging truck batteries, to allow trucks to leave their depots with fully charged batteries. Since the majority of trucks are used for local or regional delivery, most truck charging is expected to occur at depots, typically overnight between shifts.

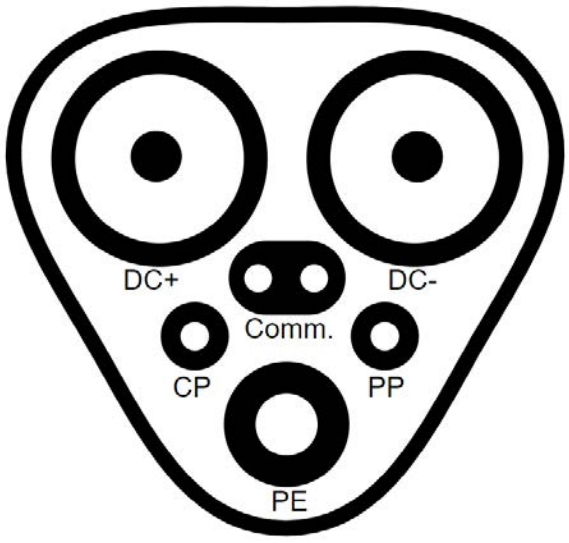
Another form of fleet hubs includes distribution centers, warehouses, and factories where trucks are loaded and unloaded. The duration of time required for truck charging varies depending on the capacity of the truck or trailer and the nature of the cargo. An excellent opportunity for charging is while the truck is parked for loading/unloading so long as the loading dock is equipped with appropriately sized charging infrastructure.

In San Joaquin County, the Port of Stockton, the Union Pacific intermodal facility in Lathrop, and the Roth Road area are prime examples of fleet hub locations requiring major charging infrastructure to handle growing volumes of electrified goods movement.

Public Overnight

Like most vehicles, the majority of trucks are driven during the day and parked overnight which presents a sufficiently long enough duration to charge using relatively low-power chargers to charge overnight. This is the most cost-effective way to charge because lower power chargers are less costly to purchase and install and are less costly to operate by using electricity at periods of lower power demand, avoiding demand charges by utilities. In addition to charging at fleet hubs, many trucks are expected to charge at public overnight charging facilities, especially for truck operators lacking access to private charging facilities.

Megawatt Charging Standard: How Electric Trucks Will Charge



The newly adopted Megawatt Charging Standard (MCS) allows for much faster charging than other standards. MCS focuses on Class 6, 7, & 8 commercial vehicles, but could easily be used for buses, aircraft, or other large battery electric vehicles (BEVs) with huge battery packs and the ability to accept a >1MW charge rate.

Capable of speeds up to nearly 1,000kW, MCS will allow a class 8 truck to charge in about the same amount of time as a light-duty EV. MCS is expected to facilitate goods movement and other heavy-duty EV applications by greatly reducing battery charging times.

MCS has a distinctive charging plug as shown in **Figure 26**.

FIGURE 26: MCS CHARGE PLUG CONFIGURATION.
Source: https://commons.wikimedia.org/wiki/File:Megawatt_Charging_System_Schematic_Plug_Design.svg)

CharIN recommends that MCS should use a minimum voltage of 500 VDC and a maximum voltage of 1250 VDC.

MCS Requirements: [16]

- Single conductive plug
- Max 1.250 volt & 3.000 ampere (DC)
- PLC + ISO/IEC 15118-20
- Touch Safe (UL2251)
- On-handle software-interpreted override switch
- Adheres to OSHA & ADA (& local equivalent) standards.
- FCC Class A EMI (& local equivalent)
- Located on the left side of the vehicle, roughly hip height.
- Capable of being automated
- UL (NRTL) certified.
- Cyber-Secure
- V2X (bi-directional)

Public Fast On-Highways

As with light-duty EVs, trucks traveling significant distances need convenient locations to charge their batteries along their routes, just as diesel trucks have always done, typically at commercial truck stops along major freight corridors like I-5, SR-99, and I-580 through San Joaquin County. However, because the travel range of EV batteries is currently significantly less than diesel, and charging takes longer than conventional liquid fueling and will likely remain so until battery technology improves, charging locations for medium and heavy-duty EVs will need to be more frequently spaced and have the capacity to handle more trucks. Facilities like restrooms, showers, and eateries, are needed for truck drivers while they wait for their batteries to be charged.

Medium-duty EVs can use either AC or DC charging and Class 7 and 8 electric trucks require DC charging. Charging infrastructure can be sized to meet projected power requirements based on battery capacity and expected vehicle dwell time available for charging. Depending on the size of the truck depots and the number of trucks served, power requirements can be significant, potentially exceeding the available capacity of most existing facilities' electrical service and possibly local electrical grid capacity in some locations, at least in the short term as utilities add distribution capacity with larger transformers and substations. Power deficits can in some cases be addressed through a combination of load management and distributed energy resources including battery storage and power production through solar, micro wind, and other sources.

[16] https://www.charin.global/technology/mcs/

FIGURE 27: TRACY TRUCK & AUTO STOP

HYDROGEN FUEL CELL

FLEET HUBS

Fleets of Hydrogen Fuel Cell-powered trucks can fuel at their depots or at hydrogen fueling stations. Due to the significant financial investments required for hydrogen, the economy of scale will likely continue to limit hydrogen fueling stations to mainly large fleet facilities.

PUBLIC FAST ON-HIGHWAYS

The rapid fueling speeds of hydrogen trucks are appropriate for the replacement of diesel fueling with virtually no behavioral change by drivers. Therefore, existing truck fueling facilities can be retrofitted with hydrogen fueling infrastructure as demand for this fuel expands over time.

FIGURE 28: FLYING J TRAVEL CENTER, LATHROP

Source:https://www.google.com/maps/contrib/100827385370055642011/photos/@37.8562275,-121.276207,17z/data=!3m1!4b1!4m3!8m2!3m1!1e1?entry=ttu

RELEVANT STUDIES, PLANS, AND PROJECTS

While the electrification of light-duty passenger vehicles has been ongoing for over a decade, electrification of medium and heavy-duty vehicles used for goods movement is the current frontier of transportation decarbonization efforts up and down the west coast and especially in California. SJCOG and its member agencies will benefit from tracking the following studies, plans, and projects all of which support medium and heavy-duty charging or fueling infrastructure on freight corridors through San Joaquin County.

WEST COAST CLEAN TRANSIT CORRIDOR INITIATIVE

The West Coast Clean Transit Corridor Initiative is one of the earliest efforts to study the feasibility of charging medium and heavy-duty electric trucks for long-distance goods movement from a utility grid perspective. This collaborative effort by 16 utilities analytically explored charging facilities for heavy- and medium-duty freight haulers and delivery trucks along I-5, from San Diego to British Columbia. This initiative published an initial report in June 2020 outlining conceptual charging sites. The West Coast utilities involved are now conducting grid readiness assessments in preparation for infrastructure installations and upgrades that will support vehicle charging capacities of at least 3.5 megawatts with the potential for further upgrades to create even higher-power sites upwards of 23.5MW.

The West Coast Clean Transit Corridor Initiative envisions a network of 27 conceptual charging sites located about 50 miles apart along the entire length of Interstate 5. These 27 sites would be built mainly to serve medium-duty trucks through 2025, after which, every other site would be upgraded to include additional charging for heavy-duty trucks. Over this period, 41 additional sites will be located at similar intervals and expanded in the same manner along multiple arterial highways in California including Interstate 5 and State Routes 99 through San Joaquin County.

California's most Important north-south freight corridors including both Interstate 5 and State Route 99 intersect with critical east-west connectors. The West Coast Clean Transportation Corridor Initiative's 2020 report[17] identifies major zero-emission truck charging plazas needed to support the region. One such site is located along Interstate 5 near French Camp in San Joaquin County. The report noted multiple substations and feeders in the area that could serve the MD charging site load of 3 .5 MW and that the area is growing quickly, and this available capacity could change in the near future.

Prospective locations had already been identified and input from the electric utilities supported these locations. The MD-HD charging plazas will utilize high-power DC fast chargers and may have chargers installed over time as demand increases. It is recommended that grid capacity be future proofed so that increased demand and/or improved technology can be accommodated. To meet the needs of the trucking industry, projects will include the co-location of travel plaza amenities and potentially L-D EV charging, renewable energy supply, and battery storage. Plazas are likely to require 25 MW of electricity with hydrogen infrastructure to meet refueling demands. Site identification, location assessment, and selection along with fuel connectivity and availability remain necessary for project advancement for San Joaquin and other counties like Yuba, Sacramento, and Placer. A number of commercial entities including WattEV, Terawatt, Forum Mobility, Greenlane and bp pulse (which has acquired Travel Centers of America) are exploring different business models for public charging hubs for MHD vehicles.

Notably, since the first WCCTC study began several years ago, the collaborative has moved from "analytical planning" to "implementation support". Given regulatory policy, charging facility development and site location is primarily in the hands of private industry which relegates utilities into a support role. Private industry is responsible for deciding on specific sites for development and then working with the local utility to get electrical service delivered through normal utility service application processes. Current regulatory policies do not allow or encourage utilities to pre-build grid capacity without service applications in place from private developers which is hampering market advancement. If a private developer is not careful in selecting a site near enough to the existing available capacity, it can lead to lengthy multi-year grid infrastructure development on the utility side to provide the electrical service. California energy-related agencies (primarily the California Public Utilities Commission, and the California Energy Commission) have started new policy initiatives to begin addressing this problem through more robust advanced planning initiatives and new policy development that hopes to address the needs for pre-deployment / investment in distribution grid expansion. Other factors that can also lead to project delays include local, regional, and state agency permitting processes, negotiation of legal easements with property owners, supply chain delays for both charging and grid equipment and sometimes poor communication between all the involved

[17] https://westcoastcleantransit.com/

parties that are necessary to execute a project. These projects are very complex, and have many players and involved, all of whom must be aligned to efficiently execute a project.

CALIFORNIA STATEWIDE TRUCK PARKING STUDY

Caltrans published its statewide truck parking study in February of 2022.[18] Though focused on truck parking, the study includes findings and recommendations directly relevant to the San Joaquin Alternative Fuels Vision Plan because using current technology, trucks must be parked to charge or fuel.

The study recommends providing zero emission fuels at truck parking facilities since overnight charging is the most cost-effective way to charge electric trucks, and doing so could address two statewide priorities: Increasing truck parking supply and transitioning to zero-emission trucking with shared infrastructure. The report notes that "while hydrogen fuel cell presents opportunities, the intersection of EV and truck parking presents the most opportunities due to the extended length of time required for EV charging." The report also recommends that Caltrans consider partnering to expand zero-emission fuels at private facilities since revenue generation from the sale of fuels is prohibited at public highway rest areas[19]. Alternatively, Caltrans could consider providing zero-emissions fuels on state property where the private sector cannot fulfill the need, and it is allowed within federal regulations, such as facilities that are not designated rest areas and not located within Interstate ROW. The report also identified curbside charging as another opportunity to install charging in areas where trucks already routinely park but noted the need to provide significant electrical capacity and plan for upgrades, as well as sufficient space.

This study designated San Joaquin County as a "Very High Priority Region" for truck parking based on the existing shortage of truck parking and other local conditions, with a peak hour parking deficit of 333 stalls.

TRADEPORT CALIFORNIA

A collaborative consortium of California partners led by the Fresno Council of Governments is currently in the process of analyzing the feasibility of developing a new, inter-modal rail spine to connect seaports to key markets via the Central Valley. Previously called the California Inland Port System, the California TradePort System[20] is envisioned to be a multi-modal network of integrated clean and efficient truck, rail, air, and cargo facilities that will boost the economic competitiveness of California's economy.

The objectives of the project include:

1. Significantly reduce vehicle miles traveled (VMT), congestion, air pollution, and greenhouse gas (GHG) emissions by reducing the number of truck trips from the seaports complex in the Los Angeles region to the San Joaquin Valley, the Sacramento region, and the Bay Area.

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[18] https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/freight-planning/plan-accordion/catrkpkgstdy-finalreport-a11y.pdf

[19] Section 111, of Title 23, United States Code, and 23 CFR 752.5

[20] https://www.tradeportcal.com/about

2. Create tangible new supply chain efficiencies and reduce shipping costs for shippers that manage global supply chains through direct intermodal rail service to/from the San Pedro seaports.
3. Catalyze significant private sector investment and new job creation by fundamentally repositioning the economic competitiveness of the San Joaquin Valley region.
4. Create a more robust and efficient intra-state distribution system with a specific focus on supporting the agriculture sector while spurring new high-value manufacturing and e-commerce investments.
5. Reduce highway road congestion, with a parallel reduction in the requirement for road maintenance; accident-avoidance savings; all of this reducing cost.

As shown in **Figure 29** and **Figure 30**, the San Joaquin Valley is the site of multiple Truck Traffic Centers, potential Trade Port locations, and satellite truck charging facilities along the 99 and adjacent rail corridors. For San Joaquin County, Stockton is the most relevant with a Truck Traffic Center of high relative volume. Truck Traffic Centers and SR-99 and other freight corridors are mapped below in **Figure 29** and potential Trade Port locations and satellite truck charging facilities are mapped in **Figure 30**.

The first phase of the Trade Port California project analyzes the size of the market; reviews the underlying truck versus rail transportation costs; and analyzes the reduction in criteria pollutants, fuel use, and GHG emissions. The second phase of the project involves developing market readiness and acceptance, estimating costs, developing a partnership with one or both Class One railroads, reviewing the economic competitiveness impact to the region, and understanding the environmental process to move forward. The third phase details a Project Financial Performance Model, a Business Plan for Green, High-Efficiency Logistics/Investment Hubs Around Intermodal Facilities, plans for an Intermodal Facility Site Selection, develops Detailed Capital Cost Programs, delivers a Railroad Agreement to Collaborate, and develops Public-Private Delivery Options. Subsequent phases include tasks relevant to the SJCOG Alternative Fuels Vision Plan including intermodal hub and Trade Port design, environmental analyses, site-specific planning, preliminary engineering, and preliminary environmental efforts for Trade Ports, Logistics Core Zone, and Satellite Trade Ports.

This project is relevant as it will decarbonize the carbon emissions from goods movement by transitioning more freight from truck to rail which will reduce the future need for charging and fueling for ZEV trucks. This transition will concentrate trucks at intermodal facilities, making these facilities increasingly appropriate locations for the installation of truck charging and hydrogen fueling facilities. The plan for an Intermodal Facility Site Selection in particular will identify charging and fueling sites currently being planned and designed.

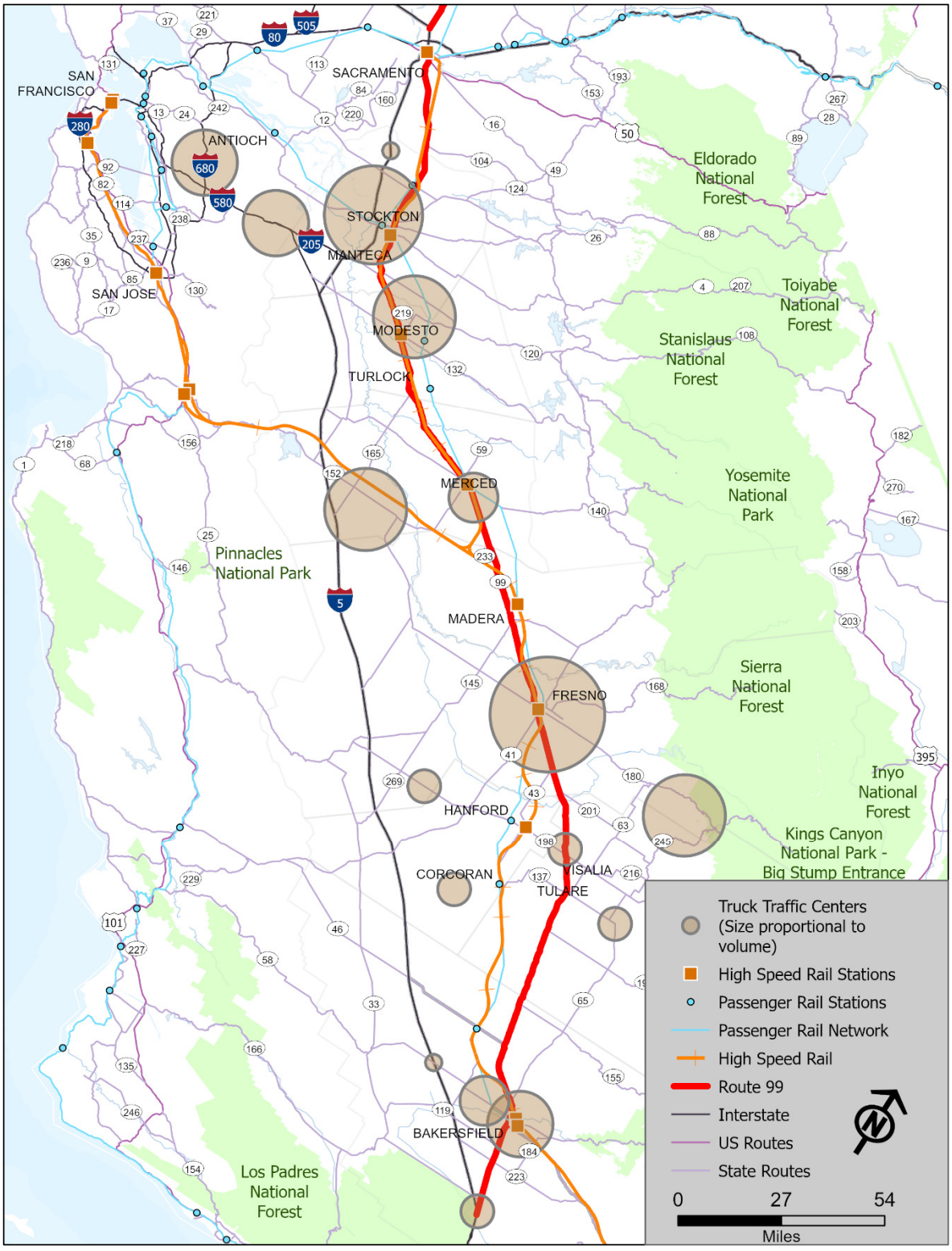

FIGURE 29: TRUCK TRAFFIC CENTERS IDENTIFIED BY TRADEPORT CALIFORNIA PROJECT

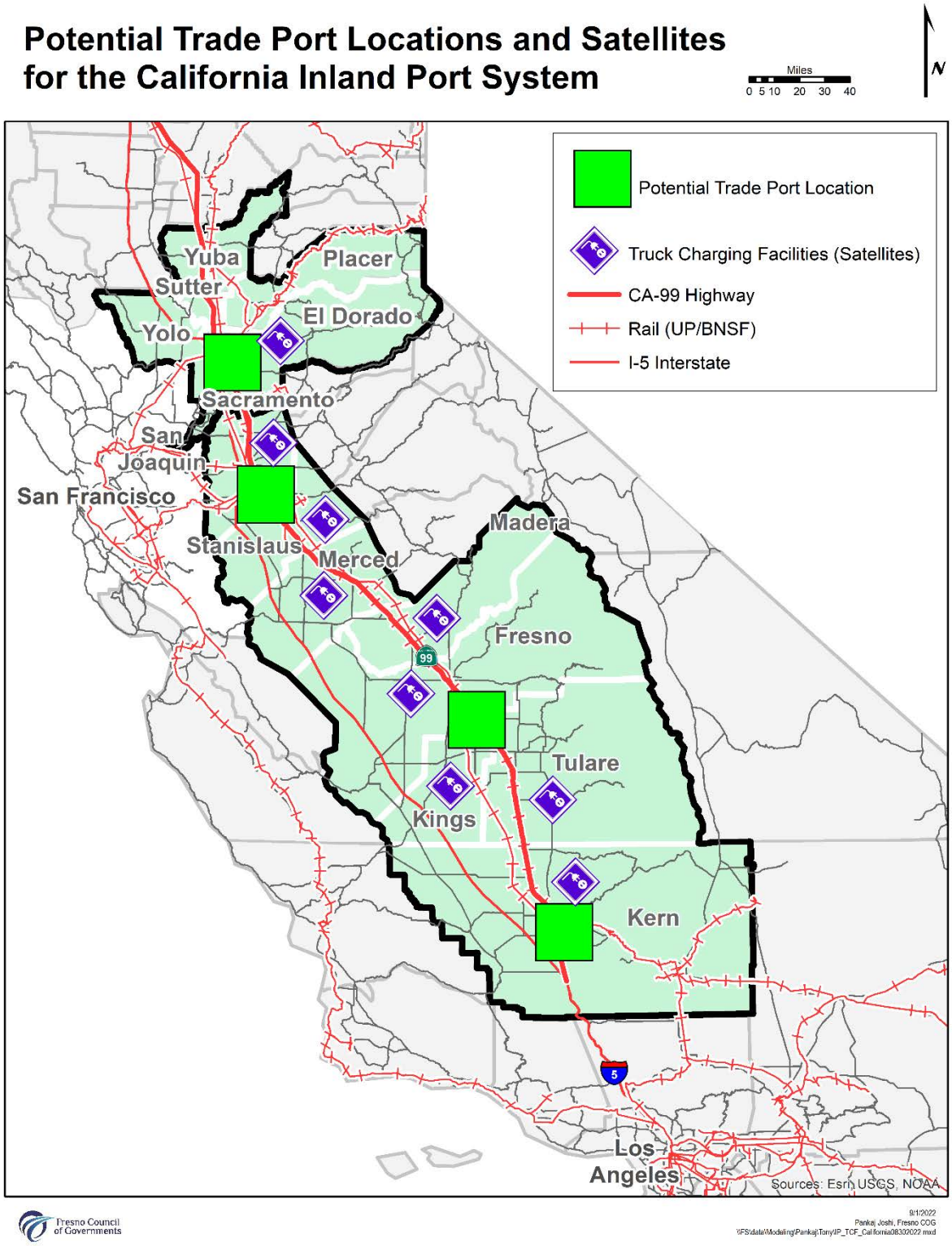

FIGURE 30: POTENTIAL TRADEPORT SITES IDENTIFIED BY TRADEPORT CALIFORNIA PROJECT

CLEAN FREIGHT CORRIDOR EFFICIENCY ASSESSMENT (SB 671)

The SB 671 Clean Freight Corridor Efficiency Assessment[21] is an initial zero-emission freight infrastructure assessment that identifies freight corridors, or segments of corridors, and the infrastructure needed to support the deployment of zero-emission medium and heavy-duty vehicles. This Assessment will be used to identify challenges related to timing, costs, and economic impacts to the Legislature. SB 671 requires the CEC and CARB to incorporate, to the extent feasible and applicable, the Assessment's findings and recommendations into their programs and guidelines documents related to freight infrastructure and technology. This Assessment will not directly result in electric grid infrastructure authorizations or cost recovery because that is within the CPUC's jurisdiction.

As part of the project, the California Transportation Commission is evaluating six proposed priority freight corridors and three potential scenarios for zero-emission truck demand and resulting estimated infrastructure needs. The priority corridors passing through San Joaquin County are I-5 and SR 99, California's primary north-south freight highways. This study is evaluating the emissions benefits of BEV and FCEV trucking, the two propulsion systems allowable under ACF. Key assumptions of the study are that BEVs, typically Class 4-6 medium-duty box trucks are most suitable for urban trips while long haul and regional trips will be predominantly performed by heavy-duty (Class 7-8) big rigs. The study also anticipates that BEV trucks will be charged at a combination of fleet hubs for trucks, public overnight charging sites, and public fast charging facilities close to highways and heavy-duty FCEVs will fuel at public fast charging facilities close to highways shared with other EVs as well as at truck fleet hubs. The study determined that the Minimum Viable Network would require 1 BEV charging station in each 50-mile span (Comparable to NEVI) and a hydrogen fueling station in each 270-mile span.

Figure 31 below shows data provided in the SB 671 documentation including the existing environment including land use (existing warehousing locations), existing infrastructure (existing electric substations and service stations suitable for heavy vehicles), existing activity (truck parking locations identified in surveys), and proposed infrastructure (CEC identified locations for future truck serving infrastructure and proposed Priority Clean Freight Corridors).

The map identifies 16 existing service stations identified as having facilities suitable for trucks (including truck stops), 6 major warehousing locations, 127 electric substations of varying output, and 14 existing locations for truck parking identified by the survey.

Additionally, the map identifies 3 estimated locations for future ZEV heavy goods vehicle infrastructure including potential hydrogen fueling stations in Stockton, Lathrop, and Lodi, as well as proposed Priority Clean Freight Corridors including Interstate 5, Interstate 205, Interstate 580, and State Route 99.

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[21] https://catc.ca.gov/programs/sb671#:~:text=SB%20671%20requires%20that%20the,is%20due%20December%201%2C%202023.

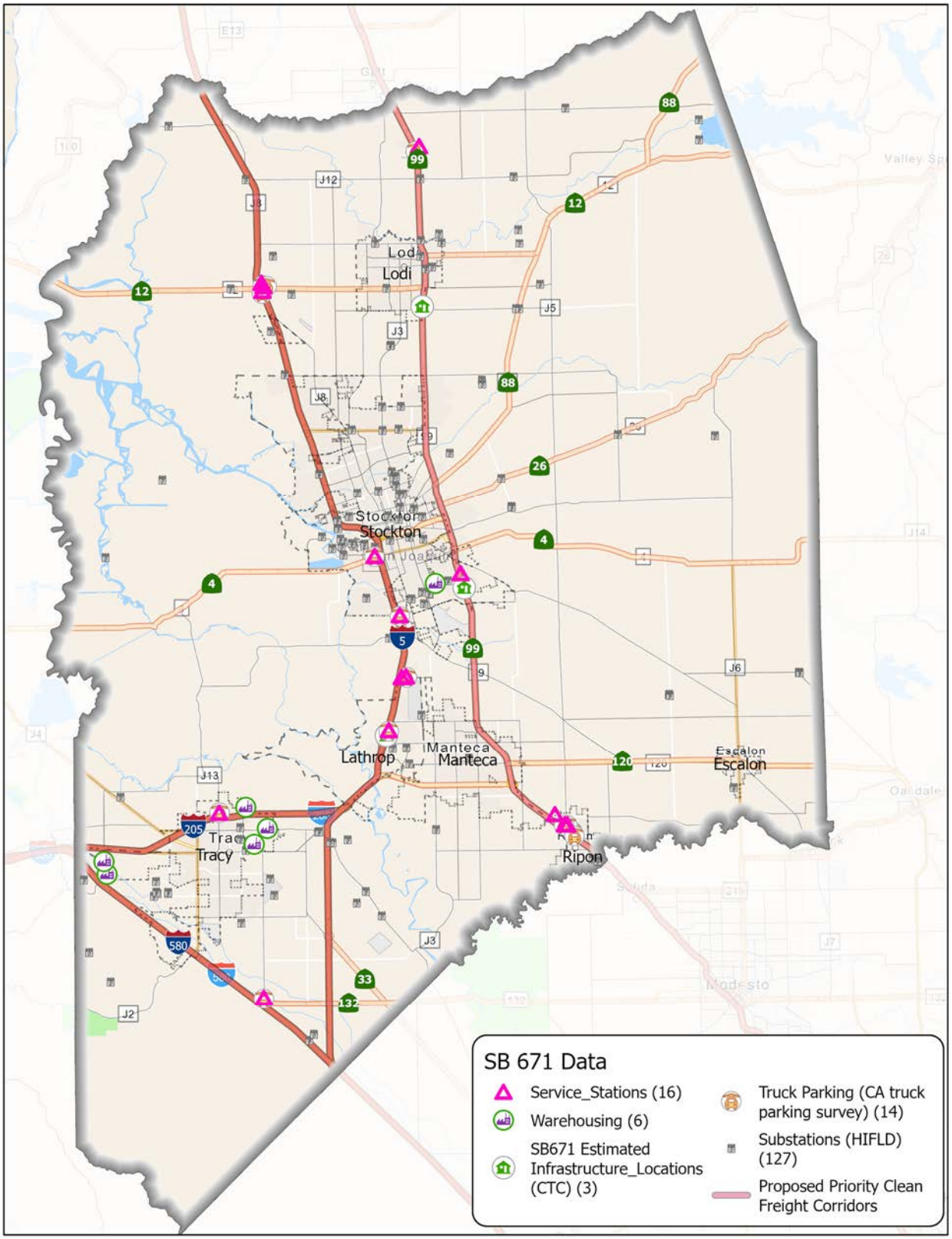

FIGURE 31: SB671 RECOMMENDED PRIORITY FREIGHT CORRIDORS

ELECTRIFIED CHARGING CORRIDOR PROJECT

The California Energy Commission (CEC) provided $2 million in funding to address barriers to long-range MHD EV deployments and encourage widespread adoption by deploying high-powered chargers at several existing Volvo Trucks dealership locations in Central and Northern California including the Western Truck Center in Stockton. The project began in 2022, with all five stations expected to be online by the end of 2023. The Electrified Charging Corridor Project has the goal of enabling convenient charging for small business fleets that want to avoid making major financial investments in large-scale charging infrastructure at their site, fleets looking to pilot an electric vehicle through rental and short-term lease opportunities as well as fleets that need an OEM-neutral location to "opportunity charge" along their route.

FIGURE 32: ELECTRIFIED CHARGING CORRIDOR PROJECT LOCATIONS

Source: https://www.fleetowner.com/emissions-efficiency/article/21246660/volvo-trucks-california-electrified-charging-corridor-project-electric-vehicle-infrastructure

NORTHERN CA MEGAREGION ZEV MEDIUM/HEAVY DUTY VEHICLE BLUEPRINT

The Sacramento Area Council of Governments (SACOG) is leading development of the Northern CA Megaregion ZEV Medium/Heavy Duty Vehicle Study funded by Caltrans. This study intends to create a plan for at least 11 major zero-emission truck charging plazas to support the Northern CA megaregion along Interstate 5, Interstate 80, and State Route 99, while also providing recommendations for Highway 50 from the corridor analysis. The partners supporting the project include the San Joaquin Council of Governments (SJCOG), Metropolitan Transportation Commission (MTC), Caltrans districts 3, 4, and 10, utilities (SMUD and PG&E), and local communities to identify actions and milestones to implement the electric charging and hydrogen refueling infrastructure needed to support the deployment of zero-emission MD-HD vehicles. Specific outcomes relevant to this Alternative Fuels Vision plan include the following:

- Context about challenges, opportunities, and impacts related to ZEV fueling compiled from interviews and focus groups with stakeholders.
- List of potential locations for medium and heavy-duty BEV charging/FCEV fueling stations and context for selecting locations for ZEV stations.
- A ZEV Station Prioritization Tool, Station Suitability Checklist, and GIS map customized for the Megaregion project and prioritization criteria, including data compiling methodology, for priority locations for M/HD ZEV charging/refueling investments.
- Summary of potential route improvements at each potential ZEV station site.
- Conceptual drawings for top priority ZEV stations and station area improvements.
- Recommendations for priority locations that include operational models, technical specifications, and community benefits/impacts.

Figure 33 outlines the Megaregion study area.

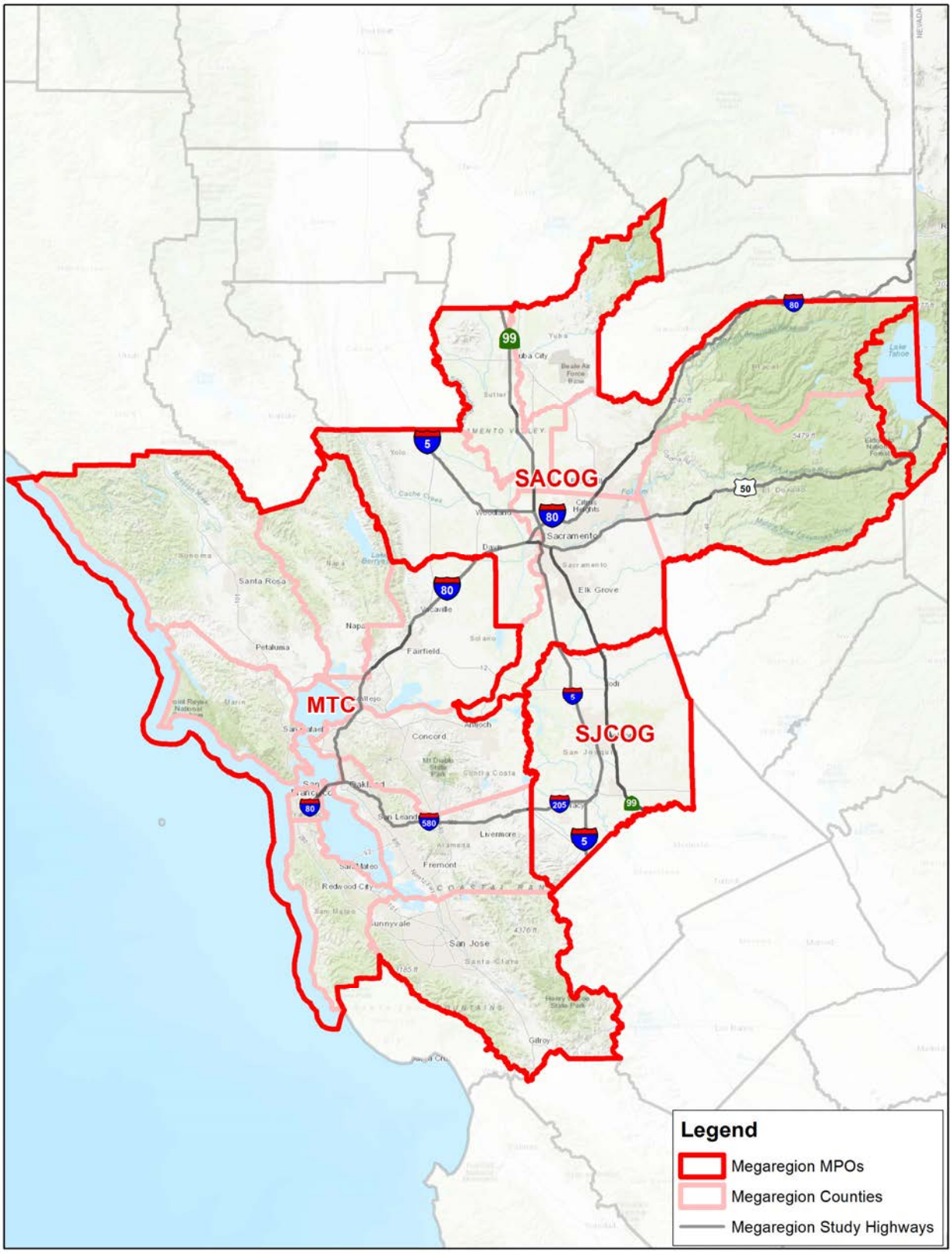

FIGURE 33: MEGAREGION STUDY AREA

MEDIUM AND HEAVY-DUTY ELECTRIC VEHICLE INFRASTRUCTURE - LOAD OPERATIONS AND DEPLOYMENT (HEVI-LOAD)

Lawrence Berkeley National Lab is developing Medium and Heavy-Duty Electric Vehicle Infrastructure - Load Operations and Deployment (HEVI-LOAD)[22] in collaboration with the CEC, funded by applied research funds from California's Clean Transportation Program. This project will project electrical state-wide infrastructure needs for decarbonizing medium and heavy-duty vehicles (GVWR > 10,000 lbs.). The goal of this project is to predict the charging infrastructure needs by future medium- and heavy- duty electric vehicles and to assess optimal deployment of the needed infrastructure in California and provide grid impacts analysis. The MHDV projections will also consider transportation system and electric system interaction with light duty vehicles. The project consists of 2 approaches in general: A top-down approach that takes aggregated MHDV adoptions as the inputs and provides county-level projections of charging load profile and infrastructure need, and a bottom-up approach that incorporates more granular (temporal, spatial, and duty-cycle-specific) behaviors of a variety of MHDVs into activity simulations/optimizations for further analysis.

ZERO-EMISSION FREIGHT INFRASTRUCTURE PLANNING (FIP) FRAMEWORK

The FIP Framework is a CPUC staff proposal for how to develop "investment grade" inputs/assumptions and MDHD charging scenarios to be used in long-term grid planning to identify EV charging infrastructure needs specific to medium and heavy-duty freight vehicles. The proposed FIP Framework[23] facilitates the identification of electrical infrastructure needed for transportation electrification over the medium and long-terms. Key provisions of FIP include:

- FIP plans for to-the-meter (utility-side) infrastructure (distribution, substation and
- transmission), not behind-the-meter infrastructure for chargers.
- FIP is focusing on medium and heavy-duty freight in the implementation assessment because it will have significant and localized impacts on the electric infrastructure.
- Proactive identification of TE electrical infrastructure necessary to accommodate future loads will reduce the likelihood that long-lead upgrades are not online when necessary.
- CPUC staff will work with stakeholders during FIP implementation to identify other vehicle classes/types that are dependent on long lead time infrastructure.

THE INTERREGIONAL TRANSPORTATION STRATEGIC PLAN (ITSP)

The Interregional Transportation Strategic Plan[24] is a Statewide plan that guides investment along California's 11 strategic interregional corridors which include I-5, SR-99, and I-580 and intercity rail corridors through San Joaquin County. The ITSP provides a policy framework to guide Caltrans and partner agencies in developing comprehensive, multimodal corridor plans and projects, providing direction to programs, districts, and partner agencies on the policies and strategies that should be considered when assessing the interregional transportation system and identifying improvements.

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[22] https://sites.google.com/lbl.gov/2020-157/landing-page

[23] https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/transportation-electrification/fip-draft-staff-proposal_5_22_23-webinar-final_ver2.pdf

[24] https://dot.ca.gov/programs/transportation-planning/multi-modal-system-planning/interregional-transportation-strategic-plan

According to this report, the Central Valley is expanding its mega-distributions centers, and population growth occurring throughout both regions, significant truck volume increases are anticipated on all routes within this corridor. Commodities transported though this corridor include agriculture, wine and other manufactured food products, and retail.[25]

The report also states that interregional trucking routes include I-5, which is a principal north-south freight corridor that spans the West Coast, and SR 99, which serves as a major farm-to-market route for most of the agricultural products exported from the Central Valley internationally. SR 99 is a heavily utilized route for interregional commuting and is a critical corridor for the interregional movement of freight which increasingly serves inland ports. This plan recommended expansion of truck parking as well as vehicle and freight truck ZEV charging and fueling infrastructure as improvements and strategies for I-5, I-580 and SR 99 which are relevant to the San Joaquin Alternative Fuel Vision Plan.

THE CALIFORNIA FREIGHT MOBILITY PLAN (CFMP)

The 2020 California Freight Mobility Plan[26] is California's state freight plan. The CFMP is a comprehensive plan that governs the immediate and long-range planning activities and capital investments by the state with respect to freight movement. It identifies freight corridors, includes a fiscally constrained infrastructure funding plan, includes investment priorities, and discusses the condition of freight infrastructure in the state. Appendix G of the CFMP identified five different types of zero and near-zero emissions truck technology, however, ZEV technology and regulations have advanced significantly since the plan was published in 2020, so only the description of Battery Electric Vehicles remains relevant to the San Joaquin Alternative Fuel Vision Plan and there is no mention of Hydrogen Fuel Cell vehicles as a stand-alone propulsion system.

[25] https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/system-planning/systemplanning/2021-itsp-oct21-a11y.pdf

[26] https://dot.ca.gov/programs/transportation-planning/division-of-transportation-planning/strategic-freight-planning/cfmp-2020

CHAPTER 6: ANALYSIS AND RECOMMENDATIONS

This chapter identifies future needs and gaps in ZEV infrastructure for EV charging and hydrogen stations that need to be filled to encourage adoption of zero emission vehicles (ZEVs) in San Joaquin County. ZEV adoption through 2030 has been estimated, a gap analysis has been performed to identify areas with inadequate ZEV infrastructure and a siting analysis performed to identify where installations should be focused. Next, barriers to promoting alternative fuels in San Joaquin County have been identified as well as recommendations to implement as a part of the Alternative Fuels Vision Plan.

NEW VEHICLE ADOPTION

Two regulations, the Advanced Clean Cars II rule which prohibits the sale of vehicles that run on fossil fuels by 2035, and the Advanced Clean Fleet rule, which will require fleets to be 100% zero emissions by 2045 have been used to create zero emission forcasts. Details about these regulations can be found in **Appendix B.**

LIGHT DUTY ZEV FORECAST

Figure 34 shows the growth curves for light duty vehicles up to the target year of 2035. Creating these curves first involves extending the current population of ZEVs using growth curves that represent increasing ZEV percentages in new light duty vehicle acquisitions, meeting the target year (2035). The fast growth curve estimates that all new light duty purchases will transition to ZEVs a year earlier than the required year (2034). The medium growth curve estimates that all new light duty purchases will become ZEVs by the target year, with adoption rates increasing exponentially in the years leading up to 2035. The slow growth curve estimates that all new light duty purchases will become ZEVs by the target year, but with adoption rates experiencing rapid growth in the two years preceding the target year (2035). Additionally, within the medium growth scenario, a 26% rate of new ZEV purchases in 2025 is utilized to roughly align with a data point from a Consumer Reports data.

Estimating the count of light duty vehicle registrations in San Joaquin County (**Figure 35**) begins by considering the number of light duty registrations from the previous year and multiplying it by the annual growth rate. To estimate the new light duty registrations in San Joaquin County, new statewide light duty registrations have been divided by the total statewide registrations per year, yielding the percentage of new registrations on a statewide scale. This percentage has been applied to San Joaquin County registrations, deriving an estimate for new light duty registrations.

Finally, the forecasted count of new light duty ZEV registrations in San Joaquin County has been calculated by utilizing historical statewide percentages of ZEV purchases from CNCDA. The medium growth scenario has been generated by creating a smooth growth trajectory culminating in 100% of new light duty purchases being ZEVs by 2030. The fast growth scenario consists of a growth trajectory that leads to 100% of new purchases becoming ZEVs by 2029. The slow growth scenario includes a growth trajectory culminating in 100% of new purchases being ZEVs by 2030, with a sharp increase in 2029. Anticipating numbers to remain limited, Fuel Cell light duty vehicles have not been separated into another category. **Figure 34** and **Figure 35** below illustrate these growth scenarios.

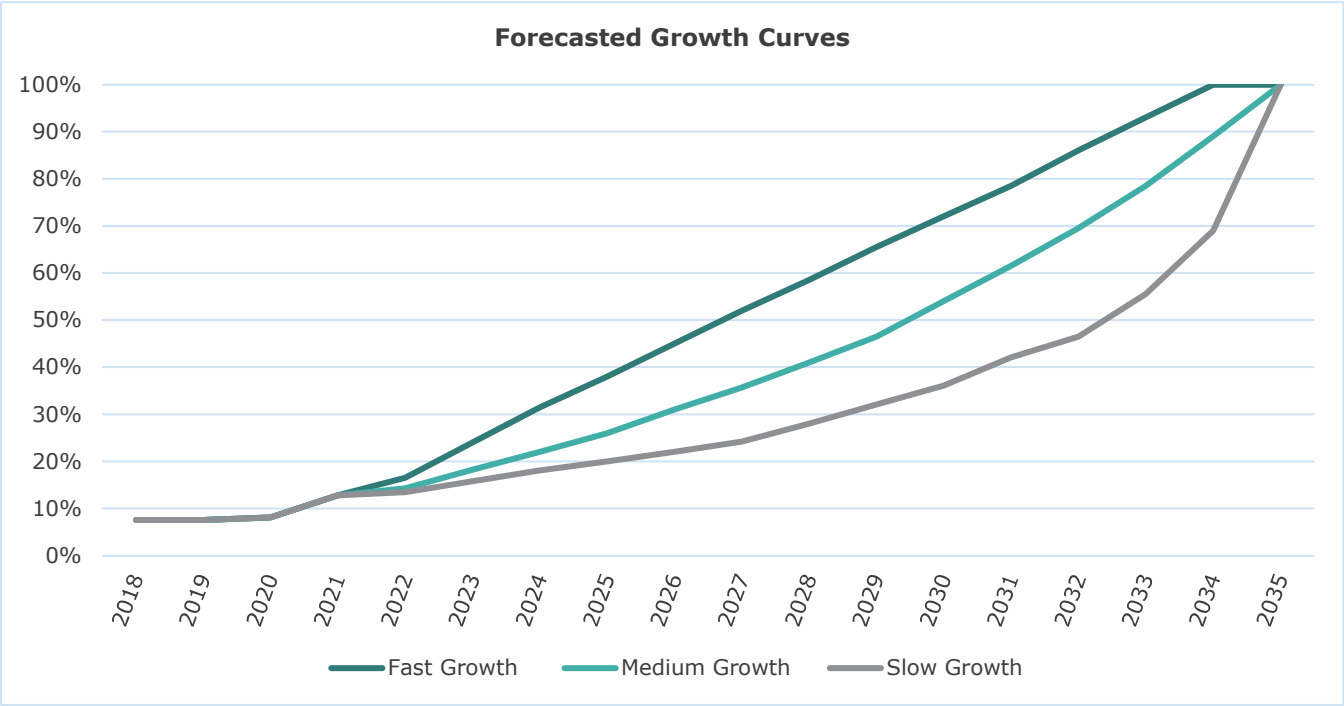

FIGURE 34: PROJECTED ZEV GROWTH

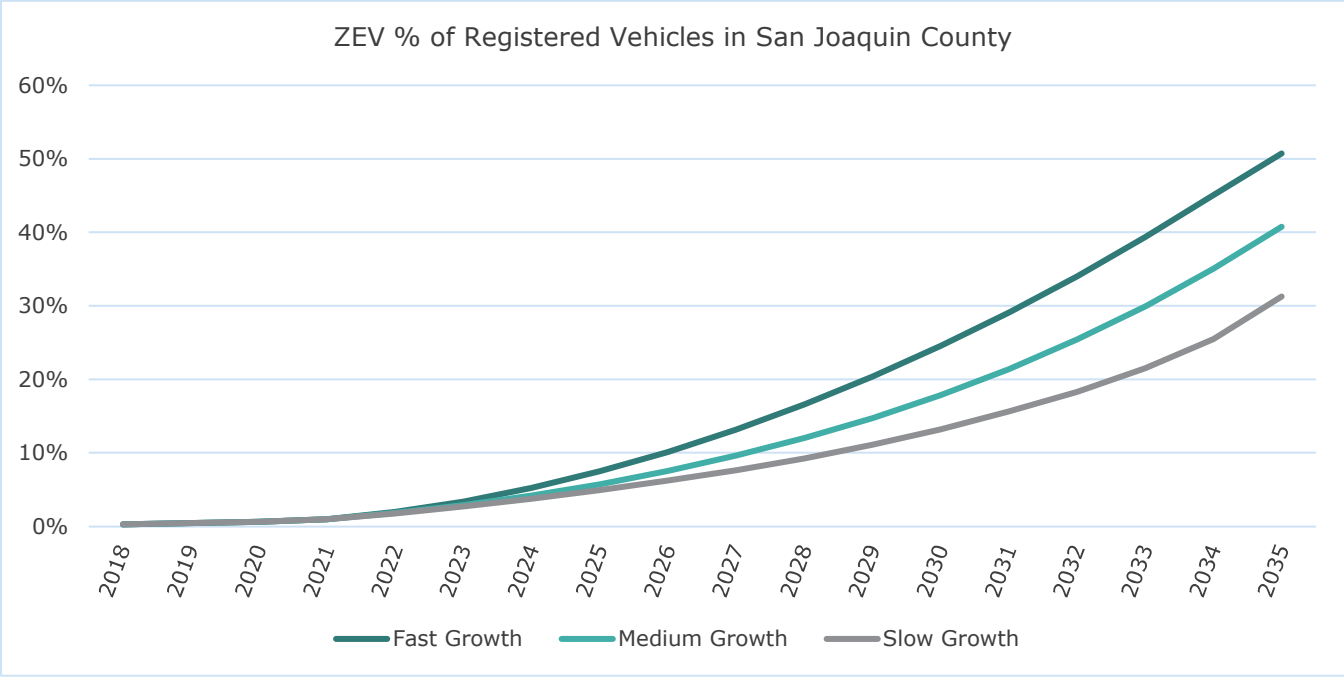

FIGURE 35: ZEV REGISTRATION VEHICLES IN SAN JOAQUIN COUNTY

NUMBER OF RECOMMENDED CHARGERS BY CEC

Assembly Bill 2127 (Electric Vehicle Charging Infrastructure Assessment[27]) requires the California Energy Commission (CEC) to assess on a biennial basis the electric vehicle infrastructure needed to meet the state's goals of putting at least 5 million zero-emission vehicles on California roads by 2030 and reducing greenhouse gas emissions to 40% below 1990 levels by 2030. To this end, the CEC published their updated forecasts in late August 2023. According to their data, as of mid-2023 California has installed more than 91,000 public and shared chargers including nearly 10,000 direct current fast chargers (DCFC). The updated report projects 1.01 million public and shared private chargers to support 7.1 million passenger plug-in electric vehicles in 2030, and 2.11 million public and shared private chargers are needed to support 15.2 million passenger plug-in electric vehicles in 2035. An additional 114,500 chargers are expected to be needed to support the 157,000 medium- and heavy-duty vehicles anticipated by 2030. In their report, the CEC presents data at the county level for projected charger needs for every year up to 2035. **Table 12** shows the projected numbers of chargers needed in San Joaquin County for each year, as projected by the CEC. The table shows four types of chargers: MUD (multi-unit dwellings), Work (workplace charging), Public, and DCFC (higher powered fast chargers). Of these four categories, the CEC assumes MUD, Work, and Public to be Level 2, while DCFC is "Level 3". Additionally, of these four categories, the CEC assumes MUD and Work to be privately operated and not available for public use (i.e., "behind the fence") while Public and DCFC are available for public use. The table shows that CEC estimates that San Joaquin County will need approximately 15,800 total chargers by 2030 and approximately 27,600 chargers by 2035. The Existing Conditions section of this report shows 182 Level 2 and 88 (mostly Tesla) DCFC chargers as of 2022. While the DCFC charger numbers are similar, the Public Level 2 chargers estimated by CEC for 2022 are significantly higher than published by the Alternative Fuels Data Center (AFDC) in 2022.

TABLE 12: CEC RECOMMENDED CHARGERS BY YEAR – SAN JOAQUIN COUNTY

Year	MUD	Work	Public	DCFC	Total	Growth per Year	%
2020	717	426	864	48	2,055		
2021	821	565	1,129	62	2,576	521	25%
2022	940	734	1,446	77	3,198	622	24%
2023	1,004	1,038	1,911	93	4,046	848	27%
2024	1,136	1,340	2,349	112	4,938	892	22%
2025	1,355	1,842	3,031	136	6,365	1,427	29%
2026	1,580	2,265	3,898	173	7,916	1,551	24%
2027	1,867	2,732	4,613	224	9,436	1,520	19%
2028	2,254	3,343	5,386	274	11,257	1,821	19%
2029	2,676	4,111	6,390	334	13,512	2,255	20%
2030	3,135	4,796	7,510	389	15,829	2,318	17%
2031	3,618	5,672	8,890	418	18,598	2,769	17%
2032	3,965	6,521	10,170	524	21,181	2,582	14%
2033	4,297	7,318	11,282	632	23,528	2,347	11%
2034	4,606	7,908	12,246	748	25,508	1,980	8%
2035	4,890	8,662	13,270	774	27,595	2,088	8%

[27] https2033://www.energy.ca.gov/data-reports/reports/electric-vehicle-charging-infrastructure-assessment-ab-2127

EVALUATION OF POTENTIAL LOCATIONS

EXISTING INFRASTRCUTURE AND GAP ANALYSIS

Chapter 2 of this plan discussed the existing alternative fuel (including EV) infrastructure in San Joaquin County. This information and a variety of data sources were then compiled to assist in both the infrastructure Gap Analysis and Siting Analysis. For a full methodology see **Appendix D**.

To identify EV and alternative fuel infrastructure gaps in the project study area, a number of data sources listed in **Appendix D** have been aggregated into a single map (**Figure 36**) displaying overlaid data including data collected during the existing conditions analysis (**Chapter 2**) which included data such as existing EV charging stations and other alternative fuel fueling stations (plus "buffers" around the existing infrastructure), existing concentrations of multi-family housing (by census tract, as defined in the methods section), existing areas defined as disadvantaged communities (by the state, by the federal government, and by both), corridors identified by the Federal Highway Administration (FHWA) as EV Corridors (both EV "Ready" and "Pending"), and DC fast chargers identified as NEVI compliant (4 or more 150 kW + chargers within one mile of an identified EV Corridor).

Figure 36 shows that much of the study area is defined as a disadvantaged community (DAC) by either the State, Federal government, or both. Most of the MUD housing is located generally within the incorporated cities and in more urban areas along the major highways. Interstates 5 and 205 and State Route 99, along with portions of State Route 12 are identified by the FHWA as EV Corridor "Ready" while other routes including State Routes 4, 12, and 120 are identified as EV "Pending". There are currently two DCFC stations identified as NEVI compliant (meaning that they have at least 4 chargers usable by multiple vehicle manufacturers with at least 150 kW output and are within 1 mile of an FHWA EV Corridor). Both of these NEVI compliant stations are operated by Electrify America. One is located north of Stockton along Interstate 5, and one is located in Tracy along Interstate 205.

The data contained in this map, along with the big data purchased from Streetlight Data, the business data obtained via ESRI Business Analyst, and the Outreach data obtained via public meetings, stakeholder meetings, workshops, focus groups, and the Social Pinpoint site, have all been utilized to facilitate the prioritized siting analysis that follows.

The Gap Analysis results (shown as a color scale based on a point scale are based on a combination of infrastructure need (based on demographics such as disadvantaged communities and prevalence of multi-unit dwellings) and infrastructure provision (based on existing and planned EV charging and alternative fuel infrastructure. "Positive" points are assigned for "need" categories and "negative" points are based on nearby existing infrastructure. The total points awarded is the sum of all positive and negative point values, with the highest values representing the highest potential for unmet need.

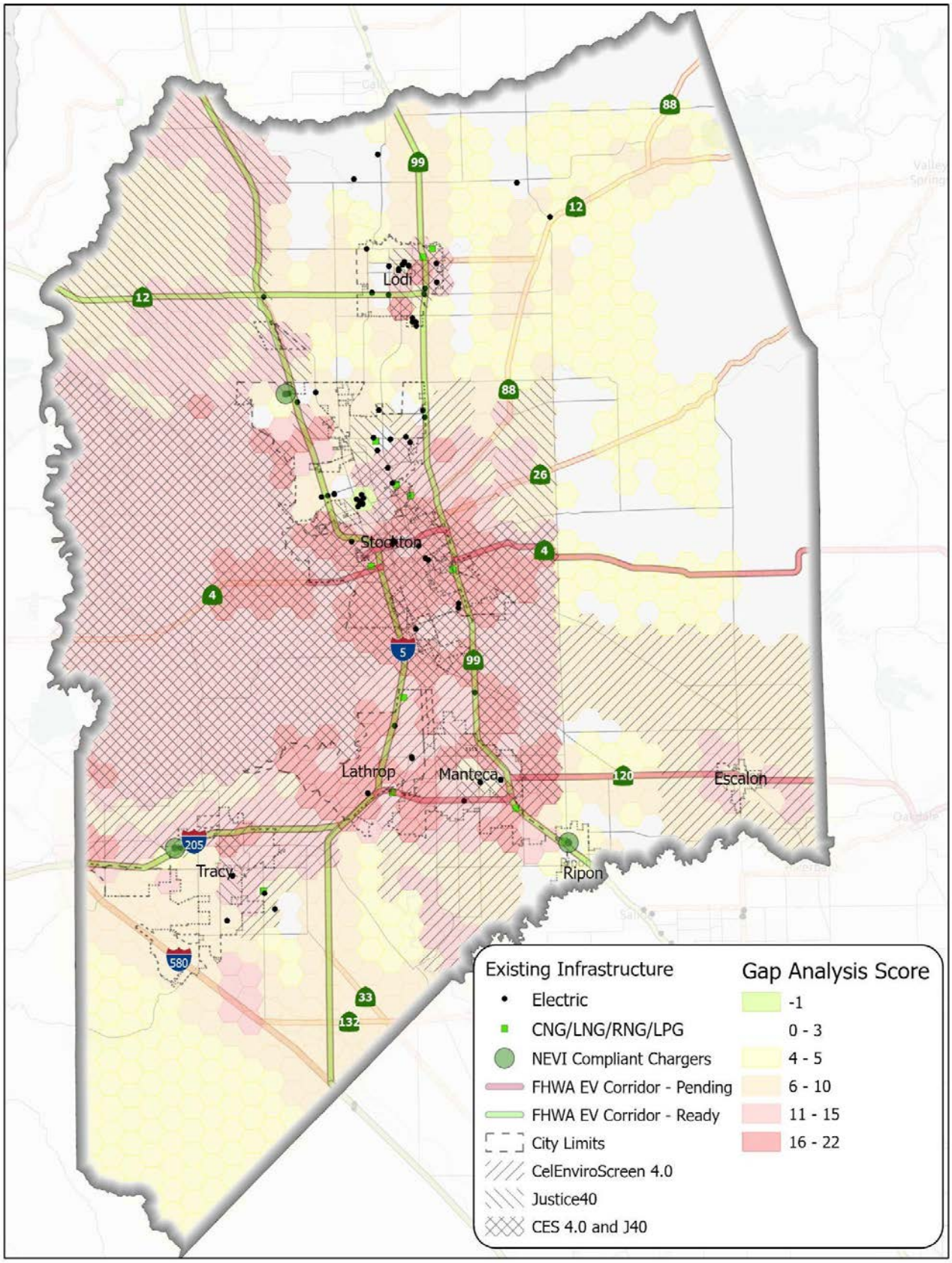

FIGURE 36: GAP ANALYSIS MAP

SITE RECOMMENDATIONS

Using the methodology and geography described in **Appendix D** and the tallying of points based on the gap analysis and siting analysis, each approximately one square mile hexagon area has been ranked both regionwide (the whole of San Joaquin County) and by jurisdiction (each incorporated city and the unincorporated county) to assure that locations throughout the County and its cities are all included in the recommended locations. The top 20 locations based on total points awarded have been identified and mapped. The top twenty locations are summarized in **Appendix E**. The top 20 locations based on the point system described in **Appendix E** include five or more locations in Stockton and Lodi, three in Tracy, two in Manteca and the unincorporated County, one in Ripon, and zero in Lathrop or Escalon.

To better represent the entire County and its communities, additional locations that do not rank within the top twenty based on total points have been identified. For equitable distribution and representation, locations have been identified in each of the incorporated cities, as well as additional locations in communities in unincorporated San Joaquin County (including Mountain House, Lockeford, Linden, and Farmington). These additional locations are based on the top-ranking locations within each jurisdiction and are identified below, in addition to the top 20. Additionally, a few of the locations identified in the Top 20 have been removed from the recommended sites, as they are located too close to multiple other sites identified.

In total, **39** locations are identified throughout San Joaquin County.

- **City of Escalon**
  - Adjacent to State Route 120 in downtown Escalon (Rank 76)
- **City of Lathrop**
  - Adjacent to Interstate 5 and West Lathrop Road (Rank 34)
  - Adjacent to Interstate 5 and East Louise Avenue (Rank 46)
  - Adjacent to interchange of Interstate 5 and State Route 120 (Rank 362)
- **City of Lodi**
  - Adjacent to State Route 99 and East Kettleman Lane (Rank 3)
  - Adjacent to State Route 99 and East Harney Lane (Rank 7)
  - Southwest of State Route 99 and East Victor Road (Rank 13)
  - Adjacent to West Kettleman Lane between South Lower Sacramento Road and South Ham Lane (Rank 14)
  - North of West Kettleman Lane between South Ham Lane and South Stockton Street (Rank 15)
- **City of Manteca**
  - Adjacent to State Route 120 and South Airport Way (Rank 6)
  - Adjacent to State Route 99 and East Yosemite Avenue (Rank 12)
  - Adjacent to interchange of State Route 99 and State Route 120 (Rank 33)
  - Southwest of State Route 99 and Lathrop Road (Rank 49)
  - Near West Yosemite Avenue between South Airport Way and South Union Road (Rank 54)
  - Near Lathrop Road between South Airport Way and South Union Road (Rank 60)
- **City of Ripon**
  - State Route 99 at Jack Tone Road (Rank 1)
  - State Route 99 at Main Street (Rank 104)

- **City of Stockton**
  - Adjacent to State Route 4 and South Stanislaus Street (Rank 4)
  - Adjacent to East Hammer Lane and West Lane (Rank 5)
  - West of Interstate 5 and West Alpine Avenue/ Country Club Road (Rank 11)
  - West of Interstate 5 and Hammer Lane (Rank 16)
  - Adjacent to State Route 4 and South Filbert Street (Rank 18)
  - Downtown Stockton near Park Street and Center Street (Rank 25)
  - Adjacent to West Benjamin Holt Drive and North Pershing Avenue (Rank 47)
  - Adjacent to State Route 99 and Arch Road interchange (Rank 58)
- **City of Tracy**
  - Adjacent to Interstate 205 and West Grant Line Road (Rank 8)
  - Adjacent to Interstate 205 and Byron Road (Rank 10)
  - East of West Grant Line Road and North Tracy Boulevard (Rank 19)
  - Adjacent to Interstate 205 between North Tracy Blvd and West Grant Line Rd (Rank 29)
  - Adjacent to Interstate 205 and North MacArthur Drive (Rank 44)
- **Unincorporated County**
  - Flag City Interchange Interstate 5 at State Route 12 (Rank 9)
  - Garden Acres Adjacent to State Route 99 and State Route 4 (Rank 17)
  - Adjacent to State Route 120 and Austin Road (Rank 38)
  - Northeast of State Route 99 and Waterloo Road (Rank 39)
  - Adjacent to State Route 12 and Lower Sacramento Road (Rank 42)
  - Unincorporated Town of **Linden** (Rank 111)
  - Unincorporated Town of **Mountain House** (Rank 360)
  - Unincorporated Town of **Lockeford** (Rank 496)
  - Unincorporated Town of **Farmington** (Rank 538)

Figure 37 shows all locations and their locations within San Joaquin County.

Figure 38 through **Figure 44** display the local context for each of the locations identified above. **Figure F- 2** through **Figure F- 5** in **Appendix F** display the local context and supporting data for each of the additional locations identified above by jurisdiction. The figures each display both the data statistics that result in the point score for each use case, as well as maps of each location showing local land use and infrastructure including interchanges, gas stations, existing charging infrastructure, existing shopping and dining locations, and existing multi-unit dwellings (MUD) within each of the top hexagon areas.

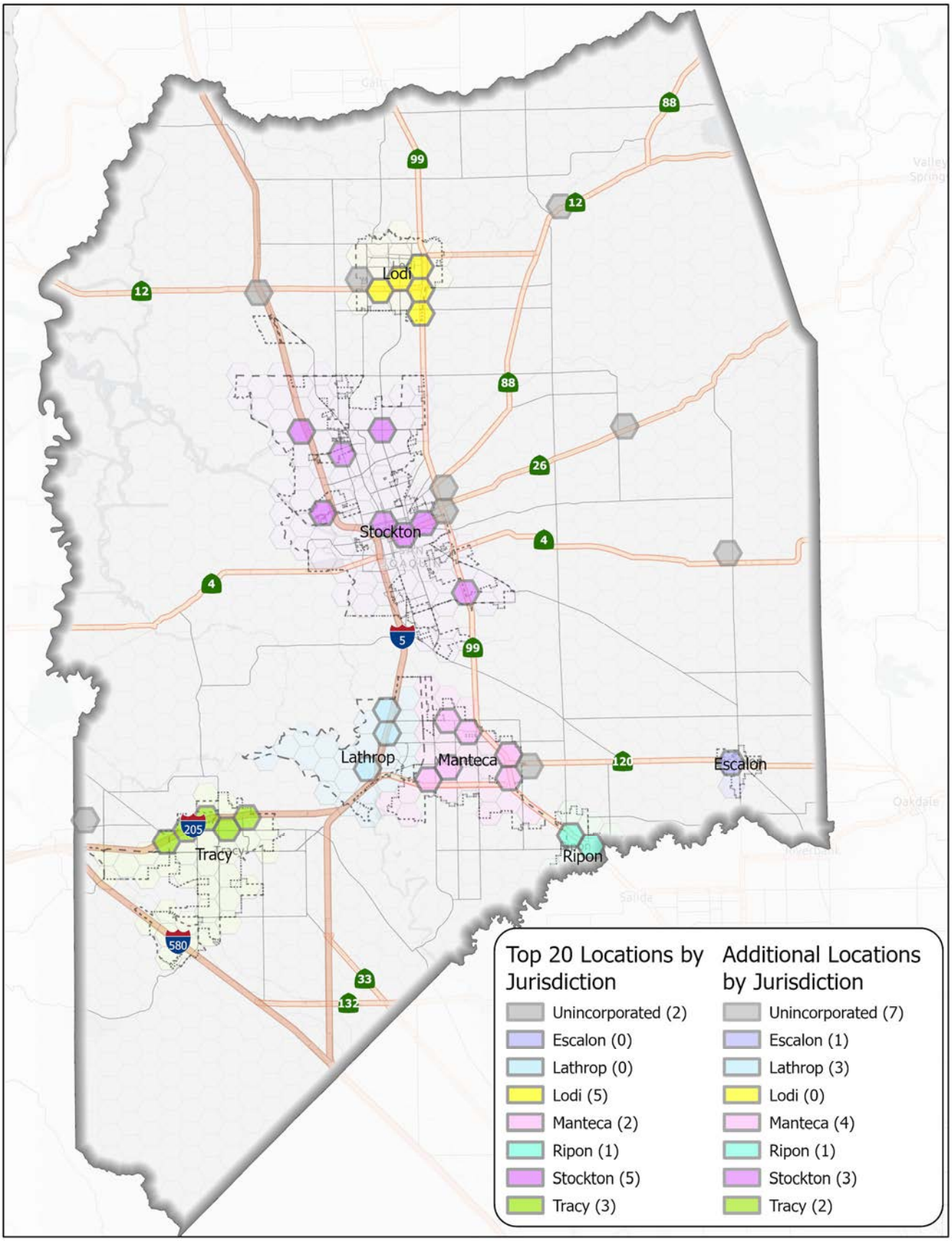

FIGURE 37: SITE PRIORITIZATION – ALL LOCATIONS

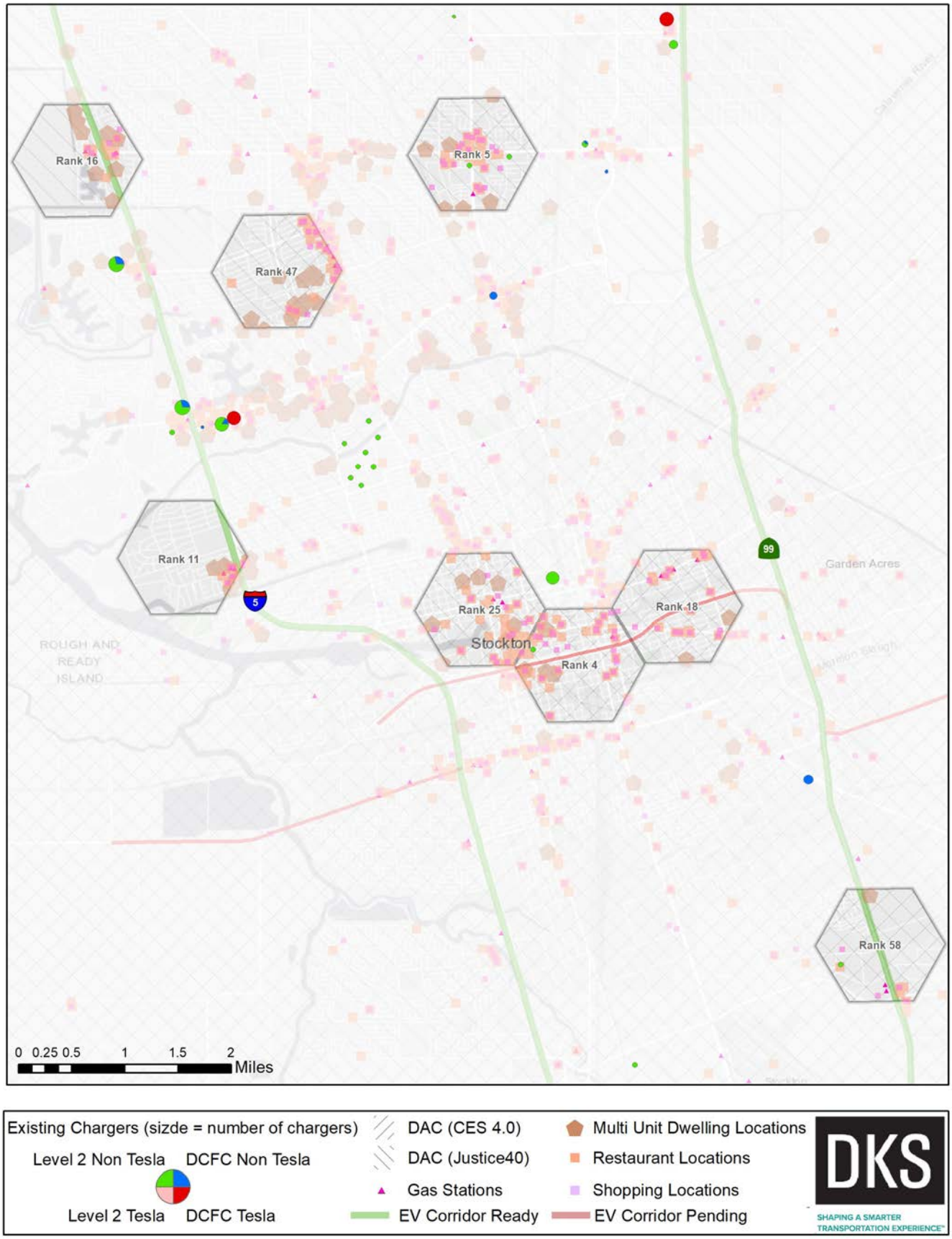

FIGURE 38: RECOMMENDED SITES – CITY OF STOCKTON

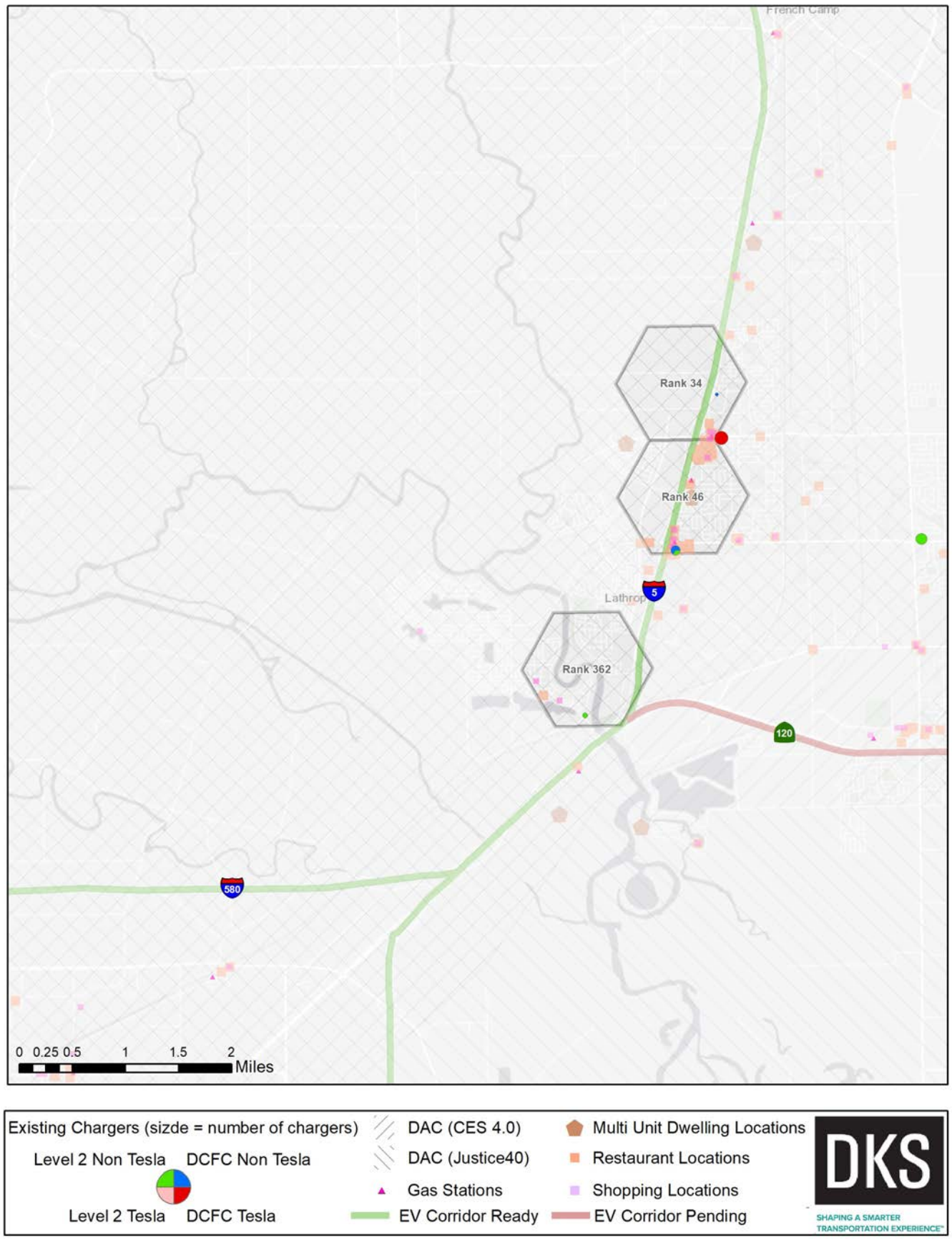

FIGURE 39: RECOMMENDED SITES – CITY OF LATHROP

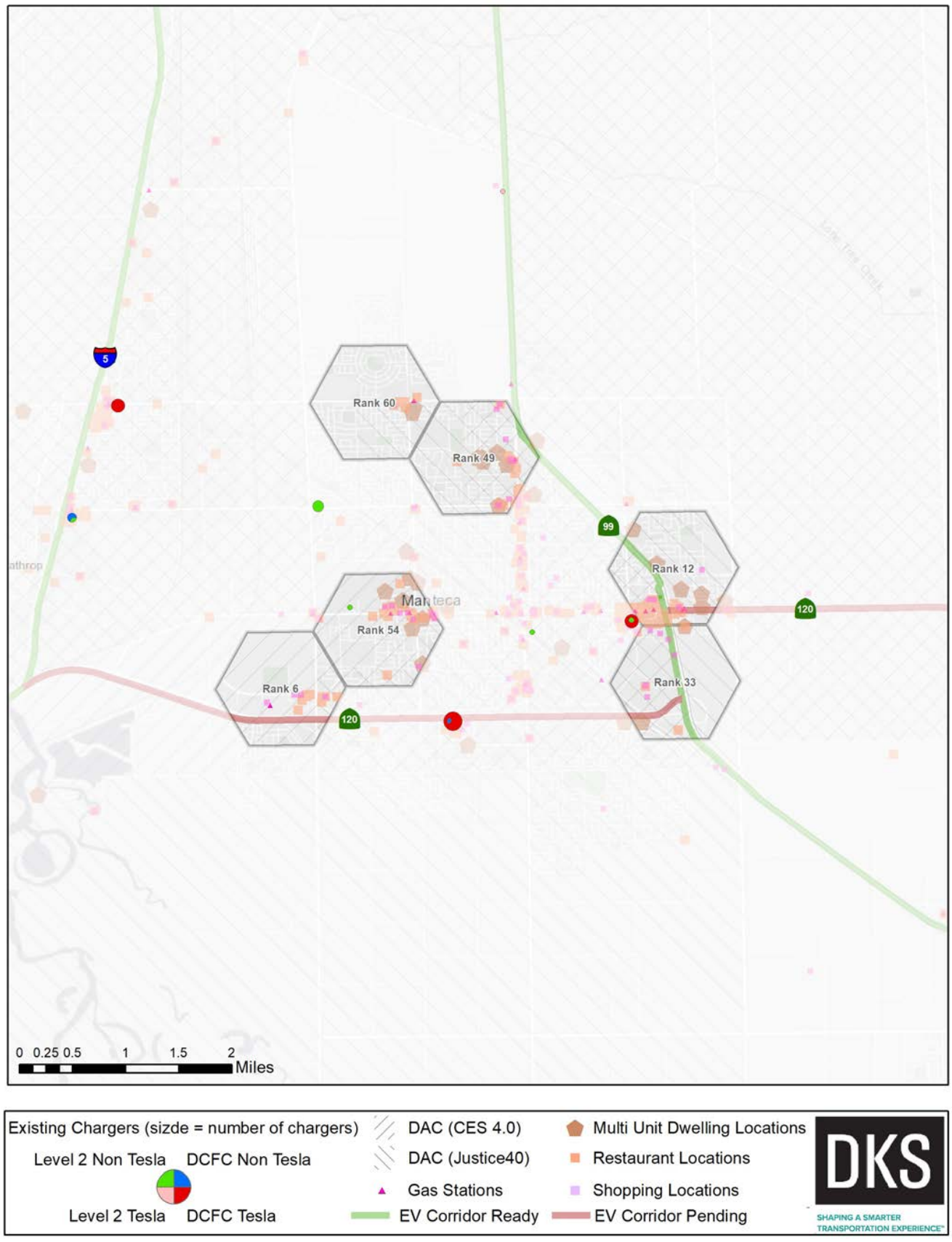

FIGURE 40: RECOMMENDED SITES – CITY OF MANTECA

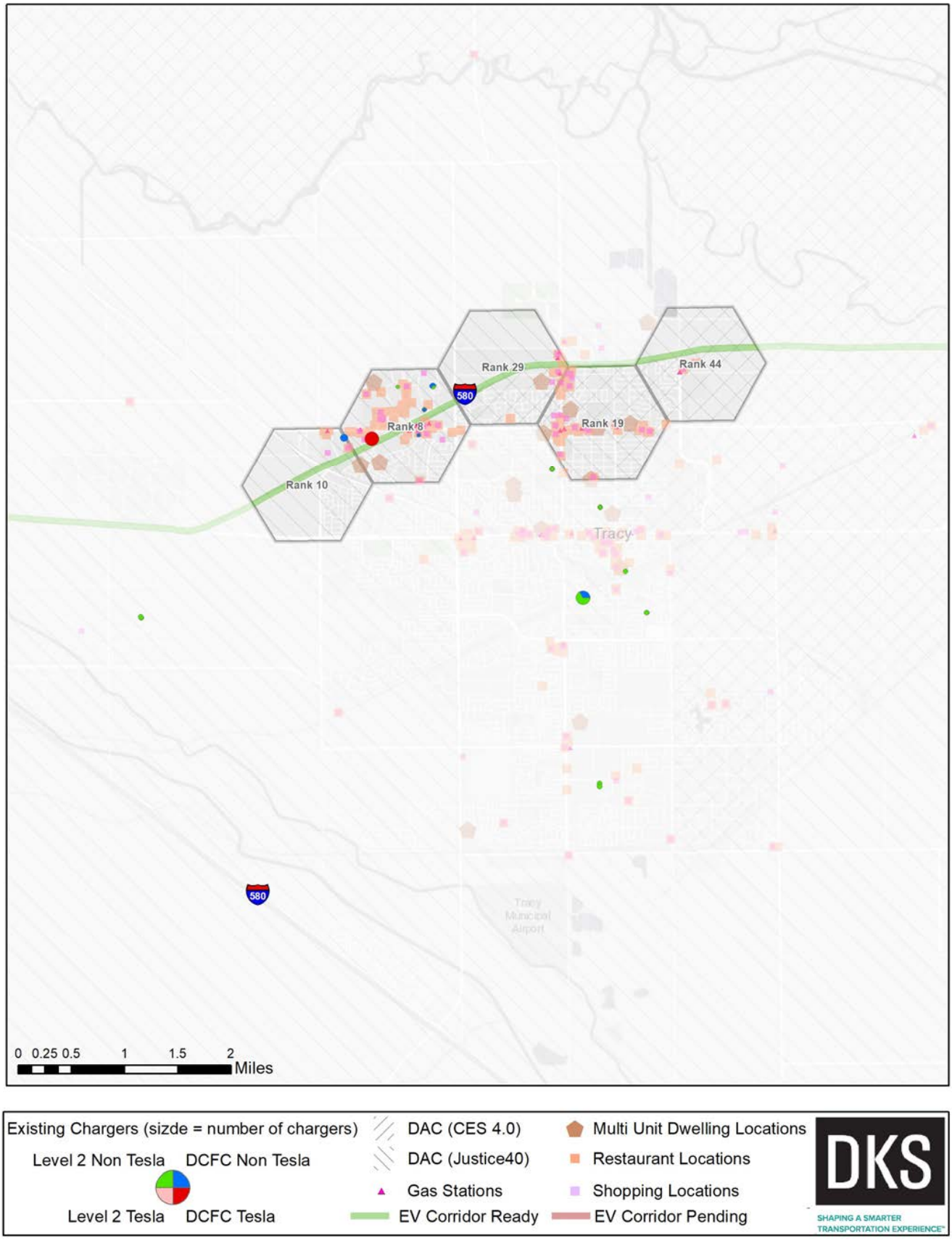

FIGURE 41: RECOMMENDED SITES – CITY OF TRACY

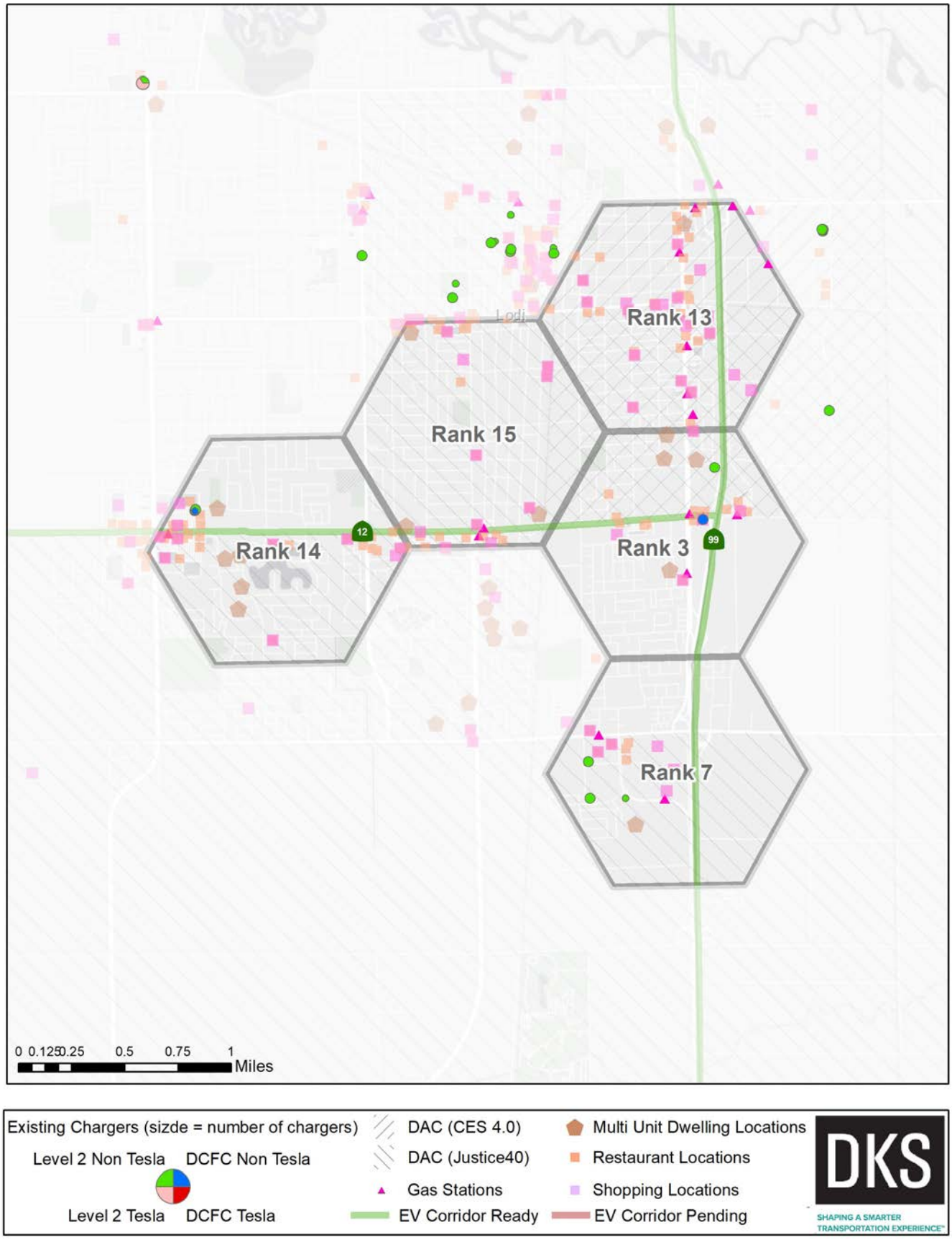

FIGURE 42: RECOMMENDED SITES – CITY OF LODI

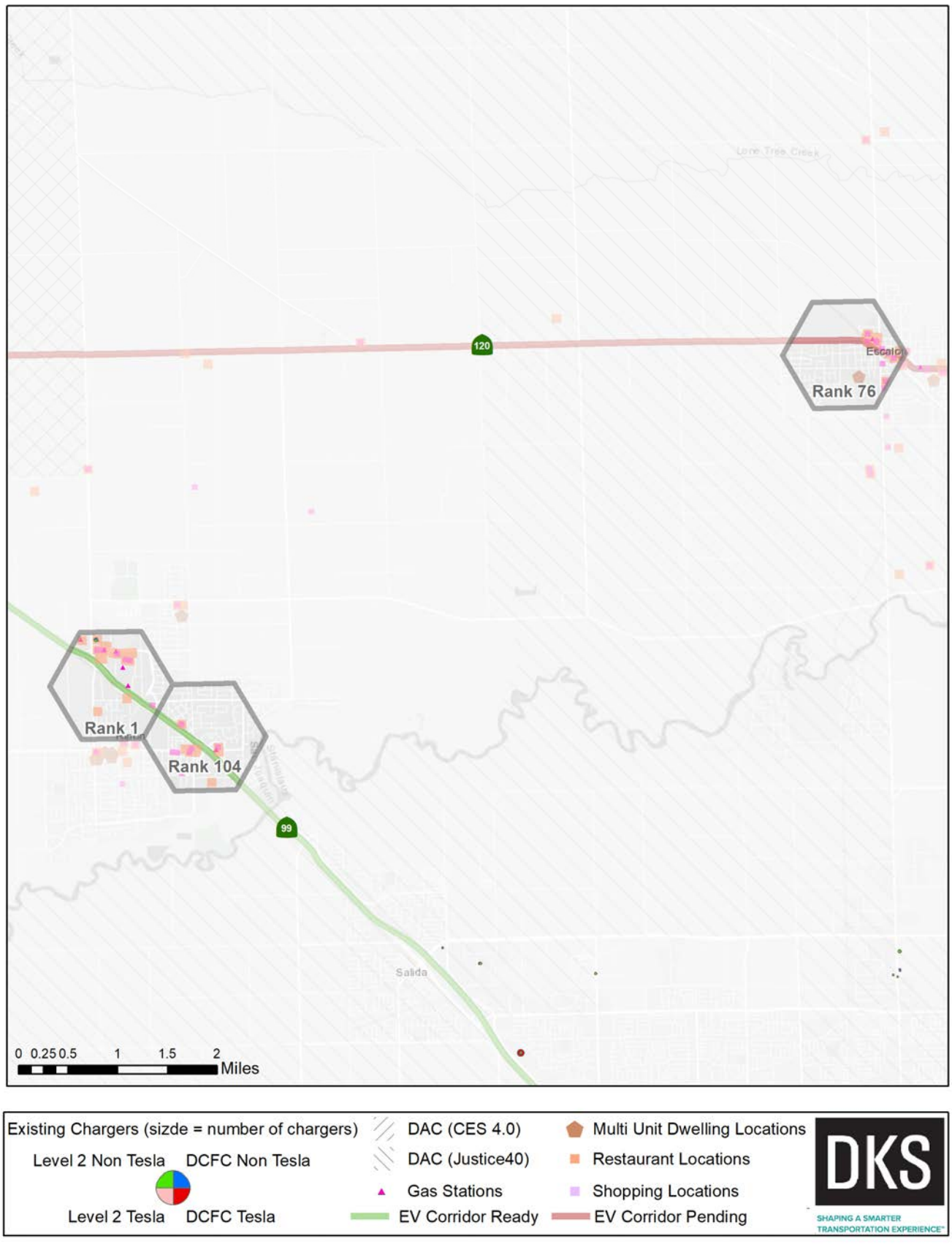

FIGURE 43: RECOMMENDED SITES – CITIES OF ESCALON AND RIPON

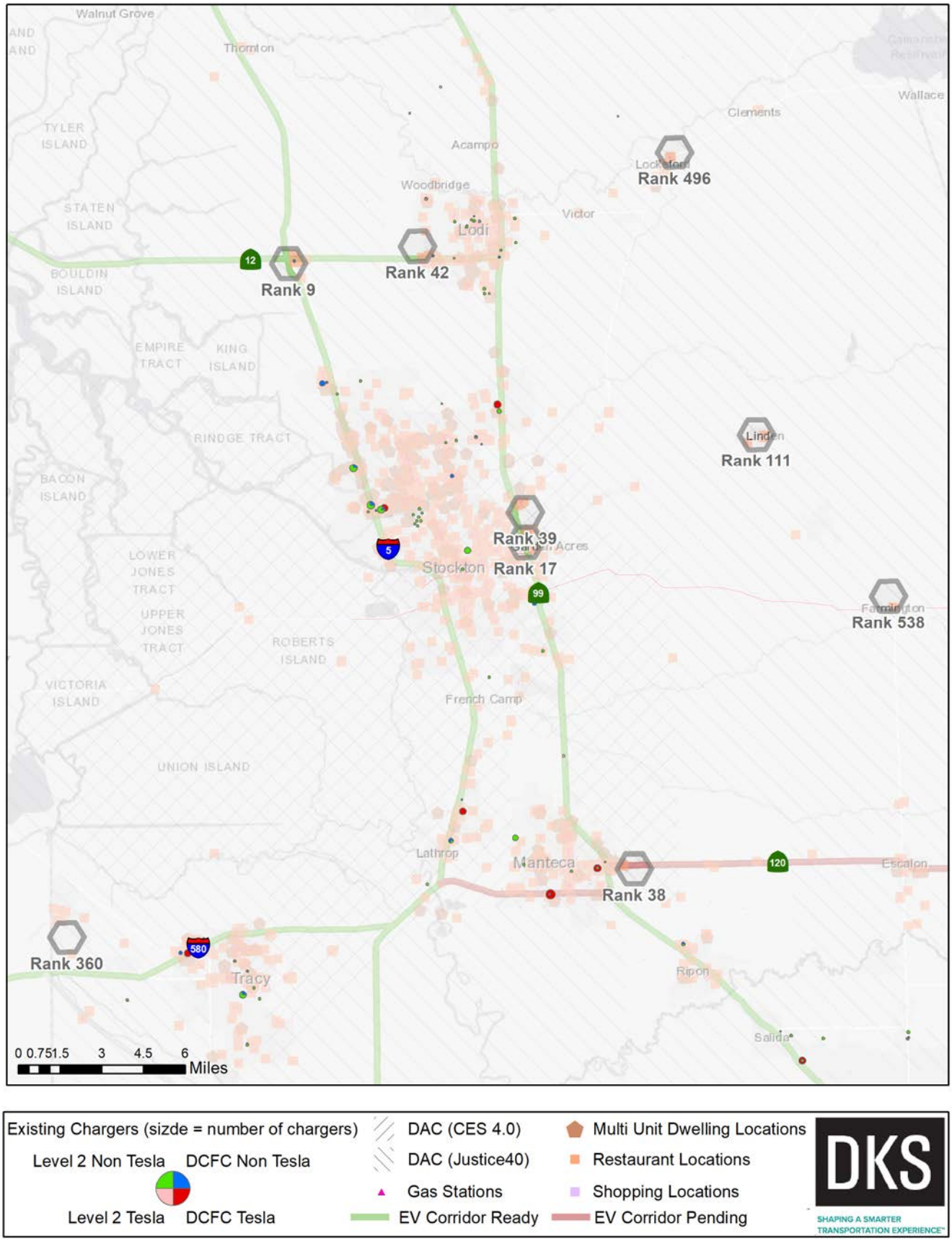

FIGURE 44: RECOMMENDED SITES – UNINCORPORATED COUNTY

BARRIERS

While federal and state legislation and regulations like those discussed in this report (**Appendix B**) support or even mandate the ZEV transition, ZEVs, and the infrastructure to support them still face a steep ramp up in adoption. In the technology adoption curve, shown in **Figure 45,** the "chasm" represents the jump from the "early adopter" phase to the "early majority" phase when a technology becomes more mainstream. To cross this chasm certain barriers will need to be overcome.

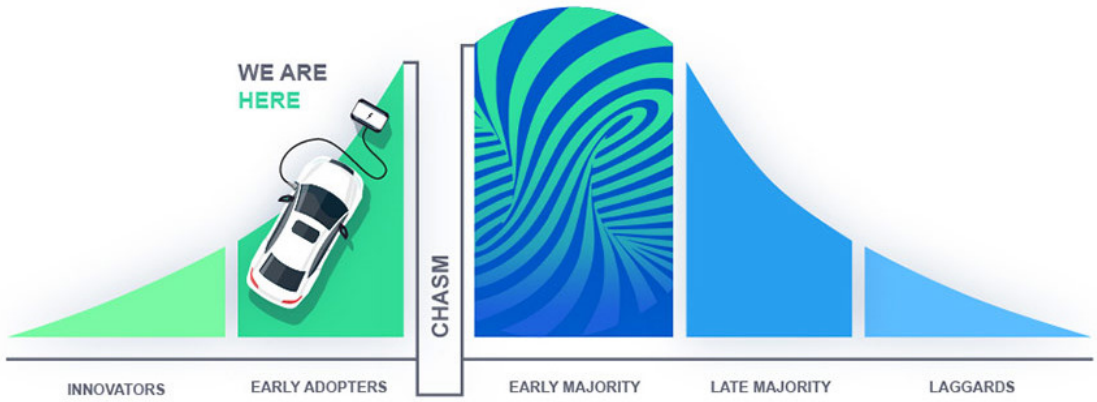

FIGURE 45. EV ADOPTION CURVE

Certain actions can be taken by local governments to support early adopters and implement rules that move others toward ZEV adoption. Through analysis of existing infrastructure gaps and community input the following barriers have been identified:

- Lack of charging infrastructure in key areas of the region
- Costs to install infrastructure
- Grid and transformer constraints to serve EV load
- Challenges in the permitting process
- The transition process for fleets
- Lack of awareness about ZEVs and available incentives
- Different payment systems for using EV chargers

LACK OF CHARGING INFRASTRUCTURE

Inadequate infrastructure is a commonly discussed barrier to ZEV adoption, and a key focus of this study. The gap analysis discussed in this chapter provided details about specific areas of San Joaquin County with the greatest need for charging infrastructure. During the community engagement process for this project participants had questions and concerns about the placement of chargers as well as how they would be managed and maintained. Stakeholders also noted that the accessibility of existing charging infrastructure had been an issue as some chargers are for workplace or fleet use only, and not accessible to the public. The community expressed that not only was there not enough infrastructure, but the location and accessibility matter greatly as well.

COSTS

Costs related to the purchase and installation of charging infrastructure can be significant and frequently arise as a concern. The Technical Advisory Committee for this project expressed curiosity about the types of charging technologies that will be discussed in this plan as well as the costs and what could be expected for San Joaquin in the future. These costs include hard costs such as equipment and material and soft costs such as permitting and design. The following list provides further detail about each of these categories of project costs:

Hard Costs

- **EV Chargers:** These typically cost $8,000-$126,000 to purchase. This includes:
  - Level 1 EV chargers (120V receptacles, no cost, if existing, otherwise, costs depend on existing electrical panel capacity and proximity of charger location)
  - Level 2 EV chargers ($8,200 for dual head ports, including 20% contingency)
  - Power cords and cable management for Level 1 or 2 chargers (costs included)
  - DC Fast Chargers ($126,000 includes for dual head 150kW DCFC ports including 20% contingency)
  - Gateway Module/ Load Management Devices ($2,000 for up to 4 chargers included in charger cost)
  - Note: this excludes costs for warranties because the standard warranty that vendor offers is part of our cost estimates.
- **Materials/Equipment**: $10-$15K per charger without electrical or panel upgrade. $20-30K with electrical or panel upgrades). This includes costs of purchasing and installing materials typically required for fleet EV charging projects (other than the EV chargers themselves) including the following items:
  - Wiring (Note 50 feet of conduit, wiring assumed per Level 1 and 100 feet per Level 2 charger)
  - Conduit Systems (underground and/or surface-mounted)
  - Trenching and/or directional drilling
  - Pull Boxes (installed in the ground and/or surface mounted)
  - Aerial wire spans
  - Footings for installation of EV charger pedestals and electrical service panels
  - Bollards
  - Wheel stops
  - Step-down transformers
  - Electrical service panels including sub-panels.
  - Circuit breakers
  - Signage
  - Striping for parking stalls
- **Site restoration:** $4-20K per charger depending on site conditions. Site restoration covers the costs to install Civil/Landscaping improvements to restore the site following excavation and other construction activities including:
  - Minor restoration for civil infrastructure such as roadway and/or sidewalk repaving
  - Minor curb and gutter restoration

- Minor surface water (drainage infrastructure) restoration
- Minor landscaping restoration such as replanting

Soft Costs

- **Contracting/Design:** Apply an estimated 20% mark-up to the total project costs to include:
  - Engineering design fees
  - Contractor profits
- **Permitting:** Each local authority with jurisdiction mandates electrical permits for installation of EV chargers.
  - Electrical permit fees charged by local jurisdictions, typically $5,000 per site plus $1,000 for labor and contingency.
- **Utility fees**: This consists of fees charged by the electrical utility (SDG&E) to bring additional power to the fleet charging depot to power the EV chargers, including:
  - Electrical upgrade design (up to $5,000 per charger)
  - Transformer replacement ($35,000-100,000)
- **Contingencies:** A 20% mark-up to be applied to the project costs for each cost category (categories #1, #2, #3, #5, and #6 including contracting/design) consistent with public agency capital project budgeting.

GRID IMPACTS

Electric grid capacity, transformer load and other concerns related to utility infrastructure are common barriers to the installation of EV charging infrastructure. As illustrated below in **Figure 46**, the capacity of California's electrical grid varies widely by electrical utility service territory and geography. This is especially true during peak demand periods in the evening hours when power demand spikes and solar power production has waned for the day.

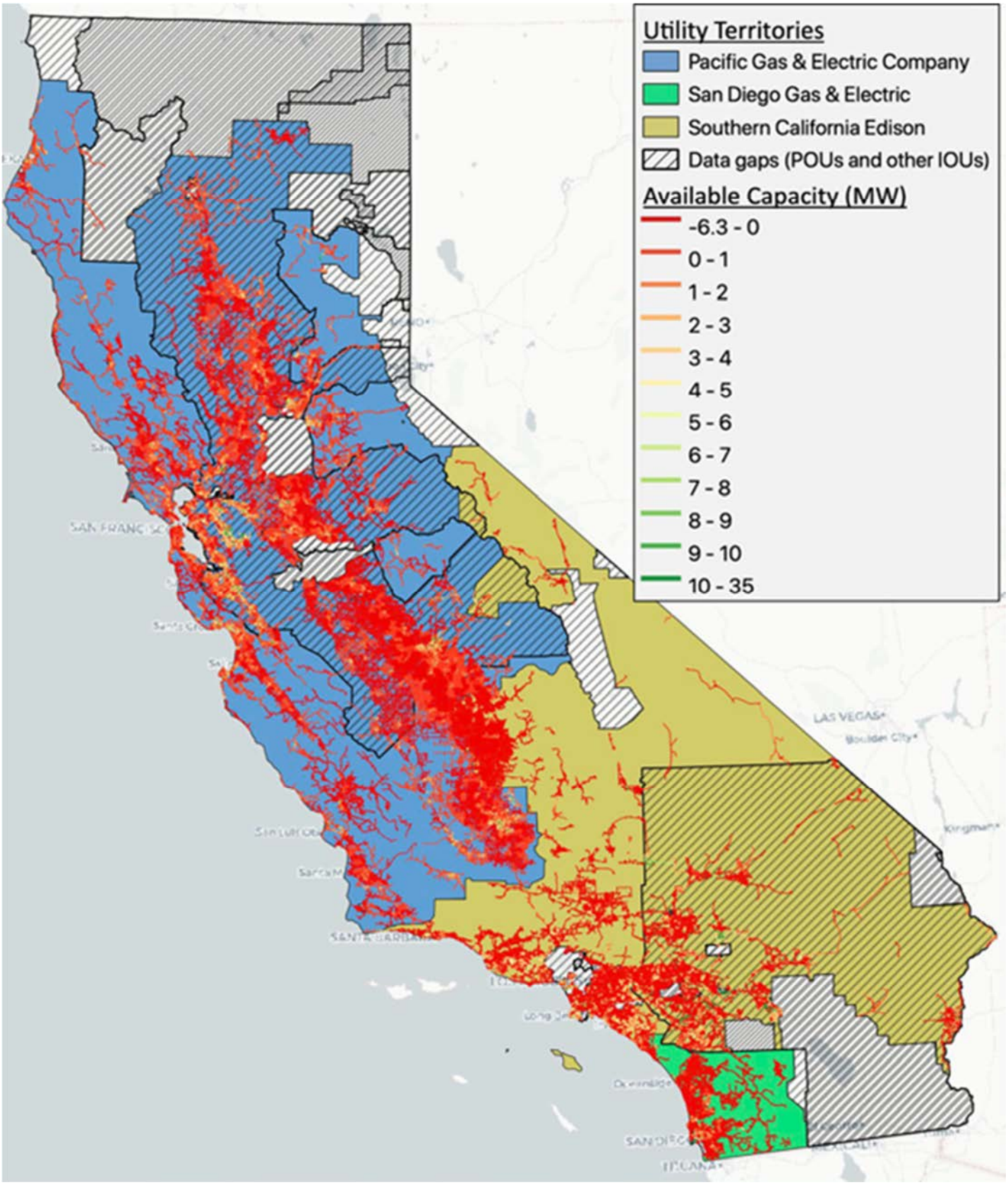

FIGURE 46: CALIFORNIA ELECTRICAL CAPACITY (SOURCE: NREL)

PERMITTING

Even after identifying the need and locations for charging infrastructure and addressing grid constraints, permitting can be yet another barrier to installing the charging equipment and the needed electrical infrastructure. For this reason, streamlining the permitting process to make it as easy as possible can be a simple and cost-effective solution to support the installation of EV charging infrastructure.

In recognition of this, AB 1236 and AB 970 require that local jurisdictions implement streamlined permitting for EV charging stations by implementing at least six of seven criteria:

1) Add a city ordinance to codify this regulation.
2) Make a checklist available from the website for expedited EV charger installations.
3) Administrative approval of permits.
4) Permits can only be disapproved for Health and Safety reasons.
5) Permit applications can be requested electronically, and electronic signatures are accepted.
6) Permits cannot be issued conditionally upon approval by an association.
7) If any deficiencies are found, all deficiencies will be noted in a single deficiency notice.

With streamlined permitting, residents, businesses, and EV installers can more accurately predict the time and cost of installing a charging station. It also decreases the likelihood that people install charging stations without obtaining a permit. At the time of this writing, San Joaquin County is still in process of meeting permit streamlining requirements. Three jurisdictions within the county, Lathrop, Ripon, and Escalon have not yet met streaming requirements (**Figure 47** and **Table 13**).

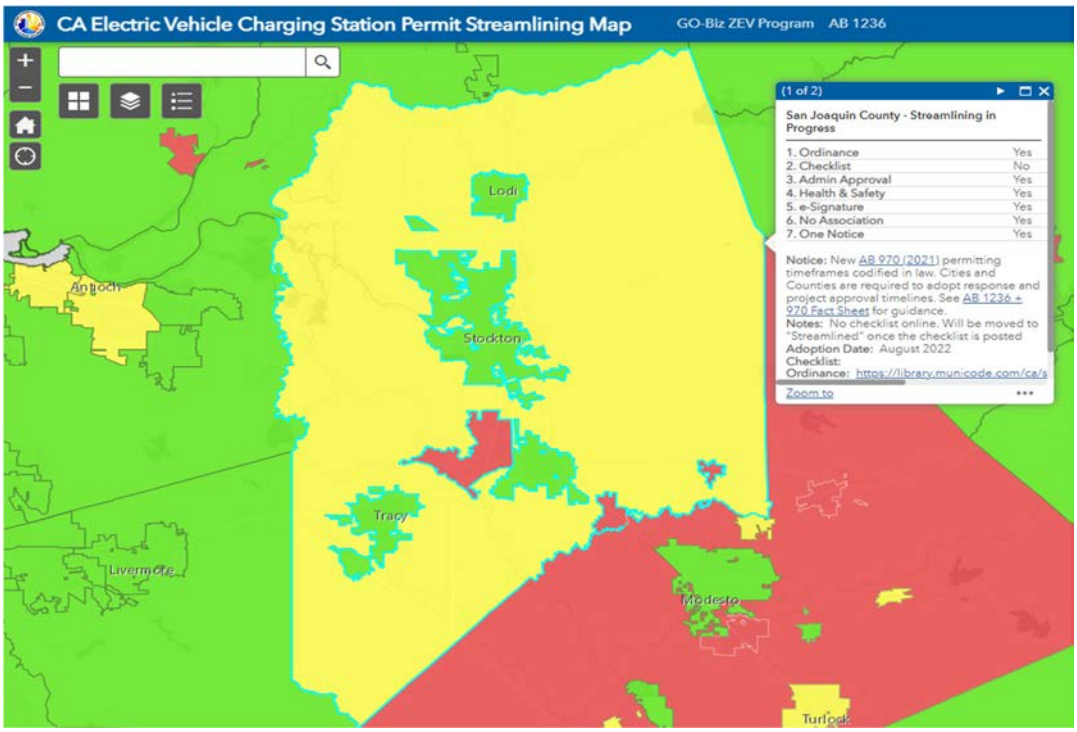

FIGURE 47: PERMIT STREAMLINING MAP-SAN JOAQUIN COUNTY

Source: https://california.maps.arcgis.com/apps/webappviewer/index.html?id=5b34002aaffa4ac08b84d24016bf04ce

TABLE 13: PERMIT STREAMLINING STATUS WITHIN SAN JOAQUIN COUNTY

JURISDICTION	STREAMLINING STATUS
LODI	YES
STOCKTON	YES
TRACY	YES
LATHROP	NO
MANTECA	YES
RIPON	NO
ESCALON	NO

THE TRANSITION OF FLEETS

During the community and stakeholder engagement process for this project, questions arose regarding the prioritization for different fuel types: A representative of the City of Lodi's Public Works noted that for public transportation agencies only electric and hydrogen fuel vehicles will count towards measurements in greenhouse gas emission reduction targets mandated by the state. They expressed concerns about how the shift to alternative fuels will impact goods movement and public transportation. Other concerns discussed included:

- Costs to purchase alternative fuel vehicles.
- Viable ZEV alternatives not being available yet, or if there is a viable option, it is still too costly to justify.
- Some fleet vehicles need to be in operation for long hours and therefore need to be able to run all day without recharging, meaning other fuels such as hydrogen would need to be considered.
- Even with grant funds, some ZEV options cost as much as four times as much as an ICE vehicle making them a challenge to justify.

Municipalities, school districts, and transit agencies will likely be the first large-scale ZEV adopters due to the regulations and funding opportunities discussed throughout this report. Yet, they face significant challenges in making this transition. They will also use more energy—electricity and hydrogen—than passenger cars will use. Some of the key mandates and funding opportunities include:

- The Innovative Clean Transit regulation which requires a transition to zero emission buses by 2040.[28] Small transit agencies must submit a transition plan to CARB by June 2023.
- The U.S. EPA and the State of California funding the replacement of diesel buses with electric buses and providing funding for charging stations. Eligible districts and third-party operators can "stack" federal and state funding to transition to electric buses.

[28] https://ww2.arb.ca.gov/sites/default/files/2019-10/ictfro-Clean-Final_0.pdf

- ARB adopting the Advanced Clean Fleet regulation in 2023. If adopted as written, all public agencies and private fleets with more than 50 vehicles and $5 million in revenue will be mandated to bring medium- and heavy-duty ZEVs into their fleets starting on January 1, 2024.

Transitioning to ZEVs involves collecting data and information about vehicles and facilities that operators often don't have. Some organizations don't have a central fleet manager and instead every department manages its own vehicles and contacts procurement when they want to buy a vehicle. Organizations are often short staffed and don't have the time to do research, solicit bids, and apply for grants and incentives. Many ZEVs are also not readily available on dealer lots, and many of the vehicles being announced won't be available for a year or more.

LACK OF AWARENESS ABOUT ZEVS AND AVAILABLE INCENTIVES

Another frequent challenge with ZEV adoption is limited awareness about zero emission vehicles themselves as well as incentives to purchase them. A general lack of awareness is an on-going challenge faced by those seeking to boost ZEV adoption. This includes knowledge about the vehicles themselves and how they work, the distance they can drive and where they can be fueled. Many are also unaware of available incentives to purchase ZEVs. This includes both for personal use and for fleets that are mandated to transition to ZEVs. To build out the needed infrastructure to support ZEVs, significant workforce development also needs to occur, which is another area where awareness will need to be increased.

EV CHARGER PAYMENT SYSTEMS

Different payment systems to use EV chargers can cause confusion and unintended barriers. At a minimum, this process should handle the transaction while not creating a barrier for drivers to use the charging equipment. However, many different payment systems currently exist for EV chargers such as RFID or NFC/chip readers, app-based, cards with the charger network, pay by phone, QR code and pay online or physical card readers. RFID or NFC/Chip readers and magnetic swipe can become non-functional or worse, thieves can install skimmers over magnetic swipe card-readers to steal credit card information. Other systems may cause inconvenience to the user requiring sign-ups with each charging network. To somewhat combat these issues. The state of California has implemented minimum standards which can be found on the CARB website:

- Minimum payment hardware technology of Euro MasterCard Visa (EMV) chip reader for credit cards and near field communications (NFC) reader for mobile payments
  - Contactless payment is enabled by NFC reader.
  - EMV chip enabled payment is available on prepaid debit cards.
  - Contactless payment is not yet available on prepaid debit cards.
- Must display a toll-free number for payment processing.
- Must comply with industry data security standards (PCI – DSS Level 1).
- Must be installed on individual EVSE or kiosk.[29]

[29] California Air Resources Board: https://ww2.arb.ca.gov/resources/documents/electric-vehicle-supply-equipment-standards-regulation-background-and-faqs

Through research, stakeholder and public engagement and analysis of current and needed infrastructure, the following recommendations have been developed to encourage adoption of alternative fuel infrastructure and vehicles throughout the San Joaquin County region.

GENERAL RECOMMENDATIONS

This section will focus on non-financial/non-infrastructure aspects of implementation that are within the control of SJCOG and its member agencies and project stakeholders.

Coordinate Cooperative Transportation Electrification Planning

Due to the very nature of transportation, planning for the ZEV transition will take coordination across borders and boundaries of counties, cities, utility service territories, transit agencies and more. For this reason, ZEV planning must be collaborative. Beyond the development of the San Joaquin County Alternative Fuels Vision Plan, it is recommended that SJCOG and its member agencies establish a collaborative committee of stakeholders and major cities within the county, and utilities as a first step. This committee should also coordinate with neighboring jurisdictions and regional efforts.

The committee will need to jointly coordinate planning and funding opportunities and efforts for expanding ZEV infrastructure moving forward. These efforts could include but may not be limited to determining goals, measuring progress, and identifying leads for tasks. Some of the goals and activities of the committee could include:

- Providing data that helps the cities, and communities in San Joaquin be more competitive for ZEV-related grants and programs and collaborating on grant and funding opportunities where appropriate. This could include collecting traffic data from identified community-based entities including Caltrans and the U.S. Census Origin-Destination and services like Streetlight. This data can then be used to identify current traffic patterns, seasonal traffic variation, projected highway and freeway annual traffic growth rates, and project potential traffic patterns for ZEVs in 2030.
- Advise on and coordinate ongoing and new funding opportunities. This includes monitoring the sources identified in **Appendix A** of this report.
- Coordinating ongoing education and outreach for residents, employees, and tourists in the leadup to the 2035 ZEV mandates.
- Developing effective outreach and communication programs for disadvantaged communities (DAC) and under-represented populations.
- Creating workforce development programs around ZEV infrastructure, vehicles, and services.
- Measuring progress toward increasing the number of charging stations in desired areas by monitoring information about existing and planned charging stations from PlugShare, Alternative Fuel Data Center, CaFCP's Hydrogen Station Map, and from planning departments EVgo, Electrify America, Tesla, and hydrogen station developers.
- Measuring and recording equity impacts.
- Measuring progress toward ZEV adoption by vehicle class and type.
- Creating and monitoring county or corridor specific goals by reviewing and sharing existing and ongoing transportation planning projects and each jurisdiction's Planning Division data, general plans, and specific plans for land-use and roadway planning.

- Estimating GHG reduction.
- Updating the San Joaquin County Alternative Vision Plan on a regular basis, perhaps every 2-5 years with annual updates to specific goals.

California has several funding programs for zero emission vehicles and infrastructure, most of which have requirements for data reporting and ensuring that data is regularly updated. Each of these information sources also provides insight into the progress of the ZEV transition. An online dashboard including this information could help paint the picture and blend in region-wide information about transit ridership, active transportation efforts, and other initiatives.

Effective Community Engagement and Workforce Development

Providing effective outreach and workforce development will be key to raising awareness and preparing for the alternative fuel future. A number of recommendations can address these challenges including using less technical language, providing materials and media in a variety of languages, training and utilizing ambassadors.

Community Engagement

Avoid Technical Language: As a first step, reducing the use of technical verbiage can be a simple change for in-person engagement, collateral, and media. Even when assumed to be simple, technical language may not be easy for people to understand, particularly with audiences where English is a second language or individuals may have limited reading skills. The use of storytelling and associations can help people understand basic concepts. For example, language like "electric vehicle like a Tesla," helps people draw the link between technology and a consumer product. Avoid acronyms, like ZEV and EVSE in outreach, which are meaningless for most people.

Avoid Heavy Use of Text: Many people in disadvantaged communities struggle with reading. Outreach, incentive, and training materials tend to be heavy with text, either in print or online. Additionally, some training programs require that applicants pass a written test or submit applications and reports in English and sometimes in Spanish. Collateral and course materials should use more images and incorporate video. Short video clips that are quick to watch have a major impact on comprehension. Use members of the community to translate materials into other languages, like Russian, Farsi, and Hindi, and ensure that the materials are culturally appropriate for the target audiences.

Benefits and challenges of ZEVs: Potential ZEV owners need to see the trade-off between today's investment and a savings that takes months or years. Materials should clearly articulate the cost of a ZEV, the comparison between the cost to fill the tank and charge a battery as well as the risks such as the need for a more robust public charging network and the challenges that may impose if one does not have access to charging at home.

Interactive events: Offering physical and interactive activities such as ride and drives, or ZEV tailgates give people firsthand experiences with ZEVs and an opportunity to talk with ZEV owners to learn about their experiences, both positive and negative. Interactive activities can also help reduce the stigma that ZEVs are inaccessible and complicated.

Workforce Development

Transparency: Workforce development participants need to see the timeline to achieve the higher incomes projected by programs. Materials also need to clearly articulate the duration of a training

program, and the risks such as the starting wage and potential wage cap for a job. It can also be more effective to offer physical and interactive activities or experiences so that people can imagine themselves in a ZEV career.

Ambassadors: Ambassadors can be an effective method to recruit people into a new or unfamiliar industry, however people in the ZEV industry often do not look like the people in disadvantaged communities. For this reason, it's important that Ambassadors reflect the target community. Ambassadors, also called "Promoters," may be employed in a ZEV job, or a job related to the industry, an early ZEV adopter, and/or actively participated in a training or employment program. Ambassadors can share their experiences or even play a more direct role as a mentor or guide.

Variety in Career Options*:* Establish an ecosystem so that activities, education, and outreach provided to the community will first be validated by the network of community partners. Program managers, coaches, social workers, counselors, and educators can participate in a series of workshops designed to educate about the scope of the ZEV industry and the many career options that exist. The workshops should be combined with site visits to further illustrate how the job functions apply. An optimal site visit will be one that has an ambassador working there. This requires strong relationships to be established with business and division executive leaders.

Community Engagement Events: Community engagement events can be a hard sell for recruitment or for participating in a career development program. People may be asked to commit on the spot, which can set them up for failure if unexpected hardships or issues arise and the participant doesn't have a support system to help them through it. For this reason, career fairs, focus groups, info sessions, and workshops should be focused on education rather than recruitment. Once a participant shows interest, the role of community partners, training providers, and employers should be to fuel that interest until it becomes a passion. It also helps to establish a strong support system within the community, the program, and a potential employer to help participants weather life's storms.

Air Quality Sensors

Collecting initial roadside data on emissions by installing air quality sensors and repeating data collection and analysis annually or bi-annually can:

- Provide important data that helps SJCOG and its member agencies, cities, or communities be more competitive for ZEV-related grants and programs.
- Measure progress toward reducing transportation related GHGs and air pollution.
- Draw a correlation between the available ZEV charging/fueling stations and zero-emission vehicle miles traveled by visitors and in-bound commuters.

The U.S. EPA has an annual competitive grant for community air monitoring. Several private companies offer roadside air monitoring stations often used during construction projects. SJCOG and its member agencies could contract with a company to deploy sensors along the most traveled roads and interchanges for at least 30 days in the summer and 30 days in the winter to create a baseline.

The benefits of monitoring air quality in high-traffic areas include setting a baseline for transportation related emissions as well as a yardstick for improvement. While this does not directly support ZEV adoption or infrastructure expansion, it does provide valuable information for grants and other funding opportunities as well as a metric by which to measure success as ZEV adoption grows.

Create a Dashboard for Local Data

A consolidated data dashboard will:

- Provide important data that helps SJCOG and its member agencies, cities, or communities be more competitive for ZEV-related grants and programs.
- Measure progress toward increasing the number of charging stations.
- Measure progress toward ZEV adoption by vehicle class and type.

California is fortunate to have many funding programs for zero emission vehicles and renewable energy, all of which have requirements for data reporting and ensuring that data is regularly updated. A single dashboard on the San Joaquin County website could paint the whole picture and blend in county-wide information about transit ridership, active transportation efforts, and other initiatives. Once roadside AQ data becomes available, it could be added to the dashboard.

A single dashboard that shows only the county information that is updated twice a year will create a visual tool that shows progress toward short- and long-term goals. It may also identify zip codes that are slower to move to ZEVs and determine targeted outreach and support needs.

Potential sources of information include:

- CALSTART and the Center for Sustainable Energy (CSE), the two organizations that administer most rebate programs, have dashboards that show rebates and incentives by county, zip code, and vehicle type. [30], [31], [32]
- The California Energy Commission's (CEC) ZEV dashboard shows ZEV vehicle registrations, charging stations, hydrogen stations, and medium-and-heavy duty deployment by county and sometimes by zip code.[33]
- The Air Resources Board requires annual reporting about transit bus deployments with a spreadsheet of each agency bus by fuel type.[34]
- California Distributed Generation Statistics shows the distribution of solar incentives from multiple funding programs.[35]
- The Governor's Office of Business Development's Permit Streamlining Map.[36]
- The American Community Survey (ACS) from the U.S. Census Bureau gives an annual snapshot of the population statistics, including employment, housing, and modes of transportation.[37]

CSE and CEC both use Tableau, an online platform that connects to external databases and creates visualizations. All the sources identified have spreadsheets that can be downloaded and used in other

[30] https://californiahvip.org/impact/#deployed-vehicle-mapping-tool,

[31] https://calevip.org/rebate-statistics

[32] https://cleanvehiclerebate.org/en/rebate-map

[33] https://www.energy.ca.gov/data-reports/energy-almanac/zero-emission-vehicle-and-infrastructure-statistics/new-zev-sales

[34] https://ww2.arb.ca.gov/our-work/programs/innovative-clean-transit/reporting-tool-data

[35] https://www.californiadgstats.ca.gov/charts/li/

[36] https://business.ca.gov/industries/zero-emission-vehicles/plug-in-readiness/

[37] https://www.census.gov/programs-surveys/acs

applications. Some of the sources also offer data integration so that information is automatically updated.

Meet State of California Requirements for Streamlined Permitting

The *San Joaquin Valley Plug-In Electric Vehicle Readiness Plan* identified that Streamlining Permitting and Inspection Processes is a core area of EV readiness.[38] It is recommended SJCOG and its member agencies prioritize compliance with permit streamlining and that SJCOG support Lathrop, Ripon, and Escalon as appropriate in meeting these requirements.

Complying with the two regulations that require streamlined permitting for charging stations will:

- Enable more residential, public, workplace, and multifamily charging stations because the process for getting an EVSE permit will be standardized and faster, which can result in lower costs.
- Prepare the region for NEVI funding as streamlined permitting is a requirement for this funding.
- Make entities more competitive for grants.
- Enable charging stations throughout the county.

The California State Building Officials (Calbo) published a set of resources for small jurisdictions that include sample forms and model ordinances for reference.[39]

Encourage Home and Workplace Charging

Creating a one-stop shop for businesses, property owners, and residents with information and resources will:

- Enable more residential, public, workplace, and multifamily charging stations because unbiased and objective information is available from a trusted resource
- More charging stations at home and at workplaces will encourage increased EV adoption and ZEV miles traveled.
- A network of charging stations that accept payment can add to tax revenue.
- A focus on workplace charging can encourage fleets to transition to ZEVs.

Many charging stations will need to be installed on privately owned land and the property owners must express interest and take action to install these charging stations.

The AIDA (Awareness, Interest, Desire, and Action) model traces the customer journey through Awareness, Interest, Desire, and Action, and is perhaps the best-known marketing model.

- Attention (or Awareness) creates buyer recognition of the technology, product, or brand.
- Interest communicates the benefits of the technology, product, or brand to the potential buyer to encourage them to learn more.
- Desire creates an emotional connection so that the buyer moves from liking the technology, product, or brand to wanting it.
- Action moves the buyer to take the next step—or to walk away.

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[38] http://www.valleyair.org/grants/documents/pev/san_joaquin_valley_pev_readiness_planning_guide.pdf

[39] https://www.calbo.org/sites/main/files/file-attachments/ab1236toolkitsmalljurisdiction.pdf?1524861090

Many of the existing EV websites and sources of information focus on Attention and Interest, and others are solely about the Action step. SJCOG can fill a void for local business owners and residents by offering objective, helpful information to move the person from thinking about installing a charging station to reaching out to a vendor or the utility to take the next step.

Create a page on the San Joaquin County website with resources for residents and businesses that includes:

- A summary of rebates and incentives grouped by single-family home, multifamily property, workplace, and public charging.
- For homeowners, a link to tools like Veloz's Home Charging Advisor
- For multifamily property owners, a link to programs like SJVAPCD's Charge Up! Incentive Program
- For employers, a link to resources like Plug-In America's Workplace Charging guide

Consider offering customer service and advice via Plug-In America[40] or Clean Vehicle Empowerment Collaborative.[41] Both nonprofits offer multilingual and email support to end users and businesses interested in EVs and charging stations on a per-call or monthly basis.

Supporting Fleet Transitions

One of the first areas the collaborative committee can address includes municipal fleets, school bus operators, and transit operators and large companies that have 50 or more medium- and heavy-duty vehicles. Coordinating with these mandated adopters could identify baseload users for one or more of the proposed ZEV fuel plazas, which would reduce each operator's costs to build individual stations. It could also identify opportunities for group buying pools to place one order under one PO. Buying larger numbers of the same vehicle (or same charging station) can mean a price reduction, faster delivery, or additional perks like training and maintenance.

Other opportunities the collaborative could explore include:

- Offering free site assessments to identify the facilities that appear to have sufficient capacity for a charging station and assisting with utility coordination.
- Provide data collection tools so that fleet managers can start collecting the information about their vehicles to start the planning.
- Identify GHG reduction from charging and hydrogen stations to estimate Low Carbon Fuel Standard (LCFS) credits.

INFRASTRUCTURE DEPLOYMENT RECOMMENDATIONS

The focus of this section will be on infrastructure deployment recommendations including charger siting and location, electrical service, operations, working with utilities and resiliency.

[40] https://pluginamerica.org/why-go-plug-in/ev-support-program/

[41] https://evequity.com/

Charging Infrastructure Placement and Installation Guidelines

A core activity of a collaborative committee for advancing alternative fuel infrastructure in San Joaquin County should include planning for cost-effective investment in ZEV infrastructure. Earlier in this chapter area recommendations were identified based on several factors discussed in the methodology in **Appendix D**. The committee will also need to determine factors for prioritization such as serving disadvantaged communities, residents living in multi-unit dwellings or serving high-traffic areas, factors which have also been identified and mapped earlier in this chapter.

To optimize operational efficiency and reduce installation costs, when planning to place or install EV chargers, consider the factors below:

Siting Chargers:

- Ease of access along key corridors, especially near intersections that have amenities for EV drivers to visit while charging. Examples of popular amenities include restrooms, popular retail venues, restaurants, libraries, community centers, tourist attractions, beaches, and parks, etc.
- Proximity to areas of concentrated high-density housing as multi-unit housing typically lacks EV charging.
- Availability of parking, preferably near a power source to minimize costs to bring power to the site such as trenching.
- Visibility of the chargers themselves which includes location in a parking lot, lighting and proximity to nearby streets or storefronts; it is not recommended they be installed in difficult to find or see areas.
- Safety of the location and of the installation including being well lit at night and ensuring charging cables will not need to run across sidewalks to be used or overlap on to sidewalks when not in use.
- Other considerations may also need to be considered such as tree roots or branches that may be disturbed and put the installation at odds with urban tree-canopy goals.

Electrical service:

- Evaluate capacity of electrical infrastructure (utility service and electrical panel) to support immediate and long-term vehicle charging needs. Identify costs for necessary electrical service upgrades in collaboration with local utilities and/or a qualified electrician.
- To help minimize costs, choose charging locations that are as close as possible to existing or proposed electrical service infrastructure and other EV charging stalls.
- Plan electrical raceway or conduit runs for electrical wiring and data cables from the electrical panel serving the chargers and consider a layout that minimizes linear conduit distances to all proposed EV charger-equipped parking spaces.
- If possible, install chargers during construction, remodels, or other facility upgrades planned to reduce costs and minimize construction impacts.
- Charger hosts should consider different strategies to separate meters for building and electric vehicle charging uses to manage peak load impact on the grid and minimize demand charges for electric vehicles.[42]

[42] See Snohomish County PUD Public Electric Vehicle Chargers Electric Rates effective January 1, 2021. This electric rate schedule allows charger hosts to install electric vehicle charging equipment that has a lower rate for demand, energy, and

Charger location and layout:

- If possible, surface-mount conduit along wall surfaces to avoid more costly trenching under paved surfaces. If wall mounting is not feasible, trench beneath planting strips to reduce cutting and re-paving costs and to minimize disruptions during construction.
- Identify suitable locations with smooth, plumb surfaces for wall mounted charging stations if possible or suitable floor surfaces for pedestal mount stations. If possible, use wall-mounted chargers to avoid the need for pedestals which are more costly and complex to install.
- To maximize charging capacity, consider installing dual-port pedestal mount stations with long charge cords (up to 25'). Many chargers include optional cord management systems such as retracting reels to minimize trip hazards. Depending on parking configuration, a single charger or dual head charger pair can serve up to eight parking stalls.
- To comply with the Americans with Disabilities Act (ADA), charging station configuration must meet current CA Title 24 Building Code requirements, charging stations must not block ramps or pathways, and cables should not extend across ramps, pathways or sidewalks when connected to a vehicle, sometimes called "path of travel".
- Where feasible, avoid locating chargers under trees where sap, pollen, or leaves would fall on the charging station.
- To better accommodate the varied charge port locations on different EVs, use perpendicular (90 degree) parking stalls that allow a vehicle to enter either front-first or rear-first instead of parallel or diagonal stall parking.
- Plan locations for easy and cost-effective future charger installation, typically adjacent to other EV charging stalls.

Operational considerations:

- Provide adequate lighting activated by motion sensors for safe night-time access and consider weather protection.
- Consider sighting chargers in areas with good visibility and securely affixed to the ground or wall.
- Closed-circuit television (CCTV) surveillance is an additional option, especially in low visibility public areas, to prevent theft and vandalism.
- Ensure chargers are easily identified and install signage or wayfinding as needed.
- Provide protective bollards and wheel blocks where appropriate, especially on sloped sites.

Data connectivity:

- Measure cellular signal levels to ensure adequate coverage where smart chargers will be installed. Underground or enclosed parking structures may require cellular repeaters to ensure adequate signal strength to chargers.

Once specific sites have been selected and optimal charger locations within the site have been identified the installation of chargers require a multi-step process summarized in **Table 14** below.

ADDRESSING GRID CONSTRAINTS

Grid constraints are not an issue unique to San Joaquin County or even to California. Utilities across the country are engaged in planning to manage both transportation and building electrification. The balance for electric utilities will be to determine the area's most in need of infrastructure upgrades

minimum charges when first installed. The charges increase incrementally each year anticipating higher future charging needs.

and when they will need to be upgraded to ensure the most cost-effective transition minimizing the pressure to raise rates. Counties and municipalities can assist in this transition as well as gain information they need for their planning by working with utilities early in the process and through the site evaluation. Ideally, the process should look as follows:

1. Even before sites have been identified, developing a relationship with a utility representative can be a vital step. **Figure 48** shows each utility across San Joaquin County.

2. Informing the local utility of the general plans for how much charging infrastructure and when it may be added will allow them to include this additional load in their long-term planning.

3. Next, potential sites for charger installation should be identified. This chapter has provided area recommendations based on several factors. Potential *specific* sites will need to be evaluated further for the factors outlined in the previous section of this chapter titled *Charging Infrastructure Placement and Installation Guidelines*.

4. Select a contractor to facilitate the installation of the charging equipment and have them do an initial evaluation of the sites. This may be an electrician that works with contractors to complete civil work such as trenching, or vice versa. They will need to work with the electric utility in the next step.

5. Once potential installation sites have been identified, a contractor and the number and type of chargers to be installed is known, the work with the utility's electrical engineers should begin immediately to determine transformer capacity and location of power available to the site. This step may take time, in some cases months.

    a. Note: If only a small number of level 2 chargers will be installed, it may be possible to run electricity from an existing electrical panel if capacity is available. Always check with an electrician first if this may be the case. If enough capacity exists in a customer owned electrical panel and the existing service, the utility may not need to be involved as the electrical upgrades would only occur on "customer owned equipment" rather than "utility owned equipment".

6. There will likely be some back-and-forth communication with the utility engineer(s) as a design for the site is developed. The number of chargers may need to be reduced, transformers or electrical services may need to be upgraded or it may be determined that bringing the needed amount of power to the site would be cost prohibitive at that time.

7. This process helps the prioritization of sites based on the electrical infrastructure needed and the associated costs. Simpler installations may be done first as the "low hanging fruit" while more complicated or expensive installations may need to wait for appropriate grant funding or other factors.

As the transportation sector transitions from fossil fuels to electricity, the grid could be further impacted, especially if EV charging occurs during peak demand times. Solutions to this challenge include:

- Time of use (TOU) electrical rates incentivize EV owners to charge during off-peak times by charging lower electrical lower rates for EV charging.

- Demand response (DR) involves shifting or shedding electricity demand to provide flexibility in wholesale and ancillary power markets, helping to balance the grid. This would be facilitated by charge management software.
- Bidirectional charging, a feature becoming more common in newer EVs allows the EV battery to be discharged back to the grid (known as vehicle-to-grid or V2G) to sell power back to the grid. If enough EVs utilize this feature, the combined EV fleet could serve as an energy storage bank to help offset power capacity constraints.
- Battery Energy Storage (BES), or the use of stationary battery systems to store electricity to augment the grid during times of constrained capacity.

TABLE 14: MILESTONES TO INSTALLATION

MILESTONE TITLE	DESCRIPTION OF ACTIVITY
PLANNING & BUDGETING	• Identify charger quantities, locations, types, and priorities and identify project costs.
PROJECT FUNDING	• Seek capital funding through City/County budgets or 3rd party funding sources.
BIDDING	• Project bids and awarded to contractor.
ELECTRICAL SERVICE UPGRADE REQUEST	• Electrical infrastructure upgrades by utility (If needed)
CHARGER INSTALLATION DESIGN	• Prepare designs for permit approval and bid package.
PROJECT PERMITTING	• Permits submitted for review and approval.
EVSE ACQUISITION	• Purchase and installation of EV chargers by selected contractor(s).
CHARGER COMMISSIONING	• Test and commission EV chargers to ensure operation.

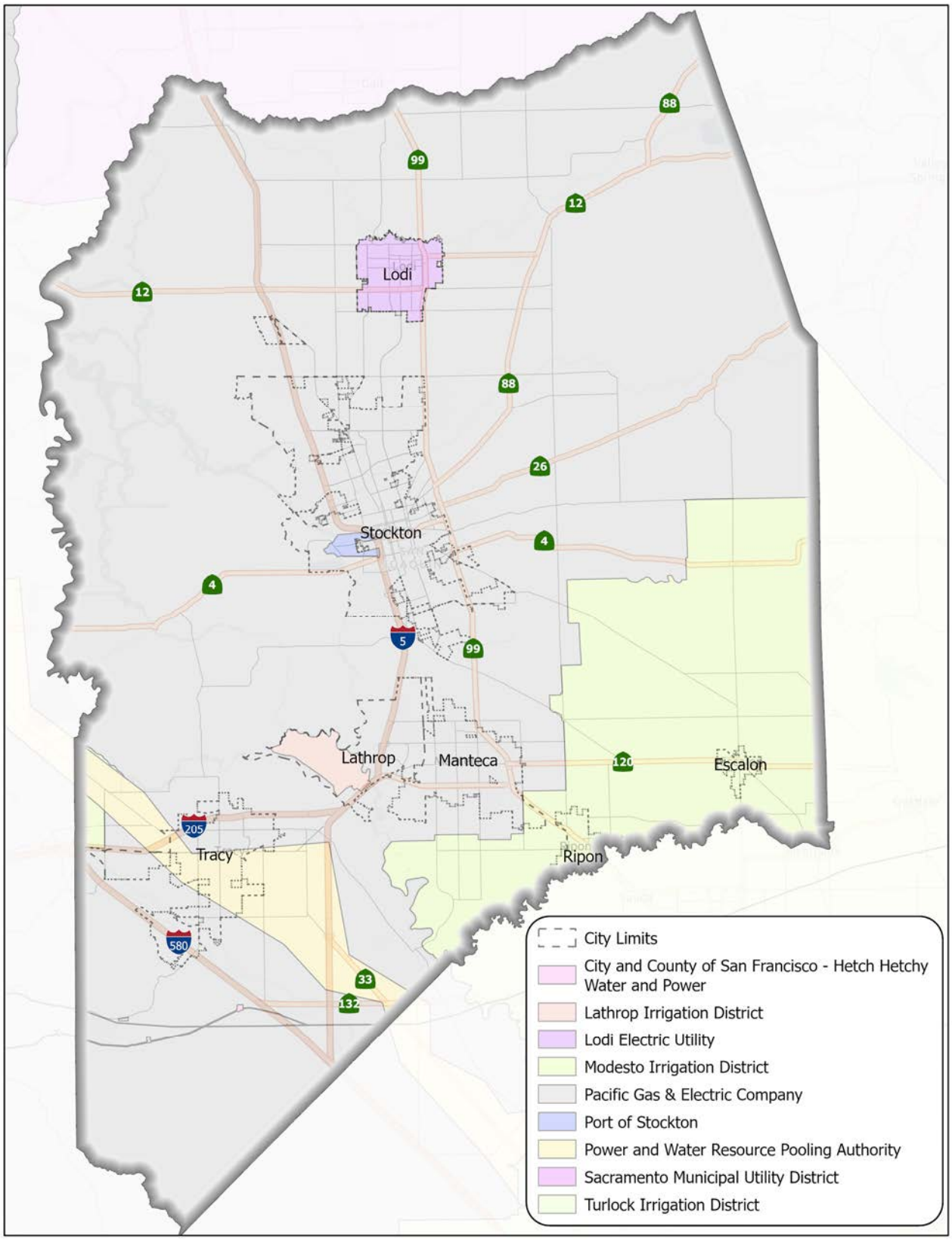

FIGURE 48: ELECTRIC UTILTIES IN SAN JOAQUIN COUNTY

COMBINE GRID RESILIENCY AND EV CHARGING

With the ever-increasing impacts of climate change, grid resiliency is becoming an urgent topic. Fortunately, the very technologies used to reduce carbon emissions, ZEVs, and renewable energy, can also be used together to provide resiliency. Solar and wind energy provide clean electricity; however, these are intermittent resources meaning they only produce electricity when the sun is shining, or the wind is blowing. This is where battery storage, either in the form of back up batteries or by utilizing the batteries in electric vehicles with bi-directional charging can provide balance to these resources by storing energy when it's being produced by solar or wind and releasing it back to the grid when these resources are not generating electricity, but power is needed.

On a smaller scale, solar paired with battery storage or EVs with bi-directional charging and the ability to "island" or disconnect from the grid in times of power outages can provide a powerful resiliency solution. It's important (and typically mandated) to have the ability to disconnect from the grid to allow utility workers to safely work on utility equipment. For this reason, solar installations typically have an automatic cut-off during outages to keep utility workers safe, unless the system is set up to "island". There now exists many back-up battery systems that can be paired with solar, and the Ford F-150 Lighting can provide back-up power for a home as a standard feature (when paired with Ford's charging station).[43] This is one of the first consumer level EV based resiliency products on the market. Together, these technologies could provide power to critical buildings during extended outages as well as residential homes with these systems in place.

The collaborative committee previously discussed can work to implement policies to encourage or even require technologies to enable islanding and back-up power. These policies could simultaneously address climate change in the reduction of carbon emissions while also preparing the region for resiliency.

INCENTIVES

Regulatory

Appendix B provides information on current and upcoming regulations supporting the ZEV and alternative fuel transition. As codes undergo regular updates and changes referencing the California Energy Codes and Standards website can provide helpful, up-to-date examples for local agencies, planning commissions and partners.[44] At the County and City level, enforcing State codes and adopting aggressive requirements for new construction can support the ZEV transition by preparing more parking spaces to be EV Ready or EV Capable which will reduce the cost of adding this infrastructure later.

The California Green Building Standards (CALGreen) requires "EV Capable" parking spaces, meaning that the building has capacity in the electrical panel and spacing for wiring for a building inhabitant to install wires, circuits, and plugs for EV charging later. **Figure 49** outlines the different levels of EVSE support.

[43] https://www.ford.com/trucks/f150/f150-lightning/2022/features/ev-charging/ford-charge-station-pro/

[44] https://localenergycodes.com/content/adopted-ordinances

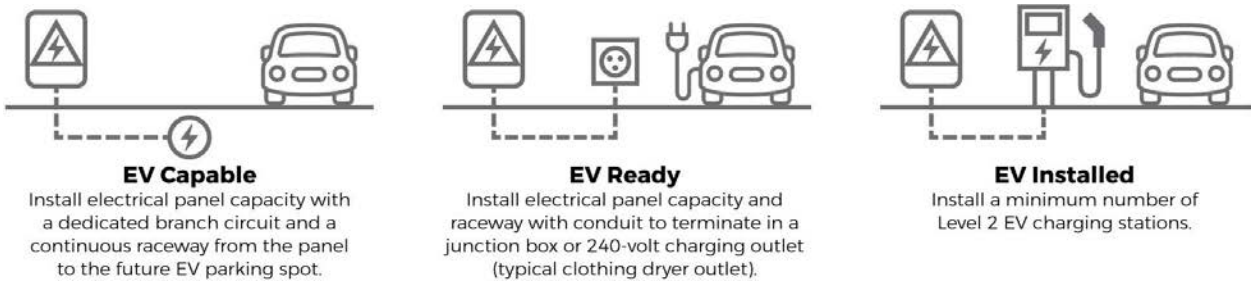

FIGURE 49: DEGREES OF EVSE SUPPORT BUILDING CODE

CALGreen Codes have mandatory compliance that all California jurisdictions must enforce, and some codes have voluntary compliance levels that jurisdictions can enforce or use as an incentive. The EVSE requirements have two voluntary levels called Tier 1 and Tier 2.

The 2022 CALGreen codes mandatory requirements include:

- Single-family residences, including townhomes and duplexes, be EV Capable
- Non-residential new construction and major alterations ($200,000 or 1,000 sq feet) to have up to 10% of parking spaces be EV Capable.
- New multifamily dwellings and new hotels/motels with 20 units or more must have 10% of all parking spaces EV Ready. (This includes parking spaces that are designated for guests or shared with ancillary business, like a banquet hall or a casino.)
- Tier 1 requires that 10% of spaces are EV Capable for a property with 19 or fewer units; for properties with 20 or more units, 25% of the dwelling unit spaces must be EV Capable.
- Tear 2 applies only to properties with 20 or more units and requires 5% of total parking spaces be EV Installed and at least one EVSE must be in a common area.
- New non-residential buildings must have EV Ready and EV Capable spaces as shown in **Figure 50**

TOTAL NUMBER OF ACTUAL PARKING SPACES	NUMBER OF REQUIRED EV CAPABLE SPACES	NUMBER OF EVCS (EV CAPABLE SPACES PROVIDED WITH EVSE)[2]
0–9	0	0
10–25	4	0
26–50	8	2
51–75	13	3
76–100	17	4
101–150	25	6
151–200	35	9
201 and over	20 percent of total[1]	25 percent of EV capable spaces[1]

1. Calculation for spaces shall be rounded up to the nearest whole number.
2. The number of required EVCS (EV capable spaces provided with EVSE) in column 3 count toward the total number of required EV capable spaces shown in column 2.

FIGURE 50: EV REQUIREMENTS FOR NON-RESIDENTIAL BUILDINGS

New grocery stores, retail stores with planned off-street loading, and warehouses must be EV Ready for medium- and heavy-duty charging based on the square footage of the building, as shown in **Figure 51.**

BUILDING TYPE	BUILDING SIZE (SQ. FT.)	NUMBER OF OFF-STREET LOADING SPACES	ADDITIONAL CAPACITY REQUIRED (KVA) FOR RACEWAY & BUSWAY AND TRANSFORMER & PANEL
Grocery	10,000 to 90,000	1 or 2	200
		3 or Greater	400
	Greater than 90,000	1 or Greater	400
Retail	10,000 to 135,000	1 or 2	200
		3 or Greater	400
	Greater than 135,000	1 or Greater	400
Warehouse	20,000 to 256,000	1 or 2	200
		3 or Greater	400
	Greater than 256,000	1 or Greater	400

FIGURE 51: CALGREEN REQUIREMENTS FOR LOADING DOCKS

Enforcing CALGreen codes and adopting Tier 1 or Tier 2 as mandatory can support the ZEV transition by:

- Enabling more residential, public, workplace, and multifamily charging stations as it will be less costly and faster to install them.
- Encouraging more public and workplace charging which will support increased EV adoption and ZEV miles traveled.
- Provide tax revenue through a network of charging stations that accept payment.
- Encourage visitors and in-bound commuters to drive ZEVs to utilize public charging in the region.

Additional Building Codes to Potentially Adopt to Support EV Readiness:

- Adopt Tier 1 or Tier 2 as a mandatory code or voluntary compliance in all new multifamily and hotel construction.
    - **Benefits**: It will increase the number of charging stations in the region without incentives. It will reduce the costs of adding charging stations later. Adopting Tier 1 or Tier 2 does not require a regulatory filing.
    - **Constraints**: Additional costs for installing a 220-volt plug and the supporting circuit add construction cost. Although the cost may be small, costs add up and influences affordability. It will be necessary to evaluate the cost of EV support at new developments aimed at lower-income populations.
- Require single-family homes to comply with CALGreen code (EV Capable) for EVSE when an alteration requires an upgrade to the electrical panel. CalGREEN does not require compliance for single family residential remodels.

- **Benefit**: Could add thousands of locations for home charging at existing houses at minimal cost to the homeowner. Because it a panel upgrade, the utility will already be involved to ensure the property can support the additional electrical load.
- **Constraints**: Could be costly for a significant number of homes that were not originally designed to run power from the panel to a parking space. Could deter homeowners and landlords from making other home upgrades the reduce energy use.

- In conjunction with community stakeholders, developers could clearly identify alternatives to on-site charging that could include ¼-mile access to public charging, on-site electric car share, or within two miles of a public hydrogen station.
  - **Benefits**: May encourage developers to collaborate on central facilities.
  - **Constraints**: Could have a negative impact on initiatives to reduce VMT.

Funding Recommendations

Multiple funding opportunities exist federally as well as in in the state of California, with eligible applicants ranging from private customers, state and local government agencies, tribal governments, school districts, transit agencies, utilities, fleet owners and operators, ports, and in some cases vehicle dealers and charging infrastructure vendors. Funding programs typically have a fixed term and a limited allocation of funds. Examples of funding opportunities can be found in **Appendix A** as well as summary tables for Federal, State, and local funding opportunities.

As funding opportunities frequently change, it's recommended to regularly monitoring the resources listed below:

- Alternative Fuels Data Center Overview of Federal and State Laws and Incentives: https://afdc.energy.gov/laws
- California Governor's Office of Business and Economic Development (GO-Biz) ZEV Funding Resources library: https://business.ca.gov/industries/zero-emission-vehicles/zev-funding-resources/
- The California Energy Commission (CEC): https://www.energy.ca.gov/funding-opportunities/solicitations
- The California Department of Transportation (CalTrans): https://dot.ca.gov/programs/budgets/state-transportation-grants
- The California Air Resources Board: https://ww2.arb.ca.gov/our-work/topics/incentives
- Calstart https://fundingfindertool.org/planning-grants/
- San Joaquin Valley Air Pollution Control District: https://ww2.valleyair.org/grants/
- PlugStar searchable database by ZIP code: https://plugstar.com/tools/incentives
- DSIRE (database of clean energy programs): https://programs.dsireusa.org/system/program

To prepare for grant and other funding opportunities consider the following:

- Identify sites and project stakeholders/partners ahead of time. Ensure the owner of a potential installation site is on board and an active participant in the process and make this known in the application for funding.
- Complete site evaluations as suggested previously in this chapter and complete as much of the design as possible to show you have done your due diligence and will be prepared to utilize the funding without delay. Projects should be as close to "shovel ready" as possible.
- Plan for staff to manage grant funding and complete reporting requirements and outline your plan in your funding application.

- Carefully review funding applications and requirements to ensure nothing is missed. Particularly with competitive grant applications at the federal and state level.

Explore Revenue Opportunities

Public EV chargers can generate revenue for their owners directly through the sale of electrons to motorists charging their vehicles to cover the cost of the electricity consumed. As with any commodity, revenues from charging are a factor of supply and demand for charging as well as the costs of installed chargers and the price of electricity.

Revenues can also be generated indirectly through the sale of Low Carbon Fuel Standard credits. The Low Carbon Fuel Standard (LCFS) is a market-based approach to incentivizing clean energy administered by the California Air Resources Board[45]. The LCFS creates a marketplace where air polluters may acquire credits to continue to operate, while clean energy users sell credits to generate revenue.

Owners of EV chargers, utility distributors, and EV owners may be eligible for California LCFS credits, if the EV charging is metered, as outlined in the funding section of this report (**Appendix A**) below. Since EV charging must be metered to qualify for LCFS credits, Level 1 chargers are usually not eligible unless they are individually metered like a Level 2 or DC Fast charger. The owner of a public charger can claim LCFS credits if the charger is publicly available. While in the case of residential charging, the base LCFS credit (like the LCFS credit from a public charger) may be claimed by the utility distributor while an incremental credit may be claimed by the EV owner as long as charging is metered.

ALTERNATIVE FUELS CORRIDOR PROGRAM

One of the key goals of this plan is to align San Joaquin County with the FHWA's Alternative Fuels Corridor Program and California's *Deployment Plan for the National Electric Vehicle Infrastructure (NEVI) Program* (adopted August 2022). Between Round 1 and Round 6, the FHWA has identified select highways nationwide as either "Ready" or "Pending" for each of several alternative fuel or power sources including:

- Electric (EV)
- Compressed Natural Gas (CNG)
- Liquid Natural Gas (LNG)
- Propane (LPG)
- Hydrogen (H)

Figure 52 through **Figure 55** show the FHWA highways within San Joaquin County that have been identified by the FHWA as either "Ready" or "Pending" for each fuel type.

Figure 52 shows that Interstate 5 and State Route 99 have been identified as EV Corridor Ready for their entire length within San Joaquin County, as is the portion of State Route 12 west of State Route 99. The figure also shows that portions of State Route 4 from Stockton to the eastern County line and State Route 120 from Interstate 5 to the eastern County line are identified as EV Corridor Pending. The California Energy Commission (CEC) has identified two charger locations in San Joaquin County as meeting NEVI requirements (at least four DC Fast Chargers with power output of at least

[45] About Low Carbon Fuel Standard. https://ww2.arb.ca.gov/our-work/programs/low-carbon-fuel-standard/about

150 kW, located within one mile of a highway interchange, and available to multiple EV makes and models). Both are Electrify America stations, with eight charge ports at a Walmart location in Stockton and four charge ports at a Walmart location in Tracy.

Figure 53 shows that Interstate 5 north of State Route 4 and south of Interstate 205, State Route 99 throughout the County, and Interstate 205 west of Interstate 5 are all identified as CNG Corridor Ready. Interstate 580 and State Route 120 are both identified for their entire length in the County as CNG Corridor Pending. There are currently six CNG stations in San Joaquin County. Of these, two are located in Stockton, two are located in Lathrop, one is located in Lodi, and one is located in Ripon. None of the existing CNG stations are located adjacent to either of the corridors identified as CNG Pending by the FHWA.

Figure 54 shows that Interstate 5 and State Route 99 for their entire lengths in San Joaquin have been identified as LNG Corridor Ready, while Interstate 205 and Interstate 580 have been identified as LNG Corridor Pending. There is currently only one LNG station in San Joaquin County. This station is located at Clean Energy's site in Lathrop.

Figure 55 shows that Interstate 5 and State Route 99 for their entire lengths in San Joaquin are identified as Hydrogen Corridor Pending. There are no Hydrogen Corridor Ready highways in San Joaquin County, nor are there any existing hydrogen stations.

No highways in San Joaquin have been identified as either Propane Corridor Ready or Propane Corridor Pending.

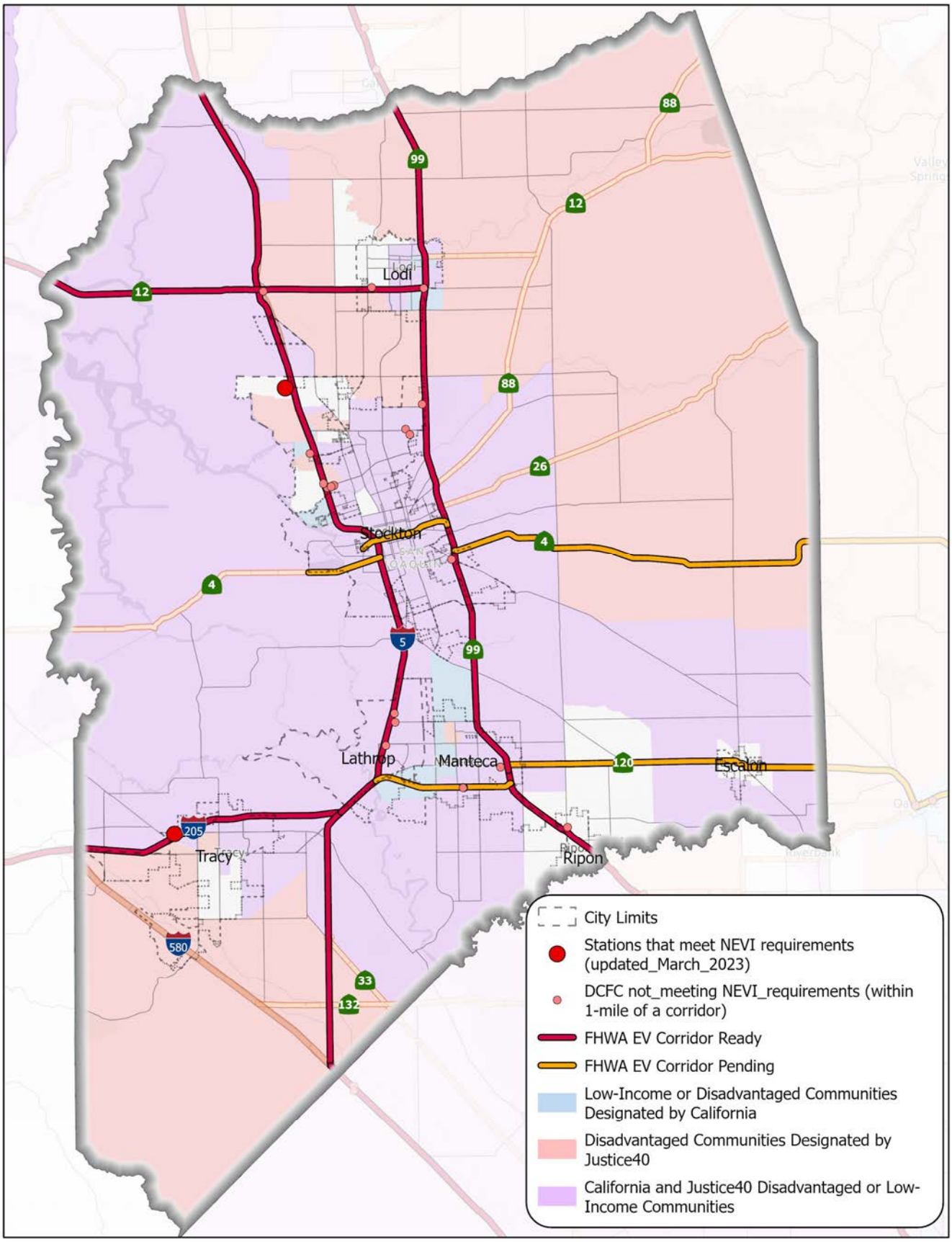

FIGURE 52: FHWA EV CORRIDORS

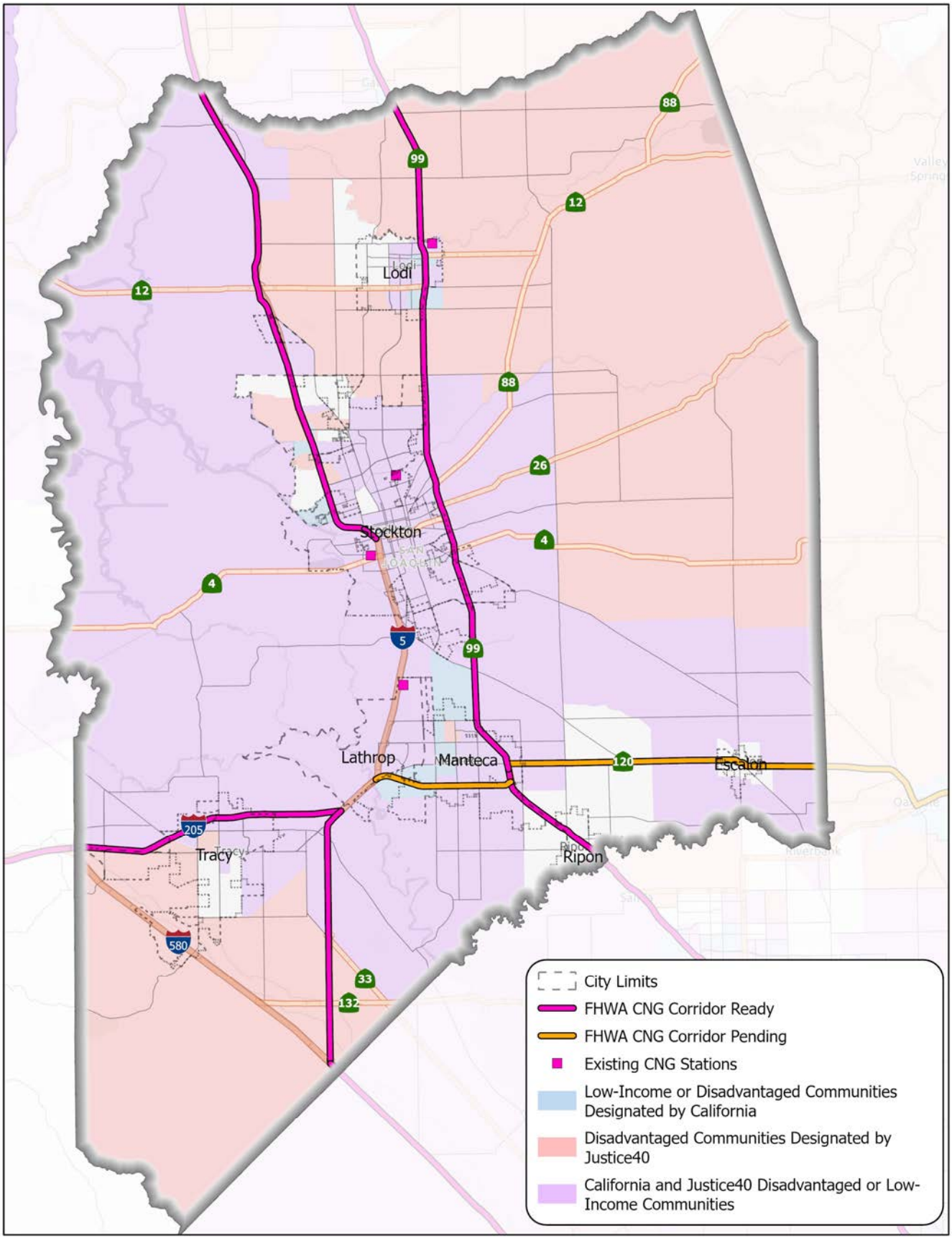

FIGURE 53: FHWA CNG CORRIDORS

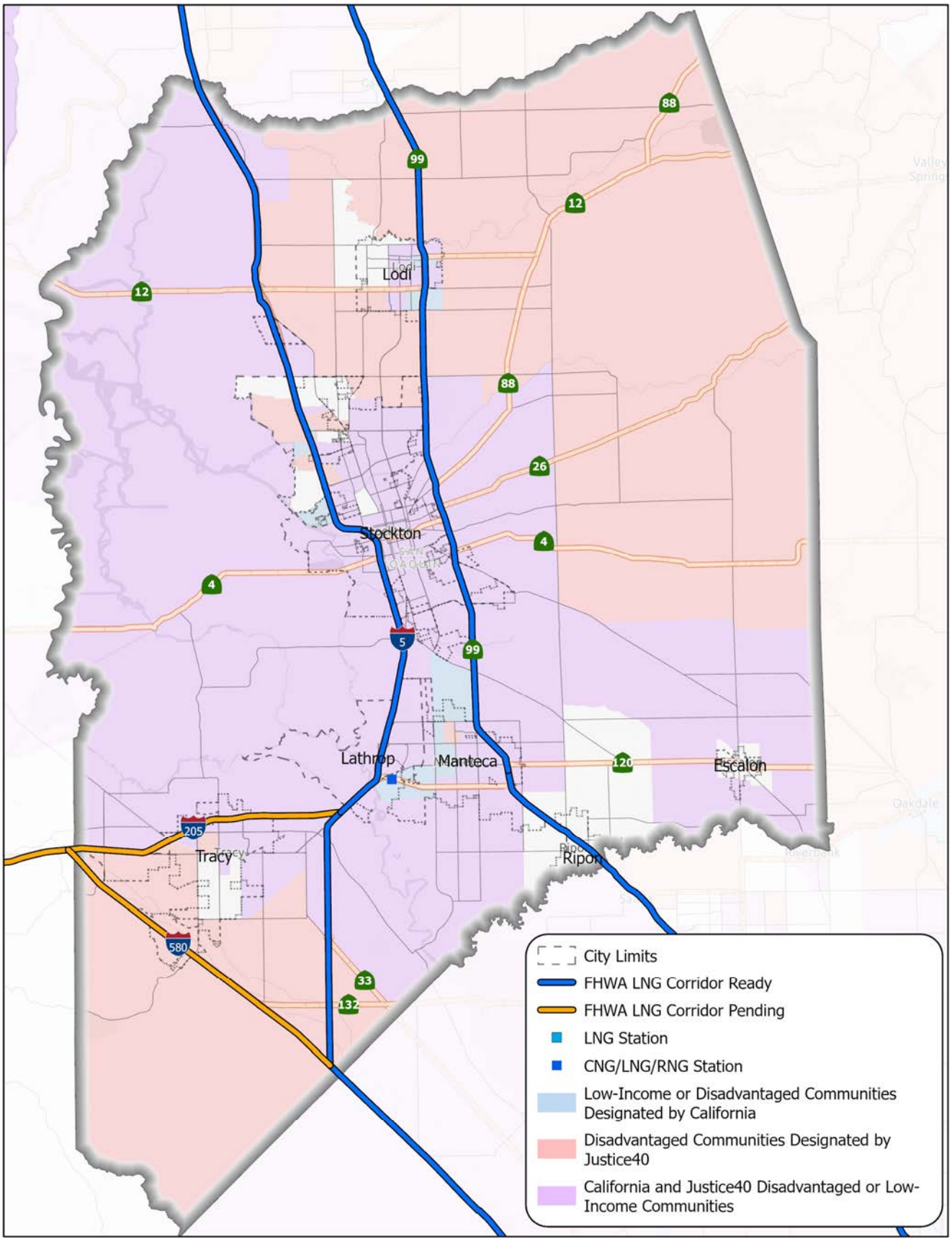

FIGURE 54: FHWA LNG CORRIDORS

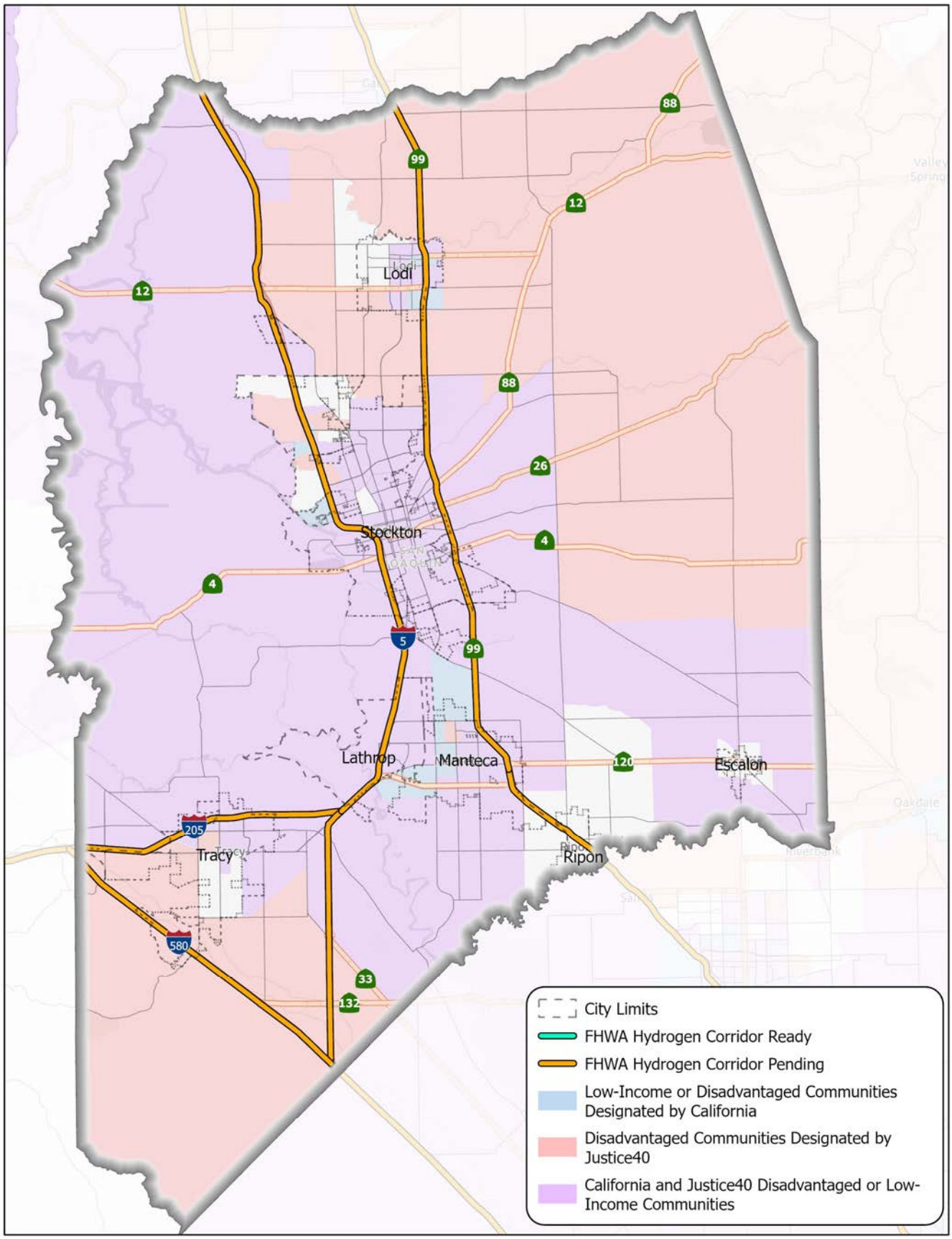

FIGURE 55: FHWA HYDROGEN CORRIDORS

ALTERNATIVE FUELS CORRIDOR RECOMMENDATIONS

The maps shown in the previous section show that San Joaquin County currently has interstates and state highways identified as EV Corridors (ready or pending) traveling north-south through the County (I-5 and State Route 99) as well as various routes traveling east-west through the southern and northwestern portions of the County (State Route 4, State Route 120, and Interstate 205). The northeastern portion of the County, however, is not currently represented by any EV corridors as identified in Rounds 1 through 6. Based on this fact, and the fact that recommended EV charging locations have been identified in the communities of Lockeford and Linden, this study recommends the following two state highways be recommended for EV Corridor designation in the current Round 7 nominations:

- **State Route 12** (from Lodi east of State Route 99 to San Joaquin County northeast border with Calaveras County)
    - Designating State Route 12 east of State Route 99 as an AFC would connect the western portion of SR 12, which is already designated, with the eastern part of San Joaquin County. The route is in a rural area and serves a disadvantaged community based on CalEnviroScreen 4.0 and Justice 40 census tract data. This segment of SR 12 originates in east Lodi, CA, a community designated as disadvantaged by both metrics. The rest of the eastern portion of SR 12 goes through rural northeast San Joaquin County designated as disadvantaged by Justice 40. There are currently no stations along this corridor with EVSE within 1 mile of the route.
- **State Route 26** (from State Route 99/ Fremont Street in east Stockton to San Joaquin County northeast border with Calaveras County)
    - SR 26 originates in east Stockton off FHWA EV Corridor Ready State Route 99. The census tract that hosts the beginning of this route is identified as disadvantaged by both CalEnviroScreen 4.0 and Justice 40. As the route extends into rural, eastern San Joaquin County the census tracts reflect disadvantaged communities designated by the federal Justice 40 initiative. There are no current EVSE within 1 mile of the corridor.
- **State Route 88** (from State Route 99 in northeast Stockton to San Joaquin County northeast border with Calaveras County)
    - SR 88 originates in northeast Stockton, a community census tract designated as disadvantaged or low-income by both CalEnviroScreen 4.0 and Justice 40. The route shifts north and merges with SR 12, a route nominated as part of the AFC Round 7 nominations, before diverging north again from SR 12 and ending at the county line with Amador County, CA. The route in conjunction with SR 12, as well as the last leg of SR 88, is designated as a disadvantaged census tract according to Justice 40. There are currently no EVSE chargers within 1 mile of the corridor.

SUMMARY OF AFVP RECOMMENDATIONS

The following section provides a complete summary of recommendations for San Joaquin County's Alternative fuels vision plan:

SITE RECOMMENDATIONS

In total, **39** locations are identified throughout San Joaquin County.

City of Escalon

- Adjacent to State Route 120 in downtown Escalon (Rank 76)

City of Lathrop

- Adjacent to Interstate 5 and West Lathrop Road (Rank 34)
- Adjacent to Interstate 5 and East Louise Avenue (Rank 46)
- Adjacent to interchange of Interstate 5 and State Route 120 (Rank 362)

City of Lodi

- Adjacent to State Route 99 and East Kettleman Lane (Rank 3)
- Adjacent to State Route 99 and East Harney Lane (Rank 7)
- Southwest of State Route 99 and East Victor Road (Rank 13)
- Adjacent to West Kettleman Lane between South Lower Sacramento Road and South Ham Lane (Rank 14)
- North of West Kettleman Lane between South Ham Lane and South Stockton Street (Rank 15)

City of Manteca

- Adjacent to State Route 120 and South Airport Way (Rank 6)
- Adjacent to State Route 99 and East Yosemite Avenue (Rank 12)
- Adjacent to interchange of State Route 99 and State Route 120 (Rank 33)
- Southwest of State Route 99 and Lathrop Road (Rank 49)
- Near West Yosemite Avenue between South Airport Way and South Union Road (Rank 54)
- Near Lathrop Road between South Airport Way and South Union Road (Rank 60)

City of Ripon

- State Route 99 at Jack Tone Road (Rank 1)
- State Route 99 at Main Street (Rank 104)

City of Stockton

- Adjacent to State Route 4 and South Stanislaus Street (Rank 4)
- Adjacent to East Hammer Lane and West Lane (Rank 5)
- West of Interstate 5 and West Alpine Avenue/ Country Club Road (Rank 11)
- West of Interstate 5 and Hammer Lane (Rank 16)
- Adjacent to State Route 4 and South Filbert Street (Rank 18)
- Downtown Stockton near Park Street and Center Street (Rank 25)

- Adjacent to West Benjamin Holt Drive and North Pershing Avenue (Rank 47)
- Adjacent to State Route 99 and Arch Road interchange (Rank 58)

City of Tracy

- Adjacent to Interstate 205 and West Grant Line Road (Rank 8)
- Adjacent to Interstate 205 and Byron Road (Rank 10)
- East of West Grant Line Road and North Tracy Boulevard (Rank 19)
- Adjacent to Interstate 205 between North Tracy Blvd and West Grant Line Rd (Rank 29)
- Adjacent to Interstate 205 and North MacArthur Drive (Rank 44)

Unincorporated County

- Flag City Interchange Interstate 5 at State Route 12 (Rank 9)
- Garden Acres Adjacent to State Route 99 and State Route 4 (Rank 17)
- Adjacent to State Route 120 and Austin Road (Rank 38)
- Northeast of State Route 99 and Waterloo Road (Rank 39)
- Adjacent to State Route 12 and Lower Sacramento Road (Rank 42)
- Unincorporated Town of **Linden** (Rank 111)
- Unincorporated Town of **Mountain House** (Rank 360)
- Unincorporated Town of **Lockeford** (Rank 496)
- Unincorporated Town of **Farmington** (Rank 538)

ALTERNATIVE FUELS CORRIDOR RECOMMENDATIONS

- **State Route 12** (from Lodi east of State Route 99 to San Joaquin County northeast border with Calaveras County)
- **State Route 26** (from State Route 99/ Fremont Street in east Stockton to San Joaquin County northeast border with Calaveras County)
- **State Route 88** (from State Route 99 in northeast Stockton to San Joaquin County northeast border with Calaveras County)

INFRASTRUCTURE DEPLOYMENT RECOMMENDATIONS

Charging Infrastructure Placement and Installation Guidelines

Considerations for Siting Chargers

- Ease of access
- Proximity to areas of MUDs
- Availability of parking
- Visibility of chargers
- Safety of location
- Other considerations such as interference by tree roots or branches

Best Practices for Electrical Service

- Evaluate electrical capacity to support both immediate and long-term vehicle charging needs
- Choose locations as close as possible to existing or proposed electrical service

- Consider a layout that minimizes electrical conduit distances to save on costs
- If possible, install chargers during construction, remodels, or other facility upgrades
- Consider strategies to separate meters for building and electric vehicle charging uses to manage peak load impact on the grid

Suggestions for Charger Location and Layout:

- If possible, surface-mount conduit along wall surfaces to avoid costly trenching
- Identify suitable locations for wall-mounted charging stations if possible or suitable floor surfaces for pedestal mount stations
- Consider installing dual-port pedestal mount stations with long charge cords (up to 25') to maximize the number of spaces that can be reached by one charger
- Always comply with the Americans with Disabilities Act (ADA) requirements
- Avoid locating chargers under trees where sap, pollen, or leaves would fall on the charging station
- To better accommodate the varied charge port locations on different EVs, use perpendicular (90-degree) parking stalls
- Plan locations for easy and cost-effective future charger installation, typically adjacent to other EV charging stalls

Operational considerations:

- Provide adequate lighting activated by motion sensors and consider weather protection
- Consider sighting chargers in areas with good visibility and securely affixed to the ground or wall
- Closed-circuit television (CCTV) surveillance is an additional option, to prevent theft and vandalism
- Ensure chargers are easily identified and install signage or wayfinding as needed
- Provide protective bollards and wheel blocks where appropriate, especially on sloped sites

Data connectivity:

- Measure cellular signal levels to ensure adequate coverage where smart chargers will be installed
- Install cellular repeaters to ensure adequate signal strength to chargers in areas with weak signal strength

Addressing Grid Constraints

- Even before sites have been identified, develop a relationship with the local electric utilities
- Inform the local electric utility of the general plans for how much charging infrastructure and when it may be added
- Select a contractor to facilitate the installation of charging equipment and have them do an initial evaluation of the selected sites
- Once sites have been selected, the number of chargers to be installed is known and an electrician/installer has done an initial evaluation, work with the electric utility's engineers to determine transformer capacity and start site design

Follow Installation Milestones

Table 14, shown previously in this chapter provides an overview of high-level installation milestones to follow. These milestones are as follows:

1. Planning and budgeting

2. Secure project funding
3. Bidding/contractor selection
4. Electrical Service upgrade request with the local electric utility
5. Charger installation design
6. Project permitting
7. EVSE acquisition
8. Charger commissioning

Combine Grid Resiliency and EV Charging

- Where possible and when budgets permit, combine solar, battery backup with EV charging
- Set up these types of systems to "island", or disconnect from the grid in the event of a power outage
- Consider vehicles capable of bi-directional charging for fleet applications to provide backup power from the vehicles themselves

GENERAL RECOMMENDATIONS

Convene a Cooperative Transportation Electrification Planning Committee

- This committee should include member agencies, stakeholders, major cities within the county, and electric utilities. This committee should:
  - Jointly coordinate planning and funding opportunities expanding ZEV infrastructure moving forward
  - Coordinate ongoing education and outreach
  - Create workforce development programs around ZEV infrastructure, vehicles, and services
  - Jointly determine goals to measure progress such as:
    - Number of public chargers in the county
    - Progress toward installing chargers in recommended areas
    - Tracking the number of MUDs with charging stations
    - Tracking progress toward recommendations for equity as outlined in **Chapter 4** of this report
    - Tracking the number of EV registrations in the county by vehicle class and type
    - Tracking Green House Gas (GHG) reduction in the county, including conducting GHG emission inventories every few years
    - Updating the San Joaquin County Alternative Vision Plan on a regular basis, perhaps every 2-5 years with annual updates to specific goals

Provide Effective Community Engagement and Workforce Development

- Avoid technical language to make messaging more understandable
- Avoid the heavy use of text to make messaging more accessible
- Provide information on the benefits as well as the challenges of ZEVs
- Provide interactive events such as ride and drives and tailgates to give people firsthand experience with ZEVs

- Participate in community events like street fairs, farmers markets, National Drive Electric Week, National Night Out etc. to share information about:
  - ZEVs in general
  - Grant or rebate opportunities relevant to the event's audience
  - Countywide or local community goals related to the Alternative Fuels Vision plan
- Promote workforce development in ZEV-related industries:
  - Provide transparency for the duration of training program timelines expected wages
  - Engage ambassadors to recruit people into the industry
  - Demonstrate the variety in available careers
  - Establish an ecosystem of activities, education, outreach and community partners
  - Utilize community engagement events for education rather than recruitment, once a participant shows interest they can be connected with an ambassador or community partner

Install Air Quality Sensors

Air quality sensors can track roadside emissions and progress toward improving air local quality. Collecting this data can:

- Provide data needed for grant applications
- Measure progress toward transportation related GHG and air pollution reduction goals
- Draw a correlation between charging stations, and ZEV miles traveled

Create a Dashboard for Local Data

Recommended data to track in a consolidated dashboard:

- Important data for ZEV-related grants and programs
- Progress toward increasing the number of charging stations
- Progress toward ZEV adoption by vehicle class and type
- Other goals determined by the SJOC Cooperative Transportation Electrification Planning Committee

Encourage Home and Workplace Charging

- As an unbiased, trusted source, SJCOG and it's member agencies should create a one-stop shop for businesses, property owners, and residents with information and resources on home and workplace charging on their website
- This webpage should include:
  - A summary of rebates and incentives grouped by single-family home, multifamily property, workplace, and public charging.
  - For homeowners, a link to tools like Veloz's Home Charging Advisor
  - For multifamily property owners, a link to programs like SJVAPCD's Charge Up! Incentive Program
  - For employers, a link to resources like Plug-In America's Workplace Charging Guide

- Consider offering customer service and advice via Plug-In America[46] or Clean Vehicle Empowerment Collaborative[47]

Support Fleet Transitions

- Coordinate with fleets mandated to transition to ZEVs to identify baseload users for one or more "ZEV fuel plazas" and identify opportunities for group buying pools
- Work with local partners to offer free site assessments to identify the facilities that appear to have sufficient capacity for a charging station and assist with utility coordination
- Provide data collection tools so that fleet managers can start collecting information about their vehicles to start the planning
- Identify GHG reduction from charging and hydrogen stations to estimate Low Carbon Fuel Standard (LCFS) credits
- Act as a resource for fleet managers by providing information on the SJCOG website about regulations related to ZEV mandates, funding opportunities, and information about cost savings that can be achieved by transitioning to ZEVs

SUMMARY OF RECOMMENDED ACTIONS TO PROMOTE EQUITY

Make EVs More Affordable and Accessible

- Provide incentives for low-income households to use toward the purchase of an EV.
- Promote existing rebates, tax credits, and low-interest financing options
- Expand shared mobility options that use electric vehicles to provide access without individuals even having to own an EV
- Provide electric shuttle services for those who cannot drive or as a solution in areas where public transit may be lacking such as rural agricultural areas

Increase Access to Charging Infrastructure

- Install public charging where people congregate in DACs
- Install public charging near small businesses in DACs to support the local economy
- Advocate for or implement policies that make it easier and less expensive to install EV charging such as permit streamlining and fee reductions or waivers

Address Range Anxiety in Rural Areas

- Increase the number of public chargers in rural areas
- Improve signage and wayfinding systems in rural areas to guide drivers to nearby charging
- Provide education to potential EV drivers about charging options available in the region and increased driving ranges available in EVs

Provide Effective Community Engagement

- Tailor outreach to the specific community, know the audience and their priorities
- Provide outreach in multiple languages

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[46] https://pluginamerica.org/why-go-plug-in/ev-support-program/

[47] https://evequity.com/

- Host events in diverse neighborhoods and in disadvantaged communities
- Focus messaging on cost savings of EVs including operation and maintenance as well as the availability of rebates, grants and tax savings, vehicle functionality, and environmental benefits
- Use community engagement as an opportunity to learn from the community about the barriers they face to guide further actions
- Build relationships with community-based organizations and other stakeholders to facilitate joint initiatives and programs
- Invest in workforce development programs that provide training and job opportunities to underserved and disadvantaged communities

Support Public Transit in the Transition to ZEBs

- Work with transit providers to prioritize the transition to ZEBs in disadvantaged communities
- Collaborate with transit providers on grants and other funding opportunities (see Appendix A)
- Implement last-mile solutions such as electric shuttle services and ride-hailing partnerships

Charging for Multiunit Dwellings

- Provide support to MUD property owners and managers to guide them through the permitting and installation process
- Promote existing funding opportunities to MUDs (see Appendix A)
- Provide financial incentives for the installation of EV charging for MUDs
- Install charging in the vicinity of MUDs

REGULATORY RECOMMENDATIONS

- Adopt Tier 1 or Tier 2 as a mandatory code or voluntary compliance in all new multifamily and hotel construction
- Require single-family homes to comply with CALGreen code (EV Capable) for EVSE when an alteration requires an upgrade to the electrical panel
- Meet State of California Requirements for Streamlined Permitting. Prioritize compliance with permit streamlining and that SJCOG support Lathrop, Ripon, and Escalon as appropriate in meeting these requirements

FUNDING RECOMMENDATIONS

Monitor funding resources

Appendix A of this report provides examples of funding opportunities on the federal, state, and local levels. As funding opportunities change frequently, it is recommended to regularly monitor resources such as:

- Alternative Fuels Data Center Overview of Federal and State Laws and Incentives: https://afdc.energy.gov/laws
- California Governor's Office of Business and Economic Development (GO-Biz) ZEV Funding Resources library: https://business.ca.gov/industries/zero-emission-vehicles/zev-funding-resources/
- The California Energy Commission (CEC): https://www.energy.ca.gov/funding-opportunities/solicitations

- The California Department of Transportation (CalTrans): https://dot.ca.gov/programs/budgets/state-transportation-grants
- The California Air Resources Board: https://ww2.arb.ca.gov/our-work/topics/incentives
- Calstart https://fundingfindertool.org/planning-grants/
- San Joaquin Valley Air Pollution Control District: https://ww2.valleyair.org/grants/
- PlugStar searchable database by ZIP code: https://plugstar.com/tools/incentives
- DSIRE (database of clean energy programs): https://programs.dsireusa.org/system/program

Prepare for funding opportunities

- Identify sites and project stakeholders/partners ahead of time
- Complete site evaluations as suggested previously in this chapter and complete as much of the design as possible to show due diligence
- Plan for staff to manage grant funding and complete reporting requirements and outline this plan in the funding application
- Carefully review funding applications and requirements to ensure nothing is missed

Explore Revenue Opportunities

- For chargers owned by SJCOG, or its member agencies cost recovery and revenue can be included in the fee for use of these stations if desired. This may be particularly desirable for stations not funded by grants
- Owners of EV chargers may be eligible for California LCFS credits if the EV charging is metered, as outlined in the funding section of this report (**Appendix A**)

APPENDICIES

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APPENDIX A. FUNDING OPPORTUNITIES

Funding opportunities in the electromobility space have been growing rapidly. Covered expenses include the purchase or lease of EVs, the purchase and installation of charging infrastructure, and expenses for FCEVs and their refueling infrastructure. Funding opportunities exist federally as well as in each state, with eligible applicants ranging from private customers, state and local government agencies, tribal governments, school districts, transit agencies, utilities, fleet owners and operators, to vehicle dealers and charging infrastructure vendors. Funding programs typically have fixed terms and limited allocated funds. Information on specific programs can change quickly so it's encouraged the San Joaquin Council of Governments monitor and identify funding sources regularly.

As opportunities can change frequently, additional resources can be found here:

- Alternative Fuels Data Center Overview of Federal and State Laws and Incentives: https://afdc.energy.gov/laws
- California Governor's Office of Business and Economic Development (GO-Biz) ZEV Funding Resources library: https://business.ca.gov/industries/zero-emission-vehicles/zev-funding-resources/
- The California Energy Commission (CEC): https://www.energy.ca.gov/funding-opportunities/solicitations
- The California Department of Transportation (CalTrans): https://dot.ca.gov/programs/budgets/state-transportation-grants
- The California Air Resources Board: https://ww2.arb.ca.gov/our-work/topics/incentives
- Calstart https://fundingfindertool.org/planning-grants/
- San Joaquin Valley Air Pollution Control District: https://ww2.valleyair.org/grants/
- PlugStar searchable database by ZIP code: https://plugstar.com/tools/incentives
- DSIRE (database of clean energy programs): https://programs.dsireusa.org/system/program

The following list includes examples of relevant funding opportunities at the federal, state, and local levels.

FEDERAL PROGRAMS

List of programs:

- National Electric Vehicle Infrastructure (NEVI) Program (web link)
- Volkswagen settlement funds (web link)
- USDOT Grants for Buses and Bus Facilities Competitive Program (web link)
- EPA Clean School Bus Program (web link)

National Electric Vehicle Infrastructure (NEVI) Program

The infrastructure bill provides a total of $7.5 billion in federal funding for EV charging infrastructure. A funding source only available to states, the National Electric Vehicle Infrastructure (NEVI) Program, allocates funding to all states to deploy EV charging infrastructure along designated alternative fuel corridors (AFCs).[48] The NEVI program is part of the Infrastructure Investment and Jobs Act, a $1

[48] US Dept. of Energy-Alternative Fuels Data Center: National Electric Vehicle Infrastructure (NEVI) Formula Program: https://afdc.energy.gov/laws/12744

trillion infrastructure bill passed by Congress in November 2021.[49] The bill required states to submit their respective NEVI implementation plans to the newly established Joint Office of the Departments of Energy and Transportation[50] by August 2021. California submitted their NEVI plan August of 2022.[51] The California Energy Commission will manage funding solicitations or Grant Funding Opportunities (GFO). The DOT will also establish an additional grant fund for states and localities that require additional assistance. At the time of this writing, further details on the distribution of funding and eligibility have not been released.

Volkswagen Settlement Funds

The Volkswagen (VW) Environmental Mitigation Trust has allocated approximately $423 million to California to address the excess nitrogen oxide (NOX) emissions resulting from VW's use of illegal emissions testing defeat devices in certain diesel vehicles. This trust is part of partial settlements with VW and focuses on "scrap and replace" projects for the heavy-duty sector, including on-road freight trucks, transit and shuttle buses, school buses, forklifts, port cargo handling equipment, commercial marine vessels, and freight switcher locomotives. To ensure that 50% of the total funding benefits low-income or disadvantaged communities, CARB (California Air Resources Board) has partnered with specific air districts, including Bay Area AQMD, San Joaquin APCD, and South Coast AQMD, to administer the funding categories outlined in the Beneficiary Mitigation Plan. Program changes were implemented to increase participation, align VW incentives with other programs, and expedite NOx reductions. The air districts will incorporate these changes into their respective categories and update their program webpages accordingly.[52] California's portion of these funds amounts to $423 million,[53] assigned to different project categories as shown in **Table A- 1.**

USDOT Grants for Buses and Bus Facilities Competitive Program

The Federal Transit Administration has announced $1.69 billion in funding for the FY23 Low- and No-Emission Grants for Buses and Bus Facilities program. The program provides funding for initiatives such as purchasing buses and related equipment and constructing bus-related facilities. Eligible recipients include states, local governments, Indian tribes, and private nonprofit organizations engaged in public transportation. Funding is allocated on a competitive basis and is available for four fiscal years. For more information, eligible applicants can access additional resources on supportive services, zero-emission fleet transition plans, and more[54].

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[49] US Dept. of Transportation-Federal Highway Administration: Bipartisan Infrastructure Law *National Electric Vehicle Infrastructure Formula Program*: https://www.fhwa.dot.gov/bipartisan-infrastructure-law/nevi_formula_program.cfm

[50] Joint Office of Energy and Transportation: https://driveelectric.gov/

[51] California's NEVI implementation plan, as prepared by Caltrans and the California Energy Commission and submitted in August 2022: https://dot.ca.gov/-/media/dot-media/programs/sustainability/documents/nevi/2022-ca-nevi-deployment-plan-a11y.pdf

[52] https://ww2.arb.ca.gov/our-work/programs/volkswagen-environmental-mitigation-trust-california/about

[53] National Association of Clean Air Agencies: VW State and Local Agency Information: https://ww2.arb.ca.gov/resources/documents/californias-beneficiary-mitigation-plan

[54] https://www.transit.dot.gov/bus-program

TABLE A- 1: CALIFORNIA VOLKSWAGEN MITIGATION TRUST PROJECT CATEGORIES

PROJECT CATEGORY	APPLICATION TYPE	BENEFITING DISADVANTAGED OR LOW-INCOME COMMUNITIES	TOTAL AMOUNT ALLOCATED
ZERO-EMISSION TRANSIT, SCHOOL, AND SHUTTLE BUSES	First-Come/First-Served	50%	$130 million
ZERO-EMISSION CLASS 8 FREIGHT AND PORT DRAYAGE TRUCKS	First-Come/First-Served	50%	$90 million
ZERO-EMISSION FREIGHT AND MARINE PROJECTS	First-Come/First-Served	75%	$70 million
COMBUSTION FREIGHT AND MARINE PROJECTS	First-Come/First-Served	50%	$60 million
LIGHT-DUTY ZERO-EMISSION VEHICLE INFRASTRUCTURE	Competitive Solicitation	35%	$10 million
RESERVE (INCL. ADMINISTRATIVE COSTS)			$63 million
TOTAL		**> 50%**	**$423 million**

EPA Clean School Bus Program

The Clean School Bus Program, funded by the Bipartisan Infrastructure Law, has been established with the goal of improving school transportation and reducing emissions. The program will run for the next five years (FY 2022-2026) and will offer $5 billion in funding to replace existing school buses with zero-emission and low-emission models. The Clean School Bus Program will keep providing updates on funding opportunities and educational resources to help schools transition to cleaner and more environmentally friendly school buses.[55]

[55] https://www.epa.gov/cleanschoolbus

Summary of Federal Funding

Table A- 2 below provides a summary of federal funding opportunities and relevant key information for each.

TABLE A- 2: SUMMARY OF FEDERAL FUNDING SOURCES

SOURCE	PROGRAM/AWARD NAME	ELIGIBLE APPLICANTS	CATEGORY	APPLICATION TYPE	BENEFITING DISADVANTAGED OR LOW-INCOME COMMUNITIES	FUNDING AMOUNT
THE U.S. DEPARTMENT OF TRANSPORTATION-FEDERAL HIGHWAY ADMINISTRATION	National Electric Vehicle Infrastructure Program (State Allocations)	States	DCFC along highway corridors	N/A: Awarded to States on a formula basis	40% as per Justice40	Varies by formula
THE U.S. DEPARTMENT OF TRANSPORTATION-FEDERAL HIGHWAY ADMINISTRATION	National Electric Vehicle Infrastructure Program (DOT Allocation)	States	EVSE, H2 and Alt. Fuel stations in community locations	Competitive Grant	40% as per Justice40	Up to 80%
VOLKSWAGEN	Volkswagen mitigation trust for California	Owners of transit buses, school buses and shuttle buses	ZEV Transit, School, and Shuttle Buses	First-Come/First-Served	50%	Up to $400,000 per vehicle
VOLKSWAGEN	Volkswagen mitigation trust for California	Public and private entities that own and operate eligible vehicles	ZEV Class 8 Freight and Port Drayage Trucks	First-Come/First-Served	50%	Up to $200,000 per vehicle

SOURCE	PROGRAM/AWARD NAME	ELIGIBLE APPLICANTS	CATEGORY	APPLICATION TYPE	BENEFITING DISADVANTAGED OR LOW-INCOME COMMUNITIES	FUNDING AMOUNT
VOLKSWAGEN	Volkswagen mitigation trust for California	Individuals, businesses, nonprofits, or government entities based in California	ZEV Freight and Marine Projects	First-Come/First-Served	75%	Up to $10 Million (last round)
VOLKSWAGEN	Volkswagen mitigation trust for California	Public and private entities that own and operate eligible equipment anywhere in California	Combustion Freight and Marine Projects	First-Come/First-Served	50%	Cap per entity: 10% ($ 3.0 million)
ENVIRONMENTAL PROTECTION AGENCY	Clean School Bus Program	Local or State Governmental Entities, Tribes or Tribal organizations, public charter school districts, Eligible contractors, nonprofit transportation associations that fit specific criteria	Zero-Emission Transit, School, and Shuttle Buses	Competitive grant	Priority given to high-need educational agencies, rural school districts, Bureau of Indian Affairs-funded schools, school districts receiving basic support payments for children residing on Indian land	Total award program funding: $400 million

CALIFORNIA STATE PROGRAMS

The following incentive programs and projects are specific to California, administered and/or funded by state agencies, such as the California Air Resources Board (CARB)[56] or the California Energy Commission (CEC)[57]. Some of the funding made available in California-specific programs comes from revenue continually generated in the state's greenhouse gas emissions cap-and-trade program[58] or the Low Carbon Fuel Standard (LCFS)[59].

List of programs:

- Clean Vehicle Rebate Project (CVRP) (web link)
- Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP) (web link)
- Clean Off-Road Equipment (CORE) Voucher Incentive Project (web link)
- California Electric Vehicle Infrastructure Project (CALeVIP) (web link)
  - Go to the San Joaquin Valley-specific project branch
  - CALeVIP 2.0 launching with the Golden State Priority Project (GSPP), for DCFC in disadvantaged or low-income communities, application window opened January 2023
- Energy Infrastructure Incentives for Zero-Emission (EnergIIZE) Commercial Vehicles (web link)
- Low Carbon Fuel Standard (LCFS) (web link)
- California Air resources Board Clean Mobility Options (web link)

Clean Vehicle Rebate Project (CVRP)

CARB authorized the Center for Sustainable Energy to administer the California Clean Vehicle Rebate Project (CVRP). The program offers a rebate for the purchase or lease of new, eligible zero-emission vehicles, including BEVs ($2,000 per vehicle), PHEVs ($1,000), and FCEVs ($4,500) to private consumers. The program is two-fold: one part for private EV buyers and one for public fleets (incl. city- or county-owned vehicles) and rental car and car sharing companies. Low-income private applicants are eligible for higher incentives. Eligibility caps apply on vehicle purchase costs ($60,000 for large vehicles such as pickups, SUVs, and minivans and $45,000 for all other light-duty vehicles). Fleets are eligible for a maximum of 20 (rental car and car sharing fleets) and 30 (public fleets) rebates per year. CVRP rebates can be combined with other federal, state, or local agency incentives.[60]

Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP)

The California Air Resources Board also runs the Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP), with more than $100 million of remaining funds for 2022 at the time of this writing. The program features two annual funding rounds and provides a point-of-sale rebate for medium- and heavy-duty vehicles, incl. buses, school buses, refuse trucks, step vans, straight trucks,

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[56] CARB: https://ww2.arb.ca.gov/

[57] CEC: https://www.energy.ca.gov/

[58] Cap-and-trade program: https://ww2.arb.ca.gov/our-work/programs/cap-and-trade-program

[59] LCFS: https://ww2.arb.ca.gov/our-work/programs/low-carbon-fuel-standard \

[60] California Clean Vehicle Rebate Project: https://cleanvehiclerebate.org/en

and tractors. The program website includes a list of all eligible vehicle models, including most of the market-ready medium- and heavy-duty EVs and incentive amounts ranging from e.g., $120,000 for many Class 7 or 8 trucks up to $375,000 for some school bus models.[61]

Clean Off-Road Equipment (CORE) Voucher Incentive Project

This incentive program focuses on off-road equipment, i.e., zero-emission vehicles and related equipment in use outside of public streets. This includes forklifts, mobile and ground power units, railcar movers, terminal tractors (e.g., at ports), transport refrigeration units, agricultural vehicles and equipment, construction vehicles, and more. Reopened with an initial $125 million in March 2022, about $23 million of funding at the time of this writing. Per-vehicle voucher amounts range from $15,000 for a small forklift to $500,000 for heavy railcar movers or agricultural and construction equipment. Manufacturers, dealers, and equipment users are eligible to apply for the CORE Voucher Incentive Project. CARB also administers this project.[62]

California Electric Vehicle Infrastructure Project (CALeVIP)

The California Electric Vehicle Infrastructure Project (CALeVIP) is funded by the California Energy Commission and implemented by the Center for Sustainable Energy. The program is split into different regions across California, including the San Joaquin Valley. Funding availability depends highly on the region and should be checked before considering an application. DCFC chargers are generally subject to tighter funding constraints; in many areas, only Level 2 charger funding remains. Eligible applicants include public agencies, businesses, non-profits, tribal governments, and other site owners.[63]

The San Joaquin Valley Incentive Project offers rebates for EV charging infrastructure in Fresno, Kern, and San Joaquin counties. Eligible applicants must be property owners or authorized agents with a completed Site Verification Form. The program covers various eligible equipment costs, and rebates are reserved on a first-come, first-served basis. 25% will be allocated to Disadvantaged Communities.[64] While the San Joaquin Valley Incentive Project is not accepting applications at this time, it's advised to monitor this fund for future openings.

CALeVIP 2.0 Project: Golden State Priority Project (GSPP)

The Golden State Priority project will provide a DC Fast Charger rebate and currently includes the Central and Eastern region counties and may add additional regions as funding availability allows. The application window opened around January 2023 with $10 million allocated to the Central region and $20 million to the Eastern region. Funding is only available for sites located within DACs or low-income communities though subsequent incentive projects under CALeVIP 2.0 may fund projects outside of DACs and LICs.

Site requirements no longer require 24/7 site access and have been reduced to a minimum of 18 hours per day, 7 days a week, excluding holidays. Only CCS will be eligible for funding, Tesla and

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[61] California HVIP: https://californiahvip.org/

[62] California CORE: https://californiacore.org/

[63] CALeVIP: https://calevip.org/

[64] https://calevip.org/incentive-project/san-joaquin-valley

CHAdeMO may be installed, but will not be considered for funding. Chargers must also be networked (Wi-Fi, ethernet, or cellular connection) and use OCPP. Construction cannot have started prior to the closing of the application window.

4-20 connecters can be funded and up to 50% of total approved costs covered by the program. Costs incurred starting September 1, 2022, will be eligible. **Table A- 3** outlines the rebate caps per active connector. At the time of this writing, the application period for the Eastern region which includes San Joaquin County has closed. It's recommended to check back periodically for future openings.

TABLE A- 3: GOLDEN STATE PRIORITY PROJECT REBATE CAPS

GUARANTEED OUTPUT PER ACTIVE CONNECTOR	REBATE CAPS PER ACTIVE CONNECTOR
150-275 KW	up to $55,000 per active connector
275 KW+	275 kW+: up to $100,000 per active connector
BELOW 150 KW	Below 150 kW: no funding

Source: https://calevip.org/incentive-project/golden-state-priority-project

Energy Infrastructure Incentives for Zero-Emission (EnergIIZE) Commercial Vehicles

The EnergIIZE program for commercial vehicles is funded by the California Energy Commission and provides incentives for zero-emission vehicle infrastructure equipment for medium- and heavy-duty BEVs and FCEVs in California. The project defines four separate funding lanes: EV Fast Track Lane, EV Jump Start Funding Lane, EV Public Charging Station Funding Lane, Hydrogen Funding Lane. The EV Jump Start Funding Lane is intended for commercial fleet operators in disadvantaged or low-income communities and opened on September 1, 2022. Funding amounts range from up to $750,000 per EV project and up to $3 million per hydrogen project. The whole program being worth $69 million, this funding lane has $13.9 million incentives available. Eligible applicants for the EnergIIZE program include public fleets, car sharing and rental car fleets, businesses, transit agencies, school districts, and EV charging infrastructure vendors. Costs for the charging equipment, required electrical service upgrades, and demand management equipment can be covered.[65]

Low Carbon Fuel Standard (LCFS)

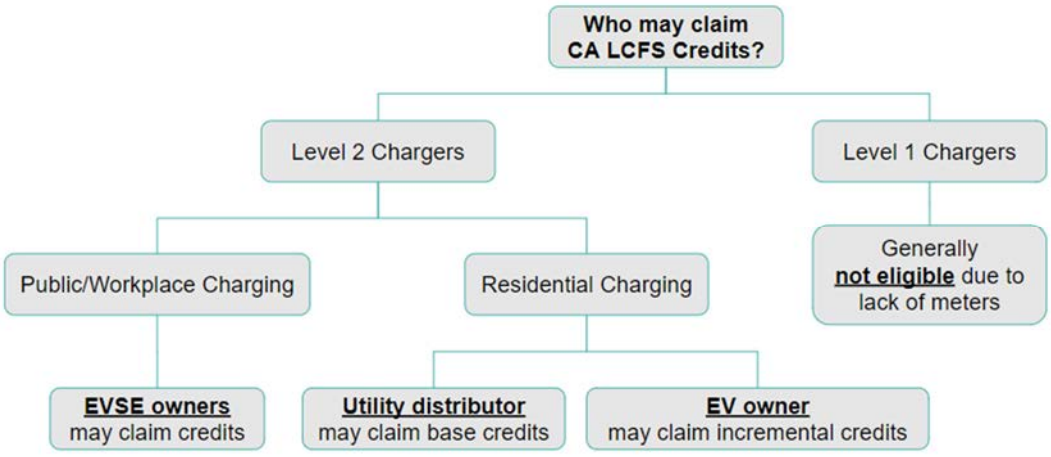
Though not a direct source of rebates, incentives, or other upfront funding, the Low Carbon Fuel Standard (LCFS) is a market-based approach to incentivizing clean energy administered by CARB. The LCFS creates a marketplace where air polluters may acquire credits to continue to operate, while clean energy users sell credits to generate revenue.[66]

Owners of EV chargers, utility distributors, and EV owners may be eligible for California LCFS credits, if the EV charging is metered, outlined by **Figure A- 1** below. Since EV charging must be metered to qualify for LCFS credits, Level 1 chargers are usually not eligible unless they are individually

[65] EnergIIZE Commercial Vehicles: https://www.energiize.org/

[66] California Air Resources Board: Low Carbon Fuel Standard: https://ww2.arb.ca.gov/our-work/programs/low-carbon-fuel-standard

metered like a Level 2 or DC Fast charger. The owner of a public charger can claim LCFS credits if the charger is publicly available. While in the case of residential charging, the base LCFS credit (like the LCFS credit from a public charger) may be claimed by the utility distributor while an incremental credit may be claimed by the EV owner as long as charging is metered.[67]



Source: California Air Resources Board

LCFS credits have the potential to generate a significant stream of revenue for the charging station owner or the utility. A 7.2 kW Level 2 charger could generate about $1,725 of LCFS credits annually

FIGURE A- 1: WHO MAY CLAIM CALIFORNIA LCFS CREDITS?

if it is utilized about 7-8 hour per day and 3-5 days per week, at an LCFS credits price of $200 per ton. The LCFS credit value is subject to market fluctuation and has been decreasing since mid-2021. The LCFS credits could be a significant revenue stream that could potentially offset operating costs or repay the capital expenditures of the chargers.

Upcoming State Funding

In November 2021, the California Energy Commission (CEC) released the 2021-2023 Investment Plan Update that increased the budget of the Clean Transportation Program by six times[68]. The Clean Transportation Program has been investing in a broad portfolio of alternative fuel transportation projects throughout the state. As part of that program, over two years, the CEC will distribute nearly $1.4 billion funding as follows:

- $314 million for light-duty electric vehicle charging infrastructure (will fund a new program administered by Center for Sustainable Energy and CALSTART)
- $690 million for medium- and heavy-duty ZEV infrastructure (battery-electric and hydrogen) (will fund EnergIIZE)
- $77 million for hydrogen refueling infrastructure
- $25 million for zero-and near-zero-carbon fuel production and supply

[67] California Air Resources Board: LCFS ZEV Infrastructure Crediting: https://ww2.arb.ca.gov/resources/documents/lcfs-zev-infrastructure-crediting

[68] CEC's 2021-2023 Investment Plan Update: https://www.energy.ca.gov/publications/2021/2021-2023-investment-plan-update-clean-transportation-program

- $244 million for ZEV manufacturing
- $15 million for workforce training and development[69]

California Energy Commission (CEC) Communities in charge

Communities in Charge will provide funding for light-duty Electric Vehicle Supply Equipment (EVSE). The CEC awarded CALSTART with $250 million block grant (GFO-20-607) in April of 2021 to design and implement this project. CALSTART will collaborate with CEC and the public to design Communities in Charge projects. [70]

California Air Resources Board Clean Mobility Options

California's Clean Mobility Options Pilot Program helps under-resourced communities with mobility. It offers funding for clean mobility projects and community transportation needs assessments. The program has $34 million available for eligible projects like ride-on-demand services, bike sharing, and electric vehicle car sharing. Government entities, tax-exempt nonprofits, or California Native American Tribal Governments can lead. The project must be in a designated community and has already awarded $21 million.[71]

California Energy Commission (CEC) Convenient, High-Visibility, Low-Cost Level 2 Charging (Chill-2)

The CEC Clean Transportation Plan (CTP) will fund the Convenient, High-Visibility, Low-Cost Level 2 Charging (CHiLL-2) grant. The primary goal of the CHiLL-2 grant will be to increase perception of Level 2 charging through high-density, highly visible installations. Additional goals include testing business models for charging such as smart charging and observing utilization across site types. $24 million in total funding is available and the CEC proposes two awards totaling $10 million each and 25% match funding required. Eligible projects will need to include a minimum of 500 Level 2 chargers within a 1-mile radius across two or more different site types. 50% or more of the chargers must also be installed in disadvantaged/low-income communities. Applications are due in Feb/March 2023.[72] At the time of this writing this grant cycle has closed.

Green School Bus Grants

As part of California's 2022-2023 budget, Governor Newsom proposed $1.5 billion of funding for a competitive grant program for school districts to replace nonelectric school buses with electric buses[73] and construct charging stations ("Green School Bus Grants"). Grant awards would be at least $500,000 each and be prioritized in areas with a high concentration of low-income students and English learners and smaller and more rural school districts. It is estimated that the program could help replace 3,000 older buses with electric buses.

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[69] CEC's Clean Transportation Plan: https://www.energy.ca.gov/programs-and-topics/programs/clean-transportation-program

[70] California Energy Commission Communities in Charge block grant: https://www.energy.ca.gov/proceedings/energy-commission-proceedings/communities-charge

[71] https://cleanmobilityoptions.org/

[72] California Energy Commission: Convenient, High-Visibility, Low-Cost Level 2 Charging (CHiLL-2) grant presentation

[73] Green School Bus Grants: https://lao.ca.gov/Publications/Report/4525

Summary of California Funding

Table A- 4 below provides a summary of California funding programs related to ZEV infrastructure and relevant key information for each.

TABLE A- 4: SUMMARY OF CA ZEV INFRASTRUCTURE FUNDING

SOURCE	PROGRAM/AWARD NAME	ELIGIBLE APPLICANTS	CATEGORY	APPLICATION TYPE	BENEFITING DISADVANTAGED OR LOW-INCOME COMMUNITIES	FUNDING AMOUNT
CARB	Clean Vehicle Rebate Project (CVRP)	Private EV buyers and public fleets	Vehicle purchase	Rebate	N/A	Varies depending on vehicle type
CARB	Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP)	Private or public buyers	Vehicle purchase	Point of sale vouchers	N/A	Varies depending on vehicle type
CARB	Clean Off-Road Equipment (CORE) Voucher Incentive Project	Private or public buyers	Vehicle purchase	Voucher	N/A	Varies depending on vehicle type
CEC	CALeVIP	Site owner or their authorized agent	Level 2 & DCFC	Rebate	Varies by region	Varies by region
CEC	CALeVIP 2.0: Golden State Priority Project (GSPP)	Site owner or their authorized agent	DCFC-150kW-274.99kW	Rebate	100%	Up to 50% of project costs capped at $55,000 per connector

SOURCE	PROGRAM/AWARD NAME	ELIGIBLE APPLICANTS	CATEGORY	APPLICATION TYPE	BENEFITING DISADVANTAGED OR LOW-INCOME COMMUNITIES	FUNDING AMOUNT
CEC	CALeVIP 2.0: Golden State Priority Project (GSPP)	Site owner or their authorized agent	DCFC-274kW+	Rebate	100%	Up to 50% of project costs capped at $100,000
CEC	Energy Infrastructure Incentives for Zero-Emission (EnergIIZE)	Public fleets, car sharing and rental car fleets, businesses, transit agencies, school districts, and EV charging infrastructure vendors	Commercial Vehicle Purchase	Incentive	N/A	Varies depending on project type
CA	LCFS	Electric Utilities, EVSE and EV owners	Clean Energy Credits	LCFS Marketplace	n/a	Market Based
CEC	TBD	TBD	Light duty EVSE	TBD	TBD	$314 million total
CEC	TBD	TBD	Med.-Heavy Duty ZEV Infrastructure	TBD	TBD	$690 million total
CEC	TBD	TBD	H2 Infrastructure	TBD	TBD	$77 million total

SOURCE	PROGRAM/AWARD NAME	ELIGIBLE APPLICANTS	CATEGORY	APPLICATION TYPE	BENEFITING DISADVANTAGED OR LOW-INCOME COMMUNITIES	FUNDING AMOUNT
CEC	CHiLL-2	All public and private entities in the state of CA	Level 2	Competitive Grant	50%	$10 million with 25% match
CEC/CALSTART	Communities in Charge	TBD	TBD	TBD	TBD	TBD
CARB	Clean Mobility Options	Government entity, Nonprofit organization and CA Native American Tribal Government	Clean Mobility Projects and Transportation Needs Assessments	Voucher	100%	Up to $1 million for projects and $100k for assessments
CA	Green School Bus Grants	School districts	School Buses and EVSE	Competitive Grant	TBD-Will prioritize DAC	Minimum $500k each

LOCAL AND REGIONAL PROGRAMS

Pacific Gas and Electric (PG&E) programs

Pacific Gas and Electric (PG&E) is the electric utility for San Joaquin County. The California Public Utilities Commission (CPUC) authorizes programs run by investor-owned utilities such as PG&E.

List of programs:

- EV Fast Charge Program (web link)
- EV Charge program (web link)
- EV Fleet program (web link)

PG&E EV Fast Charge Program

Pacific Gas and Electric (PG&E) runs an "EV Fast Charge Program" which pays to install electric infrastructure from the utility pole to the parking space at qualifying customer sites to support the expansion of publicly available DC Fast Chargers. This includes site design, permitting, and construction. A limited number of sites are selected on a competitive basis. Sites need to be accessible to the public 24 hours a day, 7 days a week. Additionally, sites meeting Disadvantaged Community (DAC) requirements may qualify for a rebate up to $25,000 per charger. A total of $22.4 million of funding is available for the years 2020-2025.[74]

PG&E EV Charge program

Like PG&E's Fast Charge Program, although not limited to fast charging stations, the "EV Charge Program" helps pay for infrastructure expenses related to EV charger installations, often covering 60-80% of total project costs depending on if the site host or the utility will own the chargers. A minimum of 10 parking spaces with EV charging need to be included in each project, with different possible ownership models. While the original program is fully subscribed at the time of this writing as of December 2022, the California Public Utility Commission approved $52,248,000 in funding for PG&E to implement the first phase of their EV Charge 2 program.[75]

PG&E EV Fleet program

PG&E's EV Fleet program is tailored to fleet owners and operators in the process of electrifying their medium- and heavy-duty vehicle fleets. This includes school buses, transit buses, tractors, refuse trucks, agricultural equipment, and other vehicle types, and their related charging infrastructure. Up to $9,000 per vehicle and 50% of the cost of the EV chargers can be covered by PG&E under the program. Applicants must be existing PG&E customers, own or lease the relevant property on which the necessary charging infrastructure is to be installed and acquire at least two medium- or heavy-duty electric vehicles.[76]

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[74] PG&E: EV Fast Charge Program: https://www.pge.com/evfastcharge

[75] California Public Utility Commission: https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M500/K043/500043974.PDF

[76] PG&E: EV Fleet Program: https://www.pge.com/evfleet

San Joaquin Valley Air Pollution Control District

A few different programs supporting EV adoption and the installation of charging infrastructure are offered by the San Joaquin Valley Air Pollution Control District.

- Charge Up! Electric Vehicle Charger Incentive Program (web link)
- Zero-Emission School Bus Replacement Incentive Program (web link)
- Clean Vehicle Fueling Infrastructure Program (web link)
- Public Benefit Grant Program (web link)

The San Joaquin Valley Air Pollution Control District offers a few different programs supporting EV adoption and the installation of charging infrastructure.

Charge Up! Electric Vehicle Charger Incentive Program

The Charge Up! EV Charger Incentive Program offers rebates for charging stations at public agencies, businesses, and property owners of multi-unit dwellings. Maximum funding amounts per unit are $5,000 ($6,000) for a single-port (dual-port) Level 2 charger and $25,000 for a DC fast charger. A funding cap of $50,000 annually per applicant/site exists.[77]

Zero-Emission School Bus Replacement Incentive Program

The San Joaquin Valley Air Pollution Control District provides $20 million in funding for the Zero-Emission School Bus Replacement Incentive Program, which incentivizes the replacement of existing yellow school buses with zero-emission school buses in disadvantaged or low-income communities within the district boundaries. Eligible applicants are school districts, Joint Power Authorities, and privately owned yellow school buses contracted with a public school[78]. Under the program, a maximum of $400,000 of funding can be used to buy up to 10 school buses per applying entity.[79]

Clean Vehicle Fueling Infrastructure Program

Also administered by the San Joaquin Valley Air Pollution Control District, the Clean Vehicle Fueling Infrastructure Program offers incentives for the establishment, conversion, and expansion of hydrogen fueling and EV charging stations specifically designed for heavy-duty vehicles is not intended for passenger vehicle-related projects. Eligible applicants include public entities (e.g., government agencies, schools) and private organizations.

The program covers three project categories: hydrogen fueling stations, charging stations (level 2 or higher), and includes certain equipment and warranty requirements for both. Funding is allocated on a first-come, first-served basis, with no guarantee of funding upon application submission. Incentive percentages are based on project types, with maximum percentages ranging from 50% to 100%, particularly for publicly accessible projects and those incorporating solar/wind generation

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[77] San Joaquin Vally Air Pollution Control District: Charge Up! Electric Vehicle Charger Incentive Program: https://ww2.valleyair.org/grants/charge-up/

[78] San Joaquin Valley Air Pollution Control District: Zero-Emission School Bus Replacement Incentive Program: https://ww2.valleyair.org/grants/zero-emission-school-bus-replacement-incentive-program/

[79] San Joaquin Valley Air Pollution Control District: Zero-Emission School Bus Replacement and Fueling Infrastructure Incentive Programs presentation: https://ww2.valleyair.org/media/zf0pmzen/zero-emission-school-bus-program-presentation.pdf

systems. Public school buses for battery charging and alternative fueling can receive 100% funding support.[80]

Public Benefit Grant Program

Targeted towards public agencies, this program has two components: Funding for the purchase of alternative fueled vehicles and the alternative fuel infrastructure. The purchase of new alternative fueled vehicles (including BEVs, PHEVs, CNG, LNG, LPG, etc.), includes up to $20,000 per vehicle and up to $100,000 per agency per year. Applications are accepted on a first-come, first-serve basis.[81] The infrastructure portion of this program is accessed through proposals sent to the San Joaquin Valley Air Pollution Control District's grants department.

PRIVATE FINANCING

There is an emerging opportunity to obtain the full amount of capital needed to fund electric fleet vehicles and charging infrastructure, charging only a usage fee to the user. Such outside capital will allow the fleet operator and/or EVSE host to avoid the high up-front capital expenditure and still realize the lower Total Cost of Operating for EVs. Although private EVSE operators have existed for a while, it may make better sense from a financial and risk perspective to partner with a company that finances the chargers, the vehicles and all future maintenance, upgrades, and expansions. The outside capital generally would consist of a combination of equity and debt and will be tailored to the project. Private financing groups like 7Gen[82] and investment groups like Sustainability Partners[83] have established some of the most creative and beneficial structures to ensure the highest excellence and efficiency for public sector customers.

[80] San Joaquin Valley Air Pollution Control District: Clean Vehicle Fueling Infrastructure Program https://ww2.valleyair.org/grants/clean-vehicle-fueling-infrastructure-program/

[81] San Joaquin Valley Air Pollution Control District: Public Benefit Grant Program: https://www.valleyair.org/grants/publicbenefit.htm

[82] https://www.7gen.com/

[83] https://www.sustainability.partners/

Summary of Local and Regional Funding Programs

Table A- 5 below provides a summary of local and regional funding programs and relevant key information for each.

TABLE A- 5: SUMMARY OF LOCAL AND REGIONAL FUNDING PROGRAMS

SOURCE	PROGRAM/AWARD NAME	ELIGIBLE APPLICANTS	CATEGORY	APPLICATION TYPE	BENEFITING DISADVANTAGED OR LOW-INCOME COMMUNITIES	FUNDING AMOUNT
PG&E	EV Charge program	Individuals, public and private entities who are PG&E customers	Level 2 EVSE	Rebate/ First come, first served	n/a	Make-ready: 100% Installation and EVSE: 60%-80%
PG&E	EV Fast Charge program	Private entities	DCFC	Competitive	DAC's may qualify for EVSE funding	Make-ready: 100% and PG&E owned DAC: up to 25% EVSE costs
PG&E	EV Fleet program	Fleet owners and operators	Vehicle and charging infrastructure	Rebate	N/A	Up to $9,000 per vehicle and 50% of the cost of the EV chargers
SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT	Charge Up! Electric Vehicle Charger Incentive Program	Public agencies, businesses, and property owners of multi-unit dwellings	Charging infrastructure	First come-First Served Voucher	N/A	Varies depending on charger type, from $5,000-$25,000
SAN JOAQUIN VALLEY AIR POLLUTION	Zero-Emission School Bus Replacement Incentive Program	Public school districts, Joint Power Authorities	Vehicle replacement	Grant	Must serve disadvantaged or low-income community	Up to $400,000

SOURCE	PROGRAM/AWARD NAME	ELIGIBLE APPLICANTS	CATEGORY	APPLICATION TYPE	BENEFITING DISADVANTAGED OR LOW-INCOME COMMUNITIES	FUNDING AMOUNT
CONTROL DISTRICT		(JPA), and privately owned yellow school buses that are contracted with a public school to transport public school children				
SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT	Clean Vehicle Fueling Infrastructure Program	Public entities and private organizations	Charging infrastructure	First come-First Served Voucher	N/A	50%-100% depending on project type
SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT	Public Benefit Grant Program	Public Agencies	Vehicle and charging infrastructure	First come-First Served	N/A	$20,000 per vehicle up to $100,000 per agency per year. Details not provided for for EVSE

APPENDIX B. REGULATIONS

Several regulations both at the state and the federal level have the express goal of accelerating the transition to clean transportation fuels. These regulations can not only provide insights as to how fast the transition may occur, but also what type of vehicles will need to be served by new EVSE networks. Some regulations target the EVSE itself and dictate certain operating procedures which should be noted during the planning process.

STATE REGULATIONS

2020 Electric Vehicle Supply Equipment (EVSE) Regulation (2021-2031)

EVSE, used for commercial purposes, are subject to regulation adopted by the Department of Measurement Standards. The regulation requires that all charging stations that accept payment must:

- Be capable of indicating the start and stop time, the total quantity of energy delivered, the unit price, and the total price for the quantity of energy delivered during each discrete phase corresponding to one of the multiple unit prices.
- EVSE units used to charge electric vehicles shall be indicated and recorded in megajoules (MJ) or kilowatt-hours (kWh) and decimal subdivisions thereof.
- In the event of a power loss, the information needed to complete any transaction (i.e., delivery is complete, and payment is settled) in progress at the time of the power loss (such as the quantity and unit price, or sales price) shall be determinable by an alternative method.

The enforcement schedule is as follows:

- **January 1, 2021**: All new commercial AC EVSE installed on or after January 1, 2021, will be fully subject to the regulation.
- **January 1, 2023**: All new commercial DCFC EVSE installed on or after January 1, 2023, will be fully subject to the regulation.
- **January 1, 2031**: All commercial AC EVSE installed prior to January 1, 2021, may continue in operation, as is, but must comply with the regulation by January 1, 2031.
- **January 1, 2033**: All commercial DCFC EVSE installed prior to January 1, 2023, may continue in operation, as is, but must comply with the regulation by January 1, 2033.[84]

Assembly Bill 841 Electric Vehicle Infrastructure Training Program and Energy Efficiency Programs (2022+)

Assembly Bill 841 requires that that 25% of installation crew members of any State-funded electric vehicle charging infrastructure be certified under the Electric Vehicle Infrastructure Training Program (EVITP). The training program is administered by Powering Michigan's Future on behalf of the National Electrical Contractors Association. The course is available to California State Certified Electricians and is 18 hours of instructor-led training. NECA has been developing a self-paced course, but it hasn't been launched yet. After completing the course, the trainee must take a 90-minute in-person test that is currently offered twice a year in the San Francisco Bay Area and twice a year in Los Angeles.

[84] https://www.cdfa.ca.gov/dms/pdfs/CA_EVSE_Regulation_Reference_Document.pdf

To enroll, a contractor must complete an online form, wait for verification of their contractor's license, pay a $275 fee, and then are told when the class and test are available. Training is not offered for electrician apprentices, site designers, or job estimators. NECA will not license the content or make it available to other training organizations.[85]

State and Local Building Codes (2022+)

California's 2022 Building Energy Efficiency Standards apply to newly constructed buildings, additions, and alterations. The 2022 Energy Code encourages efficient electric heat pumps, establishes electric-ready requirements for new homes, expands solar photovoltaic and battery storage standards.[86]

Many local jurisdictions have passed or are passing reach codes that surpass the state standards; no San Joaquin jurisdiction has an adopted reach code for all electric construction.[87]

State building codes are updated tri-annually, and the 2025 Building Energy Efficiency Standards are in a "pre-rulemaking" phase of research and public participation. Current consensus is that the next code cycle will require all-electric construction for single-family homes and low-rise multifamily (three stories or fewer.)

Innovative Clean Transit (2023)

Innovative Clean Transit regulations require transit agencies to demonstrate how they will achieve a full transition to zero-emission buses (ZEBs). Large transit agencies submitted their Rollout Plans in 2020, and small transit agencies must submit them by July 1, 2023. **Table B- 1** shows the roll out plan by year.[88]

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[85] Electric Vehicle Infrastructure Training Program- https://www.cdfa.ca.gov/dms/pdfs/CA_EVSE_Regulation_Reference_Document.pdf

[86] https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/2022-building-energy-efficiency

[87] https://localenergycodes.com/content/map

[88] California Air Resources Board: https://ww2.arb.ca.gov/sites/default/files/2019-10/ictfro-Clean-Final_0.pdf

TABLE B- 1: PERCENTAGE OF BUS PURCHASES THAT MUST BE ZEBS BY YEAR

YEAR	LARGE AGENCY	SMALL AGENCY
2023	25%	
2024	25%	
2025	25%	
2026	50%	25%
2027	50%	25%
2028	50%	25%
2029	100%	100%

Source: California Air Resources Board (CARB)

Advanced Clean Fleet (ACF) Regulation (2024-2027)

The Advanced Clean Fleet Regulation is a CARB regulation that requires all public fleets, all port and rail drayage operators, and private fleets with 50 or more vehicles or $50 million in annual revenue to make 50% of their class 2b-8 vehicles added to their fleets zero emission vehicles starting January 1, 2024. If adopted with the language in the draft regulation, it will apply to vehicles with a GVWR of 8,501 pounds and more such as pickup trucks, large vans, SUVs and larger.[89] **Table B- 2** provides a brief summary of the proposed requirements and dates they will go into effect.

TABLE B- 2: SUMMARY OF ACF REGULATION

PROPOSED REQUIRMENT	DATES
50% of Class 2b-8 vehicles added to fleet must be ZEV	2024 through 2026
100% of Class 2b-8 vehicles added to fleet must be ZEV	2027 and onward

Source: California Air Resources Board

Advanced Clean Truck (ACT) Regulation (2024-2035)

This existing California Air Resources Board (CARB) regulation requires that manufacturers sell zero emission vehicles as an increasing percentage of annual California sales from 2024-2035. It applies to vehicles with a gross vehicle weight rating (GVWR) of 8,501 pounds and more, such as pickup

[89] California Air Resources Board: https://ww2.arb.ca.gov/sites/default/files/2022-04/220504acfdraftstatelocal_ADA.pdf

trucks, large vans, SUVs and larger with the sales percentage requirements based on vehicle classes[90]. **Figure B- 1** shows the percentage of vehicles by class that manufacturers are required to sell.

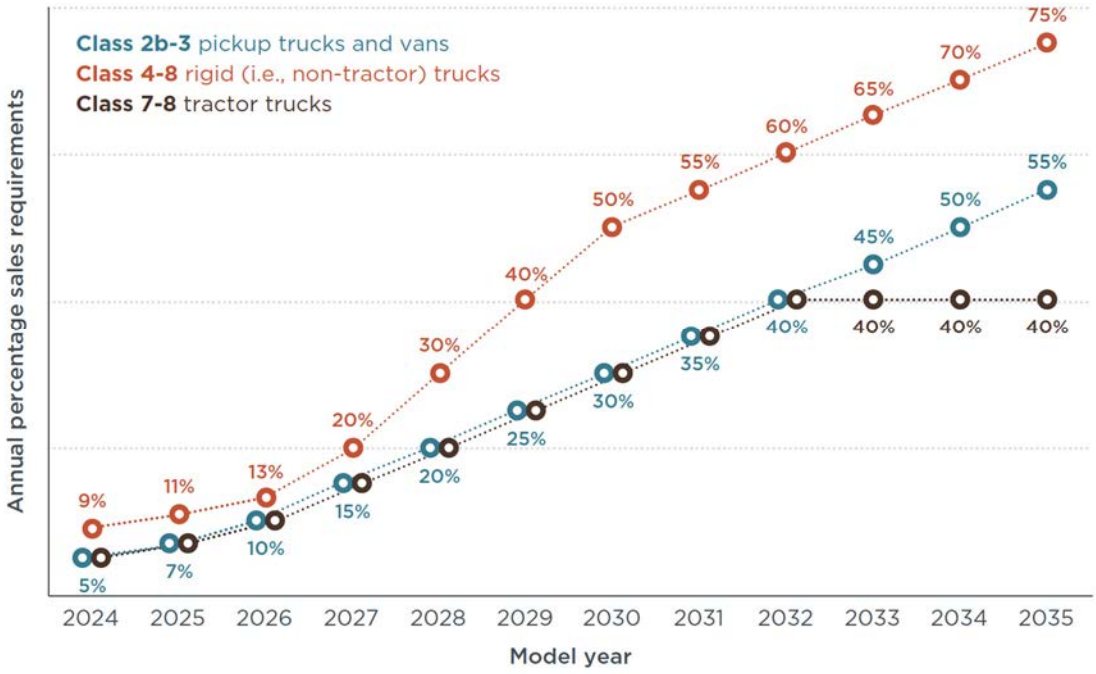

FIGURE B- 1: ACT REGULATION

Source: The ICCT

Advanced Clean Cars (ACC) II Regulation (2026-2035)

This regulation is an update to the State's passenger vehicle emission standards and zero-emission vehicle (ZEV) requirements. The ACC II regulations propose to scale down emissions from light-duty passenger cars, pickup trucks, and sport utility vehicles (SUVs), starting with the 2026 model year, and require that manufacturers sell an increasing number of zero emission vehicles; up to 100 percent by the 2035 model year. This change puts Governor Newsom's Executive Order N-79-20 into regulation.

FEDERAL ACTIONS

At the Federal level, there are a number of new actions/regulations that will have an impact on EV adoption and EVSE infrastructure:

National Electric Vehicle Infrastructure (NEVI)

The U.S. Department of Transportation's Federal Highway Administration has created minimum standards and requirements for projects funded under the National Electric Vehicle Infrastructure (NEVI) Formula Program. The rule addresses various key aspects:

[90] California Air Resources Board: https://ww2.arb.ca.gov/our-work/programs/advanced-clean-trucks/about

- **Installation, Operation, and Maintenance Standards**: The rule specifies requirements for the installation, operation, and maintenance of EV charging stations, including the qualifications, and training of technicians involved. This aims to create a standardized and reliable EV charging experience nationwide.
- **Interoperability**: The FHWA is working to establish interoperability standards for EV charging infrastructure, enabling seamless communication and operation across different software platforms and networks.
- **Traffic Control Devices and Signs**: The rule references existing regulations for traffic control devices and on-premises signs related to EV charging projects.
- **Data Submission**: States and recipients of Federal funds must submit data related to charging station use, reliability, and costs. This data will contribute to a public EV charging database.
- **Network Connectivity**: Requirements for network communication among chargers and with the grid are outlined to ensure secure monitoring, diagnostics, control, and updates, addressing cybersecurity concerns.
- **Information Accessibility**: The rule establishes standards for communicating EV charging station information to consumers, including location, real-time availability, and pricing. It ensures transparency in pricing and availability information.[91]

ADA Compliance for EV Charging Stations

Early movement to make charging stations compliant with ADA regulations, which could include connectors and screens at a different height and ability to receive verbal instructions for use ("talking screens."). Design recommendations for making EV charging stations have now been released.[92]

EPA Heavy-Duty Engine and Vehicle Standards

On December 20, 2022, the EPA implemented a final rule named "Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards." This rule establishes more stringent emissions standards for heavy-duty vehicles and engines, aiming to reduce air pollution, including ozone and particulate matter, starting from the 2027 model year. The updated standards cover a broader range of engine operating conditions and require adherence for an extended duration during on-road operation. This rule aligns with President Biden's "Strengthening American Leadership in Clean Cars and Trucks" Executive Order and represents the initial phase of the Clean Trucks Plan.[93]

Inflation Reduction Act

The Inflation Reduction Act was passed by Congress and signed into law by President Biden in August 2022, including substantial funding for climate change mitigation-related efforts.[94] The act would extend the federal tax credit of $7,500 for newly purchased all-electric vehicles and eliminate the phasing out of this tax credit after manufacturers have reached 200,000 EV sales.

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[91] https://www.federalregister.gov/documents/2023/02/28/2023-03500/national-electric-vehicle-infrastructure-standards-and-requirements#:~:text=This%20final%20rule%20enables%20States,EVs%20regardless%20of%20vehicle%20brand.

[92] https://www.access-board.gov/tad/ev/

[93] https://www.epa.gov/regulations-emissions-vehicles-and-engines/final-rule-and-related-materials-control-air-pollution#:~:text=On%20December%2020%2C%202022%2C%20EPA,heavy%2Dduty%20vehicles%20and%20engines

[94] Whitehouse.org-By the Numbers: The Inflation Reduction Act

Through the IRS, a federal tax credit of $7,500 for all new BEVs is available to all private EV buyers. The tax credit also includes PHEVs with a credit amount that is dependent on the battery capacity of the respective purchased vehicle. In case of vehicle leases, the tax credit goes to the vehicle manufacturer or leasing company, who can pass on the lower costs to the lessee.[95] The Inflation Reduction Act as signed into law in August 2022 will extend the federal tax credit until 2032 and eliminate the phasing out of this tax credit after manufacturers have reached 200,000 EV sales (starting January 1, 2023), which had been designated before. The bill expands the tax credit eligibility to used EV purchases too, at $4,000 per vehicle. However, the bill also poses restrictions on the vehicle and battery supply chains (in a move aiming to reduce reliance on China), which will likely exclude many vehicle models in the coming few years from being eligible for this tax credit.[96]

[95] IRS.gov-Plug-In Electric Drive Vehicle Credit (IRC 30D)

[96] Alternative Fuels Data Center-Inflation Reduction Act of 2022

APPENDIX C: FULL OUTREACH REPORT

OVERVIEW

The San Joaquin Council of Governments (SJCOG) is establishing an Alternative Fuels Vision Plan (AFVP) for San Joaquin County. The project involved examining existing conditions, prioritizing new locations for charging, developing a Technical Advisory Committee (TAC), and developing a recommendations report for the reduction of GHGs. Due to the far-reaching impacts of this study, outreach to community members and stakeholders have been performed to gain insight on how this effort can be most effective.

This summary memo summarizes the outreach efforts conducted for the SJCOG Alternative Fuels Vision Plan. Outreach efforts began in July 2022 and are scheduled to be completed by January 2023. To date, the following outreach efforts have been conducted to obtain input and feedback:

- Stakeholder Meetings (4 meetings)
- TAC Meetings (2 meetings)
- Public Workshops (2 meetings)
- Social Pinpoint Site
- Stakeholder Survey

The outreach conducted and input received for each of these efforts are summarized in the following sections.

STAKEHOLDER MEETINGS

The stakeholder list included relevant stakeholders within the study area. Four stakeholder meetings were conducted for this study on the following dates:

- June 30th, 2022
- August 16th, 2022
- August 17th, 2022
- October 3rd, 2022

June 30th, 2022: Stakeholder Meeting #1

On Thursday, June 30th, 2022, the San Joaquin Council of Governments (SJCOG) invited identified stakeholders to participate in the kickoff meeting for identified stakeholders to provide industry specific information and region-specific expertise to give context for the development of SJCOG's Alternative Fuels Vision Plan. Of the invited 90 participants a total of 19 attended the virtual meeting, with representatives from Caltrans, Catholic Charities Diocese of Stockton, the California Office of Planning and Research, and several electric vehicle charging companies.

Participants who attended the meeting were led through a three-part presentation that further elaborated on the efforts of SJCOG. The objective of the presentation was to inform stakeholders on the following:

Existing Conditions

- Travel behavior
- Alternative fueling infrastructure
- Socioeconomic conditions

Analysis and Recommendations

- Evaluation of Potential Strengths
- Evaluation of Opportunities
- Evaluation of Barriers
- Publicly Owned EV Chargers
- Propose Alternative Fuel Stations

Funding and Implementation

- Regulatory Incentives / Regulatory Barriers
- Funding Sources and Incentive Programs
- Implementation Strategy
- Alternative Fuels Corridor Recommendations

Attendee List

- Kevin Myose, San Joaquin County Fleet Services
- Parisa Lodge, Caltrans D10
- Kevin Schnepp, CA Department of Food & Ag, Division of Measurement Standards - ZEV Projects
- Joe Dowling, Shell Recharge
- Tessa Sanchez, Tesla
- Ally Moyers, Project Clean Air MJ
- John Barna, Anrab Associates LLC
- Chad Dickens, Blink Charging
- Jeffrey Wingfield, Port of Stockton
- Marlon Regisford, Caltrans D10
- Chris Kane, Electrify America
- Tanisha Raj, Catholic Charities Diocese of Stockton
- Ector Olivares, Catholic Charities Diocese of Stockton
- Jonathan Pruitt, Catholic Charities Diocese of Stockton
- Jon Leicester, EV Connect
- Udaya Shankar, Caltrans D10
- Morgan Rose, California Office of Planning and Research
- Ryan Dillon, Volta Charging
- Navraj Nammu, Caltrans D10

STAKEHOLDER DISCUSSION

WHAT IS THE MOST VALUABLE THING THAT HAS COME OUT OF PAST STAKEHOLDER GROUPS YOU'VE BEEN A PART OF?

Kevin Myose, San Joaquin County Fleet Services - hearing what other organizations are doing, similarities in problems and looking for different solutions and visions for a project.

Jonathan Pruitt, Catholic Charities Diocese of Stockton - focusing on issues of equity - assessing cities across the county and seeing their needs through the lens of their difference so this process can be user friendly for individual cities. Need to understand community culture and nuance.

Kevin Schneff, CA Department of Food & Ag, Division of Measurement Standards - ZEV Projects - Beneficial to hear different perspectives, comes from the regulatory side helpful to hear others.

WHAT HAVE BEEN INEFFECTIVE MEETING PRACTICES YOU'VE SEEN?

- **Jonathan Pruitt** - not having the right representatives or having people who do not attend consistently.
- **Kevin Schnepp** - structured meetings, that each meeting has a purpose and ends with an action item - that people hold each other accountable as well to ensure things are completed.

MAJOR THEMES

Industries to involve in this effort

Stakeholders who attended this kickoff meeting described that they hoped existing gas station and truck stop stakeholders would attend future meetings and be involved in this effort as these will likely become locations for charging infrastructure in the future. Additionally, participants mentioned a desire for a mix of representatives from different fleet and transportation types that will be impacted by the shift to alternative fuels such as goods movement and public transportation.

Accessibility Of Existing & Future Electric Vehicle Charging Stations

One participant raised concern about the accessibility of existing electric vehicle charging infrastructure in the San Joaquin region, that some existing chargers are inaccessible to the general public as they are on private property. According to one stakeholder participant, currently, San Joaquin County owns 47 stations, but only 14 can be used for workplace charging, the rest are fleet only, none for public use. Some of the existing chargers that were identified in existing conditions are fleet or workplace only. This concern raised a discussion about the potential for the installation of mixed-use charging facilities in the future. Another topic of discussion pertained to potential sites for public charging and alternative fueling stations – discussed sites included existing traditional gas stations as well as an idea to convert space in existing warehouses to house charging stations.

On this subject, participants discussed the need for equity to be considered as a factor in regard to understanding that different cities and areas in the San Joaquin region will need different types of outreach and project outcomes from this study. This discussion pertained to the different needs of different areas in accommodation such as how information is distributed in multiple languages and where fueling and charging stations will be installed – ideas included installation in multifamily

housing units. Lastly, one participant brought up the idea of developing messaging signs on state highways to notify drivers about charging stations, for example: 'next charging station is 10 miles'.

NEXT STEPS

Participants were encouraged to look over the presentation and follow up with any additional questions or insights. Stakeholder participants were invited to come to a scheduled second meeting of the Stakeholders as well as being notified that there will likely be smaller industry specific stakeholder meetings to be determined.

August 16 & 17th, 2022: Private and Public Fleet Stakeholder Meeting

On August 16th and 17th, 2022, public and private fleet stakeholders operating within San Joaquin County were invited to attend a virtual stakeholder meeting to learn more about the proposed San Joaquin County Council of Governments (SJCOG) Alternative Fuels Vision Plan and provide feedback on existing conditions. Several stakeholders attended the virtual meeting including representatives from Caltrans, City of Tracy, San Joaquin County, City of Stockton, the consultant team and SJCOG.

Participants who attended the meeting were led through a six-part presentation that described the efforts of the Alternative Fuels Vision Plan. The objective of the presentation was to provide stakeholders with:

- An overview of the project, its vision, and goals.
- Brief context on the current regulatory landscape for Zero Emission Vehicles (ZEV) and Alternative Fuel Vehicles (AFV) in California.
- Describe the existing conditions for ZEV and AFV infrastructure in San Joaquin County.
- Facilitate a discussion with stakeholders on the development of the AFVP.
- Next steps in the AFVP development.

A key objective was to have a discussion with stakeholders on their initial thoughts and ideas on the Alternative Fuels Vision Plan and how the plan should be developed to achieve its vision and goals. To guide this discussion, three questions were asked of stakeholders during the meeting:

1. What steps has your company or agency already taken to shift towards alternative fuel vehicles? If none yet, what implementation plans are you aware of?
2. What barriers do you perceive your company or agency faces for adoption of alternative fuel vehicles?
3. What ZEV infrastructure will you need to promote the adoption of alternative fuel vehicles? At what locations do you foresee the most need? What is your expected timeline?

In addition to the discussion, participants were also provided with a link to provide feedback through an online survey tool (Survey Monkey), as well as an interactive mapping tool (Social Pinpoint). The following sections will summarize the discussion around the three questions posed to stakeholders, as well as to identify next steps for stakeholders.

QUESTION 1: WHAT STEPS HAS YOUR COMPANY ALREADY TAKEN TO SHIFT TO ALTERNATIVE FUEL VEHICLES? IF NOTHING YET, WHAT IMPLEMENTATION PLANS ARE YOU AWARE OF?

One stakeholder, Kevin Myose (County of San Joaquin Fleet Manager), responded to this question and described the steps the County has already made in terms of transitioning to alternative fuel vehicles, summarized as follows:

- The County of San Joaquin has been deploying alternative fuel vehicles in their fleet for some time. Initially, they purchased Chevy Volts (12 of them), but they have also purchased some small construction equipment, as well as a side-by-side utility task vehicle (UTV).
- The County of San Joaquin currently has 27 Level 2 chargers and 10 Level 1 chargers.
- San Joaquin County has leveraged nearly 2 million in funding from various grants to purchase alternative fuel vehicles as well as the infrastructure for charging.
- Getting Level 2 chargers installed was challenging, as a transformer needed to be installed which required shutting down power to multiple city blocks. However, most of the construction cost was covered by grant funds.
- All charging infrastructure owned and operated by the San Joaquin County for fleet vehicles is currently not available for public use; however, the County might be amenable to providing a public charging option, especially as much of the grant money available is tied to having a public charge option available.
- One of the biggest obstacles for installing charging infrastructure is that many buildings and garages are not built to support that much power being drawn on site, as many city buildings were constructed in the 70's and transformers would be required.
- There is a possible site near Highway 12 and Highway 1 that is currently empty that Kevin hopes might be used for EV infrastructure in the future.

QUESTION 2: WHAT BARRIERS DO YOU PERCEIVE YOUR COMPANY OR AGENCY FACES FOR ADOPTION OF ALTERNATIVE FUEL VEHICLES?

One stakeholder, Kevin Myose, highlighted manufacturing and cost as the primary barriers to wider adoption of alternative fuel vehicles, especially public works vehicles. His response is summarized as follows:

- One of the barriers for adoption is that there are many fleet vehicles that do not offer a viable alternative option yet, or if there is a viable option, it is still too costly to justify. It would be challenging for much of public works to adopt alternative fuel because many of the vehicles often used (such as a 10-wheel dump truck) are not manufactured as alternative fuel vehicles.
- If some public works vehicles could run on alternative fuel, these vehicles would be in operation for long hours and therefore need to be able to run all day without recharging.
- Despite the grants available, some alternative fuel vehicle options that are manufactured cost four times as much as a combustion engine vehicle, so it would be a challenge to convince someone to accept that up-front cost, especially because grant funding might be there to purchase the first truck but perhaps not the subsequent vehicles as well as long term costs.
- The adoption of renewable diesel in 2015 was cited as a successful adoption of alternative fuels. Kevin said that what made this easy was that it's a fuel that you can easily drop and store and this made it easy to implement.

QUESTION 3: WHAT ZEV INFRASTRUCTURE WILL YOU NEED TO PROMOTE THE ADOPTION OF ALTERNATIVE FUEL VEHICLES? AT WHAT LOCATIONS DO YOU FORESEE THE MOST NEED? WHAT IS YOUR EXPECTED TIMELINE?

One stakeholder, Kevin Myose, responded to this question stating that he believes that the key to getting wider adoption of alternative fuel vehicles is to provide convenient infrastructure for charging. His response is summarized as follows:

- If there were more chargers available, more members of the public would purchase alternative fuel vehicles.
- He gave the example of when they first purchased Toyota Prius cars for fleet vehicles. Initially there was push back from employees, but once employees started using them for work, they also began purchasing them as their personal vehicles. Similarly, when they purchased Chevy Volt fleet vehicles, when employees started using them as fleet vehicles and realized that it was just as convenient as a standard vehicle (specifically that they didn't need to charge them every day), Kevin noticed that employees began purchasing them as their personal vehicle as well.
- In terms of most need, or a good place for deployment would be a space where you could have fleet charging and employee charging in the same place. Specifically for San Joaquin County, the AG center and public works would be a great place.
- Believes that for a government agency, providing charging infrastructure at work is the best way to get employee adoption of alternative fuel vehicles.

NEXT STEPS

After concluding the presentation, stakeholders were provided with the next steps for the SJCOG AFVP. These next steps included:

- Conduct further stakeholder engagement with public and private fleet operators, as well as the trucking industry.
- Solicit additional feedback from all stakeholders through a survey and social pinpoint.
- Provide additional information and post project updates through the project website.

October 3, 2022: Hydrogen Fuel Cell Webinar

On October 3, 2022, Chris White from Frontier Energy and David Park (Industry Affairs Director) presented a Hydrogen Fuel Cell Webinar to a variety of stakeholders including representatives from San Joaquin County, City of Tracy, City of Lodi GrapeLine (Transit), San Joaquin Regional Transit District (RTD), Alegre Trucking, Gilbarco Veeder-Root, Verizon, ChargePoint, Caltrans, California Department of Food and Agriculture and Valley Clean Air Now. Overall, 44 individuals were invited to attend the webinar and 29 participants attended. The purpose of this presentation was to introduce attendees to hydrogen fuel cell technology, highlight benefits of using hydrogen fuels, funding opportunities and discuss the National Hydrogen Mobility Strategy.

TAC MEETINGS

Two TAC (Technical Advisory Committee) meetings have been conducted for this study on the following dates:

- June 24, 2022
- August 24, 2022

Outreach efforts for each meeting consisted of emails and phone calls to invite interested stakeholders to each meeting. Over 50 participants were invited to attend the virtual meeting and it included a wide variety of stakeholders included in **Table C- 1**.

TABLE C- 1: STAKEHOLDER TAC LIST

ORGANIZATION TYPE	AGENCY/ORGANIZATION
EV CHARGING	Volta Charging Tesla Rivian Lyft Electrify America EVGo ChargePoint Blink EV Connect Semma Connect Greenlots (SRS) Electric Auto Association Electric Car Pledge Electric Drive Transportation Association Veloz Clipper Creek Frontier Energy Anrab Associates LLC
LOCAL JURISDICTIONS	Port of Stockton
NON-GOVERNMENT ORGANIZATION	Building Industry Association Central California Asthma Collaborative (CCAC) Valley Clean Air Now (CAN) Climate Plan Catholic Charities Diocese of Stockton Veloz SJ Green Hydrogen Project Clean Air - SJVNGP San Joaquin Renewables

ORGANIZATION TYPE	AGENCY/ORGANIZATION
REGIONAL AND STATE GOVERNMENT	California Energy Commission (CEC) CalTrans, District 10 CaleVIP, San Joaquin Valley Incentive Project San Joaquin Valley Clean Cities Coalition CalStart - San Joaquin Valley Clean Transportation Center CA High Speed Rail Authority CA Department of Food & Ag, Division of Measurement Standards - Engine Fuel Variances CA Department of Food & Ag, Division of Measurement Standards - ZEV Projects Governor's Office of Business and Economic Development (GO-Biz) - ZEV CA Public Utility Commission - Transportation Electrification Governor's Office of Planning and Research San Joaquin Council of Governments
TRIBE	California Valley Miwok Tribe (federally recognized) North Valley Yokuts Tribe California Tribal TANF Partnership Buena Vista Rancheria Mi-Wuk Indians Wilton Rancheria (Miwok) Southern Sierra Miwuk Nation United Auburn Indian Community of the Auburn Rancheria
TRUCKING	AC Trucking CA Trucking Association Delta Truck Center Shippers Transport Express

Participants who attended the TAC meetings were led through a three-part presentation that further elaborated on the efforts of the SJCOG. The objective of the presentation was to inform TAC stakeholders on the following:

Existing Conditions

- Travel behavior
- Alternative fueling infrastructure
- Socioeconomic conditions

Analysis and Recommendations

- Evaluation of Potential Strengths
- Evaluation of Opportunities
- Evaluation of Barriers
- Publicly Owned EV Chargers
- Propose Alternative Fuel Stations

Funding and Implementation

- Regulatory Incentives / Regulatory Barriers
- Funding Sources and Incentive Programs
- Implementation Strategy

Major Themes

Electric versus other alternative fuel types

Several meeting participants asked questions about the priorities of this study – if the project's goals are primarily surrounding electric vehicles or are equally considering alternative fuel types such as compressed fuel and renewable natural gas. A particular concern for this breakdown came from a representative of the City of Lodi's Public Works who described that for public transportation agencies only electrically charged and hydrogen fuel-run vehicles will count towards measurements in greenhouse gas emission reduction targets mandated by the state. The state mandate calls for all transit providers to have at least 50 percent of their fleet electrified by 2024. Other inquiries about this breakdown were more from the general interest of the priorities of the plan.

Electric Vehicle Charging Technology

TAC Meeting participants expressed curiosity about the types of charging technologies that will be discussed in the vision plan and what could be expected for San Joaquin in the future. Potential future technologies mentioned by the group included inductive charging and technology that is built into roadway infrastructure that charges vehicles while they drive. Inductive charging (versus conductive charging or plug-in) is currently just being looked at for large-scale vehicles due to the cost ($10,000). However, this will likely change as this technology becomes more affordable. Technology for charging that is under the roadway and charges, while you drive, is being developed.

Infrastructure Locations

A topic of discussion among TAC meeting participants was whether the location of charging infrastructure will be discussed and recommended as part of this vision plan. Participants asked if this study would discuss chargers that would be placed in the public right of way with follow-up questions about how this infrastructure is managed and maintained. Further discussion about charging infrastructure surrounding charging stations in public parking lots as well as at private facilities and those installed as part of new developments.

PUBLIC WORKSHOP

To present the public the updates on the development of the project and obtain public input, two public workshops have been conducted for this study on the following dates:

- August 30, 2022: 6:30 pm - 8 pm
- December 7, 2022: 6:30 pm - 8 pm

The August 30, 2022, a public workshop was hosted in the SJCOG Board Room office (555 E Weber Ave, Stockton), and it was also hosted virtually. Overall, three participants attended in person and ten participants attended virtually. The purpose of this public workshop was to introduce the community to the study, the project partners, as well as provide an overview of the project goals, the baseline existing conditions analysis, constraints, opportunities, and the community outreach efforts. The presentation was followed by a questions and answers session.

The second public workshop was hosted on December 7, 2022, as a virtual online event. The public workshop was presented to provide an additional opportunity for the community to ask questions.

Attendees received a presentation which included the project goals, baseline conditions analysis, potential recommendations, funding opportunities, and next steps of the project, followed by a question-and-answer session. In both public workshops, the interactive social pinpoint comment map was promoted to direct the public to highlight areas within San Joaquin County that need charging infrastructure.

Public Feedback:

- Tracy Bike Life Group does large groups of bicycles riding every Thursday night. Some of the bicyclists have electric bikes to keep up with the group and would like to have charging stations. There would need to be another piece of equipment to charge the bicycles.
- Some Tribe Communities were saying that they do have charging stations, however, they do not have the transformers needed for it to work for their vehicles.
- In some areas where there is no grid support, consider having solar power.
- A lead sales engineer for lighting mentioned that there have been challenges with alternative fuel sources (solar, EV charging stations, etc.). It is challenging for apartment complexes to adopt electric vehicle charges. What are you doing to ease the burden for the building owners?
    - It is not a one-size fit all solution since each building has different challenges. It is very difficult for older buildings that need a lot of upgrades since they can become very expensive to retrofit. Upcoming funding opportunities and finding creative solutions to reduce energy capacity in other areas are very important resources.

PROJECT WEBSITE

A project-specific website (https://www.sjcog.org/615/Alternative-Fuels-Vision-Plan) shared the project overview, key objectives, project-related documents, and a link to the social pinpoint comment map. **Figure C- 1** below shows a screenshot of the project website.

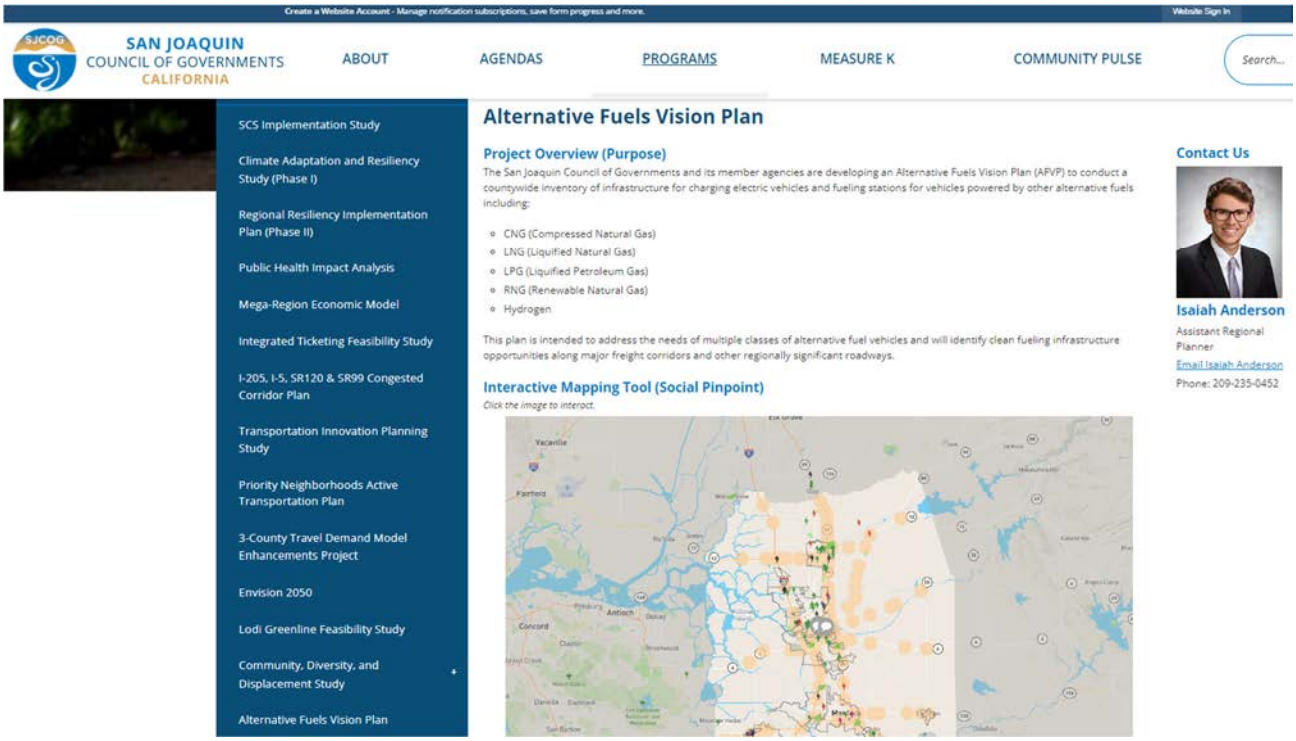

FIGURE C- 1: PROJECT WEBSITE

SOCIAL PINPOINT

Social Pinpoint is a digital engagement platform that helps organizations to communicate and collaborate through interactive maps, online surveys, and other engagement tools. Social Pinpoint was used to gather feedback from stakeholders and the public on the SJCOG AFVP project. The website (https://dks.mysocialpinpoint.com/afvp_sjco#/) for the project was launched on February 07, 2022, and remained open for comment through to November 2022. Social Pinpoint also has Google Translate abilities to translate all the default English language into 48 other languages.

Furthermore, the Social Pinpoint page provided side tabs that allowed participants to read descriptions of Alternative Fuel Types and Electric Vehicle (EV) Types on the left side of the map.

On the Social Pinpoint SJCOG page, participants could provide location-specific comments as well as "like" or "dislike" comments of others, allowing comments to be sorted by popularity. Users were allowed to submit four types of comments: *Project Suggestions, Something I like, Request DC Fast Charger,* and *Request Level 2 Charger*.

See **Figure C- 2** for a snapshot of the Social Pinpoint project landing page:

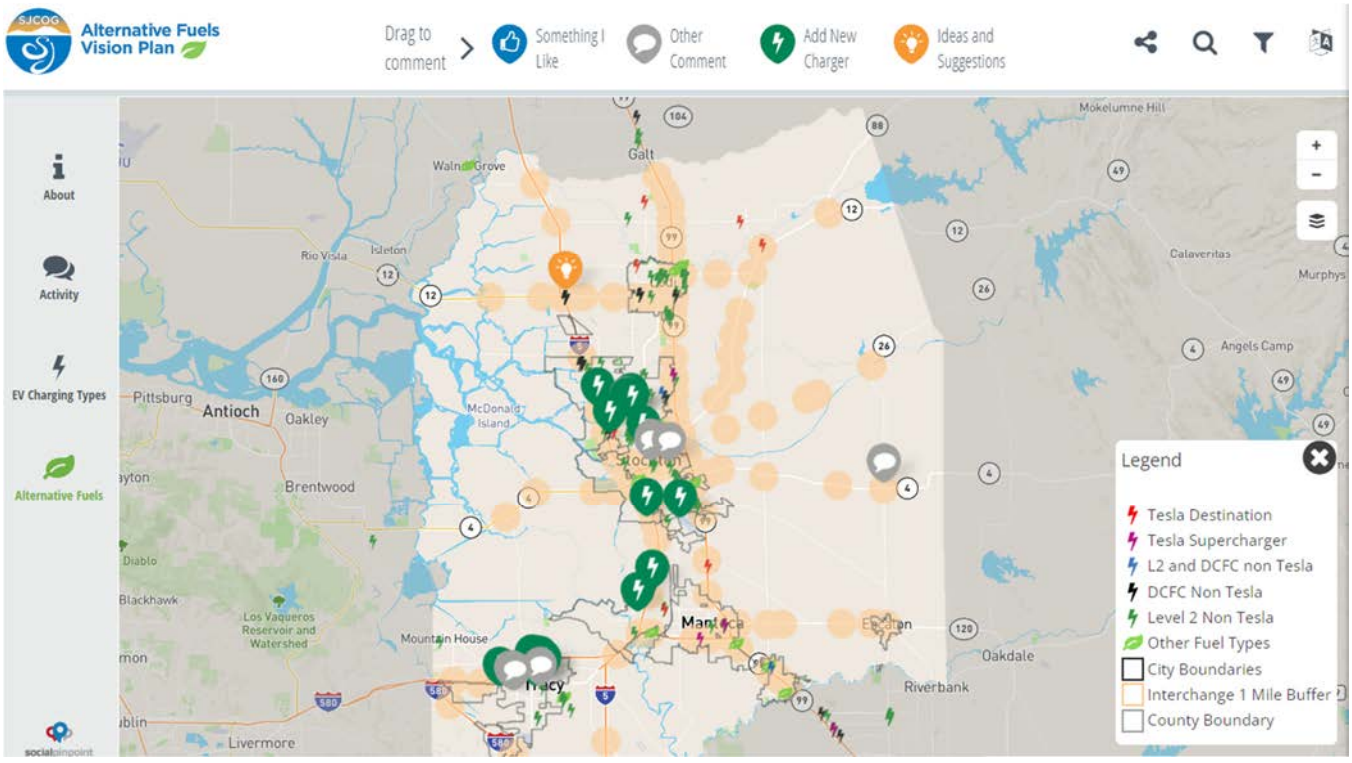

FIGURE C- 2: SCREENSHOT OF SJCOG SOCIAL PINPOINT SITE

OVERVIEW OF PUBLIC FEEDBACK RECEIVED

In total, over 500 participants visited the site, and 25 comments were submitted on the Social Pinpoint map. **Figure C- 3** below shows the distribution of comment types and **Figure C- 4** displays the social pinpoint activity over time.

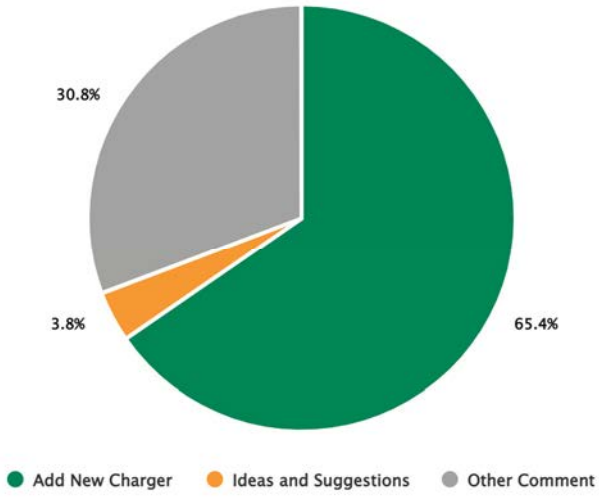

FIGURE C- 3: DISTRIBUTION OF COMMENT TYPES

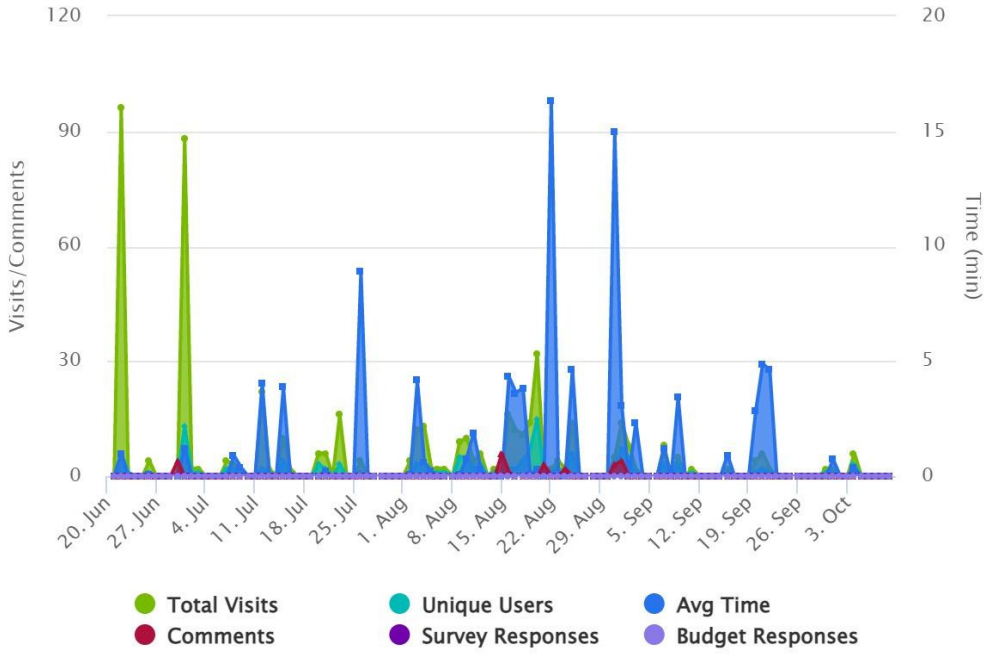

FIGURE C- 4: TIMELINE OF SOCIAL PINPOINT VISITS AND COMMENTS

Comments included specific places where the public feel chargers are needed, suggestions for charger locations, and comments on existing chargers. Overall, comments indicate that chargers would be encouraged and expected in locations where large groups congregate, such as hospitals and high schools, and where amenities such as restaurants are located where drivers can visit while vehicles charge.

LOCATIONS WITH A NEED FOR CHARGERS	• Sutter Tracy Community Hospital needs chargers • We need charging stations in our downtown area (B St & 10th St) • Every high school should have at least one charger (Kimball High School) • Lathrop City Hall • Tracy City Hall • The Tracy Branch Library • HUD Housing needs a charger for new senior housing being added at West St & W 4th St • Tesla Superchargers at Lathrop Rd and Cambridge Dr
SUGGESTIONS FOR CHARGER LOCATIONS	• Airport renovation would attract more short-term visitors with a fast charger • The area of Pacific and Harding might be a good area with some fast-food sites to wait for. • Ben Holt and I-5 is a natural area for fast charging stations. Restaurants are available while you wait.

	• The March Lane/I-5 area has restaurants to relax in. The CVS is a 24-hour business. Hotels nearby. Convenient for long-distance travelers. • Hospitals offer 24-hour services and would be a great site for additional chargers. San Joaquin General Hospital is directly off I-5. • Sherwood Mall and Weberstown Mall are heavy parking areas, ideal for EV chargers. • San Joaquin Delta College has plenty of students and staff that spend a considerable amount of time there. Enough to leave an EV to charge. • San Joaquin County Public Works Fleet Charging • The County owns a large, undeveloped lot, around the corner from the Arco AM/PM. Possible DCFC site, with 2 chargers. There is a large transformer on-site with excess capacity. We could use this for public charging. (N Republic Way & N Flag City Blvd[97])

COMMENTS ABOUT CHARGERS	• Last time I checked the Shell station at this intersection was the only fuel station in the County with E85. • Completed October 2022, the City of Lodi upgraded the chargers in the East City Hall parking lot to Level II ChargePoint EV stations. https://www.lodi.gov/CivicAlerts.aspx?AID=332 • Chargers at San Joaquin County Administration Building are workplace only and located in a controlled underground garage • Chargers at S San Joaquin St and E Market St (garage at County Veterans Services) are fleet-only and owned by San Joaquin County • Hoping that this plan also considers EV bikes and that our County might connect to the bay areas "Rails to Trails".

[97] https://www.google.com/maps/place/14720+N+Republic+Way,+Lodi,+CA+95242/@38.1131672,-121.3877024,20z/data=!4m5!3m4!1s0x809aa71ab9060fb1:0xfc14322fd77a9972!8m2!3d38.1132336!4d-121.3875292

APPENDIX D. COLLATERAL MATERIALS

PROJECT LOGO

SJCOG Alternative Fuels Vision Plan

SOCIAL MEDIA POSTS FOR PUBLIC WORKSHOPS

Alternative Fuels Vision Plan

JOIN US FOR A PUBLIC WORKSHOP

Wednesday
December 7, 2022
6:30 p.m. – 8:00 p.m.

Register **here:**
https://tinyurl.com/**SJCOGDec7**

Participate in a workshop to learn more about the goals of the Alternative Fuels Vision Plan, review the current fuel options in our county, and share your ideas about the project.

FLYER FOR PUBLIC WORKSHOP

Alternative Fuels Vision Plan

San Joaquin Council of Governments (SJCOG)
Alternative Fuels Vision Plan (AFVP)
Frequently Asked Questions

What is the purpose of the AFVP?

The SJCOG and its member agencies are developing an AFVP to conduct a County-wide inventory of infrastructure for charging electric vehicles (EVs) and fueling stations for vehicles powered by other alternative fuels including:

- Hydrogen
- Liquified Natural Gas (LNG)
- Compressed Natural Gas (CNG)
- Liquified Petroleum Gas (LPG)
- Renewable Natural Gas (RNG)

What is the goal of the AFVP?

This plan is intended to address the needs of multiple classes of alternative fuel vehicles and will identify clean fueling infrastructure opportunities along major freight corridors and other regionally significant roadways. It will also identify opportunities for creative funding, implementation, and partnership avenues to deliver a successful program to promote the transition to electromobility and other low-carbon fuels across all socio-economic segments.

What areas will be covered in the AFVP?

This plan will focus on cities and communities within San Joaquin County, including but not limited to:

- San Joaquin County
- Stockton
- Lodi
- Manteca
- Tracy
- Ripon
- Escalon
- Lathrop

Who is developing the AFVP?

The AFVP is being developed by the SJCOG, its member agencies, along with DKS Associates, Frontier Energy, and Mariposa Planning Solutions. The Technical Advisory Committee (TAC) and Stakeholder Working Group will also help facilitate and guide the development of the plan.

What is the purpose of the TAC?

An essential element of this plan is to form a TAC to facilitate collaborative development of the Plan among important stakeholders in San Joaquin County, as well as support and/or coordinate outreach with concurrent SJCOG planning activities.

If you are interested in joining the TAC please contact, Ilse Lopez-Narvaez, Community Engagement Specialist with DKS Associates via ilse.lopez-narvaez@dksassociates.com.

What is the purpose of the Stakeholder Working Group?
An essential element of this plan is formation of a Stakeholder Working Group to facilitate the collaborative development of the Plan.

If you are interested in joining the Stakeholder Working Group, please contact Ilse Lopez-Narvaez, Community Engagement Specialist with DKS Associates via ilse.lopez-narvaez@dksassociates.com.

How can I share my ideas or get involved?
We will be holding a series of workshops, presentations, and pop-up events to receive input from stakeholders and the public throughout the study. You are welcome to share your ideas and thoughts using our interactive mapping tool: https://dks.mysocialpinpoint.com/afvp_sjco#/

Further information on the AFVP can also be found on the SJCOG AFVP website:
https://www.sjcog.org/615/Alternative-Fuels-Vision-Plan

Please contact: Ilse Lopez-Narvaez, Community Engagement Specialist with DKS Associates via ilse.lopez-narvaez@dksassociates.com if you would like to be notified of upcoming workshops.

Contact:

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APPENDIX E: GAP ANALYSIS METHODOLOGY

METHODOLOGY

Data sources included commercially available sources such as Streetlight Data and ESRI Business Analyst, as well as data received from the Team's outreach efforts and generalized mapping efforts. Using data compiled from these sources, along with a series of criteria weighted by relevance and impact on future EVSE siting, locations have been ranked using a points system. Point totals have been calculated based on a "grid" of 1,540 approximately one (1) square mile hexagons. This fabric of hexagons allows for the preparation of maps displaying the density of desired data sets on a consistent geographic fabric. The consistent geography also allows for the analysis and combination of different data geographies described below, including highway interchange buffers, existing fueling stations, and other larger geographic features. **Figure E- 1** below shows the hexagon grid system for the entire County, along with the geographies of the Streetlight Data described below. For each gridded hexagon, points have been awarded based on the relative magnitude (by standard deviation, where applicable) of each data category multiplied by weighting factors determined via survey. Weighting factors have been developed for three project goals, including providing fueling options for varied use cases, including:

- Environmental Justice (access for at-risk populations and disadvantaged communities)
- Light Duty Vehicles (including workplace, home, and opportunity charging)
- Medium/ Heavy Duty Vehicles

The data sources, categories, and weighting factors are described in detail in the following sections.

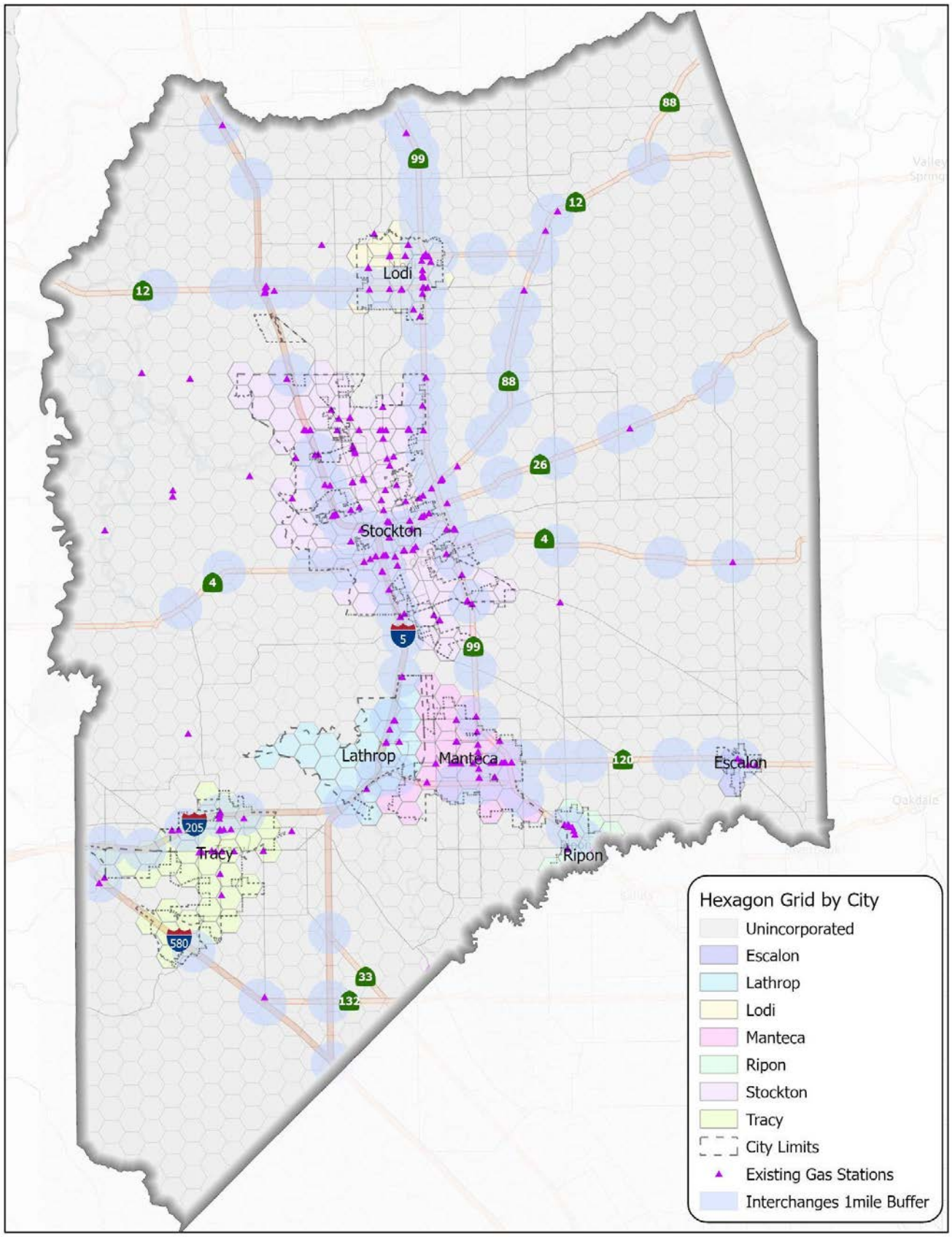


FIGURE E- 1: STUDY AREA GEOGRAPHY

DATA SOURCES

Streetlight Data

A dataset consisting of detailed travel data for the study area from Streetlight Data (a prominent provider of "Big Data") has been utilized for this study. For each of the study interchange "zones" including existing fueling (gas) stations where people currently fuel their vehicles and highway interchanges (one-mile buffers, as the crow flies) Streetlight Data (SLD) provided a comprehensive report of travel data for either the gas station parcel or the interchange one-mile radius area. Within the San Joaquin County study area, the dataset included travel data for 218 gas station parcels and 111 highway interchange one-mile buffer areas.

Data provided by SLD includes total daily volume (number of vehicles starting or stopping trip legs within each zone), breakdown of trips by "dwell" time increments (in minutes), breakdown of trips by trip length (in miles) and trip duration (in minutes), breakdown of vehicle drivers by income (in $5,000 increments), breakdown of drivers by education level, breakdown of drivers by race and ethnicity, breakdown of drivers with a disability, and breakdown of drivers by place of residence (own or rent home, type of residence, etc.). Streetlight Data's datasets are unique in that they provide data related to the drivers traveling to, from, or through a particular location, as opposed to providing data about the location itself, such as Census data. "Dwell" time data represents a unique data analysis by Streetlight Data where the time spent within a given zone for each vehicle is estimated. This data is key to assisting in planning for the different needs of slower (Level 2) chargers (i.e., need for longer stops) or faster (DC Fast Charge) chargers (i.e., need for shorter stops).

ESRI Business Analyst

ESRI (Environmental Systems Research Institute) is one of the largest purveyors of GIS (geographic information systems) software, services, and data. ESRI's Business Analyst service allows users to prepare location-based analyses for business siting and analysis. For this project, this service has been utilized to download point-based data for the project study area including various business types pertinent to EVSE demand and siting analysis. These data downloads include full-serve and fast-food restaurants, grocery and super-center shopping locations, other shopping locations, gas stations, and recreational locations (such as campgrounds and RV parks). These business locations all represent locations where EV drivers tend to stop to eat, shop, or stay while fueling or charging their vehicles. Gas stations are a useful data source as they represent where people with traditionally fueled vehicles can currently fuel their vehicles.

Project Outreach Data

Extensive outreach efforts have been conducted for this project (documented previously in this report and in **Appendix C**) that includes focus groups, stakeholder and public workshops and presentations, and an online geographically located suggestion board (Social Pinpoint website). The data compiled from the Outreach program include general requests for additional charging infrastructure in portions of the study area, as well as specific requests for charging infrastructure (slower Level 2 or faster DC fast charging) at specific locations, including study interchanges. Approximately 25 Social Pinpoint requests were received.

Disadvantaged Community/ Environmental Justice Data

California's *Deployment Plan for the National Electric Vehicle Infrastructure (NEVI) Program* (published August 2022) identified disadvantaged communities (DACs) as defined by the state with CalEnviroScreen 4.0 and by the federal government with Justice40. The Deployment Plan identifies areas within the county study area by the following three categories:

- California-designated Low-income and/or Disadvantaged Communities
- Justice40-designated Disadvantaged Communities
- Disadvantaged and/or low-income communities designated by both California and Justice40

US Census American Community Survey (ACS) Housing Data

The United States Census prepares 5-year running estimates of housing and population based on the annual American Community Survey (ACS). This data is curated and published for public consumption by ESRI in their Living Atlas online data repository and website. One dataset available includes the number of households in the structure. This data is divided into the following classifications of households: single unit detached, single unit attached, 2 units, 3 to 4 units, 5 to 9 units, 10 to 19 units, 20 to 49 units, 50 plus units, mobile homes, and boat, RV, or van as home. For analysis used in this document, multi-unit dwellings (MUDs) are assumed to be housing units of 5 or more units in the structure. The current "vintage" of five-year data is listed as 2017-2021 and was last updated on ESRI's Living Atlas website in December 2022.

DATA CRITERIA WEIGHTING AND POINTS

To calculate the total "Points" for each study interchange for ranking purposes, the relative value of a particular data type is calculated (by the standard deviation to account for huge variances in data magnitude) and multiplied by a weighting factor to promote criteria deemed to be more relevant than others. The weighting factors used in this analysis range from a high of +3 to a low of -3. A value of +3 represents the highest weighting (most desirable for additional EVSE siting. A value of +1 represents an average weighting (the criteria is not weighted higher or lower than "typical"). A value of 0 (zero) represents criteria that are not used in the points calculation. A negative value (-3 to -1) represents a criterion that lowers the perceived need for additional charging infrastructure. The only criterion with a negative value currently is Existing EVSE (representing areas that currently have good access to charging and may have less of a need for additional charging). While some locations may receive negative points based on existing EVSE, it is possible that the positive points received from other criteria far outweigh the negative points received based on existing EVSE. As stated previously, weighting factors for three use cases were developed using input from a survey deployed to SJCOG and other Team members. **Table** E- 1 shows the relative weighting factors (between -3 and +3) for all local environment factors (land use, existing charging, and disadvantaged communities) for each use case, while **Table E- 2** shows the relative weighting factors (between -3 and +3) for all trip-based factors (derived from Streetlight Data) for each use case. In both tables, factors greater than +1 (neutral) are shown in bold.

TABLE E- 1: WEIGHTING CRITERIA - LAND USE AND LOCAL AREA CHARACTERISTICS

Criteria	Environmental Justice	Light Duty	Medium/ Heavy Duty
Existing Chargers Within ½ Mile of Location	-1	-1	-1
Apartment Complexes Within ¼ Mile of Location	**+3**	+1	+1
Multi-Unit Dwellings (MUD) within ¼ Mile of Location	**+3**	**+3**	**+3**
Located within Disadvantaged Community - CalEnviroScreen 4.0	**+2**	**+2**	**+2**
Located within Disadvantaged Community - Justice40	**+2**	**+2**	**+2**
Located within Disadvantaged Communities - CalEnviroScreen 4.0 and Justice40	**+2**	**+2**	**+2**
Shopping Locations within ¼ Mile of Location - Grocery/SuperCenter	+1	+1	+1
Shopping Locations within ¼ Mile of Location - Other	+1	+1	+1
Restaurants within ¼ Mile of Location - Full Service	+1	+1	+1
Restaurants within ¼ Mile of Location - Fast Food	+1	+1	+1

TABLE E- 2: WEIGHTING CRITERIA - TRIP CHARACTERISTICS

Criteria	Environmental Justice	Light Duty	Medium/ Heavy Duty
Total Average Daily Vehicle Trips Beginning or Ending in Zone	+1	+1	+1
Medium/Heavy Duty Vehicle Trips Beginning or Ending in Zone	+1	+1	**+3**
Average Trip Length for All Vehicles	+1	+1	+1
Average Trip Length for Medium/Heavy-Duty Vehicles	+1	+1	**+3**
Percent of Vehicles with Dwell Time of 5 to 10 Minutes		+1	**+2**
Percent of Vehicles with Dwell Time of 10 to 20 Minutes		+1	**+2**
Percent of Vehicles with Dwell Time of 20 to 60 Minutes	**+2**	**+2**	
Percent of Vehicles with Dwell Time of 60 to 20 Minutes	**+2**	**+2**	
Percent of Vehicles with Dwell Time of 120 to 240 Minutes	**+3**	**+3**	
Percent of Vehicles with Dwell Time of 240 minutes or more	**+3**	**+3**	
Percent of Vehicles with Travel Distance of 0 to 20 Miles	+1	+1	+1
Percent of Vehicles with Travel Distance of 50 to 100 Miles	+1	+1	+1
Percent of Vehicles with Travel Distance of 100 Miles or More	+1	+1	+1
Percent of Vehicles with Driver Income Less than $25k	**+2**	+1	+1
Percent of Vehicles with Driver Educated 12th Grade or Less	+1	+1	+1
Percent of Vehicles with Minority Drivers	+1	+1	+1
Percent of Vehicles with Driver With Disability	+1	+1	+1
Percent of Vehicles with Driver Who Lives in Multi-Unit Dwelling	**+3**	**+2**	**+2**

APPENDIX F: SITE PRIORITIZATION MAPS BY RANK

The top 20 locations based on the total points awarded have been identified and mapped. The top twenty locations are summarized in **Table F- 1** and shown in **Figure F- 1**. The table shows that of the top twenty, 15 are distributed between the cities of Stockton (7), Lodi (5), Tracy (2), and Ripon (1). The rankings are not meant to indicate that one location should necessarily be chosen over another. Rather, they are meant to identify top locations based on points calculated and can be compared against each other for further study. This analysis does not include detailed site characteristics such as parking availability, safety, or electrical infrastructure provision. As such, because one location is ranked number "1" and another is ranked "2" or "5" this does not mean that the number 1 ranked location should necessarily be chosen first. A more detailed review of specific installation sites to assess the other characteristics described will be needed when determining suitability. This review process is explained later in this chapter.

TABLE F- 1: NUMBER OF TOP 20 LOCATIONS BY JURISDICTION

Jurisdiction	Environmental Justice	Light Duty	Medium/ Heavy Duty
City of Stockton	7	7	7
City of Lodi	5	5	5
City of Tracy	3	3	3
City of Manteca	2	2	2
City of Ripon	1	1	1
City of Lathrop	-	-	-
City of Escalon	-	-	-
Unincorporated San Joaquin County	2	2	2
Total	20	20	20

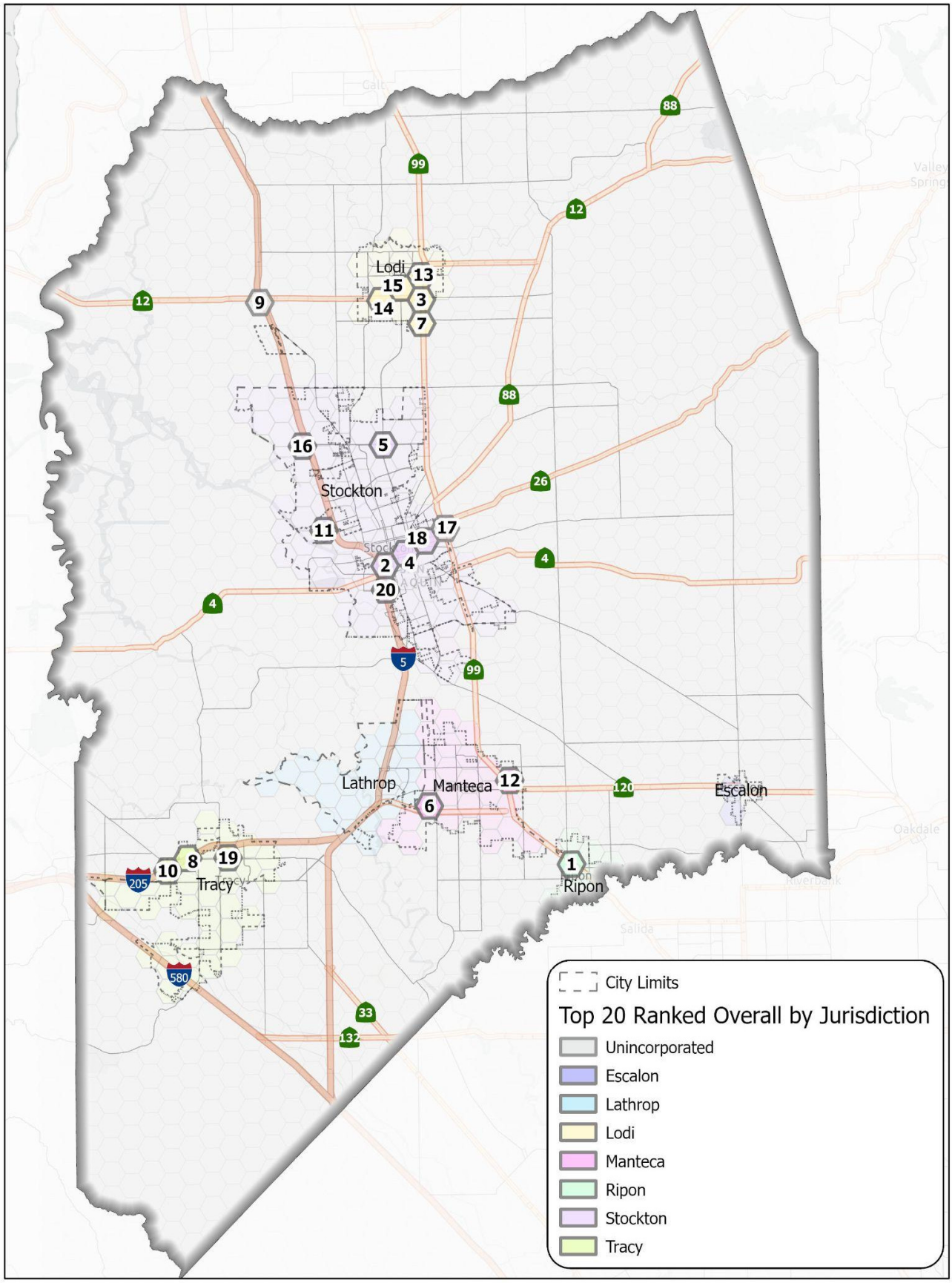


FIGURE F- 1: SITE PRIORITIZATION – TOP 20 SITES COUNTYWIDE

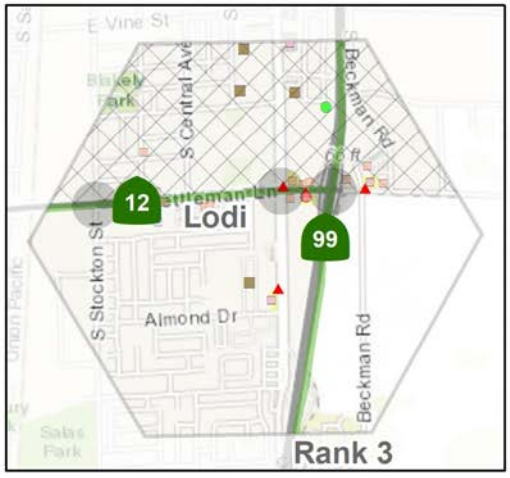
The top 20 locations ranked based on the point system are described below and listed by the jurisdiction in which they are located.

- **City of Stockton**
  - Southeast of the interchange of Interstate 5 and State Route 4 (Rank 2)
  - Adjacent to State Route 4 and South Stanislaus Street (Rank 4)
  - Adjacent to East Hammer Lane and West Lane (Rank 5)
  - West of Interstate 5 and West Alpine Avenue/ Country Club Road (Rank 11)
  - West of Interstate 5 and Hammer Lane (Rank 16)
  - Adjacent to State Route 4 and South Filbert Street (Rank 18)
  - Adjacent to Interstate 5 and West 8th Street (Rank 20)
- **City of Lodi**
  - Adjacent to State Route 99 and East Kettleman Lane (Rank 3)
  - Adjacent to State Route 99 and East Harney Lane (Rank 7)
  - Southwest of State Route 99 and East Victor Road (Rank 13)
  - Adjacent to West Kettleman Lane between South Lower Sacramento Road and South Ham Lane (Rank 14)
  - North of West Kettleman Lane between South Ham Lane and South Stockton Street (Rank 15)
- **City of Tracy**
  - Adjacent to Interstate 205 and West Grant Line Road (Rank 8)
  - Adjacent to Interstate 205 and Byron Road (Rank 10)
  - East of West Grant Line Road and North Tracy Boulevard (Rank 19)
- **City of Manteca**
  - Adjacent to State Route 120 and South Airport Way (Rank 6)
  - Adjacent to State Route 99 and East Yosemite Avenue (Rank 12)
  - Unincorporated San Joaquin County
  - Flag City Interchange Interstate 5 at State Route 12 (Rank 9)
  - Garden Acres Adjacent to State Route 99 and State Route 4 (Rank 17)
- **City of Ripon**
  - Adjacent to State Route 99 and Jack Tone Road interchange (Rank 1)
- **City of Lathrop**
  - No locations identified in the Top 20 scoring locations

Figure F- 2 through **Figure F- 5** display the local context and supporting data for each of the top twenty locations identified above. The figures each display both the data statistics that result in the point score for each use case, as well as maps of each location showing local land use and infrastructure including interchanges, gas stations, existing charging infrastructure, existing shopping and dining locations, and existing multi-unit dwellings (MUD) within each of the top hexagon areas.

Figure F- 6 through **Figure F- 9** show the same data for selected locations that are not ranked in the Top 20.

County Rank	1	2	3	4	5
Grid	AA-36	R-24	T-13	S-23	R-19
City	Ripon	Stockton	Lodi	Stockton	Stockton
Total Points (Equity)	1,225	1,200	1,033	1,007	903
Total Points (Light Duty)	1,082	1,052	901	870	744
Total Points (Medium/Heavy Duty)	988	992	836	829	739
Total Daily Volume (Gas Stations)	12,537	1,544	2,795	624	12,010
Total Daily Volume (Interchanges)	139,830	252,007	223,773	195,555	0
Level 2 Chargers within 1 mile	2	0	2	22	45
DCFC Chargers whithin 1 mile	4	0	2	0	0
In Justice40 Area	No	Yes	Yes	Yes	Yes
In CalEnviroScreen 4.0 Area	No	Yes	No	Yes	No
Full Serve Restaurants within 1 mile	11	12	9	17	29
Fast Food Restaurants within 1 mile	8	5	5	1	7
Grocery/ Super-Center within 1 mile	1	5	0	14	7
Other Shopping within 1 mile	5	6	5	13	14
MUD Units within 1 mile	0	31	187	215	1,238
Percent of Gas Station Dwell Times Less than 20 minutes	72%	88%	82%	90%	47%
Percent of Interchange Dwell Times Less than 20 minutes	81%	86%	87%	88%	-
Percent of Gas Station Dwell Times Greater than 60 minutes	14%	7%	10%	5%	13%
Percent of Interchange Dwell Times Greater than 60 minutes	44%	46%	49%	43%	-
Percent of Drivers with income less than $25k	14%	27%	19%	29%	20%
Percent of Drivers who live in MUD housing	8%	15%	12%	15%	11%



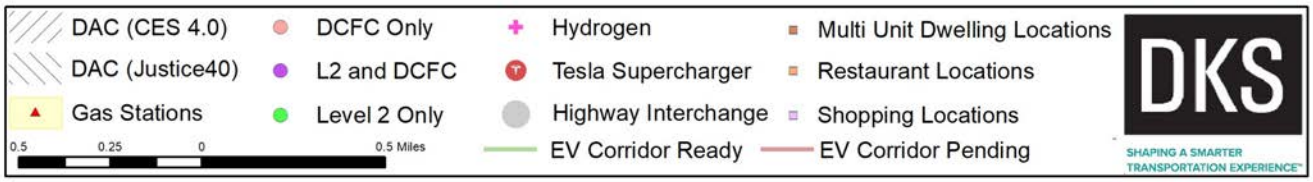
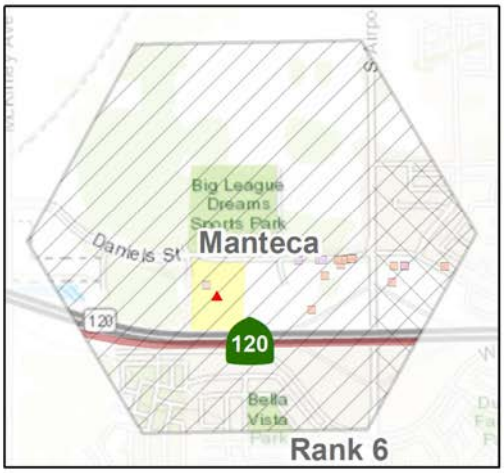


FIGURE F- 2: SITE PRIORITIZATION – RANK 1-5



County Rank	6	7	8	9	10
Grid	T-34	T-14	H-36	L-13	G-36
City	Manteca	Lodi	Tracy	-	Tracy
Total Points (Equity)	866	814	770	720	660
Total Points (Light Duty)	780	703	710	619	598
Total Points (Medium/Heavy Duty)	730	663	675	596	540
Total Daily Volume (Gas Stations)	12,700	11,272	3,155	9,562	10,263
Total Daily Volume (Interchanges)	0	48,779	126,351	19,091	0
Level 2 Chargers within 1 mile	0	9	5	2	0
DCFC Chargers whithin 1 mile	0	0	20	3	4
In Justice40 Area	No	No	No	Yes	No
In CalEnviroScreen 4.0 Area	Yes	No	Yes	No	No
Full Serve Restaurants within 1 mile	7	1	40	2	2
Fast Food Restaurants within 1 mile	4	4	22	4	2
Grocery/ Super-Center within 1 mile	0	1	2	0	0
Other Shopping within 1 mile	6	5	23	1	4
MUD Units within 1 mile	0	156	652	0	216
Percent of Gas Station Dwell Times Less than 20 minutes	48%	49%	74%	68%	38%
Percent of Interchange Dwell Times Less than 20 minutes	-	87%	84%	36%	-
Percent of Gas Station Dwell Times Greater than 60 minutes	12%	11%	11%	14%	17%
Percent of Interchange Dwell Times Greater than 60 minutes	-	43%	41%	19%	-
Percent of Drivers with income less than $25k	14%	15%	10%	17%	9%
Percent of Drivers who live in MUD housing	8%	10%	9%	13%	8%

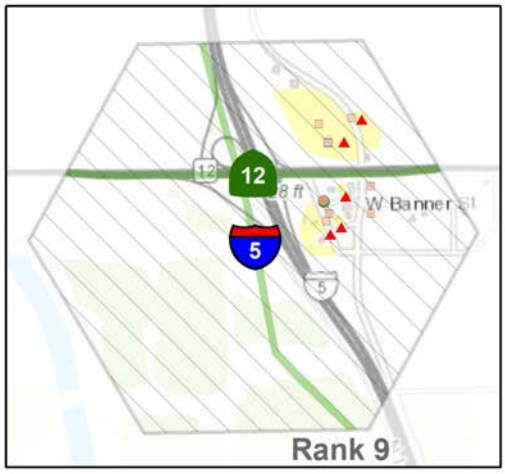
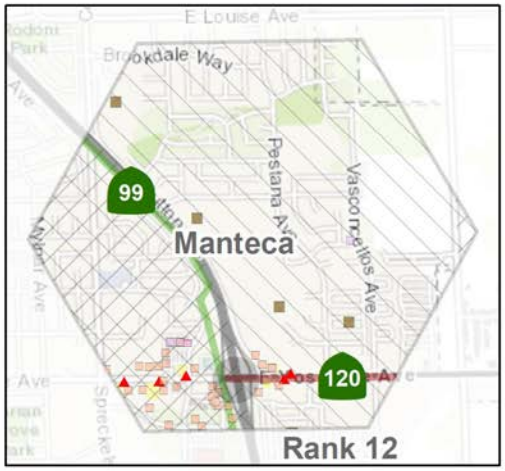


FIGURE F- 3: SITE PRIORITIZATION – RANK 6-10

County Rank	11	12	13	14	15
Grid	O-22	X-33	T-12	R-13	S-12
City	Stockton	Manteca	Lodi	Lodi	Lodi
Total Points (Equity)	620	615	593	615	565
Total Points (Light Duty)	555	548	545	526	501
Total Points (Medium/Heavy Duty)	524	528	524	494	472
Total Daily Volume (Gas Stations)	1,211	1,944	1,313	1,016	665
Total Daily Volume (Interchanges)	103,112	95,224	67,238	111,953	97,076
Level 2 Chargers within 1 mile	0	0	0	5	0
DCFC Chargers whithin 1 mile	0	0	0	2	0
In Justice40 Area	Yes	Yes	Yes	No	Yes
In CalEnviroScreen 4.0 Area	Yes	No	Yes	No	No
Full Serve Restaurants within 1 mile	5	13	24	19	11
Fast Food Restaurants within 1 mile	1	15	3	8	6
Grocery/ Super-Center within 1 mile	1	1	10	3	6
Other Shopping within 1 mile	3	4	10	7	2
MUD Units within 1 mile	260	588	0	649	212
Percent of Gas Station Dwell Times Less than 20 minutes	86%	84%	77%	83%	76%
Percent of Interchange Dwell Times Less than 20 minutes	89%	84%	87%	91%	-
Percent of Gas Station Dwell Times Greater than 60 minutes	8%	6%	14%	9%	12%
Percent of Interchange Dwell Times Greater than 60 minutes	56%	37%	49%	52%	-
Percent of Drivers with income less than $25k	21%	16%	20%	18%	18%
Percent of Drivers who live in MUD housing	12%	10%	14%	13%	13%



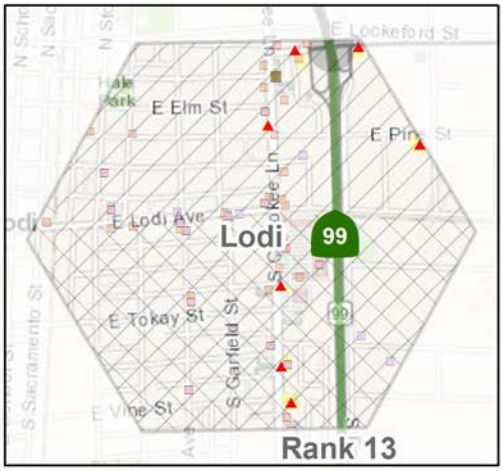
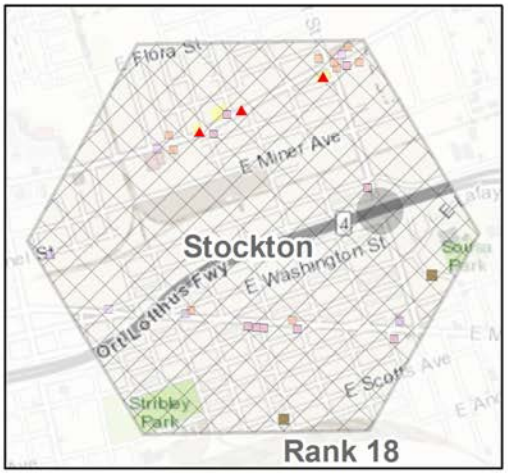
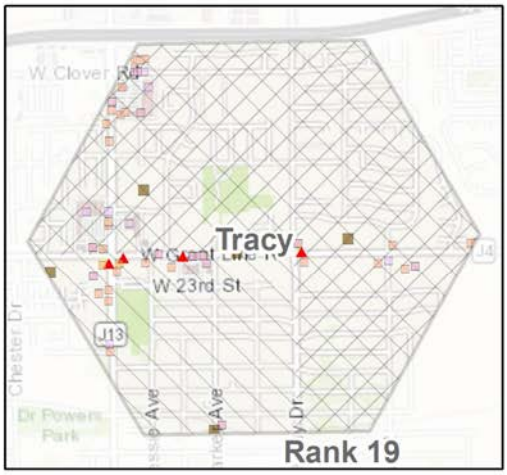


FIGURE F- 4: SITE PRIORITIZATION – RANK 11-15

County Rank	16	17	18	19	20
Grid	N-19	U-22	T-23	J-36	R-25
City	Stockton	-	Stockton	Tracy	Stockton
Total Points (Equity)	530	500	483	481	469
Total Points (Light Duty)	446	468	447	437	436
Total Points (Medium/Heavy Duty)	440	446	431	434	415
Total Daily Volume (Gas Stations)	1,671	269	699	900	875
Total Daily Volume (Interchanges)	0	80,317	53,604	0	66,499
Level 2 Chargers within 1 mile	0	0	0	0	0
DCFC Chargers whithin 1 mile	0	0	0	0	0
In Justice40 Area	Yes	Yes	Yes	Yes	Yes
In CalEnviroScreen 4.0 Area	No	Yes	Yes	Yes	Yes
Full Serve Restaurants within 1 mile	12	3	9	34	1
Fast Food Restaurants within 1 mile	6	1	0	8	0
Grocery/ Super-Center within 1 mile	0	3	7	6	2
Other Shopping within 1 mile	6	1	11	22	1
MUD Units within 1 mile	1,440	63	219	438	0
Percent of Gas Station Dwell Times Less than 20 minutes	85%	89%	84%	87%	83%
Percent of Interchange Dwell Times Less than 20 minutes	-	87%	88%	-	-
Percent of Gas Station Dwell Times Greater than 60 minutes	8%	5%	10%	7%	12%
Percent of Interchange Dwell Times Greater than 60 minutes	-	55%	50%	-	49%
Percent of Drivers with income less than $25k	18%	27%	28%	13%	27%
Percent of Drivers who live in MUD housing	15%	7%	8%	11%	7%





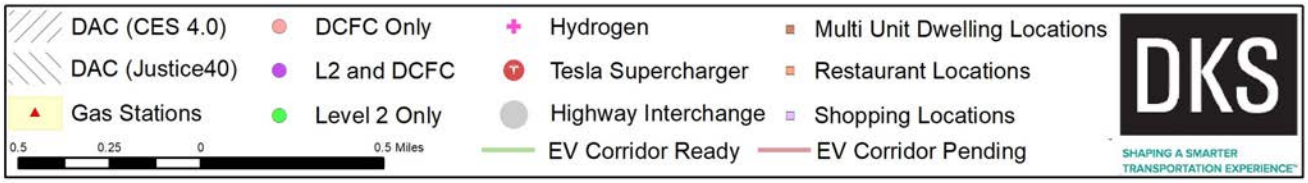
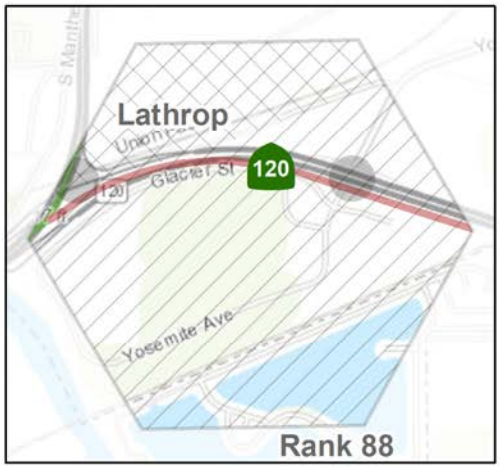


FIGURE F- 5: SITE PRIORITIZATION – RANK 16-20

County Rank	34	46	88	99	76
Grid	R-31	R-32	R-34	Q-34	AI-33
City	Lathrop	Lathrop	Lathrop	Lathrop	Escalon
Total Points (Equity)	379	339	209	190	246
Total Points (Light Duty)	356	319	201	184	226
Total Points (Medium/Heavy Duty)	335	308	193	180	215
Total Daily Volume (Gas Stations)	1,610	2,506	0	752	328
Total Daily Volume (Interchanges)	53,428	0	31,273	0	39,670
Level 2 Chargers within 1 mile	0	0	0	0	0
DCFC Chargers whithin 1 mile	1	0	0	0	0
In Justice40 Area	No	No	No	No	No
In CalEnviroScreen 4.0 Area	Yes	Yes	Yes	Yes	No
Full Serve Restaurants within 1 mile	3	14	0	0	10
Fast Food Restaurants within 1 mile	0	11	0	1	3
Grocery/ Super-Center within 1 mile	0	2	0	0	3
Other Shopping within 1 mile	3	2	0	0	9
MUD Units within 1 mile	0	167	0	57	44
Percent of Gas Station Dwell Times Less than 20 minutes	89%	86%		88%	91%
Percent of Interchange Dwell Times Less than 20 minutes	85%		74%		-
Percent of Gas Station Dwell Times Greater than 60 minutes	4%	5%		8%	4%
Percent of Interchange Dwell Times Greater than 60 minutes	50%		63%		-
Percent of Drivers with income less than $25k	14%	15%	14%	15%	16%
Percent of Drivers who live in MUD housing	6%	10%	8%	12%	6%



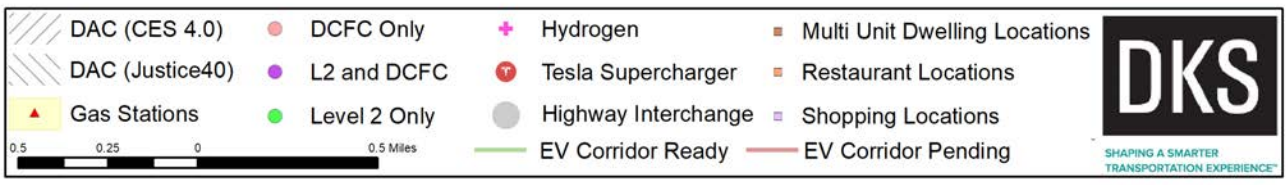
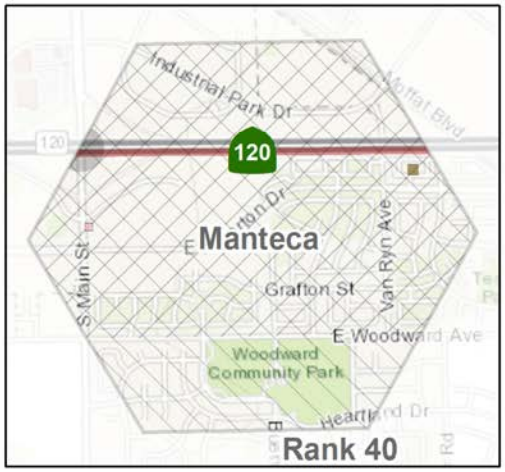
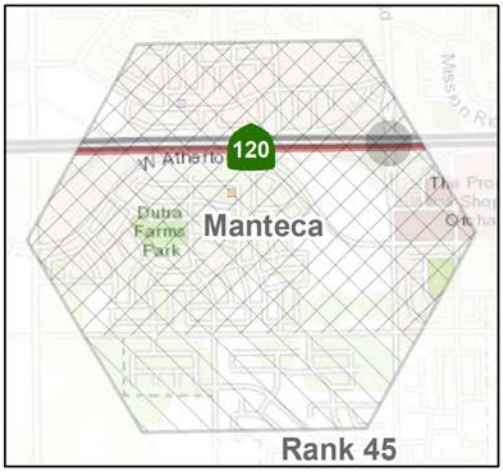


FIGURE F- 6: ADDITIONAL SITES – LATHROP AND ESCALON

County Rank	33	40	45	29	44
Grid	X-34	W-34	U-34	I-35	K-35
City	Manteca	Manteca	Manteca	Tracy	Tracy
Total Points (Equity)	384	362	347	403	344
Total Points (Light Duty)	361	330	323	373	324
Total Points (Medium/Heavy Duty)	353	314	305	354	307
Total Daily Volume (Gas Stations)	0	0	0	1,088	1,419
Total Daily Volume (Interchanges)	54,916	85,371	87,880	73,479	32,659
Level 2 Chargers within 1 mile	0	0	0	0	0
DCFC Chargers whithin 1 mile	0	0	0	0	0
In Justice40 Area	Yes	No	No	No	No
In CalEnviroScreen 4.0 Area	Yes	Yes	Yes	Yes	Yes
Full Serve Restaurants within 1 mile	2	1	1	2	3
Fast Food Restaurants within 1 mile	0	0	0	4	1
Grocery/ Super-Center within 1 mile	1	0	0	0	0
Other Shopping within 1 mile	3	1	1	3	3
MUD Units within 1 mile	434	154	0	97	0
Percent of Gas Station Dwell Times Less than 20 minutes				87%	84%
Percent of Interchange Dwell Times Less than 20 minutes	-	86%	86%	81%	-
Percent of Gas Station Dwell Times Greater than 60 minutes				6%	9%
Percent of Interchange Dwell Times Greater than 60 minutes	-	49%	52%	43%	-
Percent of Drivers with income less than $25k	14%	15%	15%	11%	11%
Percent of Drivers who live in MUD housing	10%	9%	9%	10%	9%





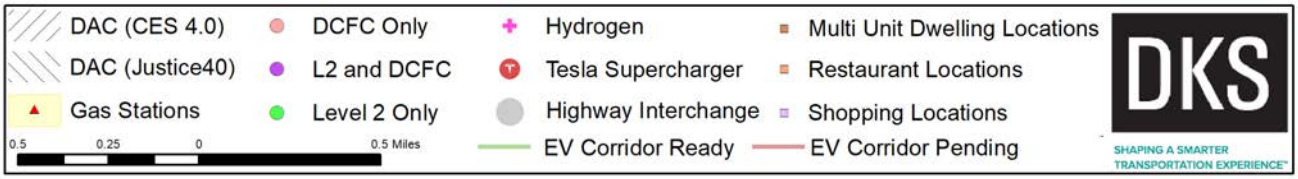
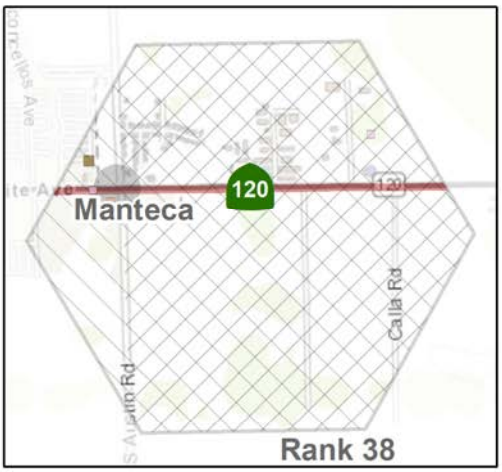
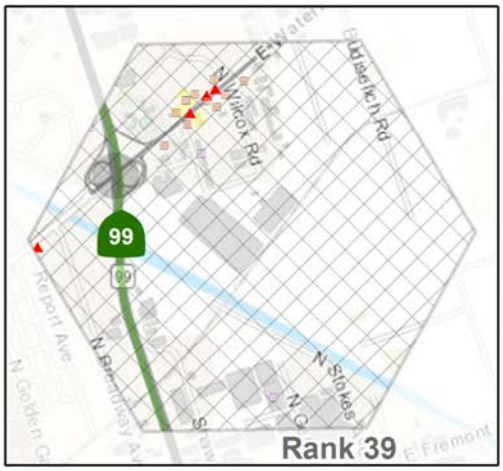
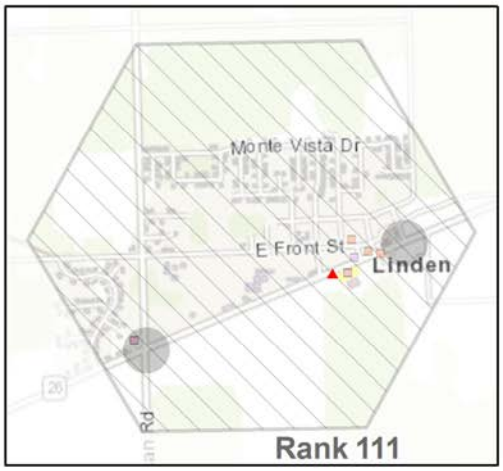


FIGURE F- 7: ADDITIONAL SITES – MANTECA AND TRACY



County Rank	38	39	111	496	104
Grid	Y-33	U-21	AD-19	AA-9	AB-37
City	Uninc	Uninc	Uninc	Uninc	Ripon
Total Points (Equity)	359	362	189	106	196
Total Points (Light Duty)	332	335	179	98	182
Total Points (Medium/Heavy Duty)	324	316	159	92	170
Total Daily Volume (Gas Stations)	0	1,688	1,041	952	367
Total Daily Volume (Interchanges)	67,165	37,621	20,915	0	46,303
Level 2 Chargers within 1 mile	0	0	0	0	0
DCFC Chargers whithin 1 mile	0	0	0	0	0
In Justice40 Area	Yes	No	No	No	No
In CalEnviroScreen 4.0 Area	Yes	Yes	No	No	No
Full Serve Restaurants within 1 mile	1	4	3	1	7
Fast Food Restaurants within 1 mile	0	6	0	2	0
Grocery/ Super-Center within 1 mile	1	1	1	0	1
Other Shopping within 1 mile	1	2	1	1	4
MUD Units within 1 mile	0	0	0	0	0
Percent of Gas Station Dwell Times Less than 20 minutes		86%	70%	91%	92%
Percent of Interchange Dwell Times Less than 20 minutes	83%	82%	83%		-
Percent of Gas Station Dwell Times Greater than 60 minutes		6%	18%	7%	4%
Percent of Interchange Dwell Times Greater than 60 minutes	31%	40%	56%		-
Percent of Drivers with income less than $25k	16%	24%	14%	18%	13%
Percent of Drivers who live in MUD housing	10%	8%	4%	8%	7%





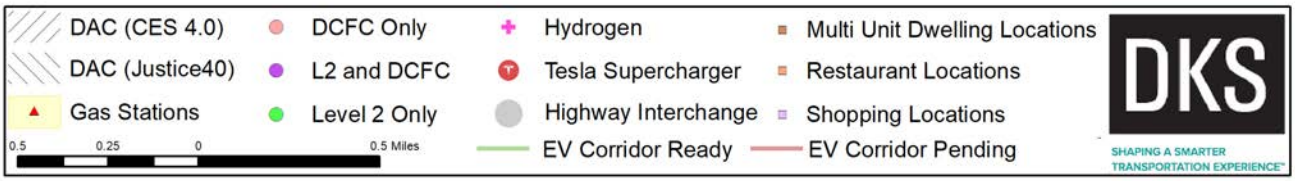


FIGURE F- 8: ADDITIONAL SITES – UNINCORPORATED COUNTY AND RIPON

ADDITIONAL POTENTIAL PRIORITIZED LOCATION
MOUNTAIN HOUSE

County Rank	360
Grid	C-35
City	Uninc
Total Points (Equity)	138
Total Points (Light Duty)	138
Total Points (Medium/Heavy Duty)	138
Total Daily Volume (Gas Stations)	0
Total Daily Volume (Interchanges)	0
Level 2 Chargers within 1 mile	0
DCFC Chargers whithin 1 mile	0
In Justice40 Area	No
In CalEnviroScreen 4.0 Area	Yes
Full Serve Restaurants within 1 mile	0
Fast Food Restaurants within 1 mile	0
Grocery/ Super-Center within 1 mile	0
Other Shopping within 1 mile	1
MUD Units within 1 mile	0
Social Pinpoint Requests for Chargers	0
Percent of Gas Station Dwell Times Less than 20 minutes	
Percent of Interchange Dwell Times Less than 20 minutes	-
Percent of Gas Station Dwell Times Greater than 60 minutes	
Percent of Interchange Dwell Times Greater than 60 minutes	-
Percent of Drivers with income less than $25k	
Percent of Drivers who live in MUD housing	

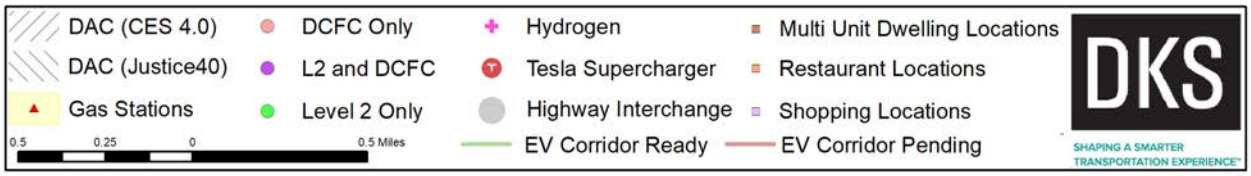


FIGURE F- 9: ADDITIONAL SITES – MOUNTAIN HOUSE