Sacramento EV Blueprint

Task 3.6:
Community EV Planning Blueprint

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Prepared for the City of Sacramento by Frontier Energy and DKS Associates

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Task 3.6: Community EV Planning Blueprint

The goal of this task to prepare a blueprint report summarizing Sacramento's approach to advance EVSE in new construction. This report also identifies the contribution of future EVSE in new construction to achieve the goal of 75,000 zero emission vehicles by 2025.

Issues, Constraints, Opportunities, and Costs

The Task 3.1 report, *Constraints and Opportunities to Accelerate Electric Vehicle Supply Equipment in New Construction*, describes the California Green Building Standards (CALGreen). Sections of the code describe mandatory and voluntary standards for future installation of electric vehicle charging in attached garages and parking spaces. The mandatory provision is referred to as "EV Capable." Local ordinances that require greater degrees of readiness refer to EV Ready and EV Installed. Figure 1 shows the difference between the terms.

Figure 1: Degrees of EV support in state code and local building ordinances

To advance EV infrastructure, the team identified opportunities to use City codes to encourage more EV charging to support reaching the goal of 75,000 EVs by 2025. These opportunities are based on technical analysis, cost-effectiveness, and feedback and vetting with stakeholders, Planning Commissioners, and City staff:

1. Develop a local ordinance (building code) to make EV Ready mandatory (installation of a 240-volt outlet and supporting electric supply). Initial cost estimates confirmed through stakeholder input estimate that EV Ready will cost about $1,100 per installation, an 11% increase from the estimated $800 for EV Capable.[1]
2. Revise existing and enact new City codes that require and incentivize EV support in parking lots, separate from building construction.
3. Revise existing City codes to incentivize EV car-sharing as projects that meet requirements for reducing vehicle miles traveled (VMT), or to require EV spaces when projects exceed parking maximums.

[1] California Air Resources Board staff estimate that the cost to install a raceway with an adequate panel capacity is approximately $800 per EV charging. A 2016 City of Oakland cost effectiveness report estimated total cost of an EV-ready space at $1,300. A 2016 City and County of San Francisco report estimated $900. The average of the two values is $1,100.

Each code revision or adoption requires stakeholder engagement and public comment, and then must proceed through the City's internal processes to determine approach, and establish local ordinances and documentation, if pursued.

Building Code

The 2019 California Green Building Code (CALGreen)[2] will be published in July 2019 and go in effect on January 2020. Specific to EV charging, the new code cycle requires all new construction and major alterations[3] as follows:

- Single-family residences, including townhomes and duplexes, be EV Capable
- Non-residential construction has 6% of parking spaces EV Capable
- Multiunit dwelling (MUD) construction has 10% of parking spaces EV Capable

The EV Blueprint project identified the process for Sacramento to follow to create a local ordinance that requires all new construction be EV Ready (circuit breaker, wires, and a 240-volt outlet.) This will ensure that new construction is ready for a resident or tenant to plug in a car without undue cost burden to the real estate developer. Stakeholder feedback at meetings and through focus groups indicated that developers and property owners would not oppose this local ordinance but cautioned that EV Ready would be one of many small construction-related cost increases. After a City public process, if passed, the ordinance would have to be filed with the California State Buildings Standards Commission, a process detailed in Task 3.4, *EV Readiness Guidelines*.

City Code

The team identified opportunities in City codes to increase EV charging locations—and potentially EV car-sharing locations—independent of building construction and alteration by focusing on parking and parking lots. Two potential code revisions enable the property owner or developer to reduce the number of required parking spots. WGI, a construction firm that specializes in parking structures, estimates that surface parking costs $5,000-$10,000 per space to construct, excluding the cost of land.[4] If a $6,000-to-$8,000 investment in a Level 2 electric vehicle service equipment (EVSE) can enable a developer to reduce four parking space to two, the cost saving could be an attractive investment. Additionally, fewer parking spaces can help meet the City's goal of reducing vehicle miles traveled. Opportunities in City code are:

1. Revise the existing City code "Transportation management plan measure"[5] to specify that a greater degree of EV charging support than required in City building code or implementation of EV car-sharing are acceptable measures to reduce the minimum number of parking spots. A developer that voluntarily complies with EV Installed or hosts an onsite EV car sharing hub can reduce the minimum number of parking spaces. Cost savings from construction and ongoing maintenance of parking spaces could pay for EVSE and increase

[2] http://www.hcd.ca.gov/building-standards/calgreen/docs/2018CALGreen-LegReport.PDF
[3] Code defines major alteration as a permit value of $200,000 or 1,000 square feet
[4] https://wginc.com/wp-content/uploads/2018/07/Parking-Construction-Cost-Article-17x11-8.5x11-Pages.pdf
[5] https://www.qcode.us/codes/sacramento/view.php?topic=17-vii-17_700-17_700_070

the availability of public charging, particularly in low-income and disadvantaged communities.

2. Revise existing City code "Development standards for off-street parking facilities"[6] to describe the location, size, and signage required for EV spaces in parking lots and structures to create a common understanding for designers, developers, contractors, and City staff to ensure that EV spaces are included in parking facilities in a manner consistent with building codes. This code has no associated cost and creates common understanding about EV parking spaces.
3. Add a new section to "Development standards for off-street parking facilities" to require that when developers install new light poles, solar canopies and carports, security gates, booths, and other structures that require electricity adjacent to parking spots they must include EV charging support.
4. Revise existing City code "Parking requirements of land use type and parking district" [7] to require EV support consistent with the building code requirement in stand-alone parking lots and parking garages. Surface parking and parking structures are often exempt from CALGreen code.[8]
5. Revise existing City code "Alternatives to standard parking requirements; other modifications"[9] (called the administrative parking permit) to enable developers to install above-code EVSE to deviate from minimum parking requirements.
6. Revise City Code "Waiver of minimum and maximum parking requirements"[10] to require that any additional parking spaces above the maximum vehicle requirement will be constructed as EV installed parking spaces.
7. Create a new code based on existing City code "Tree shading requirements for parking lots"[11] that will require compliance with City code for EVs during expansion of surface parking lots. Like the Tree shading code, language will be specific about the definition of expansion and include exceptions.

On June 13, 2019, City staff presented these options at the Planning and Design Commission meeting.[12] After a presentation, questions from the commissioners, and comments from two members of the public, the Commission recommended that staff move forward with the formal adoption process for all codes.

[6] https://www.qcode.us/codes/sacramento/view.php?topic=17-vi-17_608-17_608_040
[7] https://www.qcode.us/codes/sacramento/view.php?topic=17-vi-17_608-17_608_030
[8] Parking lots are exempt from CALGreen standards because they are not buildings. Parking garages are considered S-2 occupancies (storage) and have several exemptions from CALGreen.
[9] https://www.qcode.us/codes/sacramento/view.php?topic=17-vi-17_608-17_608_060
[10] http://www.qcode.us/codes/sacramento/view.php?topic=17-vi-17_608-17_608_070&fram
[11] https://www.qcode.us/codes/sacramento/view.php?topic=17-vi-17_612-17_612_040
[12] http://sacramento.granicus.com/GeneratedAgendaViewer.php?view_id=34&clip_id=4421

2040 General Plan

During this project, Sacramento started the update to its General Plan. The team identified two opportunities to expand wording in the General Plan's Mobility Element. [13]

1. Expand mobility to include microtransit and car sharing, and include Level 2 and DC fast charging hubs and hydrogen stations that can support transit, car-share and mobility hubs.
2. Distinguish charging hubs and hydrogen stations in the Parking section as methods of reducing greenhouse gas emissions.

In 2021, electricity will be regulated as a fuel[14] and, as such, zoning that applies to fuel stations could apply to charging locations. The City of Sacramento is working with State and County agencies to stay informed as the proposed regulation makes its way through the comment and implementation periods.

Citywide EV Forecasts, Targets for New Construction, and Gaps

Task 2.1, *EV Data and Forecasts*, looked at many factors to estimate the population of vehicles in general and at zero emission vehicles (ZEVs) as of January 1, 2019. Table 1 shows the calculations used to arrive at the baseline number of 4,772 total ZEVs and 2,468 battery electric vehicles (EVs) in Sacramento zip codes. Fuel cell electric vehicles are FCEVs and plug-in hybrids are PHEVs.

Table 1: Estimated baseline of all ZEVs as of 1/1/19

	EV	FCEV	PHEV	Total
DMV 1/1/18 registrations[15]	1,887	79	1,751	3,717
CVRP rebates 1/1/18-9/30/18[16]	290	26	219	535
Additional 30% ZEVs that did not apply for rebate[17]	87	8	66	161
Estimated ZEV registrations 10/1/18-12/31/18	126	11	95	232
Total estimated vehicles in Sacramento on January 1, 2019	**2,390**	**2,131**	**124**	**4,644**

According data from the Alternative Fuel Data Center and PlugShare,[18] Sacramento had 110 public and workplace charging locations that were open and under construction in January 2019 with 612 connectors, as listed in Table 2. This doesn't include EVSE that were in planning and permitting stages.

[13] http://www.cityofsacramento.org/~/media/Corporate/Files/ParksandRec/NS/content/Public%20Review%20Draft%202035%20General%20Plan%20full%20DocumentReducedA%2081414.pdf Page 2-99
[14] https://www.cdfa.ca.gov/dms/regulations.html
[15] Includes light-duty, heavy-duty, commercial, and exempt vehicles. https://www.dmv.ca.gov/portal/wcm/connect/c24637c9-5faf-4fe2-9375-9b5221a2ef4a/motorvehiclefueltypes_city.pdf?MOD=AJPERES&CVID
[16] https://cleanvehiclerebate.org/eng/rebate-statistics
[17] Based on conversations with SMUD, Center for Sustainable Energy, and UC Davis
[18] https://www.plugshare.com/

Table 2: Public charging available and under construction

Total Charging Connections	612
Level 1 (wall outlet—full charge in 8+ hours)	72
Level 2 (full charge in 4-6 hours)	454
DC Fast Charging (full charge in less than an hour)	39
Tesla-only (uses a specific connector)	47

Task 2.1 also used available data to estimate the number of new light-duty vehicles, which included cars, pick-up trucks, SUVs, and vans in Sacramento zip codes and estimated that in 2017:

- 26,600 new light-duty vehicles were registered in Sacramento
- 11,000 used light-duty vehicles were purchased from a dealership and registered in Sacramento

Statewide, new light-duty vehicle sales have been consistent at about 2 million a year since 2015 and expected to be 2 million again in 2019.[19]

Based on calculations in the Task 2.1 report, Table 3 illustrates the percentage of ZEVs as new car registrations needed to reach 75,000 ZEVs by 2025. *These numbers are to help understand how quickly sales must ramp up and not meant to be used as sales projections, forecasts, or estimates.*

Table 3: Illustration of percentage of new vehicle sales needed to reach ZEV target

Date	Registered ZEVs	Total Vehicles	Assumed new ZEV registrations	Assumed new ZEV registrations	Percentage of new vehicle registrations
1/1/2018	3,717[1]	591,134[1]	26,000[3]	0.63%	3%
1/1/2019	4,644[2]	617,134	26,000	0.75%	4%
1/1/2020	8,000	643,134	26,000	1.24%	15%
1/1/2021	12,000	669,134	26,000	1.79%	23%
1/1/2022	18,000	695,134	26,000	2.59%	35%
1/1/2023	27,000	721,134	26,000	3.74%	42%
1/1/2024	38,000	747,134	26,000	5.09%	65%
1/1/2025	55,000	773,134	26,000	7.11%	77%
1/1/2026	75,000	799,134		9.39%	
Cumulative new ZEV registrations			**208,000**		

1) From DMV data on 1/1/18 2) From estimates in this memo
3) Doesn't include new trucks, buses, or medium-duty vehicles that are included with DMV data

It is important to note that conversations with Sacramento area new car dealers, SMUD staff, and other stakeholders indicated that Sacramento residents do not turn over their vehicles as quickly as other residents in the state and 26,000 new registrations a year may be ambitious.

[19] https://www.cncda.org/wp-content/uploads/Cal-Covering-4Q-18.pdf

Task 2.4, *EV Infrastructure Deployment Plan*, projected the need for additional charging infrastructure. To support 75,000 light-duty EVs, in addition to existing charging connectors, it is estimated that Sacramento needs:

- 738 Workplace Level 2 connectors
- 398 Public Level 2 connectors
- 399 DC fast charging connectors
- 6,600 multifamily dwelling connectors
- 53,664 Level 1 or Level 2 connectors at single-family residences

From planning data provided by the City of Sacramento Community Development Department, the number of EV spaces from new construction planned as of January 2019 is shown in Table 4.

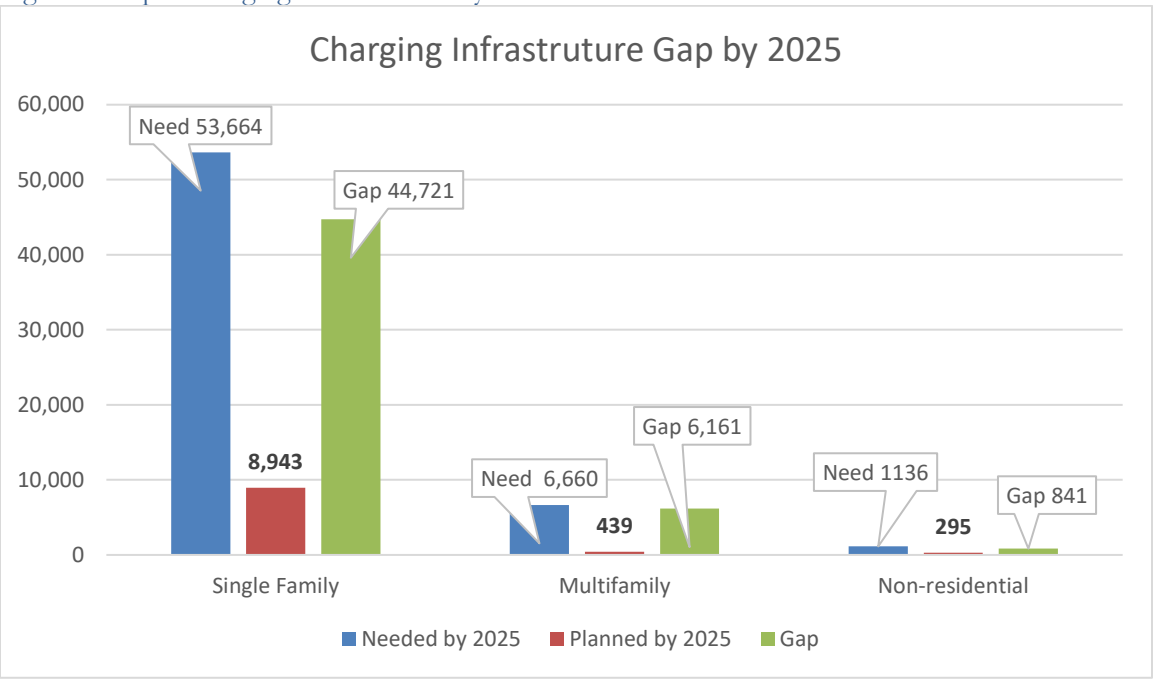
Table 4: Number of new EV spaces from planned development

Structure	# EV Spots added by 2021	# EV Spots added 2022-2024	# EV Spots added 2025-2029	# EV Spots added 2030 and after	Total
Single Family	3,660	3,621	1,662	None listed	8,943
Multifamily	331	81	23	0	439
Non-residential	200	63	0	32	295
Grand total	4,191	3,765	1,685	32	9,667

It's important to note that the CALGreen code requires EV Capable spaces. A more-stringent local ordinance will ensure that each of these nearly 10,000 parking spots is ready to charge a car.

New building projects will always enter the planning and building cycle and will increase the number of EV spaced in 2022 and beyond, and builders may add more EV connectors in later years, However, between now and 2025 reliance on building codes alone will not result in enough locations for charging, as shown in Figure 2.

Figure 2: Gap in charging infrastructure by 2025



Incentives from SMUD, the Air Resources Board's California Electric Vehicle Infrastructure Program (CALeVIP),[20] Electrify America[21] and other potential funders may provide dozens of charging locations but will not fill the gap.

How Codes Help Fill the Gap

By requiring EV charging as a function of parking instead of building, the City could add thousands of EV parking spots at existing multifamily dwellings, workplaces, and parking lots over 10 years. When a parking lot undergoes a major expansion (not simply repaving or restriping) or adds an accessory structure that requires electric service (e.g., solar canopy, freestanding light poles), it could be required comply with building code requirements for EV charging as part of the renovation. For example, if the building code requires EV Ready (panel capacity and a 240-volt plug), then City code could require the same degree of support in a parking lot. The following three scenarios are examples of how City codes might apply to parking lots.

Example Scenario 1

If the parking lot in Figure 3 added solar canopies to generate electricity and shade or expanded parking into the vacant lot, City code could require EV Ready outlets be added at the same time. The property owner could choose to upgrade to Level 2 of DC fast chargers that could collect a fee for charging vehicles. The availability of vehicle charging may encourage one or more tenants to purchase EV fleet vehicles that could charge overnight, encourage hotel guests to rent EVs or use EV car-share vehicles, or encourage taxi and ride-hailing drivers to use EVs.

[20] https://calevip.org/
[21] https://sactozero.com/

Figure 3: Gateway Center in Natomas with nine office buildings, two hotels, and one vacant property. Zero EV charging.

Example Scenario 2

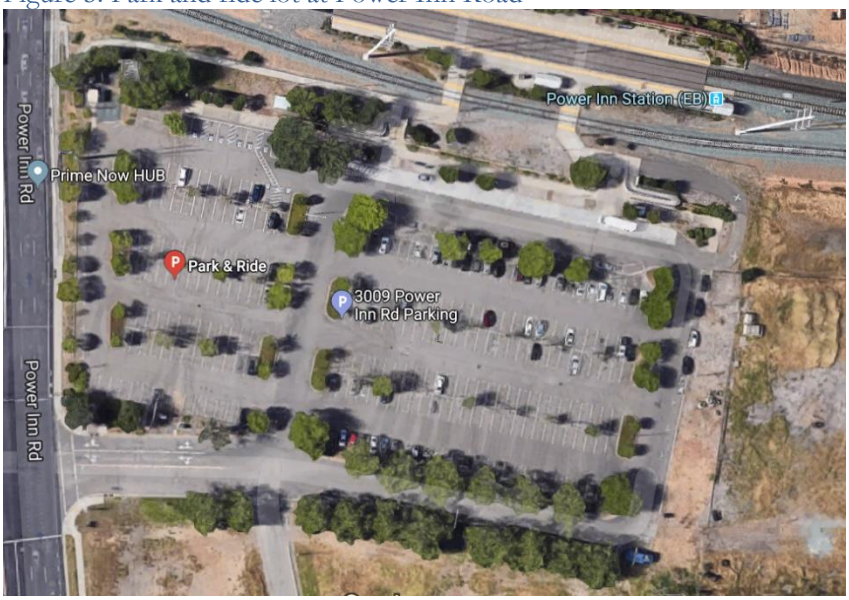
Figure 4 is an aerial view of a development site near Sacramento's old arena as submitted to the Planning Commission in 2017. It shows one of the eight hotels proposed to be built around the old arena, labeled Sleep Train Arena in the picture. City codes currently allow the developer to build fewer parking spaces than required by employing one or more methods of reducing transportation-related greenhouse gas measures. Revised City code could specify that Level 2 charging infrastructure (EV Installed) and/or EV car sharing are allowable measures that could to reduce parking spots by up to 35%. Code can additionally require that EV charging and car sharing be available to all employees, tenants, guests, or the public. Including this measure could reduce overall VMT and create a profitable business model for a car-share operator that could encourage more cars at additional locations in the community.

Figure 4: One of eight hotels being planned for Arena reuse area

Example Scenario 3

Figure 4 is a Google map view of the Park & Ride lot on Power Inn Road. Parking lots that are not attached to a building are exempt from building code requirements. By identifying surface parking lots and parking structures in City code, new lots can be required to have the same EV charging support as the building code requires. Parking lot operators may choose to install pay-per-use chargers that could generate revenue.

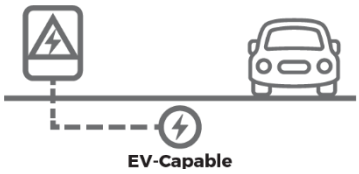
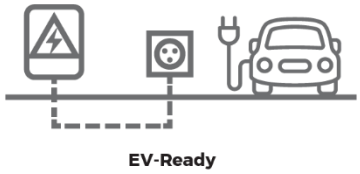
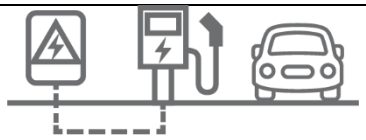
Figure 5: Park and ride lot at Power Inn Road



Cost-Benefit Findings

Task 3.2, *EV Infrastructure Cost-Effectiveness Study for Sacramento*, estimated the cost of complying with degrees of EV support during new construction. Table 5 shows the mean cost per parking space for each degree of EV support independent of the type and size of the building.

Table 5: Estimated costs of degrees of EV support per EV charging space

EVSE Support	Technical Components	Average Installation Cost	Average EVSE Unit Cost	Average Total Cost	Percentage Increase Over Mandatory
EV Capable[22] (mandatory in State building code)	 Raceway, Circuit	$800	N/A	$800	NA
EV Ready[23] (240-volt plug)	 Raceway, Circuit, Wiring, Outlet	$1,100	N/A	$1,100	11%
EV Installed[24] (non-networked, pedestal mounted Level 2 EVSE)	 Raceway, Circuit, Wiring, L2 EVSE	$3,000	$3,000	$6,000	60%

The cost benefit is realized by the resident/tenant who avoids a future cost of installing wiring and hardware for EV Ready or EV Installed, and by the City of Sacramento from reduced greenhouse gas emissions and air pollutants. The Task 3.2 report shows that an EV Ready parking space will cost about $1,100 when installed during construction. Findings from Bay Area cities show that the same level of compliance in a retrofit can cost $2,370 to $3,750 per parking space.[25]

[22] California Air Resources Board staff estimate that the cost to install a raceway with an adequate panel capacity is approximately $800 per EV charging.
[23] A 2016 City of Oakland cost effectiveness report estimated total cost of an EV-ready space at $1,300. A 2016 City and County of San Francisco report estimated $900. The average of the two values is $1,100.
[24] From 2015 U.S. Department of Energy https://afdc.energy.gov/files/u/publication/evse_cost_report_2015.pdf
[25] The range considers the potential for breaking concrete to run electrical wiring through an existing wall and the length of conduit. Costs do not include additional upgrades to an electrical panel.

During an outreach event with electrical contractors, the group stated that should a parking space be EV Capable, the cost of bringing an electrician back to the site to later install the breaker, wires, and 240-volt outlet would likely cost $1,100—the same cost as installing EV-Ready during construction.

The Task 3.2 report also evaluated the cost effectiveness of installing additional solar panels to offset the energy use of charging a vehicle at multifamily and non-residential buildings. The 2019 Energy Code (Title 24 Part 6) of the California State Building Codes[26] will require additional energy efficiency measures and solar panels on all new construction. If the City of Sacramento proposes a local ordinance that requires photovoltaics (PV) in above State code requirement, the City must demonstrate to the California Energy Commission that energy savings will offset the cost of additional PV. Using CAL-ERES for energy modeling it was determined that additional PV at multifamily dwellings and non-residential construction only to offset light-duty EV charging would not meet the Energy Commission's cost-effectiveness requirements.[27]

In 2021 electricity will be regulated as a fuel and every EVSE that sells fuel will pay an annual fee to the County of Sacramento to cover the cost of testing. The Interim Agricultural Commissioner/Sealer at the County of Sacramento stated in an email that the County is considering a cost of $120 per EVSE annually. It will be important to calculate the $120 into operating and maintenance costs for all Level 2 and DC fast charging stations that accept payment.

Stakeholder Recommendations and Key Issues

Initial conversations with developers, property owners, low-income housing providers, and other construction-industry representatives indicate that they are amenable to the City of Sacramento requiring EV Ready (a 240-volt outlet) and that $1,100 per parking space is a valid mean dollar amount. The cautioned, however, that this $300 increase[28] is one of several proposed fee increases and to pay attention to the bottom line of combined fee increases. The City is currently working with Economic & Planning Systems, Inc. (EPS) to assess the feasibility of new community impact fees that every developer pays for water, sewer, parks, transportation, flood protection, and other services.

Members of the community expressed verbally and in writing that they support the City requiring greater numbers of EV parking spaces and made two suggestions:

- The City require that 20% of parking spaces at multifamily be made EV Ready instead of 10% of spaces because it will make charging available to more residents. (The 2019 CALGreen code requires that 10% of parking spaces at multifamily be EV Capable; 20% is the Tier 2 voluntary level.)
- Instead of requiring 10% of parking spaces be EV Ready, include a 120-volt outlet in every parking space. The theory is that the amount of energy needed for one 240-volt outlet could support six 120-volt outlets for the same cost. Because cars are parked for eight hours or more, the slow charge could replenish the range for most drivers.

[26] Effective January 1, 2020
[27] Task 3.2 did not include energy analysis and modeling for single-family homes.
[28] The incremental dollar amount between mandatory compliance (EV Capable) and EV Ready

Conversations with developers, the business community, and housing operators indicated that they would not support requiring 20% of parking spaces to be EV Capable or EV Ready. The expressed that it could put property mangers in the position of having too many dedicated parking spaces for several years and, therefore, not enough parking for other tenants. Developers stated that they would not support two measures that surpassed the state standard.

Property managers and the business community worried that putting 120-volt outlets in parking lots could both create an attractive nuisance and cause electricity bills to increase. A 240-volt outlet on a dedicated breaker can be submetered, but 120-volt outlets cannot. Tenants, guests, and passers-by could use 120-volt outlets for everything that needs electricity, from a cell phone to running household appliances.

Specific feedback from Sacramento Housing and Redevelopment Agency and Mutual Housing were that 240-volt outlets were affordable now and could later be upgraded to Level 2 chargers as need for EV charging increases over time.

Analysis and Recommended Approach to Advance EVSE

Building and city codes are tools that cities can use to require EV infrastructure, but the Sacramento EV Blueprint demonstrates that new construction cannot meet the need for charging infrastructure. To encourage more infrastructure, EV charging needs an attractive business case.

Many of the costs of EV infrastructure are outside of the control of a City. For example, electricity demand charges can make up as much as 90 percent of the monthly bill of operational public DC fast chargers, driving the cost of delivered electricity as high as $1.96 per kilowatt-hour—about seven times the cost of gasoline.[29] Utilities, including SMUD, work with EVSE providers and regulators on strategies that can reduce electricity costs, and the Air Resources Board recently added new crediting mechanism to the Low Carbon Fuel Standard to issue credits for ZEV infrastructure on a calculation of capacity, less the actual fuel dispensed.[30] Station operators can sell the credits which creates an income stream to offset operational costs. All of this is outside the purview of the City.

The State of California, Sacramento Metro Air Quality Management District, Sacramento Area Council of Governments, and SMUD all have incentive programs for public charging stations to reduce the capital costs of Level 2 and/or DC Fast Charging. In early 2019, the Air Resources Board launched the California Electric Vehicle Incentive Program (CALeVIP) in Sacramento to further encourage public charging infrastructure. This, too, is outside of the City's control, although City staff actively contribute as engaged stakeholders and plan to use this funding to upgrade many of the EVSE in City parking garages.

The City of Sacramento can play a role in reducing costs and developing a business case. During the Sacramento EV Blueprint project, the City identified five approaches that may reduce costs of installing EV infrastructure.

1. *Job training*

Interviews throughout the project identified a crucial need for more electricians. Several factors from a decade of de-emphasizing trades as a career path in high school to a construction boom related to wildfire reconstruction resulted in a shortage of electricians and a steep rise in wages. One Sacramento-area developer stated that two years ago he paid second-year apprentices about $20 an hour; currently he pays between $45 and $60 an hour. The International Brotherhood of Electric Workers (IBEW) Local 340 represents the Sacramento area and reported that it needs about additional 1,500 people in the apprenticeship pipeline. As detailed in Task 5.2, *EV Economic Pathways*, the City of Sacramento can collaborate with its partners to help prepare people to become electrician apprentices, which will reduce EVSE costs and provide residents with well-paying jobs.

[29] https://rmi.org/press-release/press-release-rmi-evgo-report-reveals-utility-rate-structures-support-fast-charging-growth/
[30] https://www.arb.ca.gov/fuels/lcfs/guidance/fci_userguide.pdf

2. Hotels and car-sharing

In 2016, Visit Sacramento[31] reported more than 200,000 hotel room nights and 400 meetings, conventions and sporting events. In 2019, Sacramento will begin expansion of the Convention Center and Mayor Darrell Steinberg announced a major revitalization of the Old Sacramento waterfront, one of the city's top tourist destinations. These projects, and others, will attract more visitors to our city and present an opportunity to reduce the number of gas-powered vehicles that visitors drive. Working with Visit Sacramento, the Sacramento Metro Chamber of Commerce, City of Sacramento Economic Development, and the property-based improvement districts (PBID), the City can facilitate relationships that could place EV car-sharing programs at area hotels and tourist attractions. Because visitors often use rental cars, taxis, or ride-hailing, they already expect to pay for local transportation. Shifting that transportation to a shared EV can increase the number of EVs in Sacramento, increase EVSE usage, build a profit model for car-share providers, and reduce the number of cars on Sacramento streets.

3. EVSE at City Facilities

Task 4.3: *Evaluate and Recommend EVSE Upgrades and Strategies to Optimize Public Charging Access* proposed five projects at City-owned facilities that can increase access to charging for residents that live nearby. To identify the five properties, the project team developed the EVSE Priority Siting Tool, an Excel model that combines land-use information with SACOG travel data. The team used the tool to narrow down a long list of City properties to those in low-income or disadvantaged communities, were somewhat isolated from transit stops, and were within safe walking distance of multifamily communities, retail, community services, and/or education.

Recommended opportunity locations and configurations are in Table 6.

Table 6: Recommended locations to add EVSE at City-owned properties

Community Centers, Libraries and Parks	Address	Potential EVSE
Hagginwood Community Center	3271 Marysville Blvd.	Two Level 2 EVSEs with two connectors
Oak Park Community Center	3425 Martin Luther King Jr. Blvd.	Two Level 2 EVSEs with two connectors
Samuel C. Pannell Community Center	2450 Meadowview Rd.	Three Level 2 EVSEs with two connectors
Martin Luther King Jr. Library	7340 24th St. Bypass	Two Level 2 EVSEs with two connectors
Oakbrook Park (under construction)	3341 Soda Way	One curbside Level 2 EVSEs with two connectors

Concept drawings and cost estimates for the five locations are at the end of this report.

[31] https://www.visitsacramento.com/articles/post/new-tourism-figures-shows-industrys-impact-in-sacramento/

4. E-Mobility Hubs

Mobility hubs are centers of connectivity where multiple modes of travel converge. They provide an integrated suite of mobility modes—safe walking and biking, transit connections, and cars; amenities like lockers, wayfinding, and enjoyable waiting areas; and technologies like dynamic parking management strategies, real-time traveler information, and real-time ridesharing. Mobility hubs can also depots for ride hailing, package delivery, and "kiss-and-ride" drop-off/pick-up zones.

Many cities are talking about and planning for mobility hubs, but Sacramento is taking a different approach with an e-mobility hub. As described in *Task 6.3: E-Mobility Opportunities*, an e-mobility hub includes charging infrastructure that supports zero-emission transportation. The flexible design is ideal for park-and-ride lots at Sacramento's light rail stations and can include reserved DC Fast Charging for working drivers—ride-hailing, package delivery, microtransit shuttles, and super commuters—and Level 2 charging for ride chaining (people who drive to the park and ride for one leg of the trip, and then take transit for the next leg). It also includes reserved Level 2 charging for ride-share cars and low-speed charging for electric bikes and scooters. On June 20, 2019, the EV Blueprint team led a short focus group with about 40 leaders of regional community-based organizations (CBOs) to solicit input on how this concept would work for the people they serve. All present could see how this concept could work: a client takes light rail to the e-mobility hub, then uses a transit card at a kiosk (or with an attendant) to check out an e-bike, call an on-demand shuttle, or rent an EV for the next leg of the trip. Representatives from three job training programs said that their clients are often late to or absent from classes because they miss a bus connection or can't get a ride. Representatives from two community health service organizations immediately focused on the ability to connect people with food, even suggesting that a farmer's market or lockers where the Sacramento Food Bank could leave deliveries could expand the hub's utility. Other organizations talked about making the hub come alive with art, music, and a garden. They suggested that the hub have an attendant that could help people use vehicles, caution drivers to watch for bicyclists, and loan items like car seats and tools for bike repair.

The concept drawing and cost estimate for the e-mobility hub are included at the end of this report.

5. Disadvantaged Communities

Greenlining Institute's Electric Vehicles for All Equity Toolkit[32] recommends focusing EV projects on identified community needs. The EV Blueprint team met one-on-one and in groups with several community-based organizations (CBOs) and identified opportunities for CBOs to prepare for an upcoming ARB voucher program. The Clean Mobility Voucher Program will be available to CBOs to establish and operate mobility projects that can include transit, bikes, and cars to address specific needs of a low-income or disadvantaged community. Sacramento can support potential project by leveraging local experience with clean mobility programs and workforce development efforts.

The City will also coordinate with the Electrify America-funded Sac to Zero programs to understand how the charging, car-share, and microtransit pilot programs address community needs. The City

[32] http://greenlining.org/publications-resources/electric-vehicles-for-all/#tab4-section1

will continue to coordinate with project stakeholders to understand actions the City might take to sustain the programs when private funding or public grants end.

Coordination Among Groups

Sacramento has an effective stakeholder group, the Sacramento PEV Collaborative, that meets monthly and discusses efforts, needs, and upcoming opportunities. During the Sacramento EV Blueprint project, the EV Blueprint team met with additional groups and identified two that are essential to meeting the City's 75,000 ZEV goal.

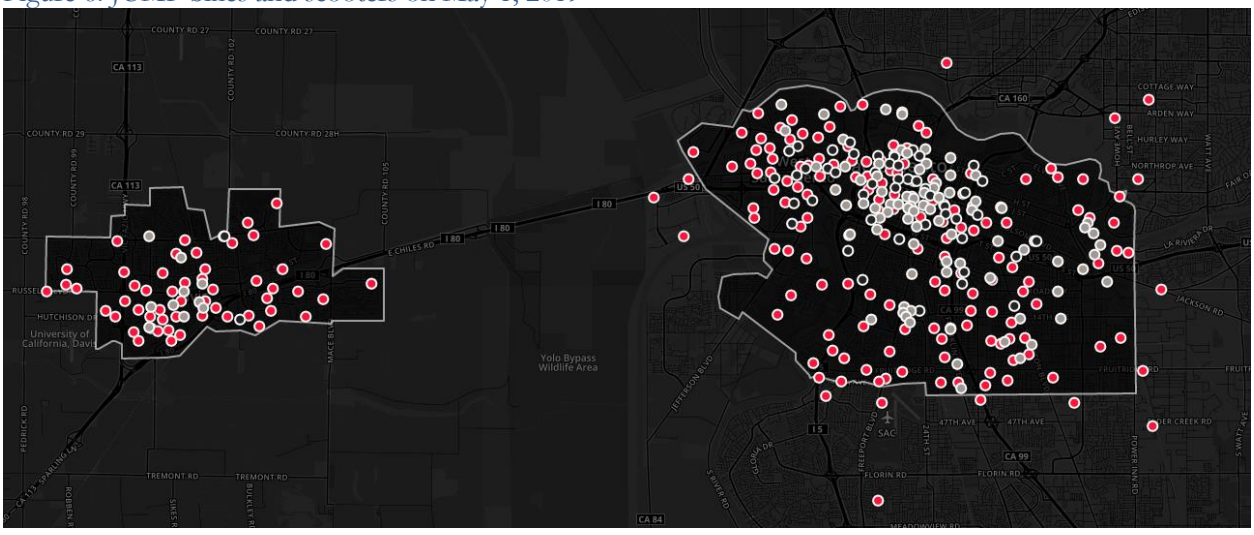
1. Business Districts

Property-based improvement districts (PBIDs) are public/private sector partnerships that perform a variety of services to improve the images of their cities and promote individual business districts. PBIDs are formed by the City and property owners who fund the district by a special assessment on their properties. The owners then form a board to direct how the funds are spent in the district. Sacramento has 11 PBIDs, each with an executive director and some with paid staff. PBID executive directors reported that they receive multiple requests from companies seeking partners for car- and/or bike-share hubs, locations for charging stations, and partners for other innovative programs. Closer collaboration with the City can better prepare the executive directors to respond to opportunities that can result in more charging infrastructure.

2. Data Scientists

Data science is an emerging opportunity the public and private sector. For example, greater Sacramento is home to the largest deployment of JUMP bikes and scooters, a shared mobility service. Figure 6 shows the home zones in Davis, West Sacramento and Sacramento outlined in white. Red dots are available bikes and scooters; grey dots are locations of bike racks. The dark area between the cities is a wildlife refuge. JUMP travelers can ride the vehicles between cities. Travelers must use the JUMP/Uber app to check out a bike or scooter. The app transmits the phone's location and speed, which data scientists analyze to understand travel behavior.

Figure 6: JUMP bikes and scooters on May 1, 2019



Smartphones track movement—the places a user visits, how many times they've been there, and the days and time of day they were there. Companies buy that data to target advertising, enable GPS-based services, and enable Internet of Things (IoT) devices like smart locks and thermostats. Transportation apps on a phone, including those that let you board a plane or bus, also track the phone's speed of travel. Transit agencies and urban planners are often customers for the analyzed data.

In Task 4.1, *Current Status and Utilization of Public and Workplace EVSE*, the City summarized the usage data of 22 City-owned networked Level 2 EVSE connectors and 15 non-networked Level 2 and Level 1 connectors at five downtown Sacramento parking garages. The data from the networked connectors included the number of charging sessions, unique vehicles, and charging session length. Data from the non-networked connectors showed only energy use. Movement data from a transportation app might provide additional insight into charging use, including drivers that wanted to charge when the connector was in use, session information from non-networked connectors, and periods that connectors were unused.

By engaging with tech incubators, universities, and information innovators, the City can better understand new opportunities to collect and use data, potentially create new job classifications within the City, encourage innovation at tech start-ups, and stimulate new degree programs in data science at local universities.

Summary of Code Revisions or Other Mechanisms to Achieve City Goals

1. Begin the process for adopting a local ordinance that requires EV Ready as mandatory in single-family residential, multifamily, mixed-use, and non-residential new construction and major alterations in 2020.
2. Revise the "Transportation management plan measures" (City code 17.700.070) to specify that above-code EV charging and EV car share programs are acceptable measures.
3. Revise "Development standards for off-street parking facilities" (City code 17.608.040) to describe the location, size, and signage required for EV spaces in parking lots and structures.
4. Add a new section to "Development standards" that requires EV support in new parking structures that require electricity.
5. Revise the "Parking requirements of land use type and parking district" (City code 17.608.030) to require EV support consistent with the building code in stand-alone parking lots and structures.
6. Revise "Alternatives to standard parking requirements; other modifications" (City code 17.608.060) to enable developers to install above-code EVSE to deviate from minimum parking requirements.
7. Revise "Waiver of minimum and maximum parking requirements" to require that parking spaces above the maximum be constructed as EV installed.
8. Create a new code using Tree shading requirements for parking lots (City code 17.612.040) as a guideline that will require minimum EVSE compliance for parking lot construction projects.
9. Coordinate with businesses and educators to develop a business case for EVs by increasing the workforce and supporting synergetic projects for car-sharing.
10. Support and/or seek funding for an e-mobility hub pilot, ideally in partnership with other agencies and local groups, for a project at a park-and-ride lot in a low-income/disadvantaged community. Consider leveraging funding from the upcoming Clean Mobility Voucher project and grants from SACOG.
11. Identify opportunities for increased insight from data collection and analysis.

Attachment of code revisions, or other recommended revisions and materials to support the permitting framework

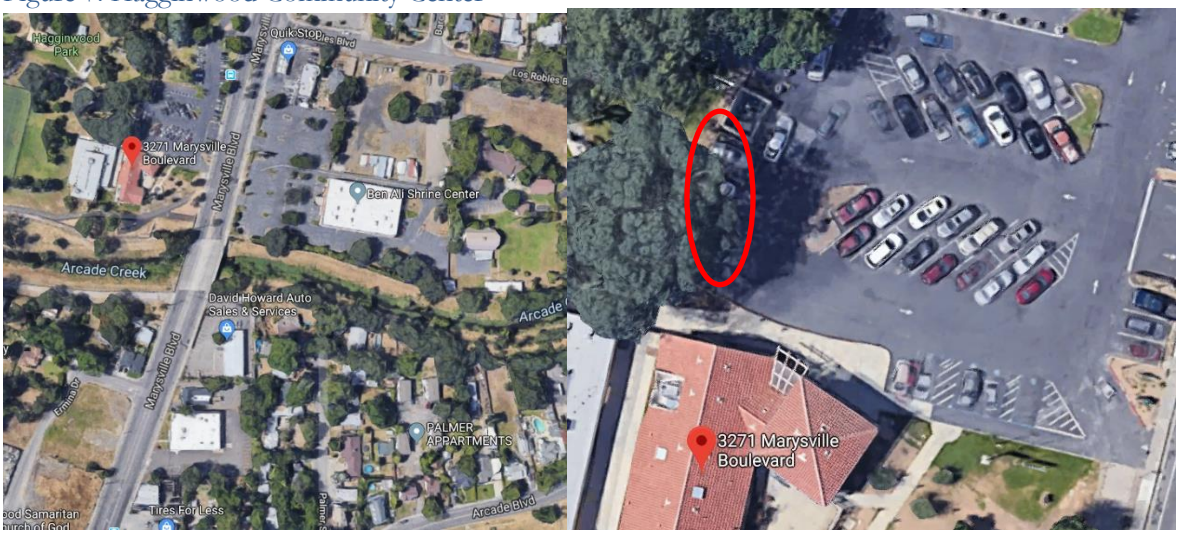
Refer to the Task 3.4 report, *Guidelines for EV Readiness,* for recommended code revisions that City staff will seek to implement following grant completion. These recommended options for code revisions are summarized above, in the preceding section.

Project Recommendation: EVSE in Public Lots

Task 4.3: *Strategies to Optimize Public Charging Access* identified five City-owned properties that could potentially have Level 2 charging stations added to increase access to charging in low-income and disadvantaged communities. The EV Blueprint team created a model, the EVSE Priority Siting Tool, that uses 20 factors to score each census tract for its opportunity to increase public-serving EVSE. To identify potential locations this task, the tool was used to weight tracts with City-owned properties in close proximity to rental housing in low-income communities. It identified 12 libaries and parks, which were then further distilled based on reasonable walking distance (1/8 mile) to homes or services, the availability of parking, and reasonable safety for a person to walk elsewhere after plugging in their car (e.g., lights, sidewalks, the amount of high-speed car traffic). The resulting five locations are below:

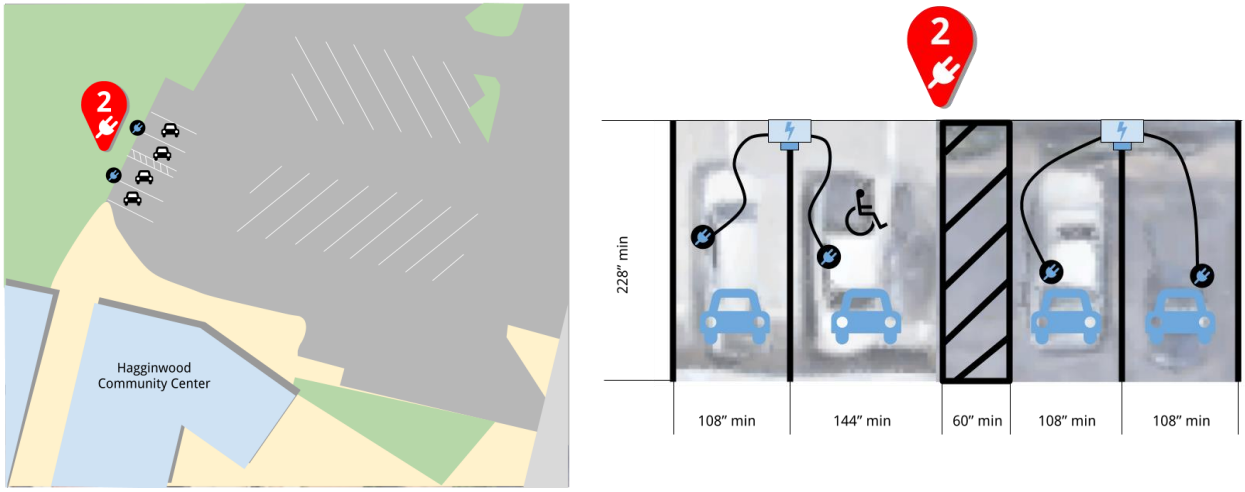
Hagginwood Community Center (Figure 7)**Error! Reference source not found.** is the Hagginwood Community Center and surrounding neighborhood that includes apartments, businesses, and the Ben Ali Shrine Center. It can support two pedestal mounted Level 2 EVSE, each with two connectors, in the area circled in red. The section of the parking lot is well light and close to the community center's front door. The building will not require electrical upgrades for the EVSE. Configuration of the parking spaces is conceptual drawings of the EVSE configuration.

Figure 7: Hagginwood Community Center



The section of the parking lot is well light and close to the community center's front door. The building will not require electrical upgrades for the EVSE. Configuration of the parking spaces follows recommendations in the upcoming *Electric Vehicle Charging Station Permitting Guidebook* from the Governor's Office of Business and Economic Development (GO-Biz.)

Figure 8: Hagginwood Conceptual Drawing

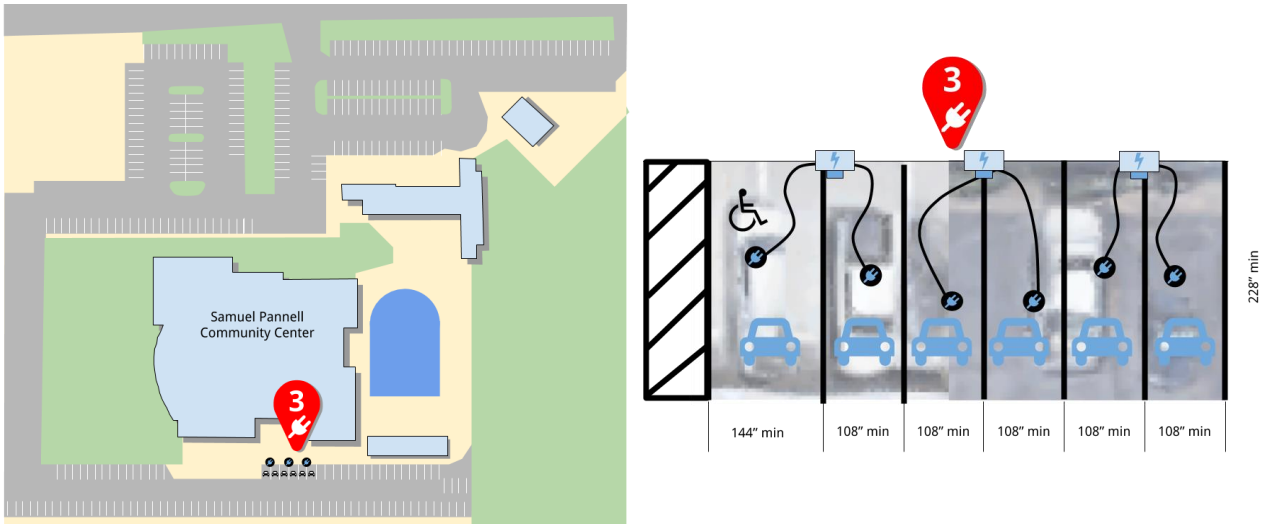


Samuel Parnell Community Center (Figure 8) is a large complex in a residential area with apartments and older single-family homes. A rear parking lot, circled in the picture, is directly adjacent to the building and could potentially support up to four Level 2 EVSE. Figure 10 is conceptual drawings of the EVSE configuration.

Figure 9: Sam Parnell Community Center

The section of the lot is at the rear of the building and already has van-accessible parking spots. It does not have free-standing lighting and it is advisable to add motion-sensitive spot lights mounted on the building. It currently has 20 parking spaces and a no-parking area for delivery truck unloading. To make use of the existing ADA spaces, it's advisable to move the delivery zone.

Figure 10: Parnell Conceptual Drawing



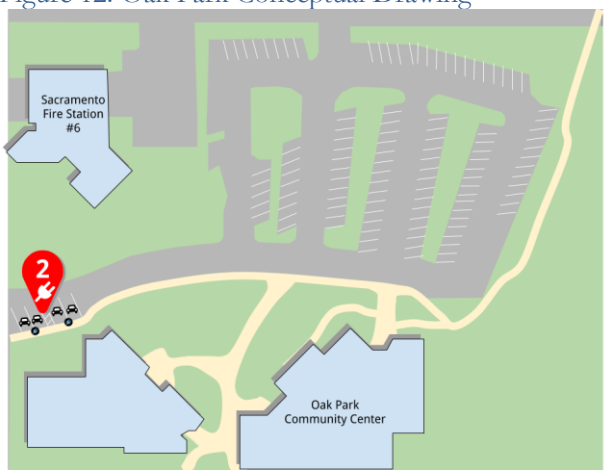
Oak Park Community Center (Figure 11Figure 10) also includes a fire station, childcare center and social services. The surrounding community includes homes, restaurants, and an elementary school. The four parking spots closest to the entrance (circled in red) could support two Level 2 EVSE and has enough space to reconfigure the striping for a van-accessible parking space. This is also a potential location for an e-mobility hub that includes bikes and car sharing, potentially in coordination with the Father Kenny K-8 School. Figure 12 is conceptual drawings of the EVSE configuration.

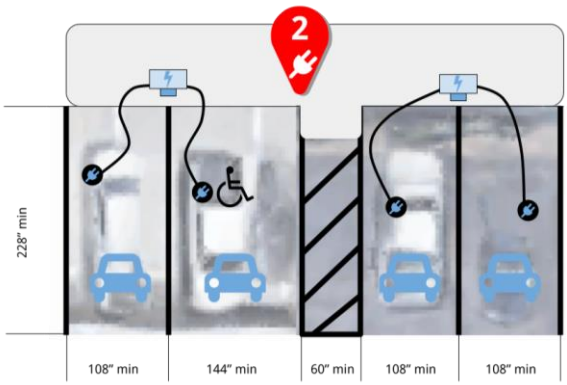
Figure 11: Oak Park Community Center

The section of the lot is immediately inside the center's driveway and has free-standing lighting. A sidewalk leads from this parking section to the building's front door. High visibility from the street may help deter theft of vehicles left overnight. The section currently has five parking spaces that will be reconfigured to four to follow recommendations in the upcoming *Electric Vehicle Charging Station Permitting Guidebook*. Because the parking spaces are adjacent to the driveway, the EVSE will need to

be curb mounted which requires widening the sidewalk. A ramp from the ADA parking space to the sidewalk will also need to be added.

Figure 12: Oak Park Conceptual Drawing





Oakbrook Park (Figure 13Figure 10) is a recommended alternative location to the South Natomas Community Center. The park is directly adjacent to existing multifamily dwellings and is currently under construction. One pedestal-mounted Level 2 EVSE with two connectors can be added to the drop-off area on San Juan Road without impacting traffic. This section already has wide sidewalk, is well-lighted and has room for four cars to park.

Figure 13: Oakbrook Park

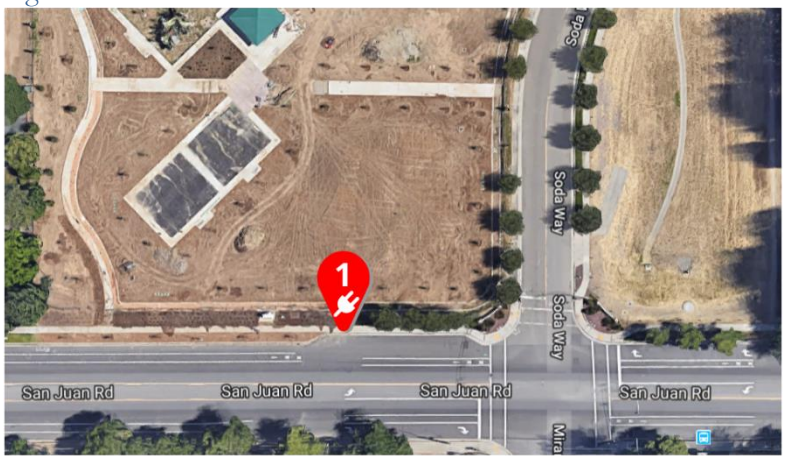
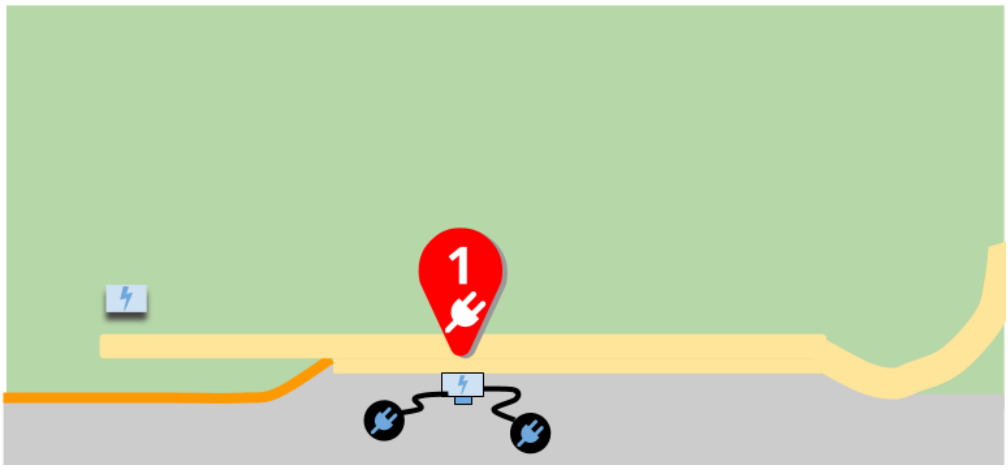


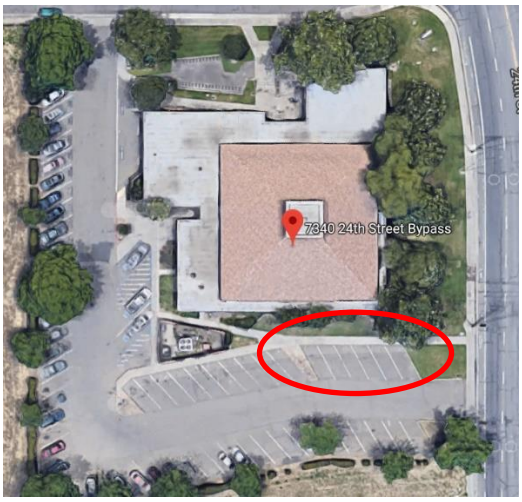
Figure 14 shows a potential schematic for adding one pedestal-mounted EVSE at the curb. If necessary to maintain ADA access of the sidewalk, the EVSE could be mounted on a small curb extension in the right of way or the sidewalk slightly widened around the EVSE.

Figure 14: Oakbrook Park Schematic



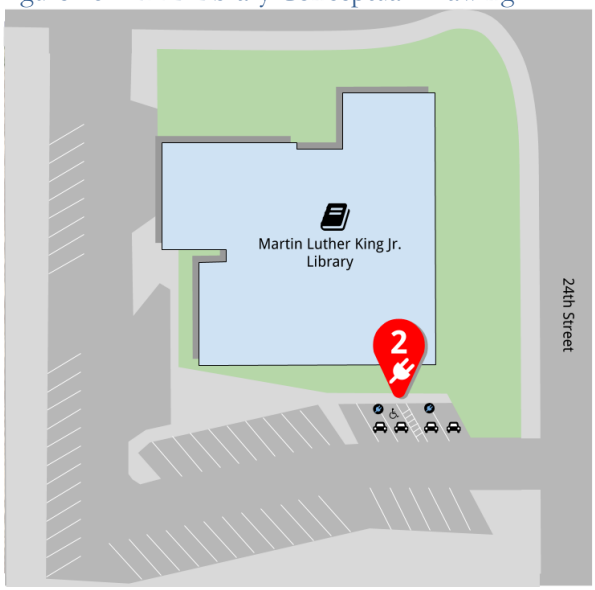
The Martin Luther King, Jr. Library (Figure 15Figure 10) is across the street from an apartment building and an easy walk to more residential. The circled area of the parking lot is likely to be closest to electrical supply, has room for an ADA-accessible charging space, has free-standing lighting, and is visible from the street, which may help deter theft of vehicles left overnight. Figure 16 is conceptual drawings of the EVSE configuration.

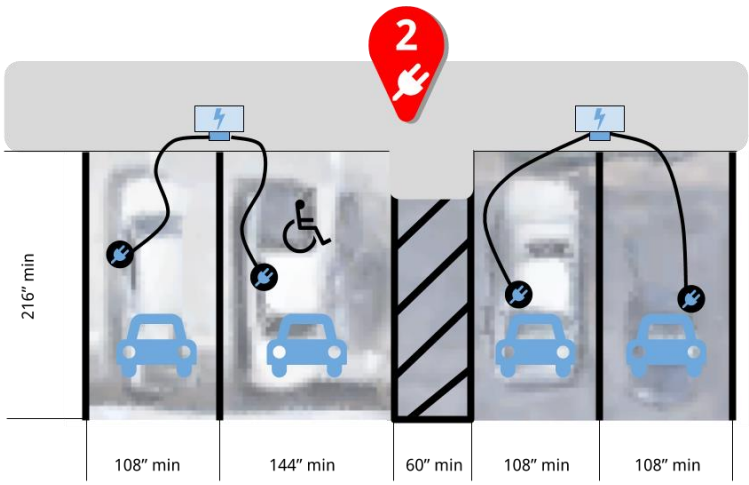
Figure 15: MLK Library



The section of the lot is immediately inside the center's driveway. The section currently has five parking spaces that will be reconfigured to four to follow recommendations in the upcoming *Electric Vehicle Charging Station Permitting Guidebook*. Because the parking spaces are adjacent to the driveway, the EVSE will need to be curb mounted which requires widening the sidewalk. A ramp from the ADA parking space to the sidewalk will also need to be added.

Figure 16: MKL Library Conceptual Drawing





Estimated Project Budgets

Table 7 is the consolidated estimates for purchasing and installing equipment and estimates for other costs associated with EVSE, like parking lot improvements, EV Only signs, and City labor. Assumptions do not include upgrades to the building electrical supply, permits, or other improvements that might be triggered by adding EVSE. The City may be able to leverage economies of scale by installing multiple projects at one time.

Table 7: Costs for adding EVSE at five City properties

Location	Total Cost
Hagginwood	$22,686
Parnell	$29,071
Oak Park	$24,142
Oakbrook Park	$15,355
MLK Library	$24,180
Total for five locations	**$115,434**

The team also considered a budget for placing a free-standing EV ARC at one facility, most likely the Parnell Community Center. The EV ARC is an all-in-one unit that includes a solar canopy, energy storage, and charging for cars and bikes. It doesn't require construction or ground-disturbance and can be quickly installed and set-up without permitting. More expensive than an EVSE, the EV ARC can be quickly deployed and relocated, and can provide back-up power in an emergency.

At the Pannell Center, the EV ARC could be placed in the current ADA space and the adjacent space. The other spaces could host a bike/scooter sharing hub without reconfiguring the parking lot, running electricity from the building, or disturbing the neighbors with construction. Table 8 is an estimate for the EV ARC with two networked Level 2 connectors.

Table 8: Parnell Community Center alternative estimate

Item	Total Cost	Note
EV ARC base	$57,500	Includes minimum level of energy storage
ChargePoint networked EVSE with two connectors	$6,949	Includes lights and EV Charging signs
Network fees	$540	$540 per year; one year paid in advance
E-bike charging hub	$8,700	Can charge 12 bikes/scooters
Total	**$73,689**	

Project Recommendation: E-Mobility Hub

Task 6.2, *E-Mobility Hub Recommendations,* analyzed concepts and plans of other regions' mobility hubs and expanded on those concepts to create an e-mobility hub. Sacramento's intention is to take the mobility hub principle a step further by encouraging all transportation to be electric. However, the emphasis should remain on active transportation and shared rides, including transit. Figure 17 shows an example of transportation modes that a traveler would ideally use to get to or from light rail or an electric bus.

Figure 17: E-mobility hub travel

The concept e-mobility hub envisions re-configuring surface parking at a light rail stop into a flexible, modular design prototype that can be scaled up or down depending on available space, mobility demand, and electrical capacity. Optionally, some elements could be adjacent to a transit stop—across the street or at a nearby community center.

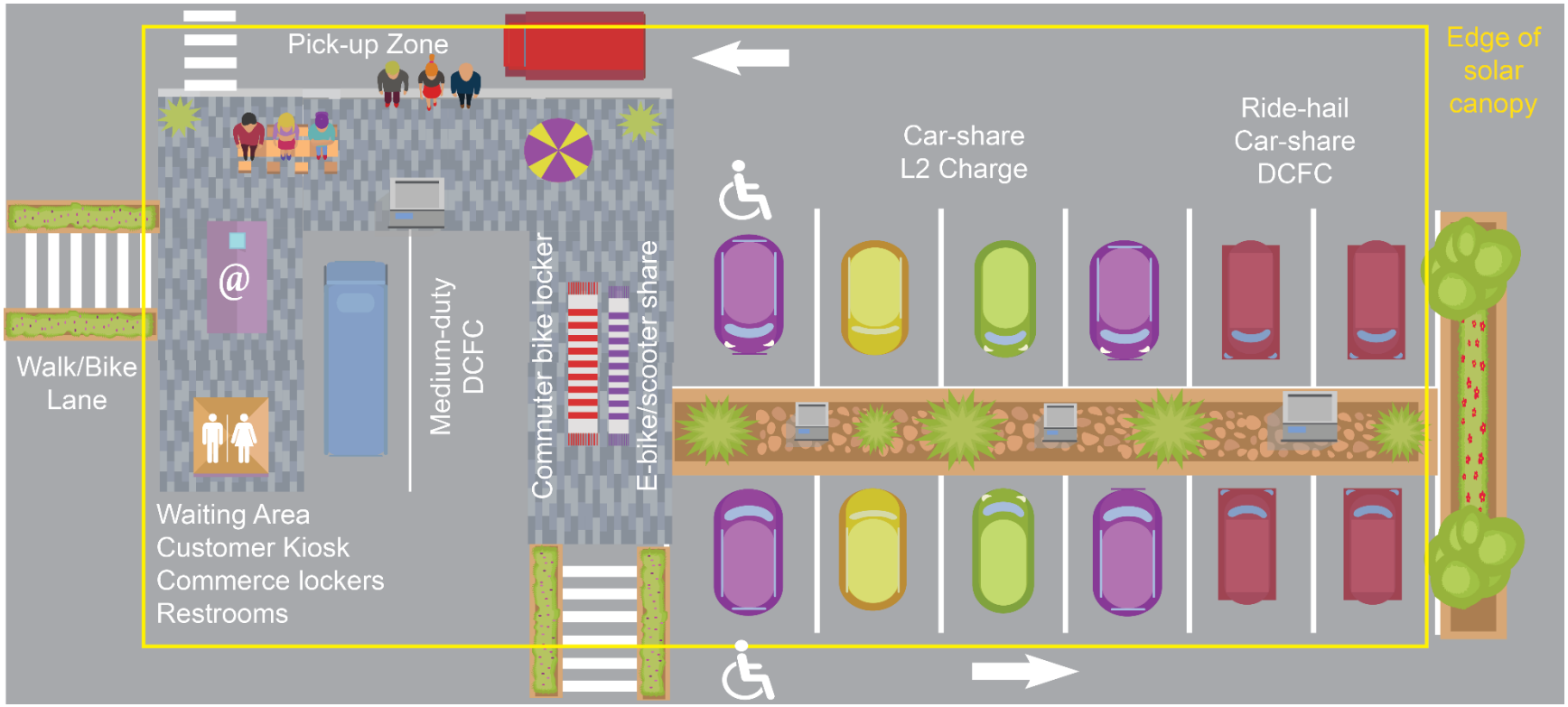
The modular approach also future proofs the regional transit system as share mobility becomes more convenient and economical than private vehicle ownership. For example, commuter parking spaces can gradually be replaced with docks for shared vehicles, a larger drop-off zone, or additional light rail tracks.

The layout of the e-mobility hub concept is intended to fit within a standard park-and-ride lot, which allows the e-mobility hub to be scaled up or down without impacting the design or operation of the lot.

Figure 18 is a concept drawing that fits within a row of parking stalls that is two parking spaces deep (36-40 feet) by approximately 20-25 parking spaces wide (170-215 feet). It assumes that this row would the closest to the light rail station. Some of the existing parking spaces would be transformed into a structure with public amenities concentrated at one end of the site. The other end would for parking and charging car-share and ride-hailing EVs. The concept shows 12 spaces for shared-ride passenger cars and leaves two spaces for medium-duty vehicle charging.

To expand in the future as transportation becomes more dependent on shared EV mobility, the e-mobility hubs should be within the longest rows of parking at the transit center. This enables adding more chargers and/or expanding the active transportation portions as housing and commerce grow closer to the hub.

Figure 18: E-Mobility Hub Conceptual Drawing



This drawing shows two car-share spaces that are ADA accessible. Once charger in the center aisle can serve four vehicles. Parking at 90 degrees instead of 45 degrees makes the EVSEs accessible to a wider variety of vehicles. Plants in the center of the row ensure this is not interpreted as a walkway to the amenity area. The bike lockers and shared ridables (scooters and bikes) are placed together so that one power source can charge personal and shared bikes/scooters. The protected bike lane in this configuration enables people to safely cross the area where shared cars are pulling in and out.

The purple-and-yellow circle represents the customer service kiosk. This could be an attended station, a self-service kiosk, or a convenience store or coffee shop. A mobile office staffed by a person in an electric van could serve as an attendant who moves from hub to hub. A delivery van can pull into the medium-duty charger and quickly charge while unloading goods into the e-commerce lockers (marked with @ in the drawing). This can reduce VMT from the van and the person who might otherwise drive to a store, food bank, or library.

Anticipated Costs

Table 9 is an estimate of the initial start-up costs based on public records of similar projects' initial costs. These do not include operational costs for the first two years because data isn't currently available.

Table 9: E-mobility hub cost estimate

Item	Cost	Explanation
Land acquisition	$0	Project assumed to be in an existing parking lot
Engineering, design, and construction	$500,000-$800,000	SACOG grants for developing light rail stations[33] and Safe Route to School improvements[34]
PV array and battery storage	$130,000 (PV) + 10,022 (storage)	From EV Blueprint tasks 3.2 and 6.2
Establish car-share hub	$750,000-$1,300,000	Energy Commission grants for ZEV car share programs.[35] Initial grant for Our Community CarShare that included purchase of eight cars and four Level 2 EVSEs[36]
Expand microtransit	$849,000	City of West Sacramento cost to establish and operate Via for one year after deducting operator's revenue[37]
Establish bike/scooter share	$0	To date, operators have not applied for grant funding
Implement technology solutions	$536,000	FTA award to San Diego for integrated app for paratransit[38]
Installation of DCFC	($2,000)	EVgo pays the City of Sacramento a $2,000 annual licensing fee for curbside DCFC[39]
Total funding needed	**$2.7-$3.5 million**	

[33] https://www.sacog.org/sites/main/files/file-attachments/description_of_funded_projects_round_7.pdf
[34] https://www.sacog.org/funding-award-recipient/2019-regional-atp-funding-awards
[35] https://ww2.energy.ca.gov/contracts/GFO-16-605_NOPA.pdf
[36] http://policies.sharedusemobilitycenter.org/#/policies/853
[37] https://blob.cityofwestsacramento.org/civica/filebank/blobdload.asp?BlobID=16816
[38] https://www.transit.dot.gov/funding/grants/grant-programs/access-mobility-partnership-grants-fy2019-project-selections
[39] http://www.cityofsacramento.org/-/media/Corporate/Files/Public-Works/Electric-Vehicles/EVgo-Charging-Southside-Park.pdf?la=en