CITY OF ENCINITAS ELECTRIC VEHICLE CHARGING MASTER PLAN

PLANNING FOR AN ELECTRIC TRANSPORTATION FUTURE

MARCH 2023

PREPARED FOR:

CITY OF ENCINITAS, CA

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PREPARED FOR THE CITY OF ENCINITAS

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GLOSSARY

Term or acronym	Description
BES	Battery Energy Storage
BEV	Battery electric vehicle (i.e., a fully electric vehicle)
CAP	Climate Action Plan of the City of Encinitas, adopted in 2018
DCFC	Direct current fast charger (480 Volt, 50-350 kW)
DR	Demand Response
EV	Electric vehicle (includes BEVs and PHEVs)
EVSE	Electric vehicle supply equipment
GHG	Greenhouse gas
GSM	Global System for Mobile communication
ICEV	Internal combustion engine vehicle
L2	Level 2 (240 Volt, typically 6-7 kW up to 9.2 kW)
LCFS	Low Carbon Fuel Standard
LD	Light-duty
MUD	Multi-unit dwelling
NEMA	National Electrical Manufacturers Association
OCPP	Open Charge Point Protocol
PHEV	Plug-in hybrid electric vehicle
SDG&E	San Diego Gas & Electric (public utility company for San Diego County)
TOU	Time of use
VGI	Vehicle to grid integration

EXECUTIVE SUMMARY

INTRODUCTION

The purpose of this master plan is to facilitate the transition to electrified transportation for the City of Encinitas' citizens, employees, and visitors by planning deployment of Electric Vehicle (EV) charging stations.

The term 'charger' for this document refers to the port, or plug, of an Electric Vehicle Service Equipment (EVSE). Additionally, 'charging station' refers to an overall site which might have one or many EVSE, similar to a gasoline station which is an overall site for fueling that contains one or more pumps. EVSE ports have colloquially become known synonymously as the 'chargers', therefore, this document uses this wording to avoid any confusion. Technically speaking, the actual charger is built-in on-board electric vehicles to convert AC power to DC power for storage in the EV's battery, the EVSE is the electrical supply that includes the plug to connect to the vehicle.

EXISTING CONDITIONS AND NEEDS

Based on data obtained from the State of California, in 2021, 5.5% of the 52,800 registered vehicles in the City of Encinitas were electric vehicles, battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs), of which two thirds were fully electric. Encinitas has a higher rate of EV adoption than neighboring jurisdictions like Carlsbad (5.1%), San Diego (3.1%), Vista (1.8%), and San Marcos (3.2%). Looking forward, the number of EVs in Encinitas is estimated to be up to 4,588 by in 2025 and as many as between 8,166 and 16,685 by 2030.

The City of Encinitas has 14 Level 2 and 15 Direct Current Fast Charge (DCFC) plugs located within its boundaries. In addition, there are a total of 168 Level 2 (J1772), 14 DCFC (CCS Combo plus CHAdeMO), 29 Tesla Destination, and 65 Tesla Supercharger plugs, all located within 5 miles of Encinitas in adjacent jurisdictions of Carlsbad, Del Mar, San Marcos, San Diego, Solana Beach, Rancho Santa Fe and Vista. The majority of existing public EV chargers are located along the main travel corridors such as I-5 where they are primarily clustered in commercial areas near the I-5 interchanges as well as the El Camino Real and the Highway 101 corridor. The public DCFC plugs are generally located in publicly accessible parking lots close to retail and other amenities of potential interest to EV drivers.

The project Team leveraged National Renewable Energy Laboratory's (NREL) Electric Vehicle Infrastructure Projection Lite Tool (EVI-Pro Lite) tool to quantify recommended numbers of Level 2 and DCFC chargers for the City of Encinitas while also factoring in the City of Encinitas' higher level of EV adoption rates compared to the San Diego County average. To serve projected future growth in EV ownership, Encinitas should plan and prepare for up to 120 EV chargers accessible to the public by 2025 (90 Level 2 and 30 DCFC), and about 280 chargers by 2030 (238 Level 2 and 43 DCFC). To achieve these numbers, the City needs to take multiple actions and facilitate the

expansion of the local EV charging network. This Master Plan presents guidance on how to achieve these goals.

CHARGING INFRASTRUCTURE RECOMMENDATIONS

This plan contains detailed recommendations for proposed charger quantities for Level 2 and DC Fast Chargers including high power chargers[1] as well as proposed charging locations summarized in the table below.

TABLE 1. PROPOSED FUTURE EV CHARGERS BY FOCCUS AREA

AREA	2025		2030	
	Level 2	DCFC	Level 2	DCFC
ENCINITAS RANCH TOWN CENTER	8	3	21	4
DOWNTOWN ENCINITAS	26	6	44	6
NORTH COAST HWY 101	6	2	17	3
EL CAMINO PROMENADE & ENCINITAS VILLAGE	8	3	21	4
OLIVENHAIN	4	1	8	2
SOUTH COAST HWY 101	21	7	57	10
I-5/ENCINITAS BLVD & MOONLIGHT MARKETPLACE	9	3	23	4
OTHER AREAS (25% OF TOTAL)	22	7	59	11
TOTAL	**104**	**32**	**250**	**46**

In addition, the plan includes recommendations for charger selection, guidelines for charging infrastructure placement, and installation and analysis of typical project cost components. The following overarching or strategic charging recommendations apply to the City as a whole.

STRATEGIC RECOMMENDATIONS

1. The City should install or partner with others to install chargers at popular public destinations, especially parks, libraries, the community and senior center, beaches, schools and other institutions, over time concurrent with EV adoption to minimize the impacts of parking displacement.

2. EV charger types (Level 2, or low or high-power DC Fast Chargers) should be selected based on anticipated dwell times of EVs.

[1] High power chargers are DCFC with liquid cooled charger cables typically above 150kW.

3. Faster chargers such as mid to high output Level 2 and high-power DC Fast Chargers should be deployed when feasible in terms of electrical capacity and funding availability.

4. The City and its partners should provide for future expansion of additional chargers by sizing electrical infrastructure upgrades with capacity to double the number of chargers in the future to meet anticipated EV adoption.

5. The City should prioritize installation of public EV chargers to meet the needs of residents of multifamily housing and other EV drivers lacking access to home charging.

6. The City should encourage employers and commercial property owners and managers to provide EV chargers at worksites for commuters.

7. The City should encourage or partner with private commercial and multifamily property owners and other public agencies and institutions to provide equitable geographic distribution of EV chargers.

8. The City should prioritize the needs of disadvantaged populations by working with businesses that cater to lower income residents to install chargers for use by their patrons as well as supporting the transportation electrification needs of social service agencies and shared mobility providers.

9. The City should encourage and assist private property owners and managers to apply for grants and incentives offered by CEC, SDG&E, San Diego County Air Pollution Control District and other funding sources.

PROJECT IMPLEMENTATION AND POLICY IMPLICATIONS

This section of the plan summarizes different local, regional, state, and national policies and regulations related to EV charging infrastructure.

INTRODUCTION

The purpose of this master plan is to facilitate the transition to electrified transportation for the City of Encinitas' citizens, employees, and visitors by planning the deployment of public EV charging stations.

This plan has been developed consistent with the Encinitas Climate Action Plan which requires the City to "Complete and implement an Electric Vehicle Charging Station Master Plan to increase the use of Zero-Emission vehicles by the community". Strategy 4 *Clean and Efficient Transportation* of this plan, includes the following relevant goal: *Increase Use of Alternative Fuels (*Goal 4.3), to be tracked based on the following performance metrics:

- City Action CET-4: Install 65 residential EV charging stations by 2020 and 370 by 2030.

- City Action CET-5: Install 150 commercial EV charging stations by 2020: 150 and 490 stations by 2030.

In addition, the Climate Action Plan includes the following supporting measures:

  - *Expand and implement a Green Building Incentive Program to increase electric vehicle charging at home and businesses.*
  - *Complete and implement an Electric Vehicle Charging Station Master Plan to increase the use of Zero-Emission vehicles by the community.*
  - *Work with SDG&E to explore projects through their Power Your Drive Program.*
  - *Develop and implement EV charging plan for municipal facilities.*

Along with the plan document, the City's website hosts an interactive progress dashboard: https://www.encinitasenvironment.org/climate-action-plan

VISIONS, GOALS, AND OBJECTIVES

The main objectives of the EV Charging Station Master Plan include:

- Identification of existing electric vehicle charging stations within the City of Encinitas as well as within a short drive from the city;
- Provide a plan to install EV charging stations at nearly all City-owned worksites and public facilities, and;
- Provide recommendations that would generally support the residential transition from fossil fuel vehicles to clean transportation options, focused on EVs, in the City of Encinitas.

These goals and objectives have been achieved through a comprehensive planning process informed by an inclusive public involvement process and technical analysis.

EXISTING CONDITIONS AND NEEDS

This section is designed to provide an overview of the current status of electric vehicle adoption and installation of EV charging infrastructure in the City of Encinitas, and to assess potential future trends, suitable goals, and needs for EV charging.

EXISTING EV OWNERSHIP AND EV GROWTH GOALS AND SCENARIOS

EXISTING EV ADOPTION IN ENCINITAS

As can be seen in Table 2, as of end of 2021, there were nearly 52,800 light-duty vehicles registered in the City of Encinitas. Of these, about 2,900 (or 5.5%) were electric vehicles (BEVs and PHEVs), including nearly 2,000 fully electric vehicles (BEVs, 3.8% of all light-duty vehicles). Of the nearly 2,000 BEVs registered in the City of Encinitas, approximately 1,400 (70%) are Tesla vehicles (and thus use the Tesla connector), approximately 50 (3.5%) are Nissan or Mitsubishi vehicles (and thus use the CHAdeMO connector), and the remaining approximately 550 (27.5%) are other vehicles (and thus use the CCS Combo connector). The City outperforms the San Diego County and California-wide average of EV adoption rate, which are currently at 2.7% and 2.8%, respectively.

TABLE 2: NUMBER OF ELECTRIC VEHICLES IN ENCINITAS, SAN DIEGO COUNTY, AND CALIFORNIA

Location	BEVs	PHEVs	BEVs + PHEVs	All Light-Duty Vehicles	BEVs [% of all LD]	PHEVs [% of all LD]	BEVs + PHEVs [% of all LD]
Encinitas	1,990	920	2,910	52,766	3.8%	1.7%	5.5%
San Diego County	45,979	23,785	69,764	2,584,614	1.8%	0.9%	2.7%
California	522,445	305,315	827,760	29,942,517	1.7%	1.0%	2.8%

Source: Data is taken from [2], as of the end of 2021.

The number of electric vehicles registered in the City of Encinitas currently represent 4.2% of all EVs in San Diego County. In turn, light-duty vehicle registrations in Encinitas represent only 2.0% of all vehicle registrations in San Diego County. This implies a higher adoption rate of EVs, and BEVs in particular, in Encinitas to date, compared with other jurisdictions in the region.

FUTURE EV ADOPTION SCENARIOS

The State of California aims to achieve 5 million Zero Emission Vehicle (ZEV) registrations by 2030 [3], with an expected 1.5 million ZEVs by 2025 [4]. The State has further committed to build 250,000 EV charging stations by 2025, to support the charging needs of the rapidly growing number of electric vehicles. Compared to today's level of EV ownership, California could multiply its EV registrations nearly eight-fold by 2030 if the State achieved its EV adoption target. From 2025 to 2030, California would more than triple the number of electric vehicles on the road.

San Diego County expects an increase of EV adoption from today's level (about 69,700) to more than 110,000 by 2025 [4]. Using the expected relative growth of EV adoption statewide, one can extrapolate the likely number of EVs in San Diego County by 2030. Doing so, between 366,000 and 421,000 EVs are anticipated in San Diego County by 2030.[2]

The City's Climate Action Plan (CAP) [Reference 1] referenced above in the Introduction lays out ZEV supporting policies as a means to reducing greenhouse gas emissions. The City's CAP Goal 4.3, to "increase the use of alternative fuels", includes EV charging expansion but no specific

[2] The stated range is the result of extrapolating 2022 San Diego County EV numbers using the statewide expected EV adoption growth either between 2030 and 2022 or between 2030 and 2025.

numbers in terms of EV adoption. Therefore, plausible ranges of citywide EV adoption in 2025 and 2030 were extrapolated from San Diego County numbers. As previously noted, 4.2% of all EVs and 2.0% of all light-duty vehicles in the county are registered to owners from Encinitas. Assuming that over time Encinitas will roughly follow statewide and countywide trends in terms of vehicle electrification rates, the share of Encinitas-based EVs, out of all EVs in San Diego County, is expected to remain in the 2-4% range. Based on these projections, the number of EVs in Encinitas in 2025 is estimated to grow to 4,588. By 2030, there could be as many as 8,166 to 16,685 EVs registered in the City. Table 3 shows past and present EV adoption numbers as well as these projections for 2025 and 2030.

TABLE 3: PAST, PRESENT, AND PROJECTED FUTURE NUMBER OF EVS IN ENCINITAS, SAN DIEGO COUNTY, AND CALIFORNIA

Location	2013	2017	2021	2025	2030
Encinitas	197	1,192	2,910	4,588	8,166-16,685
San Diego County	4,448	23,347	69,764	110,000	400,000
California	52,427	322,762	827,760	1,500,000	5,000,000

Source: [5], DKS

In terms of the subsequent determination of charging requirements, the electric vehicle fleet composition (BEVs vs. PHEVs) is relevant. As of 2021, Encinitas has nearly twice as many BEVs compared to PHEVs (see Table 2), corresponding to a BEV share of all EVs of about 64% (California average: 59%). Since transportation electrification pursues the goal of eventually eliminating greenhouse gas (GHG) emissions from the transportation sector altogether, a steadily rising share over time of BEVs out of all EV sales is anticipated, translating into gradually increasing portion of BEVs on the road. Of all electric vehicle registrations in 2025 and 2030, 88% and 89% are projected to be BEV, respectively.[3] Based on these projections, the City of Encinitas should plan for up to 3,500 fully electric vehicles by 2025, and approximately 15,000 by 2030. Figure 1 depicts the trend of EV adoption growth in Encinitas from 2013 to 2030.

As a consequence of the rapidly rising number of electric vehicles in the City as well as in neighboring jurisdictions and the State of California in general, the corresponding charging demand is expected to spike. This Master Plan serves as guidance to accommodate and plan for this demand.

[3] These estimates are based on a 2021 study by the International Council on Clean Transportation (ICCT) in which the PHEV *share* of all EV sales is projected to be 10% in 2030. Because the *absolute* number of EV sales is expected to grow rapidly in the coming few years, the share of BEVs or PHEVs of all EVs on the road will quickly approach the share of BEVs or PHEVs of all EV sales in a given year.

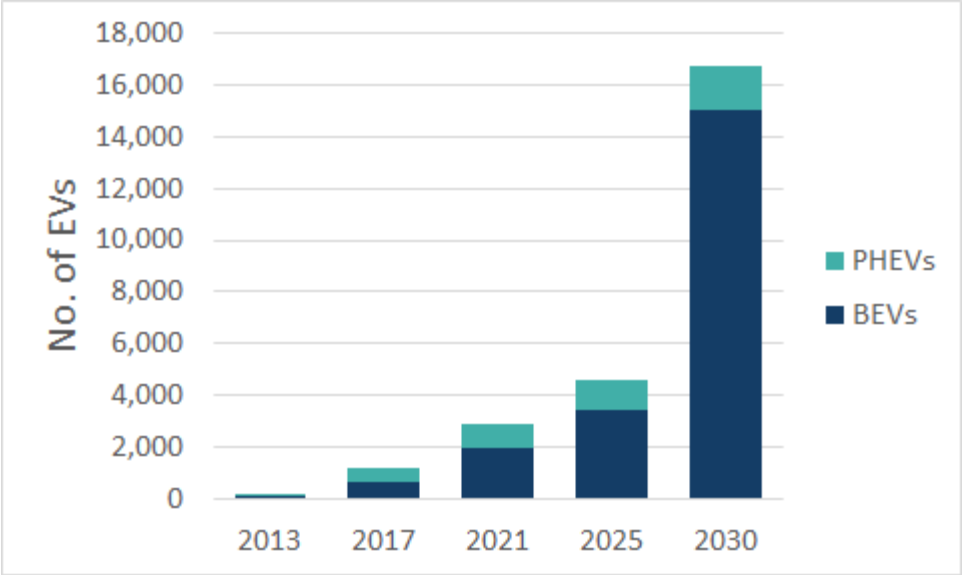


FIGURE 1: EV ADOPTION IN ENCINITAS[4].

This analysis intentionally does not aim to project EV adoption numbers further out than 2030. The rapidly growing electromobility market is still at an early stage. Dynamic factors such as changing regulations and incentives, public charger deployment, new EV models, and EV availability in the coming few years will highly impact overall EV adoption by 2030.

The EV industry is currently expanding at a rapid pace. Over the coming years this pace will be largely determined by technological developments, not just in EV battery and charging technology innovation, but also autonomous vehicle deployment. For example, in the near future, electric vehicles may feature far greater driving ranges or the ability to be charged while driving via dynamic inductive charging. In addition, within the next decade, autonomous connected vehicles could facilitate mobility as a service, meaning that the need for privately owned cars could decline significantly, especially in urban areas like Encinitas. This would impact the total number of light-duty vehicles on the roads as well as the demand for public chargers. With so many variables, it is impossible to accurately predict the rate of these changes, especially when trying to project beyond 2030.

[4] Numbers for 2025 and 2030 are estimates based on expected EV adoption in San Diego County for these years.

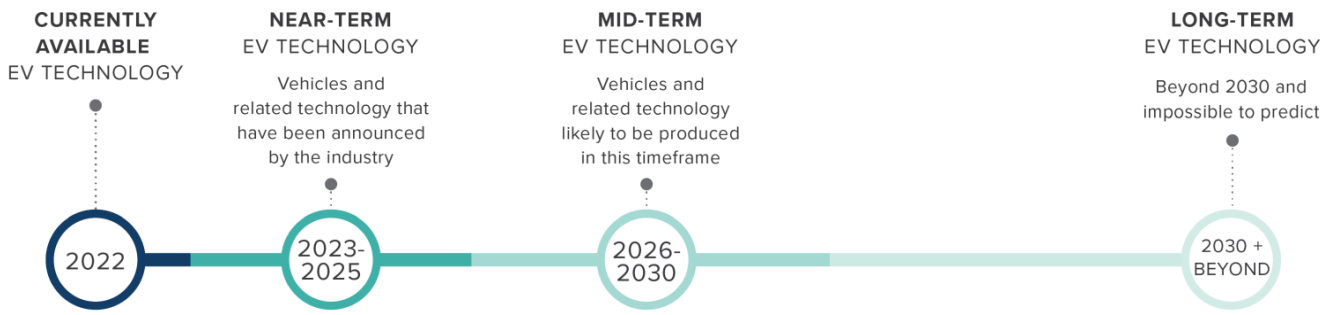


FIGURE 2. ANTICIPATED EV TECHNOLOGY PROGRESSION

Accordingly, future charging needs are projected only until 2030, including the number of recommended chargers for the City as a whole as well as by subarea. This 8-year planning timeframe creates the opportunity for the City to pursue the recommended goals set forth in this plan, with a healthy combination of urgency and reasonability.

EXISTING EV CHARGERS AND PROJECTED FUTURE CHARGING NEEDS

EXISTING EV CHARGING STATIONS IN AND AROUND ENCINITAS

This section summarizes EV charging infrastructure available for public EV charging installed within Encinitas and within close proximity (5 miles from the Encinitas city limits).

Table 4 and Figure 3 summarize the general locations of existing charger plugs in, and near, Encinitas. The table and figure show that the vast majority of publicly accessible chargers are located within easy driving distance of Encinitas but are outside of the City of Encinitas' boundaries in the adjacent jurisdictions of Carlsbad, Del Mar, San Marcos, San Diego, Solana Beach, Rancho Santa Fe and Vista. The City of Encinitas has 14 Level 2 and 15 DCFC plugs located within its boundaries.

TABLE 4: EXISTING STUDY AREA EV CHARGER PLUGS BY LOCATION AND TYPE

Location	Level 2 Plugs		DC Fast Charge (DCFC) Plugs			Total
	J1772	Tesla	CCS Combo	CHAdeMO	Tesla	
Encinitas	14	-	7	7	1	29
Carlsbad	82	11	5	4	44	146
San Diego	37	-	-	-	-	37
San Marcos	4	4	-	-	20	28
Del Mar	17	5	1	2	1	26
Solana Beach	21	4	-	-	-	25
Vista	6	-	1	1	-	8
Rancho Santa Fe	1	5	-	-	-	6
TOTAL	182	29	14	14	66	**305**
	211			**94**		

Sources: AFDC, PlugShare

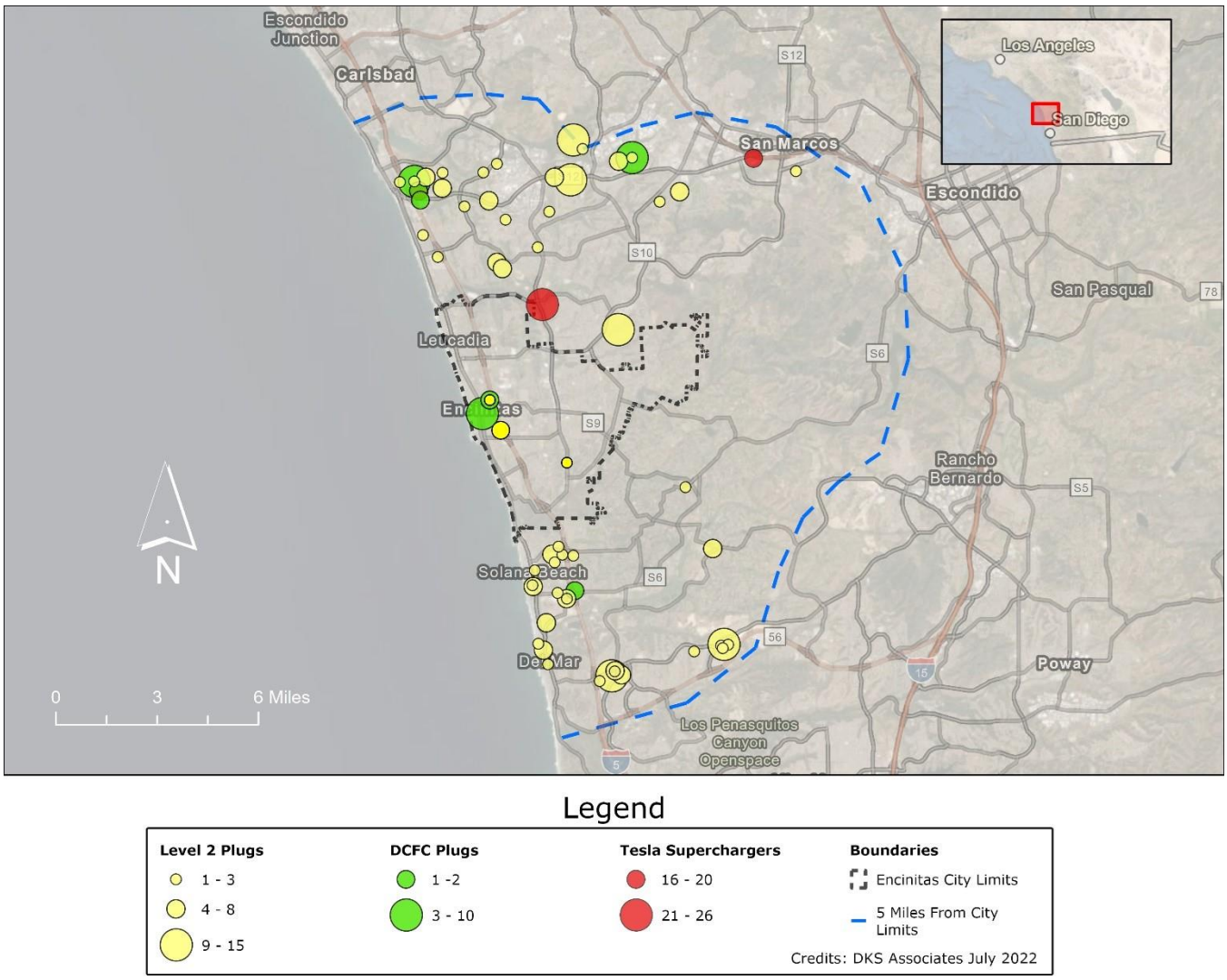


FIGURE 3: MAP OF EXISTING EV CHARGERS (PLUGS) BY TYPE AND QUANTITY

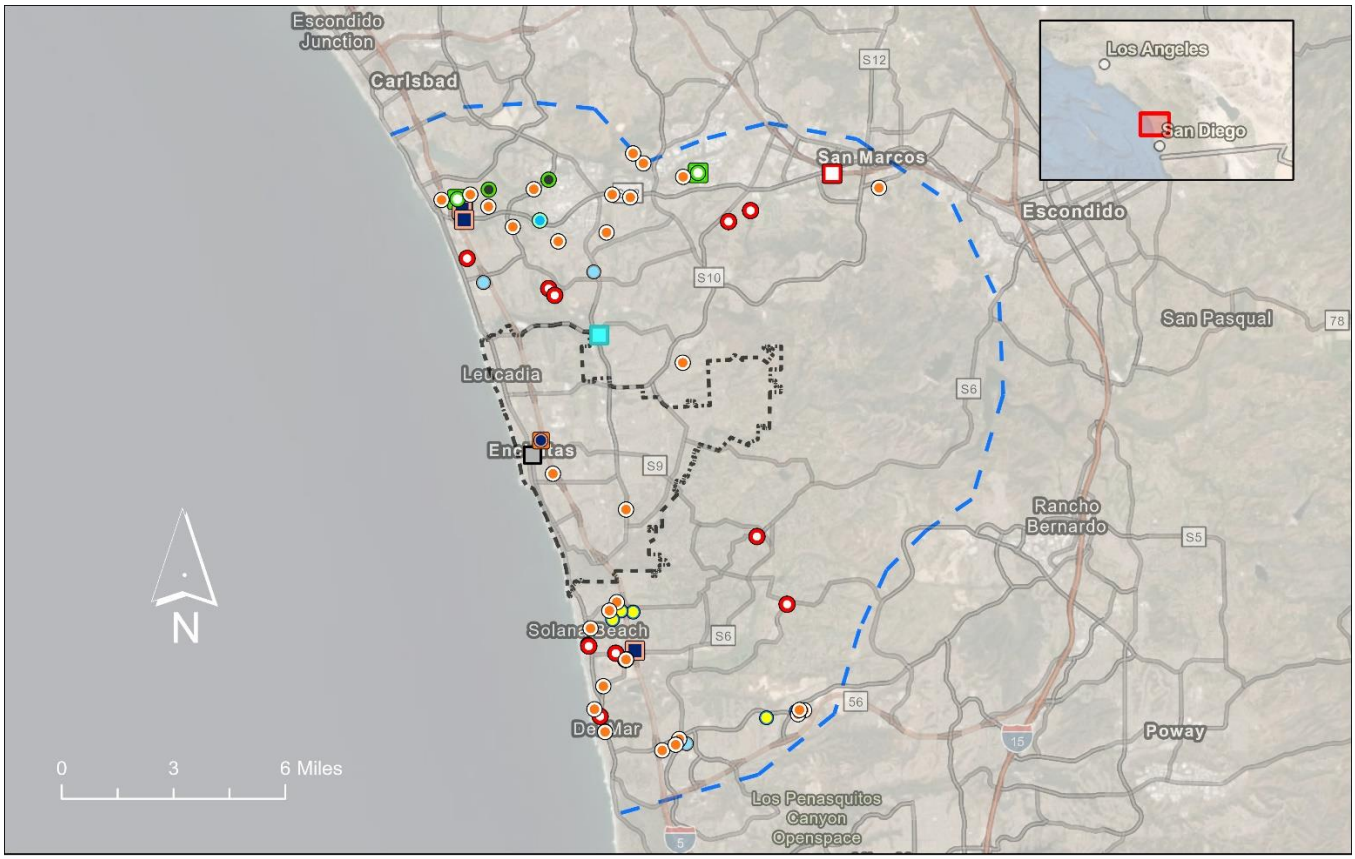
Table 5 and Figure 4 show the location and number of chargers by charging network or provider. The data shows that ChargePoint has the highest number of total chargers at 128. These are all Level 2 (J1772) chargers, there are no DCFC chargers installed by ChargePoint. There are 29 Tesla Destination chargers located primarily at hotels. It should be noted that these Tesla Destination chargers are not the more widely recognized DCFC 250kW Tesla Superchargers. Instead, these are slower Level 2 chargers predominantly located in hotels and higher end retail centers where vehicles can park for a number of hours and charge at a slower rate. EV Connect has four Level 2 J1772 chargers within the study area. Electrify America has chargers in two different locations consisting of two CHAdeMO and two J1772. In addition, there are four DCFC CCS Combo chargers, co-located with the Level 2 chargers. EVgo operates a total of 29 chargers in the study area including ten CCS Combo and twelve CHAdeMO DCFC plugs, as well as three J1772 Level 2 chargers. Blink Network has eight total chargers, all Level 2 J1772 in Carlsbad and Solana Beach. SemaCharge Network offers Level 2 J1772 chargers with twelve located in Solana Beach and San Diego. Lastly, Volta has eight Level 2 J1772 chargers in Carlsbad and San Diego.

Of the 211 Level 2 charging connectors located in the study area, 182 are the most common J1772 connector while 29 are Tesla Destination chargers. Of the 94 DC Fast Charge connectors, 14 are CHAdeMO connectors, 14 are CCS Combo connectors, and 66 are Tesla Supercharger (Tesla connectors).

TABLE 5: EXISTING STUDY AREA EV CHARGER PLUGS BY TYPE AND CHARGING NETWORK PROVIDER

Charge Network	Number of Locations	Level 2 Plugs		DC Fast Charge (DCFC) Plugs			Total
		J1772	Tesla	CCS Combo	CHAdeMO	Tesla	
ChargePoint Network	32	128	-	-	-	-	128
Tesla Supercharger	3	-	-	-	-	62	62
Tesla Destination	11	15	29	-	-	-	44
EVgo Network	5	3	-	10	12	4	29
SemaCharge Network	5	12	-	-	-	-	12
Electrify America	2	4	-	4	2	-	10
Blink Network	4	8	-	-	-	-	8
Volta	3	8	-	-	-	-	8
EV Connect	1	4	-	-	-	-	4
TOTAL STUDY AREA	**66**	182	29	14	14	66	**305**
		211			**94**		

Sources: AFDC, PlugShare



Legend

Level 2 Plugs by Charging Network in Encinitas
- eVgo Network
- ChargePoint Network

Level 2 Plugs by Charging Network within 5 Miles
- SemaCharge Network
- Volta
- Blink Network
- EV Connect
- Electrify America
- Tesla Destination
- ChargePoint Network

DCFC Plugs by Charging Network within 5 Miles
- Electrify America
- eVgo Network

DCFC Plugs by Charging Network in Encinitas
- Non-Networked
- eVgo Network

Boundaries
- Encinitas City Limits
- 5 Miles From City Limits

Credits: DKS Associates July 2022

FIGURE 4: MAP OF EXISTING EV CHARGERS BY NETWORK PROVIDER

The majority of existing public EV chargers, especially DC Fast chargers are located along the main travel corridors including I-5, El Camino Real and the Highway 101 corridor, primarily clustered in commercial areas near I-5 interchanges. These public DC Fast chargers 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 in and around Encinitas 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. Level 2 chargers within Encinitas are located at San Diego Botanic Garden, the City of Encinitas' Lot B (SW Corner Vulcan and E St.), Scripps Hospital Patient Garage, Lux Art Institute and San Elijo Water Reclamation Facility. Encinitas' highest concentration of public chargers is the lower lot of City Hall with 6 chargers followed by Lazy Acres which hosts 50kW chargers with CHAdeMO and CCS Combo plugs as well as a pair of Level 2 chargers all operated by the EVgo network and a and a 50kW Tesla charger.

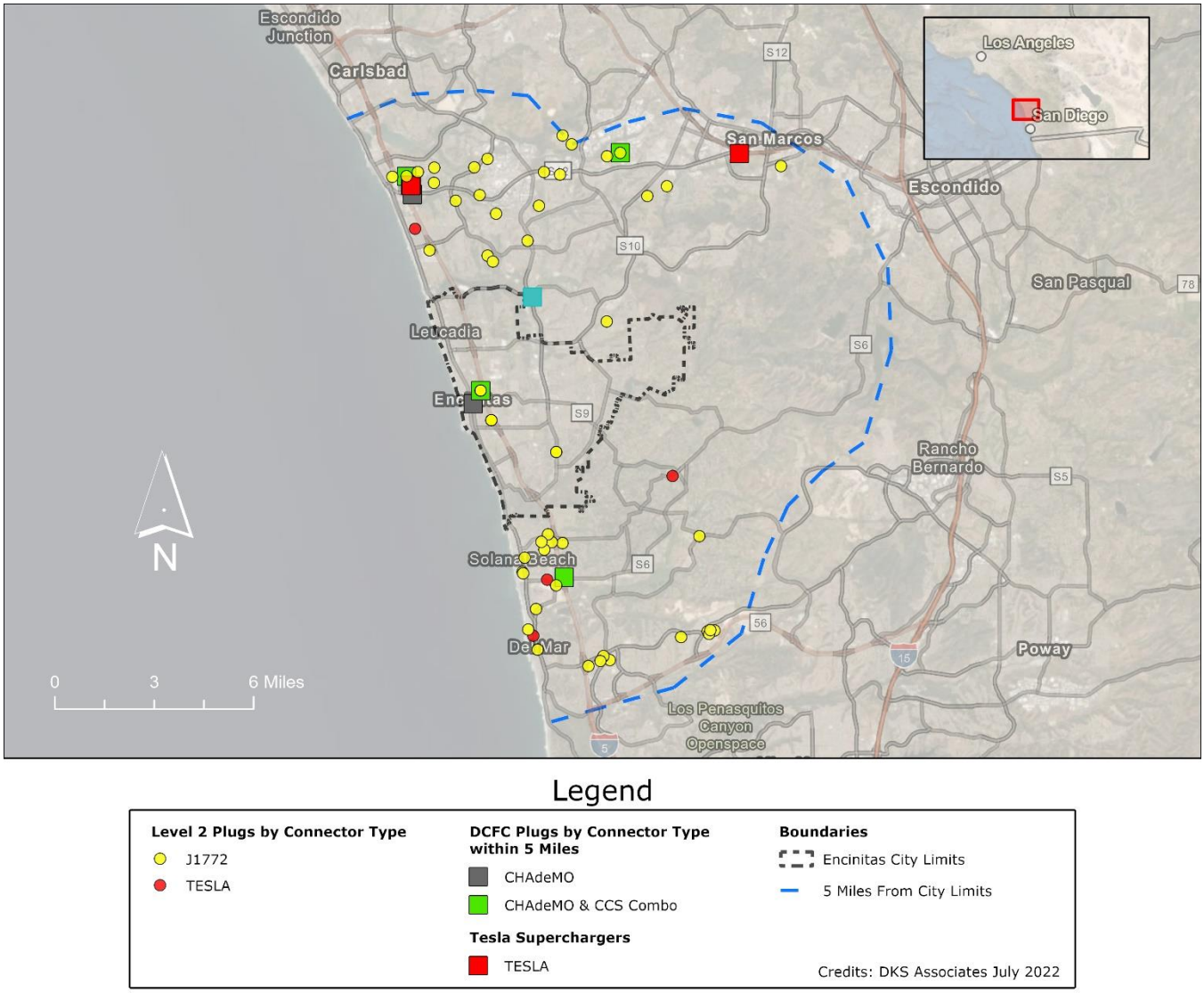


FIGURE 5: EV CHARGERS BY CONNECTOR TYPE

As Table 6 shows, within the City of Encinitas, there are currently 14 Level 2 charger plugs and 15 DCFC charger plugs available (data as of July 2022). The Level 2 chargers are geographically distributed across four locations, while DCFC chargers are only available at two different locations (the two city hall locations are adjacent to each other). To support and facilitate future EV adoption, more chargers will be needed. It should be noted that one of the chargers (the Blink Network Level 2 Charger at 600 South Vulcan Avenue) is currently non-operational and there are currently no plans to repair it.

TABLE 6: EXISTING EV CHARGER PLUGS IN ENCINITAS BY LOCATION AND TYPE

Location	Address	EV Network	Level 2 Plugs	DC Fast Charge (DCFC) Plugs		
			J1772	Tesla	CHAdeMO	CCS
Lazy Acres	150 Encinitas Blvd	EVgo	3 (7.2kW each)	1	1	1
				(50 kW, one at a time)		
City of Encinitas	561 S. Vulcan Ave	EVgo		-	6	6
				(50 kW, six at a time)		
	600 S. Vulcan Ave	Blink	1 (non-functional)	-	-	-
Lux Art Institute	1578 El Camino Real	Charge Point	2 (6.48 kW)	-	-	-
Scripps Health	310 Santa Fe Dr	Charge Point	2 (6.6 kW)	-	-	-
San Elijo Water Reclamation	2695 Manchester Ave	Charge Point	6 (6.48 kW)	-	-	-
TOTAL			**14**	1	7	7
					15	

Sources: AFDC, PlugShare

POTENTIAL FUTURE CHARGING NEEDS

The Project Team leveraged NREL's EVI-Pro Lite tool [6] to quantify recommended numbers of Level 2 and DCFC chargers for the City of Encinitas at a high level. Since EVI-Pro Lite allows for modeling only in a certain number of cities and areas (and Encinitas is not included), results were scaled down from results found for the entire San Diego area to the City of Encinitas. For this, current levels of light-duty vehicles in San Diego County were used (about 2,584,000 vehicles, according to the California Open Data Portal data.ca.gov, based on the dataset "Vehicle Fuel Type Count by Zip Code", which provides data as of the end of 2021, see [2]) and scaled resulting charger counts down to Encinitas' light-duty vehicle ownership numbers (currently about 52,700).[5] In doing so, the Project Team respected the higher market penetration of EVs found for the City of Encinitas (5.5%) compared to the San Diego County average (2.7%). The Project Team assumed the expected numbers of EVs in San Diego County for 2025 and 2030, as presented in Table 3.

[5] To yield these numbers, the "Vehicle Fuel Type Count by Zip Code" was filtered by the list of ZIP codes in the City of Encinitas (92007, 92024) and San Diego County (192 different ZIP codes).

Further assumptions include:

- 60% of EV drivers in Encinitas have access to at-home charging[6]
- In 2025, 88% of registered EVs will be fully electric. By 2030, this percentage will be 89%.
- For plug-in hybrid EVs, we target full support, meaning that PHEVs would not need to use gasoline on a typical day.

The resulting numbers of required EV chargers in Encinitas by 2025 and 2030 are listed in Table 7.[7] They are grouped by Level 2 chargers at workplaces and in the public as well as DC Fast Chargers in the public. The City of Encinitas should plan and prepare for up to 120 EV chargers accessible to the public by 2025 (90 Level 2 and 30 DCFC), and about 280 chargers by 2030 (238 Level 2 and 43 DCFC). To achieve these numbers, the City needs to take multiple actions and facilitate the expansion of the local EV charging network. This Master Plan presents guidance on how to achieve these goals.

TABLE 7: NUMBER OF REQUIRED EV CHARGERS IN ENCINITAS BY 2025 AND 2030

Year	Workplace L2	Public L2	Public DCFC
2025	140	90	30
2030	420	238	43

Source: DKS, with use of NREL EVI-Pro Lite tool

In many cases, workplace chargers (at least for private sector employers) will not be accessible to the public; thus, the City should promote both public charging and workplace charging. Workplace charging can be encouraged by working with employers and owners of existing commercial properties and mandating installation of workplace chargers through the City's Building Code. Recommended numbers of workplace chargers are included in this report to provide context on additional charging needs which along with residential charging, are Climate Action Plan performance metrics.

It is important to note that the numbers of chargers are only estimates and actual charging needs could be different under different EV adoption scenarios. Moreover, the exact number needed to support a certain number of EVs will depend on the exact fleet composition (PHEVs vs. BEVs and their respective battery ranges and charge ports), maximum EV charging power acceptance rate, and the rate of installation of residential chargers (and their use rate). In addition, the mix of EVs should be considered as Nissan, Tesla and other EVs use different charger plugs. A contingency factor of +/- 20% applied to the presented numbers of public EV chargers would result in ranges of 96-144 public chargers by 2025 (including 72-108 Level 2 and 24-36 DCFC chargers), and 225-337 public chargers by 2030 (including 190-285 Level 2 and 35-52 DCFC chargers).

[6] This assumption is based on the relatively high share of single-family homes in Encinitas (~60-70%) as well as supporting policies that would facilitate at-home charger installations.

[7] Numbers are rounded for simplicity.

CHARGING INFRASTRUCTURE GAP ANALYSIS

OVERVIEW

As the previous section on existing electric vehicle chargers in Encinitas and the surrounding areas highlighted, a substantial gap exists between the current numbers of EV chargers and future needs, due to the acceleration in EV adoption expected over the coming years.

In addition, there is a gap between the current quantity of EV chargers and their geographic distribution and current community needs and desires. This was confirmed throughout the public engagement process of this project, specifically in the input received in the Social Pinpoint portal, which is accessible at this web link: https://dks.mysocialpinpoint.com/encinitas-ev-plan#/.

This section demonstrates the overall gaps between the existing and expected EV charging installations and addresses how gaps in charging needs will need to be closed over the years, as EV adoption significantly expands.

PUBLIC ENGAGEMENT: PROCESS, RESULTS, AND TAKEWAYS

This section presents the results of the public engagement process, which was based on a project web site, accessible at http://www.encinitasevplan.com/. The City advertised about the website, workshop, and comment opportunity via the City's weekly newsletter, social media, and relevant City-maintained notification lists. Notices were sent via email to those signed up for the following lists: Climate Action Plan, Environmental Commission, and Economic Development, as well as email contacts for registered businesses in the City. In total,2,228 people were notified via email about the workshop.

On March 14, 2022, City and consultant staff hosted an informational booth at the Leucadia Farmer's Market to directly engage with local citizens. A printed map of Encinitas was available at the booth for people to mark where they would like to see EV charging stations. Several farmer's market attendees stopped by the booth and a total of 52 suggested EV charging station locations were noted on the map. These locations were subsequently added to the recommended charging locations in the master plan.

On June 14, 2022, the public had the opportunity to take part in a public workshop for the Encinitas Electric Vehicle Charging Master Plan to learn about the different ongoing planning efforts and the different considerations going into the development of this Master Plan. The community was also informed about the public engagement opportunity through the Social Pinpoint website portal.

During the public engagement process, respondents were able to drop pins on the online map to suggest the installation of public charging stations (grouped by charging type, including Level 2, DC fast chargers, and high-power chargers). The DC chargers were broken up into DC fast chargers and high-power chargers, solely for respondents to differentiate whether the need for very high-speed charging (e.g., 150 kW and above) is desired, or whether other DC fast chargers (< 150 kW) would suffice. Respondents were also able to mark points on the map that they "like", which could

apply, for instance, to existing EV charging stations. Project and other suggestions were additional ways for respondents to communicate their preferences and interests with respect to the expansion of the local charging infrastructure.

The portal was open for public input, suggestions, and comments from June 14 until July 15, 2022. During this period, a total of 131 responses were received. Figure 6 is a map of Encinitas as available for community members on the Social Pinpoint portal during the public engagement period. The map displays Encinitas' city limits (solid black line), as well as the spatial extent of commercial properties (red areas), public land (orange lines), and multi-family residents (pink areas). It also shows the location of current EV charging stations, including Level 2 chargers (yellow bolts), DC fast chargers (green bolts), and Tesla Superchargers (red Ts) in and around the city. The map also shows designated areas of interest (dashed black lines), serving as focus areas for planning future EV charger siting. These areas cover the main commercial areas with convenient services and attractions, including:

- Encinitas Ranch Town Center
- Downtown Encinitas
- North Coast Hwy 101
- El Camino Promenade & Encinitas Village
- Olivenhain
- South Coast Hwy 101
- I-5/Encinitas Blvd & Moonlight Marketplace

As shown in the figure, the map of Encinitas is populated very well with charging station location suggestions. The suggestions occur across the majority of the city, though some parts have received few or no suggestions, especially including the southern parts of S El Camino Real as well as Olivenhain and the eastern residential parts of the city.

The most common words in the provided comments include: *chargers, charging, shopping, parking, power, beach, parks, public, needs, campus, destination, center, restaurants*. They give some flavor of the respondents' preferences, which are presented in more detail below.

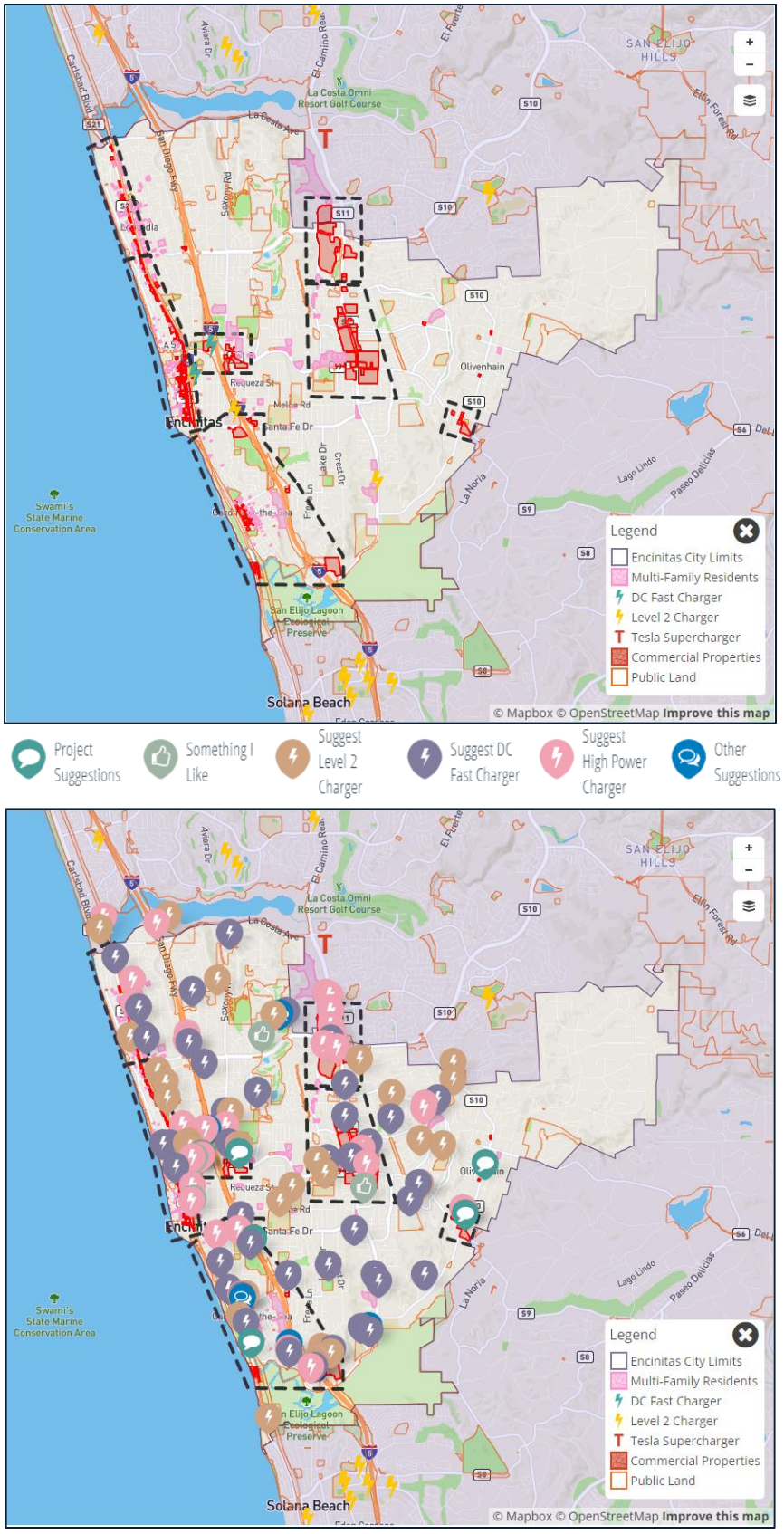


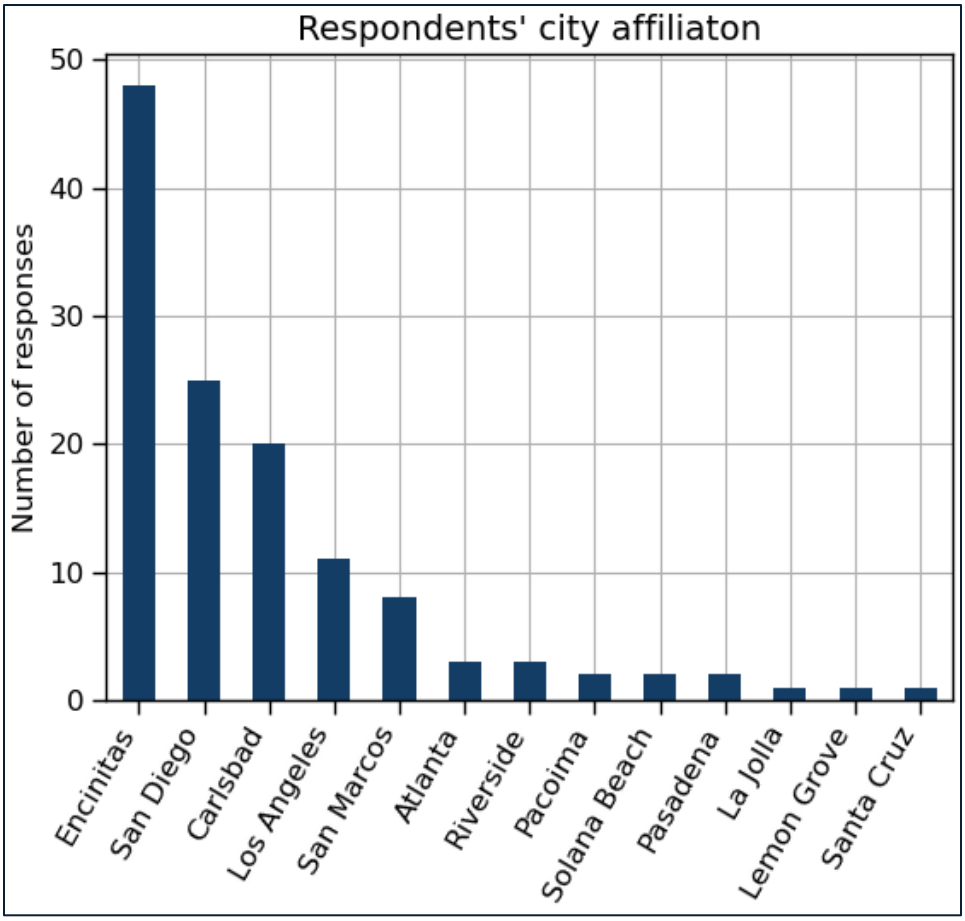
FIGURE 6: MAP OF ENCINITAS BEFORE (TOP) AND AFTER (BOTTOM) COMMUNITY INPUT

Figure 7 shows a high-level overview of the Social Pinpoint public engagement results. 48 of all responses (37%) were from residents of Encinitas. Many other responses were received from residents of San Diego, Carlsbad, Los Angeles, and San Marcos. This indicates: (1) a relatively large interest by residents of adjacent cities (such as Carlsbad and San Marcos) to ensure the provision of sufficient reliable charging infrastructure in Encinitas and (2) a relatively large interest by residents from large cities along the I-5 to ensure corridor charging for long-distance trips, such as between San Diego and Los Angeles.

Of the responses to which the respondent also provided their name, on average, each respondent submitted 2.9 responses. There were 99 named responses overall from 34 different respondents. Another 32 responses did not include the respondent's name. Notably, the responses' overall sentiment was very positive, with about 89% of the comments being positive or neutral or mixed, and only about 11% of all responses containing negatively-connotated language, as shown in Figure 7. This confirms the overall positive attitude of residents of Encinitas and neighboring jurisdictions towards EV infrastructure. However, we can also not exclude a selection bias towards relatively many EV enthusiasts providing comments.

In Figure 8, the number of proposed EV chargers is broken down into the different focus areas and by land use of the proposed location. Most charger sites were suggested in the South Coast Highway 101 area (27 sites), followed by Downtown Encinitas (15), I-5/Encinitas Blvd & Moonlight Marketplace (11), and Encinitas Ranch Town Center and El Camino Promenade & Encinitas Village (10 each). In total, there are 114 different charger sites proposed by the community across the City, out of which 85 lie in the designated focus areas (dashed black lines).

With respect to the current land use of the charging station locations suggested by the community, public land was the most common land use (57% of all sites proposed on either public land, commercial property, or multi-family residences). Commercial property was the second most common land use in the suggested sites. Multi-family residences were only subject to charger site suggestions in four (4) cases. Since residents of multi-unit dwellings (MUDs) were found to lack sufficient access to charging infrastructure (see e.g. [7]), this indicates that the City should try to engage multi-unit residents, developers and property managers better and be more proactive about educating on the benefits of EVs and their charging needs.



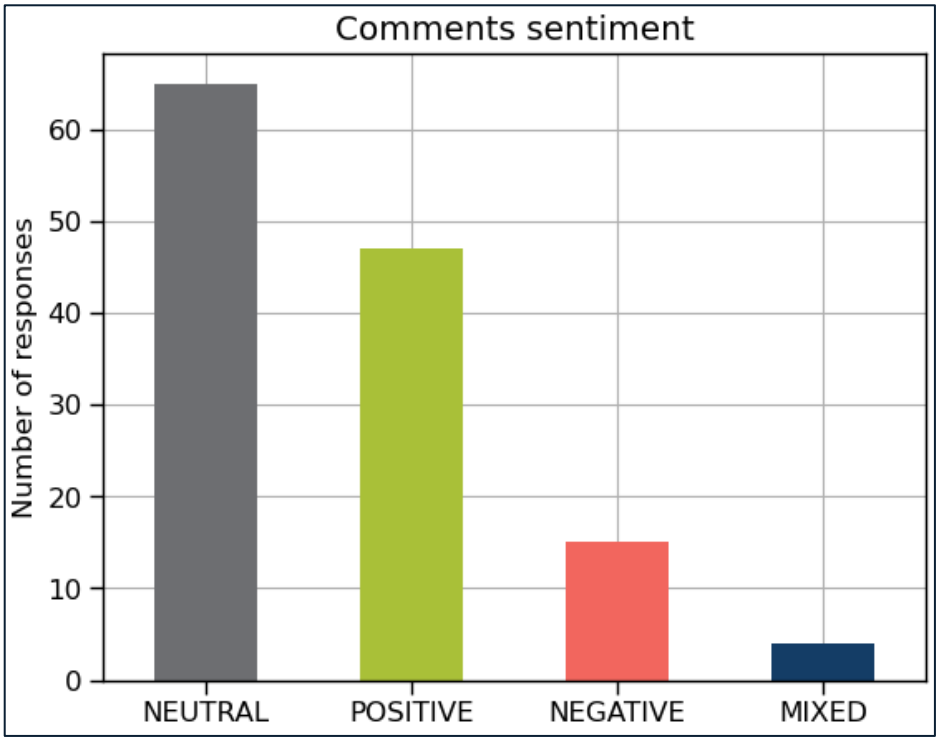


FIGURE 7: HIGH-LEVEL OVERVIEW OF PUBLIC ENGAGEMENT PROCESS

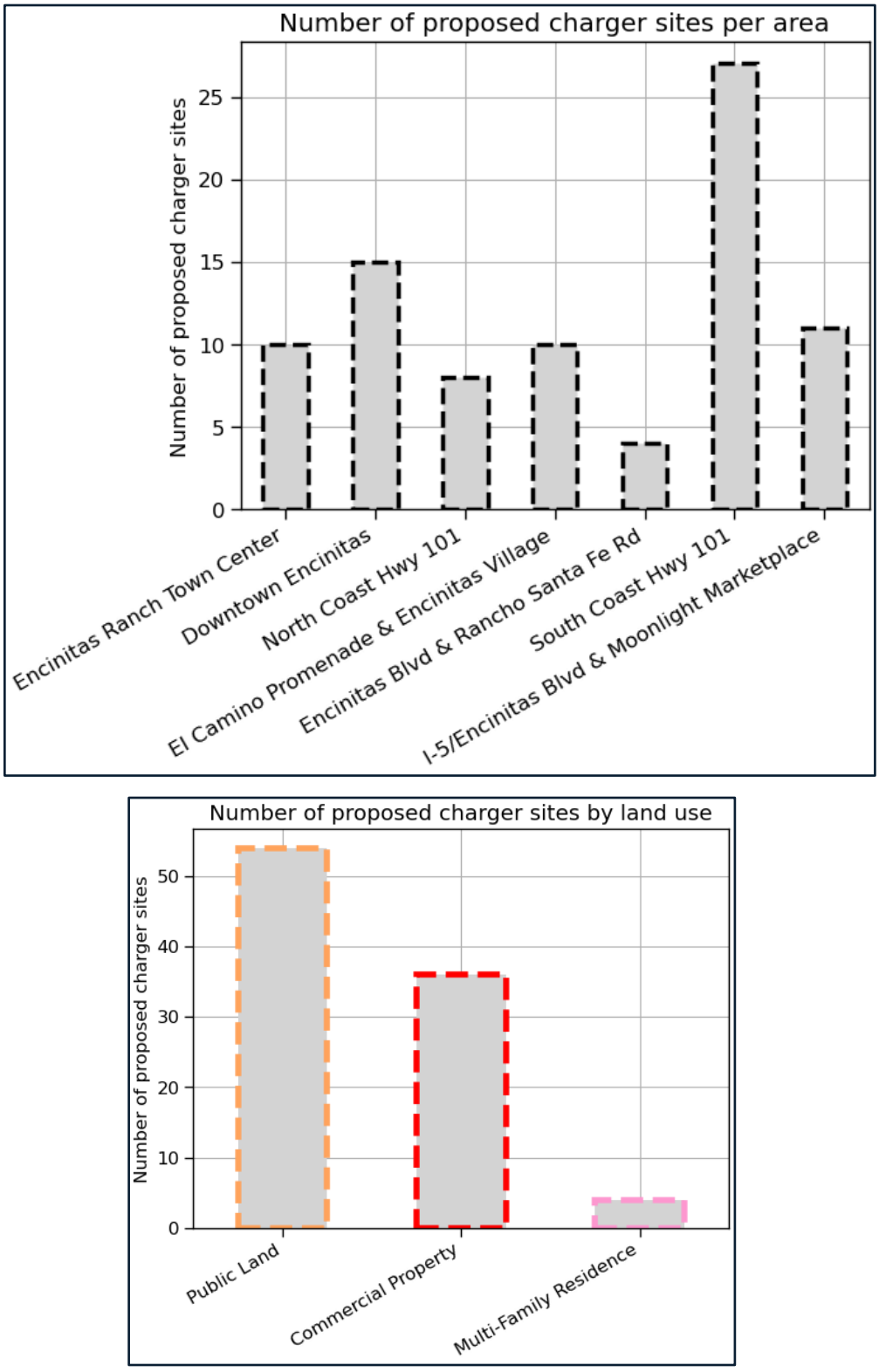


FIGURE 8: PUBLIC ENGAGEMENT RESULTS ON PROPOSED EV CHARGERS

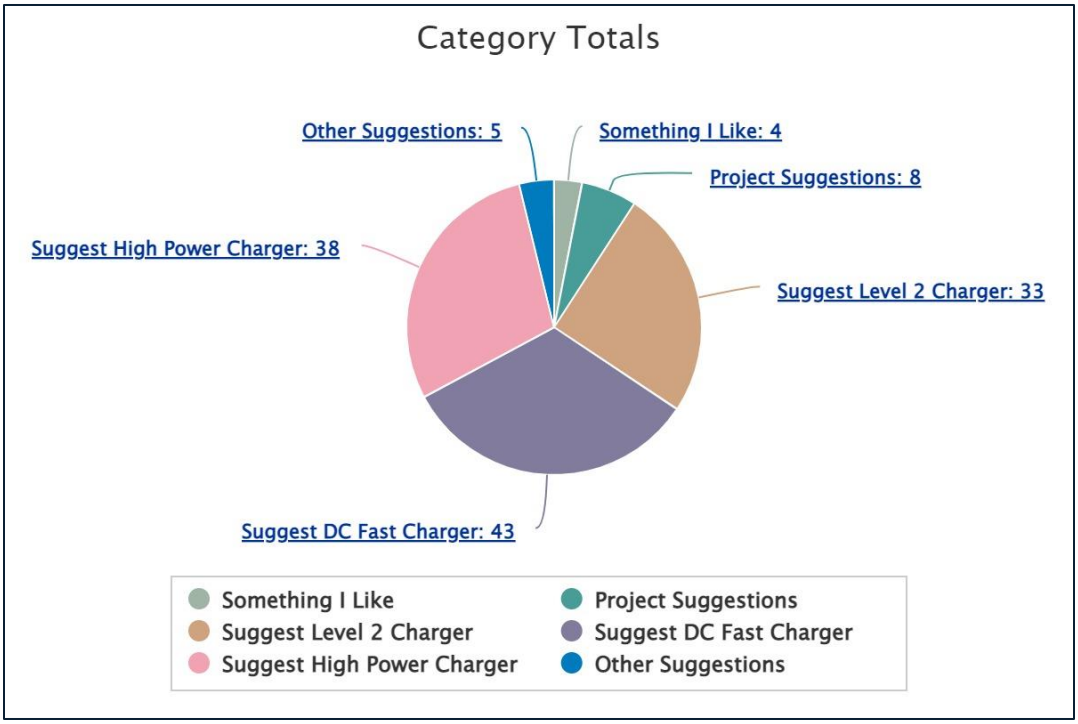


FIGURE 9: NUMBER OF PROPOSED EV CHARGERS BY TYPE

The community generally supports a balanced mix of charger types between Level 2 (33), DC fast chargers (43), and high-power chargers (38), as demonstrated in Figure 9. Comparing these numbers, however, with the recommended number of EV chargers for Encinitas in 2025 and 2030 (see Table 7), it appears that residents underestimate the need for and benefits of Level 2 chargers. Most respondents to the public engagement process suggested DCFC stations (with different power output), but only 43 public DCFC chargers will be required by 2030 compared to 238 Level 2 chargers (more than five times as many L2 compared to DCFC). Destination charging at locations like parks, beaches, and commercial areas and of course worksites with longer dwell times will remain important and the need for Level 2 chargers will continue to grow as EV adoption expands in the future.

In the free-text comments, the following were common keywords. We added recommendations and best practices underneath each set of keywords.

- "I-5"/"Hwy-101"/"freeway": provide fast chargers
  - Providing fast-charging along major intercity highways, including the I-5 and Highway 101, is very sensible. This supports long distance trips, such as when going from San Diego to Los Angeles.
- "Shopping"/"retail"/"restaurants": provide Level 2 + fast chargers
  - A mix of Level 2 and fast chargers is recommended for sites at which different dwell times are common.
- Parking (lots and on-street): Level 2 + fast
  - Depending on the type of parking lot, it makes sense to provide publicly accessible Level 2 and fast chargers. In a parking lot with quick turnover rates, fast chargers make more sense.

Public lots close to activities with longer dwell times, however, are best equipped with multiple Level 2 chargers. Examples include public parks, beaches, and the train station.

  - On-street parking is crucial to ensure charging access e.g., to MUDs. This can be ensured through dedicated programs run by the local utility or the City to allow for EV charging stations in the public right-of-way.

- "Beach": provide Level 2 chargers
  - Providing destination charging at beaches was suggested multiple times in the public comments. This is appropriate as people typically spend multiple hours at a beach and their parked vehicles can completely recharge their batteries cost-effectively if plugged in to a Level 2 charger while visiting the beach.
- "Train station", "library", "campus"
  - Respondents also called for charging stations near the train station, at public libraries, and near school campuses.
  - Chargers near the train station could serve EV drivers who leave the city for their daily trip to work by train. Low output Level 2 chargers with load management are best for such long parking times.
  - Public libraries are likely best served with mid-to-high output Level 2 chargers, due to relatively brief dwell times in the range of 30 minutes to a couple of hours.
  - Campus parking can be well served by Level 2 chargers when used by students, teachers, or other employees for parking. Ideally, managed chargers equipped with load management with variable charging speeds can serve different battery states of charge and differing vehicle dwell durations.
- "Solar-powered"
  - The community also brought up solar-powered chargers. Along with being environmentally sustainable, solar chargers can provide a grid-independent way to provide EV charging, including in areas lacking access to the power grid as well as resilience during power outages. Of course, the community may not be aware that solar charger models on the market are more costly than conventional grid-powered chargers.
- Concerns: "uptime"/"operability", "blocking by ICEVs and non-charging EVs"
  - Concerns were raised about the uptime and operability of existing EV chargers. Working with vendors and ensuring an uptime of charging stations as high as possible is desirable to continue winning public support for EVs and their required charging infrastructure.
  - In addition, some respondents expressed concerns about non-charging vehicles (including both conventional vehicles, or ICEVs, and EVs) blocking the parking spot for EV drivers arriving and wanting to charge their EV. Clear signage, as well as enforcement of potential fines through local parking enforcement officers can mitigate this issue over time.

The many charging sites proposed on public land are mostly around schools and parks. This includes the Encinitas Community Park, the Mira Costa Community College San Elijo Campus, multiple elementary, middle, and high schools, Ecke Park, and San Diego Botanic Garden. Typically, as described before, charging at such sites should mostly be accommodated by Level 2 chargers due to longer vehicle dwell times, comparably low installation costs and grid impacts.

GAP ANALYSIS RESULTS

Using NREL's EVI-Pro Lite tool and inputting current EV registration counts for San Diego County, after extrapolating the numbers of chargers down to the Encinitas EV ownership, about 18 DC fast chargers and about 116 Level 2 chargers are required to appropriately provide charging for Encinitas' current electric vehicle owners. Given that there are 15 DCFC plugs, but only 14 Level 2 plugs in the city today, we can conclude that there is not only a charging infrastructure gap that needs to be closed for the future, but that there is an immediate need for more public charging, especially Level 2 charging stations.

In addition, the public engagement process for this Master Plan has shown where community participants would like to see charging stations in the future. It is important to highlight that a geographic and socioeconomic balance needs to be ensured between areas of different needs and societal groups. Areas that did not receive much or any attention during the public engagement process will also need to provide appropriate charging infrastructure. The low number of suggestions in these areas may result from a lack of awareness regarding EVs and their benefits or simply result from the lack of suitable sites for public chargers.

EVs are still new to the market relative to internal combustion-powered vehicles and typically cost more to purchase than internal combustion-powered equivalents. Many drivers who can afford EVs can also afford to own single family homes. The preferred charging location for the majority of EV drivers is at home where EVs can charge while parked overnight. Not surprisingly, most EVs are driven by single family homeowners with access to private parking in a garage or driveway. Unfortunately, residents of multifamily housing including apartments and condominiums lacking private parking have not typically been able to charge at home since most multifamily housing lacks EV charging and retrofitting existing electrical systems is often prohibitively expensive, preventing installation of EV charging for many multifamily residents.

In the future, EVs are expected to become more affordable as production scales up and drives down production costs, battery technology improves, lower cost-EV models are introduced and availability of used EVs grows. As EVs become more available and affordable, demand for EVs by multifamily residents is expected to grow, but they will need alternatives to residential charging, primarily workplace and public charging. This Master Plan aims to recommend charging infrastructure to meet the needs of city residents and visitors including multifamily dwellers. Therefore, public charging will be needed in all parts of the city. Specifically, it is crucial to include neighborhoods and communities with commercial or recreational opportunities to complement charging as well as meet the needs of residents living in multi-family dwelling who may lack access to home or worksite charging.

CHARGING INFRASTRUCTURE RECOMMENDATIONS

CHARGING TYPES AND TECHNOLOGIES

This section describes different types of EV chargers currently available for public use.

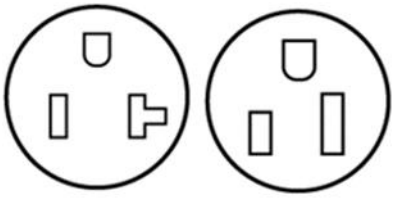


FIGURE 10: STANDARD 120 VOLT WALL OUTLETS USED FOR LEVEL 1 CHARGING

LEVEL 1 EVSE

Level 1 typically consists of standard wall outlets providing 110 Volts of alternating current (AC). Occasionally, Level 1 EVSE can include an actual charger enclosure and J1772 connector, but this type of installation is not very common. More common would be for an EV driver to use the charging cable that came with their vehicle to plug into a 110 outlet. Charging using a 110 outlet typically adds less than 5 miles of range to an EV per hour, thus resulting in a full charge taking a matter of days, not hours or minutes.

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 AC power to DC for storage in the EV's battery. In that sense, Level 2 EVSE is simply the electrical supply that powers an EV's on-board charger. In general terms, Level 2 EVSE supplies 220-240 Volts of alternating current (AC) and is usually capable of outputting 6-12 kW of power. Some Level 2 charging models can output up to 19.2 kW when supplied by a 100 A circuit. 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 12, there are two main connector types for Level 2 EVSE. The most typical connection is the J1772 connector, which is compatible with all recent and current plug-in vehicles (although Tesla vehicles need to use an adapter that is supplied with the car). The less typical, but often faster, connector is the Tesla connector. This connector is only compatible with Tesla vehicles, and there is currently no approved adapter to connect a Tesla charger to a non-

FIGURE 12: LEVEL 2 CHARGING CONNECTORS

FIGURE 11: EXISTING LEVEL 2 EVSE IN ENCINITAS

Tesla vehicle. 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.

Given that several hours (often between 4 and 12 hours) are required to fully re-charge a depleted EV battery, the two most common charging applications for Level 2 chargers are residential and workplace charging. Residential charging typically takes place overnight while the EV is parked at its driver's home. The residential charger either belongs to the homeowner or landlord. 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 energy cost in these applications.

Since charging at Level 2 chargers typically requires more than an hour to charge, EV drivers prefer to take advantage of public Level 2 chargers that are located where they will be parked for longer periods of time. This makes them appropriate for locations such as sports venues, parks, libraries, parks, hotels, restaurants, etc. This is why Level 2 chargers are commonly provided for public use operated by commercial charging networks at hotels, restaurants, and other local destinations typically as a customer amenity, providing low-cost or occasionally free charging for patrons (see Figure 11).

Many commercial 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.

FIGURE 13: DCFC CONNECTORS

DC FAST CHARGERS (DCFC)

As previously discussed, EVs have on-board chargers that are capable of slowly converting AC power to DC for storage. A faster way to charge an EV is directly though DC using powerful chargers sometimes referred to as Level 3 or simply DC Fast Chargers. These operate on 400+ volts and are capable of between 25- and 350-kW power output. These chargers can add anywhere between 60 miles and 500+ miles of range per hour of charge depending on the power supply, charger rating and EV's acceptance rate. It takes between 20 minutes to one hour to fully charge an EV using a DF Fast Charger, depending on how depleted the EV's battery is.

As illustrated by Figure 13, 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 DC Fast Charging connector is the CCS COMBO (or more commonly known as just "CCS") connector 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 during the past few years. (All newer EV models will use CCS chargers, so CHAdeMO is expected to be replaced by CCS going forward.) All other EVs moving forward will use either the CCS or Tesla connectors. CCS COMBO chargers range between 50 and 350 kW 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 these two DC Fast Charge connectors are not typically compatible with lower capacity plug-in hybrid (PHEV) vehicles and that not all BEVs are equipped with a fast-charging port.

FIGURE 14: DC FAST CHARGER AT LAZY ACRES, ENCINITAS

DC Fast Charging is the preferred charging technology for opportunity charging facilities serving travelers along freeway corridors and the general public needing a quick charge while performing short errands like shopping (as illustrated in Figure 14). On a per-unit basis, DC Fast Chargers are far more expensive to purchase and install than Level 2 chargers. Installations of DC Fast Chargers often require electrical service upgrades which can add to the cost. They are also more likely to incur demand charges from utilities and require more maintenance once installed. The higher capital and operations costs are passed onto users in terms of higher per-kWh charging costs in exchange for the convenience of much quicker charging speeds.

HIGH POWER CHARGERS

DC Fast Chargers above 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 chargers have charging speeds ranging from 150 – 350 kW, 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 operate at 150 kW. Since California's share from the NEVI Formula Program is estimated to be $384 million over the next 5 years[8] and significant additional discretionary Charging and Fueling Infrastructure (CFI) grant program funding will also be available, a major focus of this master plan should be

[8] https://www.energy.ca.gov/programs-and-topics/programs/national-electric-vehicle-infrastructure-program-nevi#:~:text=Caltrans%20and%20the%20CEC%20are,%24384%20million%20over%205%20years.

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 convenient to major transportation corridors.

TESLA DCFC/HIGH POWER CHARGERS

As with Level 2 chargers, Tesla has its own DCFC for exclusive use by Tesla EVs. These use the same Tesla connector as on its Level 2 chargers shown in Figures 11 and 13. Tesla DCFC include 72 kW "urban DC Fast chargers" as well as first- and second-generation high-power chargers branded as "Superchargers" that have charging speeds up to 150 kW and 250 kW respectively. The vast majority of Tesla Superchargers are located within urban areas or along major travel corridors, such as Interstates, US Highways, and State Routes.

Because Tesla plans, installs, and operates its own proprietary network of urban DC Fast chargers and Superchargers, the City should not need to include recommendations for either in this master plan. Nevertheless, the majority of EVs in Encinitas are currently Tesla models, thus there is a disproportionate need for Tesla chargers relative to CCS or CHAdeMO ports. Fortunately, Tesla adaptors are available for both CHAdeMO and CCS and J1772 charge ports. There are also after-market adaptors allowing other EV marques to charge on Tesla chargers though Tesla does not officially support them. The City should encourage Tesla to install more public charging stations in the City of Encinitas to accommodate the high proportion of Tesla owners.

CHARGER SELECTION

Charger typologies used in this Master Plan include:

- Mid-to-high-output Level 2 Chargers (9.6-19.2 kW)
- Mid-output DC Fast Chargers (50 kW)
- High-output DC Fast Chargers (150-350 kW)

The exact vendors and configurations are determined on a project-by-project basis. This master plan provides guidance on selection criteria and recommendations in Table 8 and the corresponding footnotes on the following pages.

TABLE 8: SUMMARY OF EV CHARGER SELECTION ATTRIBUTES

Attribute	Recommended Capability/Features
Usability	• Cable management capability with 25-foot cable length • Visible charging status lights
Ruggedness	• National Electrical Manufacturers Association (NEMA)-4 rated to operate outdoors and in extreme weather conditions • Minimum warranty of three years • Field-swappable modular components
Connectivity	• Ethernet • 3G/4G wireless communication • Global System for Mobile communication (GSM) • Wi-Fi • Bluetooth
Payment	• Payment collection options to include RFID or QR code, Credit/debit card tap or swipe, Apple Pay, Google Wallet, or with smartphone app. At a minimum payment option should include credit/debit card and RFID. • Compliance with electric metering requirements in the CCR 4002.11 Electrical Vehicle Fueling Systems
Efficiency	• Load management/power sharing capability • ENERGY STAR[9] rated

[9] EPA's ENERGY STAR certified EV chargers provide the same functionality as standard products but use 40% less energy in standby mode: https://www.energystar.gov/productfinder/product/certified-evse/results

Attribute	Recommended Capability/Features
Certification	• Certified by the Underwriters Laboratories, Inc.[10] (UL), ETL listed or an equivalent certification • Compliant with Society of Automotive Engineers (SAE) J1772 standard for charging plug connector and operational requirements[11] • Appropriate IEEE[12] & NEC[13] Ratings
Future Proofing	• Open Charge Point Protocol (OCPP)1.6 compliance and certification • Modular architecture and scalability • Demand Response capable • ISO 15118 Plug and Charge technology-ready • Bidirectional (V2G) charging[14] based on ISO/IEC 15118 standards and UL 1741-SA and UL 9741 Certification
Data Collection	• Capacity to accurately record and produce the number of unique charging events, average duration of each charging event, kilowatt hours delivered by each charger and downtime at each charger by month • Cloud based dashboard portal

CHARGING INFRASTRUCTURE PLACEMENT AND INSTALLATION GUIDELINES

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

[10] UL is an OSHA-accredited Nationally Recognized Testing Laboratory (NRTL) that tests products, including EV charging stations, to applicable UL standards for safety. UL has multiple EV safety standards including: 2202 – Electric Vehicle (EV) Charging System Equipment; 2594 – Electric Vehicle Supply Equipment (EVSE); 2251 – Plugs, Receptacles and Couplers for Electric Vehicles; 62 – Flexible Cords and Cables; 2231 - 1 & -2 - Personnel Protection for EVSEs and 9741 – Bidirectional EV Charging System Equipment: https://www.ul.com/resources/apps/product-iq

[11] Society of Automotive Engineers (SAE) J1772 covers the general physical, electrical, functional and performance requirements to facilitate conductive charging of EV/PHEV vehicles in North America. https://www.sae.org/standards/content/j1772_201710/

[12] IEEE 1547: Interconnecting Distributed Resources with Electric Power Systems and IEEE 1547.1: Conformance Test Procedures for Equipment Interconnecting Distributed Resources with Electric Power Systems. https://standards.ieee.org/standard/1547-2018.html

[13] Section 625 of The National Electrical Code regulates electrical conductors and equipment supporting EV charging. https://www.ecmweb.com/national-electrical-code/article/20899765/article-625-electric-vehicle-charging-systems

[14] https://www.charinev.org/news/news-detail-2018/news/the-five-levels-of-grid-integration-charin-ev-grid-integration-roadmap-published/

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.[15]

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.

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

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.

CHARGING INFRASTRUCTURE PURCHASE AND INSTALLATION COSTS

Each of these categories of project capital costs are explained and listed below.

Hard costs:

1. EV Chargers typically cost $8,000-$126,000 to purchase as explained below.
    - This includes:
        - Level 1 EV chargers (120V receptacles, no cost, if existing, otherwise costs depends 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 the cost estimate tool.
2. Materials/Equipment: ($10,000-$15,000 per charger without electrical or panel upgrade. $20,000-30,000 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
- Stepdown transformers
- Electrical service panels including sub panels
- Circuit breakers
- Signage
- Striping for parking stalls

3. Site restoration ($4,000-20,000 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:

4. Contracting/Design
    - Apply an estimated 20% mark-up to the total project costs to include:
        - Engineering design fees
        - Contractor profits
5. 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.
6. 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)
7. 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.

CHARGING INFRASTRUCTURE SITING CRITERIA AND RANKINGS

Installation of chargers requires a multi-step process summarized in Figure 15 below.

TABLE 9: MILESTONES TO INSTALLATION

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

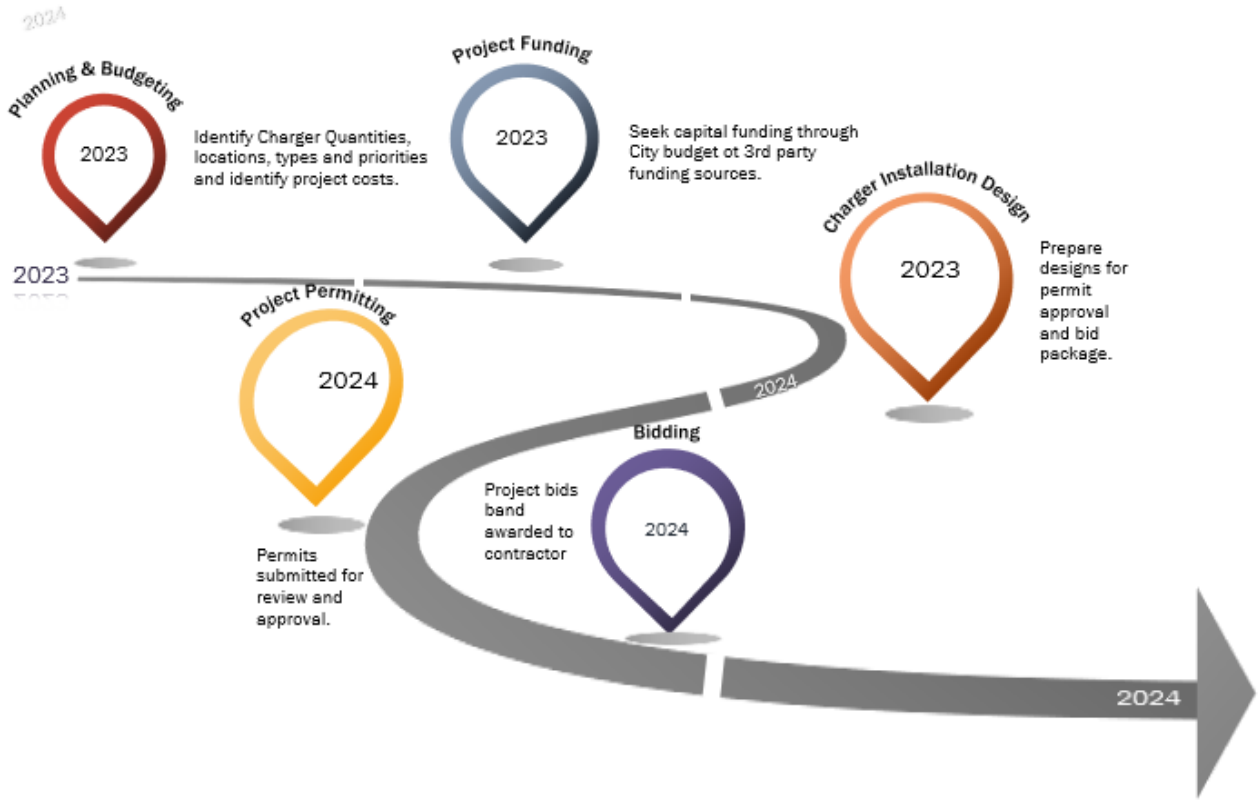


FIGURE 15: CONCEPTUAL CHARGER INSTALLATION PROCESS AND TIMEFRAME

CHARGING INFRASTRUCTURE SITING CRITERIA AND RANKINGS

The following siting criteria combined with community input collected through the project's Social Pinpoint site were used to identify appropriate locations throughout the city to install public EV chargers. Design criteria are also listed to optimize placement of chargers at each charging site.

TABLE 10: CHARGER SITING AND DESIGN CRITERIA

SITING CRITERIA	DESCRIPTION
PARKING SPACES AVAILABLE	• Has available parking spaces
SITE CONTROL	• Ownership of land by City of Encinitas or supportive agency/owner
AVAILABILITY	• Location is available for public charging 24/7 or nearly 24/7
SAFETY	• Personal safety for a person charging at night or in a remote area, traffic safety when entering and existing the parking lot
ACTIVITIES FOR DCFC	• Short dwell-time activities are close by (park, coffee shop, grocery store, bank)
ACTIVITIES FOR LEVEL 2 CHARGING	• Medium dwell-time activities are close by (health club, medical office, restaurant, recreation)
PUBLIC RESTROOM	• Facilities available to EV drivers
LOT CONFIGURATION	• Configuring parking lot for EVSE installation and van-accessible ADA parking space
EV READY	• Existing EV infrastructure
TRANSFORMER CAPACITY	• Sufficient available capacity on a 480V, three phase transformer
DISTANCE	• Distance from transformer to furthest proposed equipment
SURFACE	• Surface material b/w transformer and furthest proposed equipment

PROPOSED CHARGER TYPOLOGIES AND CHARGING SITES

The proposed number of EV chargers by charging level and area for the years 2025 and 2030 is summarized in Table 11. The underlying quantitative distribution is based on meeting 2025 and 2030 EV targets (See Table 7) as well as the number of proposed chargers sought by the public through the public outreach process combined with the project team's knowledge about the availability of parking spaces and other amenities suitable for installing publicly accessible EV charging stations listed in Table 10.

Each focus area is discussed in detail in subsequent sections.

TABLE 11: PROPOSED NUMBER OF EV CHARGERS FOR 2025 AND 2030 BY CHARGING LEVEL AND AREA

FOCUS AREA	2025		2030	
	Level 2	DCFC	Level 2	DCFC
ENCINITAS RANCH TOWN CENTER	8	3	21	4
DOWNTOWN ENCINITAS	26	6	44	6
NORTH COAST HWY 101	6	2	17	3
EL CAMINO PROMENADE & ENCINITAS VILLAGE	8	3	21	4
OLIVENHAIN	4	1	8	2
SOUTH COAST HWY 101	21	7	57	10
I-5/ENCINITAS BLVD & MOONLIGHT MARKETPLACE	9	3	23	4
OTHER AREAS (25% OF TOTAL)	22	7	59	11
TOTAL	**104**	**32**	**250**	**46**

ENCINITAS RANCH TOWN CENTER

The Encinitas Ranch Town Center is a large retail complex with ample surface parking projected to need 8 Level 2 and 3 DC fast chargers by 2025 and 21 Level 2 and 4 DC fast chargers by 2030. The large commercial parking lots at Encinitas Ranch Town Center as well as the parking area of Leo Mullen Sports Park would be appropriate sites. Shopping center merchants would benefit from additional customers shopping or dinning while their EVs charge in the parking lot. EV drivers would benefit by being able to conduct errands while their EVs charge. Figure 16 below shows specific charging locations recommended by the public. Although this is private property, the future building permits applications for the property could trigger the City's requirement to install charging stations. The City can also encourage property owners and managers to voluntarily install chargers. Encouragement could include assisting property owners with grant applications or incentive applications offered by CEC, SDG&E, San Diego County Air Pollution Control District or other funding sources.

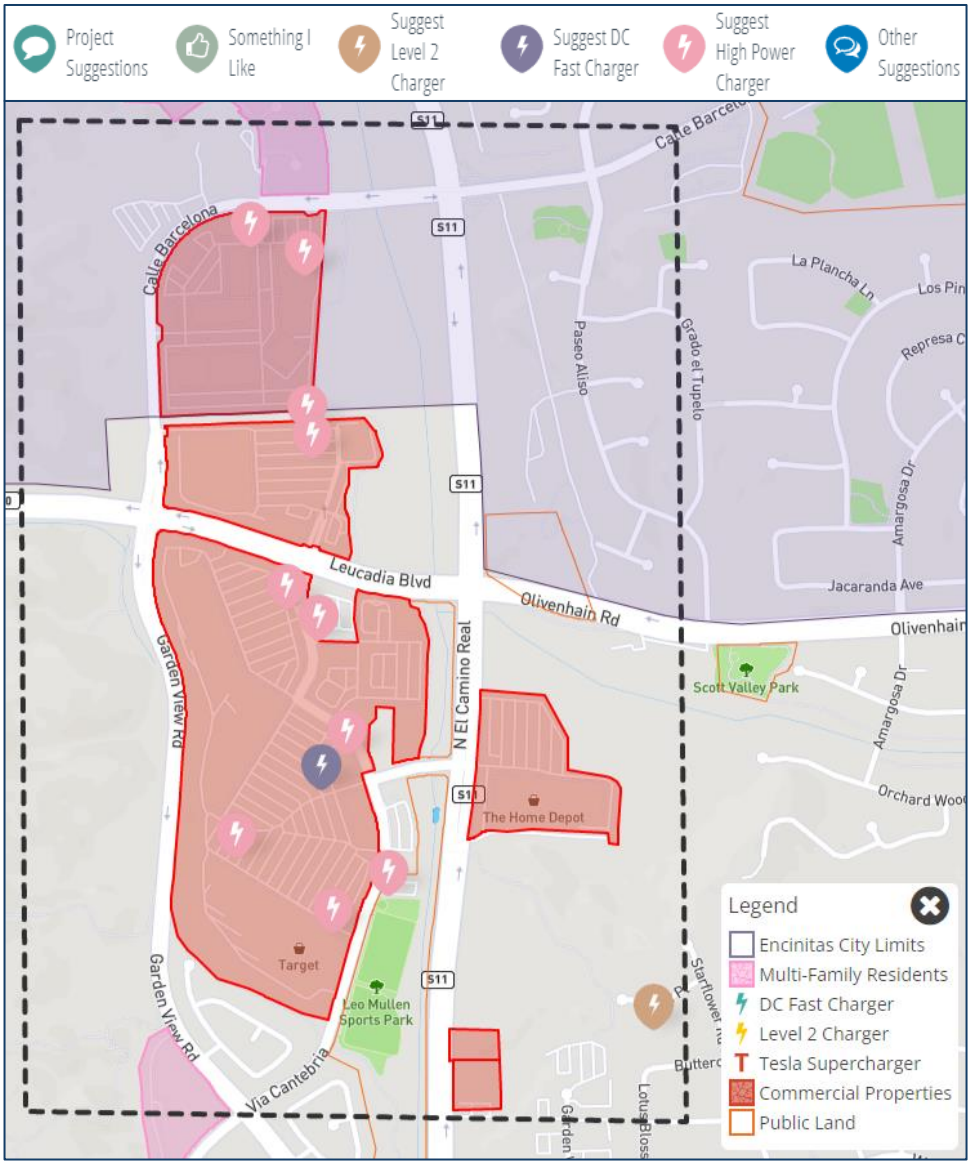


FIGURE 16: THE ENCINITAS RANCH TOWN CENTER FOCUS AREA - CHARGING LOCATIONS SUGGESTED BY THE PUBLIC

DOWNTOWN ENCINITAS

Downtown Encinitas is an area of mixed land uses including numerous multi-unit housing and commercial properties. Downtown is projected to need 12 Level 2 and 4 DC fast chargers by 2025 and 31 Level 2 and 6 DC fast chargers by 2030. Specific charging opportunities and recommendations are described below for portions of downtown Encinitas that are especially suitable for adding chargers. In addition to serving as a destination for commercial activity, beach access, and City Hall and Library access, Downtown Encinitas is also close to two major travel corridors, Coast Highway 101 and Interstate-5, therefore it would be appropriate for DC Fast Chargers, possibly including NEVI-funded high-power chargers. Appropriate locations for 4-6 NEVI-funded high-power chargers could include commercial parking lots, the Encinitas Transit Station or potentially on-street public parking.

- **Moonlight Beach** is a major regional public destination with a large parking lot that could accommodate multiple EV chargers. Due to the long dwell times of many beach goers, beaches like Moonlight Beach are especially appropriate for Level 2 chargers. 10 Level 2 chargers are currently proposed for installation here as part of the CALeVIP funding program. The City should monitor utilization rates for these chargers to determine if additional chargers should be added in the future.
- **City Hall** is the site of 16 recently installed (2022) chargers including 11 dual port Level 2 chargers on the upper lot plus 6 single port 50kW DC Fast Chargers on the lower lot. This site would be appropriate for additional chargers in the future if demand warrants.
- **The Encinitas Library** is a popular destination for City residents with 93 stalls of surface parking to the east of City Hall. As an important destination for both short and longer visits in a central location with excellent access and proximity to Interstate 5 and South Coast Highway 101, the library would be an excellent location for both level 2 and DC Fast Chargers.
- **Pacific View** is a former elementary school that will be redeveloped as a community public art facility. Once Pacific View is redeveloped, it will be a destination for community art classes, exhibitions, and events. It is also walking distance to the downtown commercial corridor. This site would be suitable for Level 2 chargers to be installed due to the longer dwell times expected. During redevelopment, the City should consider adding electrical capacity to support future EV chargers as this would be the most cost-effective time to install the infrastructure for future EV charging.
- **Encinitas Transit Station** is the main commuter rail terminal for San Diego-bound rail commuters comprised of 4 separate parking lots. The station also serves three local North County Transit District (NCTD) BREEZE bus routes. NCTD operates three of the parking lots and the City of Encinitas maintains Lot B which currently has 2 existing Level 2 chargers. These are older Blink charges which a are slated for upgrade. Due to the long dwell times of commuters who park for the duration of their workday, these parking lots would be appropriate for large numbers of load managed Level 2 charging.

As the highest density part of the city, downtown would be an excellent location for EV chargers to support multi-unit residents lacking charging in garages and driveways as well as customers of local businesses. The City should partner with commercial property owners, businesses, and developers to encourage charger installation on privately owned sites including commercial property and at multifamily housing. For example, the City could provide information on permitting and assist property owners in applying for grants and incentives offered by CEC, SDG&E, San Diego County Air Pollution Control District and other funding sources.

TABLE 12: CHARGING ALLOCATIONS FOR DOWNTOWN ENCINITAS

LOCATION	TYPE	2025 CHARGERS	2030 CHARGERS
MOONLIGHT BEACH	Beach parking lot	10 L2	10 L2
CITY HALL	City facility	10 L2 & 6 DCFC	10 L2 & 6 DCFC
PACIFIC VIEW	City facility (under redevelopment)	4 L2	4 L2
ENCINITAS TRANSIT STATION	Transit/rail station, commuter train	2 L2	20 L2
TOTAL		**26 L2 & 6 DCFC**	**44 L2 & 6 DCFC**

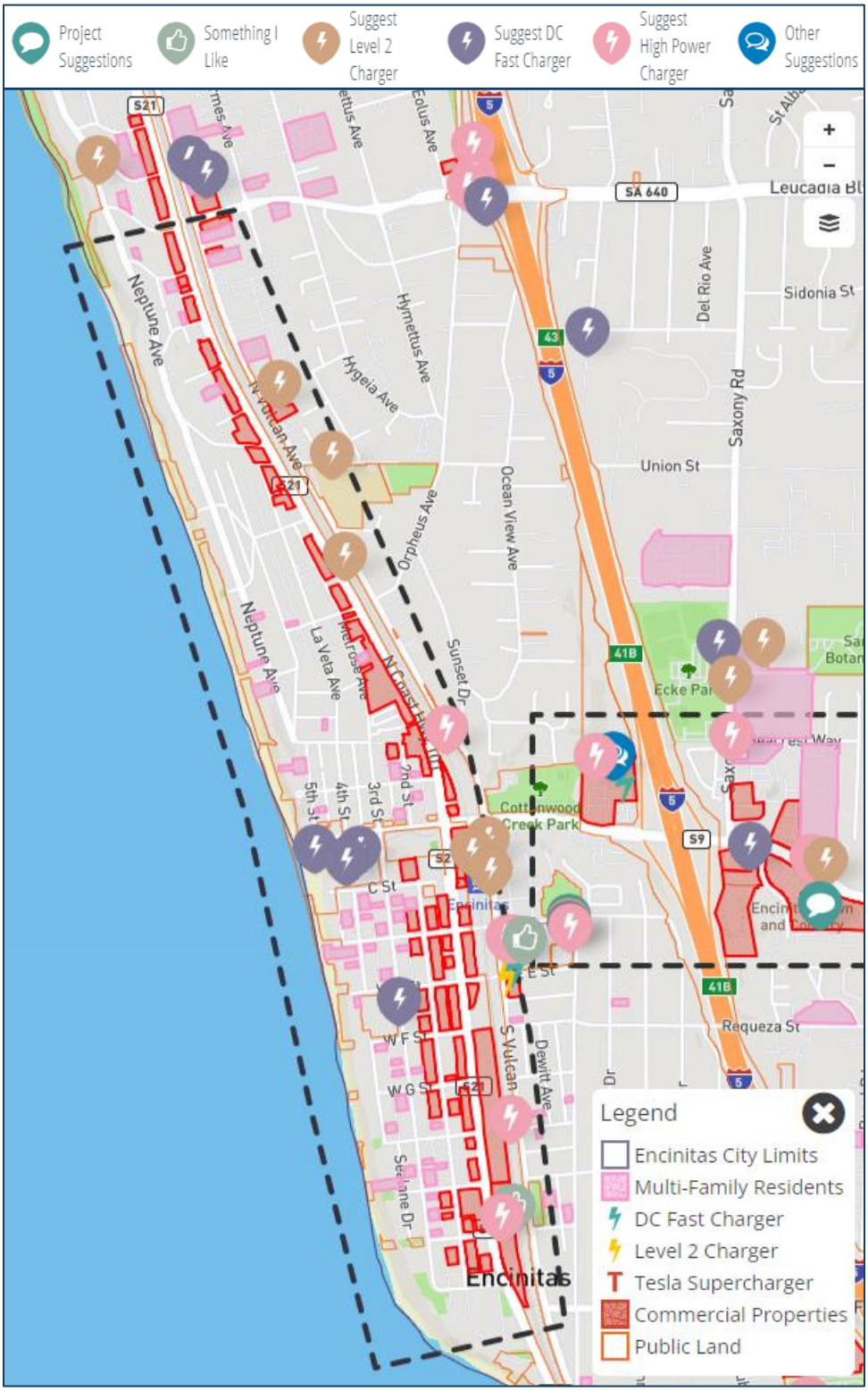


FIGURE 17: THE DOWNTOWN ENCINITAS FOCUS AREA - CHARGING LOCATIONS SUGGESTED BY THE PUBLIC

NORTH COAST HWY 101

Immediately north of downtown, the North Coast Highway 101 focus area has significant concentrations of multi-family housing units and scattered businesses. This corridor is projected to need 6 Level 2 and 2 DC fast chargers by 2025 and 17 Level 2 and 3 DC fast chargers by 2030. Specific charging opportunities and recommendations are described below for portions of this corridor especially suitable for adding EV chargers.

- **North Coast Highway 101 from La Costa to A street** Right of way upgrades are being implemented on 3-mile-long stretch of this corridor as part of the City's Leucadia Streetscape Project. This is a budget- and parking-constrained project in which planning and engineering deigns have been completed. The first phase of the project is complete and future phase of the project will be built over the next 1 to 5 years. Due to the concentration of multifamily housing, commercial properties, and on street parking, the majority of public EV chargers slated for this focus area should be installed along this corridor. As with downtown, the City should partner with commercial property owners, businesses, and developers to encourage charger installation on privately owned sites including commercial property and at multifamily housing.
- **Grandview Beach** has a small parking lot that would be an appropriate location for adding Level 2 chargers for beachgoers and residents of nearby apartment complexes lacking residential charging.
- **Beacon's Beach** The existing heavily used angle parking lot atop the bluff will be reconfigured, allowing opportunity for addition of L2 charging during project construction as well as on street that could also serve nearby multi-unit housing and mobile homes, serving residents lacking residential parking.

TABLE 13: CHARGING ALLOCATIONS FOR NORTH COAST HWY 101

LOCATION	TYPE	2025 CHARGERS	2030 CHARGERS
GRANDVIEW SURF BEACH	Beach parking lot	2	4
LEUCADIA STREETSCAPE (HWY 101)	Street parking	2 L2 & 2 DCFC	9 L2 & 1 DCFC
BEACON'S BEACH	Beach parking lot	2	4
TOTAL		**6 L2 & 2 DCFC**	**17 L2 & 3 DCFC**

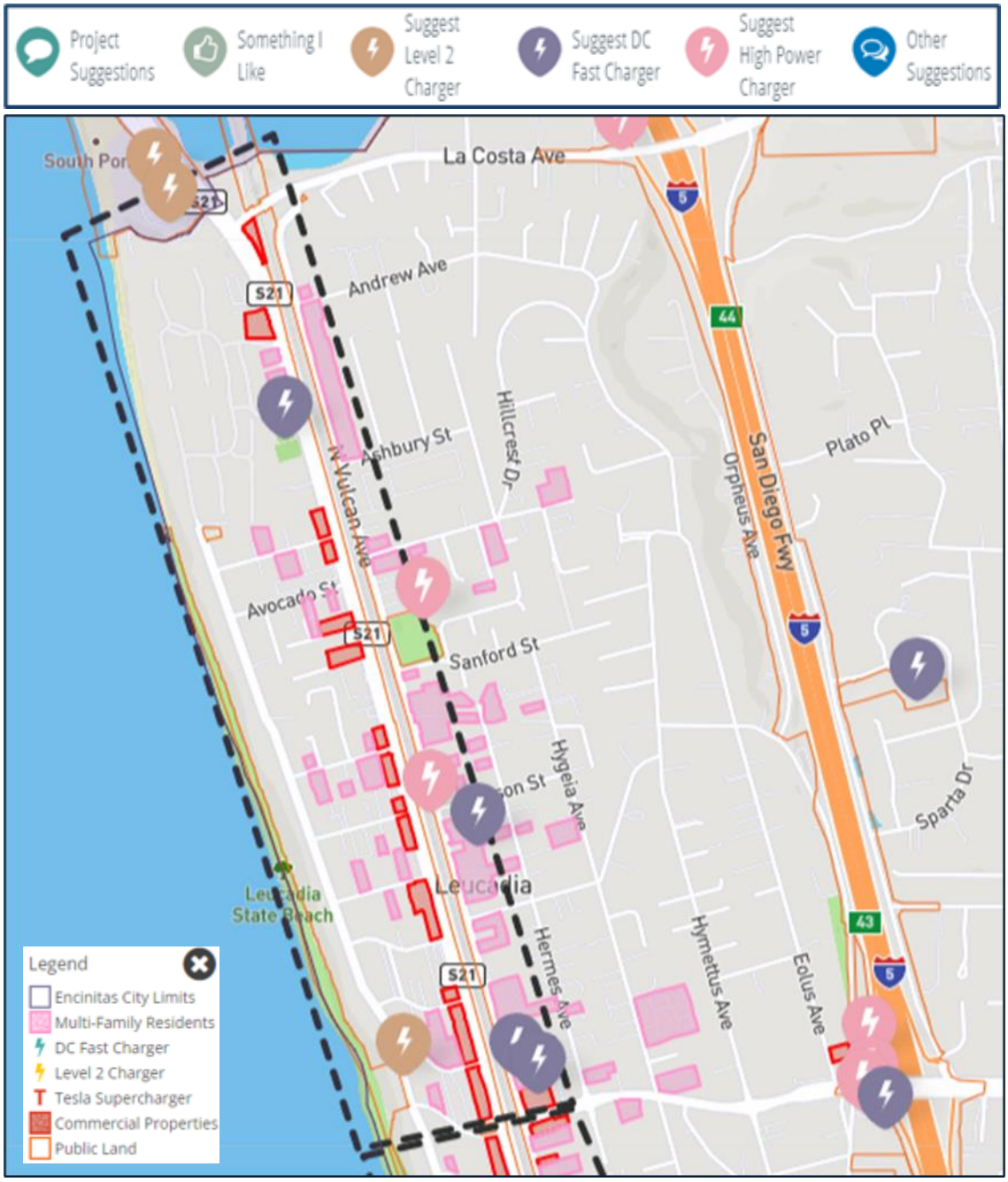


FIGURE 18: NORTH COAST HWY 101 - CHARGING LOCATIONS SUGGESTED BY THE PUBLIC

EL CAMINO REAL & ENCINITAS BOULEVARD

The area surrounding the intersection of El Camino Real & Encinitas Boulevard includes several shopping centers with large parking lots (El Camino Promenade, Encinitas Village Weigand Plaza, and Camino Real Shopping Center), all of which would be appropriate to locate chargers, especially DC Fast Chargers for shoppers. The City operates two popular public facilities here including Encinitas Community and Senior Center and the adjacent Oak Crest Park, both of which would be appropriate locations for Level 2 chargers.

This focus area is projected to need 8 Level 2 and 3 DC fast chargers by 2025 and 21 Level 2 and 4 DC fast chargers by 2030. Members of the public identified several locations they consider especially suitable for adding DC Fast and high-power chargers within the privately owned, publicly accessible commercial shopping centers. The City should encourage property owners and managers to install chargers, perhaps by assisting property owners apply for grants and incentives offered by CEC, SDG&E, San Diego County Air Pollution Control District and other funding sources.

TABLE 14: CHARGING ALLOCATIONS FOR EL CAMINO PROMENADE & ENCINITAS VILLAGE

LOCATION	TYPE	2025 CHARGERS	2030 CHARGERS
ENCINTIAS COMMUNITY AND SENIOR CENTER	Community public facilities parking lot	4 L2	8 L2
OAK CREST PARK	Park parking lot	4 L2	8 L2
COMMERCIAL & RESIDENTIAL	Private, publicly available	3 DCFC	5 L2 & 4 DCFC
TOTAL		8 L2 & 3 DCFC	21 L2 & 4 DCFC

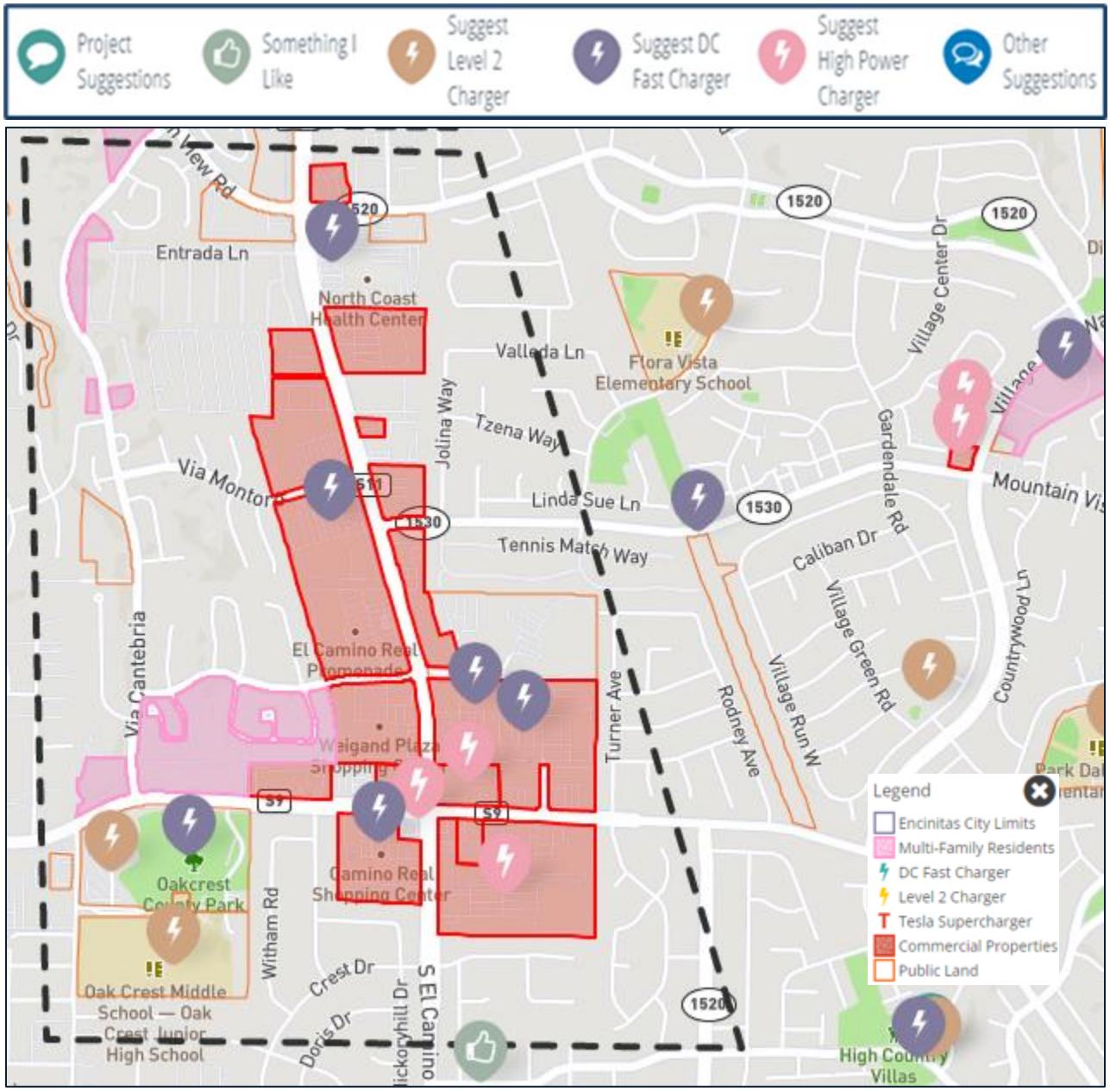


FIGURE 19: EL CAMINO REAL & ENCINITAS BLVD - CHARGING LOCATIONS SUGGESTED BY THE PUBLIC

OLIVENHAIN

The area surrounding the intersection of Encinitas Blvd & Rancho Santa Fe Rd in the community of Olivenhain in eastern Encinitas is a rural residential area dominated by single family housing with no publicly owned facilities. Public charging opportunities are generally limited to a few commercial retail parcels at this intersection as well as at the nearby Olivenhain Meeting Hall. The proposed Encinitas Boulevard Apartments development would add 283 dwelling units and would install chargers as mandated by the City's local green building code requirements. The Olivenhain community is projected to need 3 Level 2 and 1 DC fast chargers by 2025 and 8 Level 2 and 2 DC fast chargers by 2030. Specific charging opportunities and recommendations are described below for portions of these areas especially suitable for adding EV chargers. As with other focus areas, the City should partner with local commercial property owners, businesses and developers to encourage charger installation on privately owned sites including commercial property and at multifamily housing. For example, High Country Villas was identified during the public comment period as "a great spot to include access for local residents and those that want to get EV cars charged…on the way to the freeway or coming back home."

- **Rancho Santa Fe Plaza** is a neighborhood shopping plaza serving the residential portions of eastern Encinitas that would be appropriate for a small number of EV chargers in an area of the city with few commercial or public sites suitable for public charging.
- **Olivenhain Meeting Hall** is historical landmark and event space located in the center of Olivenhain that has a large unimproved dirt parking lot. The site is owned and operated by the Olivenhain Town Council, a non-profit organization. The City should encourage the Olivenhain Town Council to consider adding EV charging stations at this central location. The site would befit from the addition of Level 2 chargers for meeting hall attendees which could be added cost-effectively.

TABLE 15: CHARGING ALLOCATIONS FOR OLIVENHAIN

LOCATION	TYPE	2025 CHARGERS	2030 CHARGERS
RANCHO SANTA FE PLAZA	Privately owned, publicly available parking lot	2 L2 & 1 DCFC	6 L2 & 2 DCFC
OLIVENHAIN MEETING HALL	Historical building with parking lot	2 L2	2 L2
TOTAL		**4 L2 & 1 DCFC**	**8 L2 & 2 DCFC**

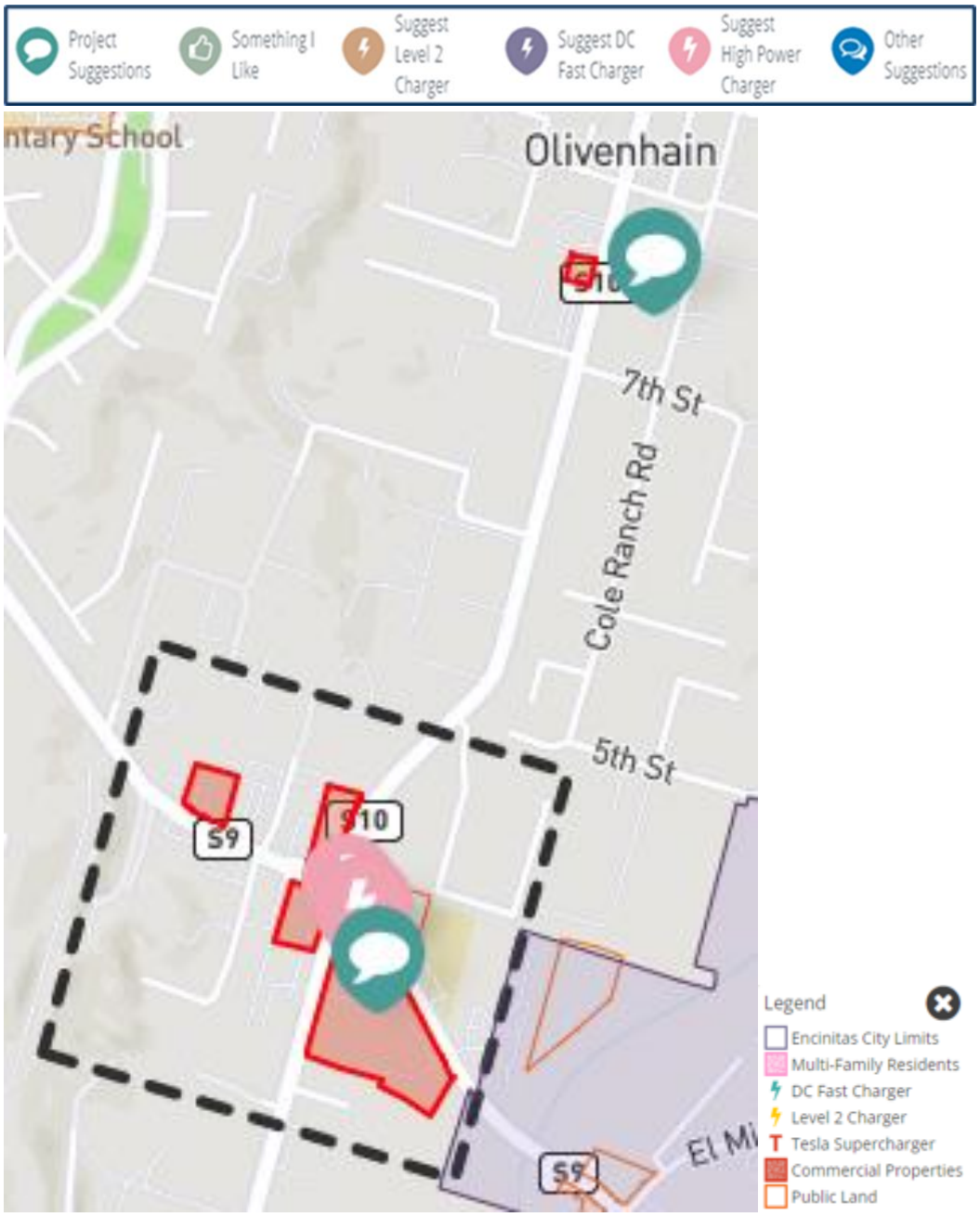


FIGURE 20: OLIVENHAIN - CHARGING LOCATIONS SUGGESTED BY THE PUBLIC

SOUTH COAST HWY 101

The South Coast Highway 101 focus area is primarily dominated by single family residential housing, but also includes a large multifamily housing complex called Elán Cardiff By the Sea Apartments. Potential locations for public charging include several City parks, Scripps Memorial Hospital, the Von's shopping plaza, and Cardiff Town Center. The City should partner with the owners of these shopping centers other commercial property owners, and the hospital to encourage charger installation on each of these sites as well as at Elán Cardiff By the Sea Apartments and any other multifamily housing.

This focus area is projected to need 21 Level 2 and 7 DC fast chargers by 2025 and 57 Level 2 and 10 DC fast chargers by 2030. Specific charging opportunities and recommendations are described below for public agency-managed portions of this corridor that would be suitable for adding EV chargers.

- **Encinitas Community Park** is the City's largest park which offers a variety of amenities, including a skate park, sports fields, playground, passive use areas, recreational trails, and a dog park. This park has ample parking along its east side that could support several Level 2 chargers for park visitors. Due to its proximity to the Santa Fe Drive/I-5 interchange and the Von's shopping center (walking distance), the park's north parking lot would also be appropriate for NEVI-funded DCFC.
- **Cardiff Sports Park** has a large parking lot serving multiple sports fields that could host multiple Level 2 chargers for park visitors.
- **Cardiff State Beach (Seaside)** is a state-owned beach with a large parking lot that could support Level 2 chargers serving beach goers. This site has applied for CALeVIP funding that, if awarded, will fund the chargers installation.
- **MiraCosta College** has a huge parking lot needing increasing quantities of Level 2 chargers for commuters. If it has not done so already, MiraCosta College will likely need to perform its own EV charging masterplan.

Other public facilities such as Swamis Beach and Cardiff State Beach (Cardiff Reef) were considered for public charging but were omitted due to their small size and heavy use. San Elijo Nature Center, managed by San Diego County, was also considered but was omitted because six Level 2 chargers were recently installed in an adjacent parking lot at the San Elijo Water Campus that is within walking distance of the nature center. Finally, while not included in the following list, Glenn Park may be a good location for Level 2 charging stations but the parking lot is relatively small and may lack demand for public charging.

TABLE 16: CHARGING ALLOCATIONS FOR SOUTH COAST HWY 101

LOCATION	TYPE	2025 CHARGERS	2030 CHARGERS
ENCINITAS COMMUNITY PARK	Park and sports field with parking lot	8 L2 & 2 DCFC	16 L2 & 2 DCFC
CARDIFF SPORTS PARK	Park with parking lot	4 L2 & 2 DCFC	8 L2 & 2 DCFC
CARDIFF STATE BEACH (SEASIDE)	state-owned facility	3 L2	4 L2
MIRACOSTA COLLEGE	state-owned facility	3 L2	20 L2
COMMERCIAL	Private, publicly available	3 L2 & 3 DCFC	9 L2 & 6 DCFC
TOTAL		**21 L2 & 7 DCFC**	**57 L2 & 10 DCFC**

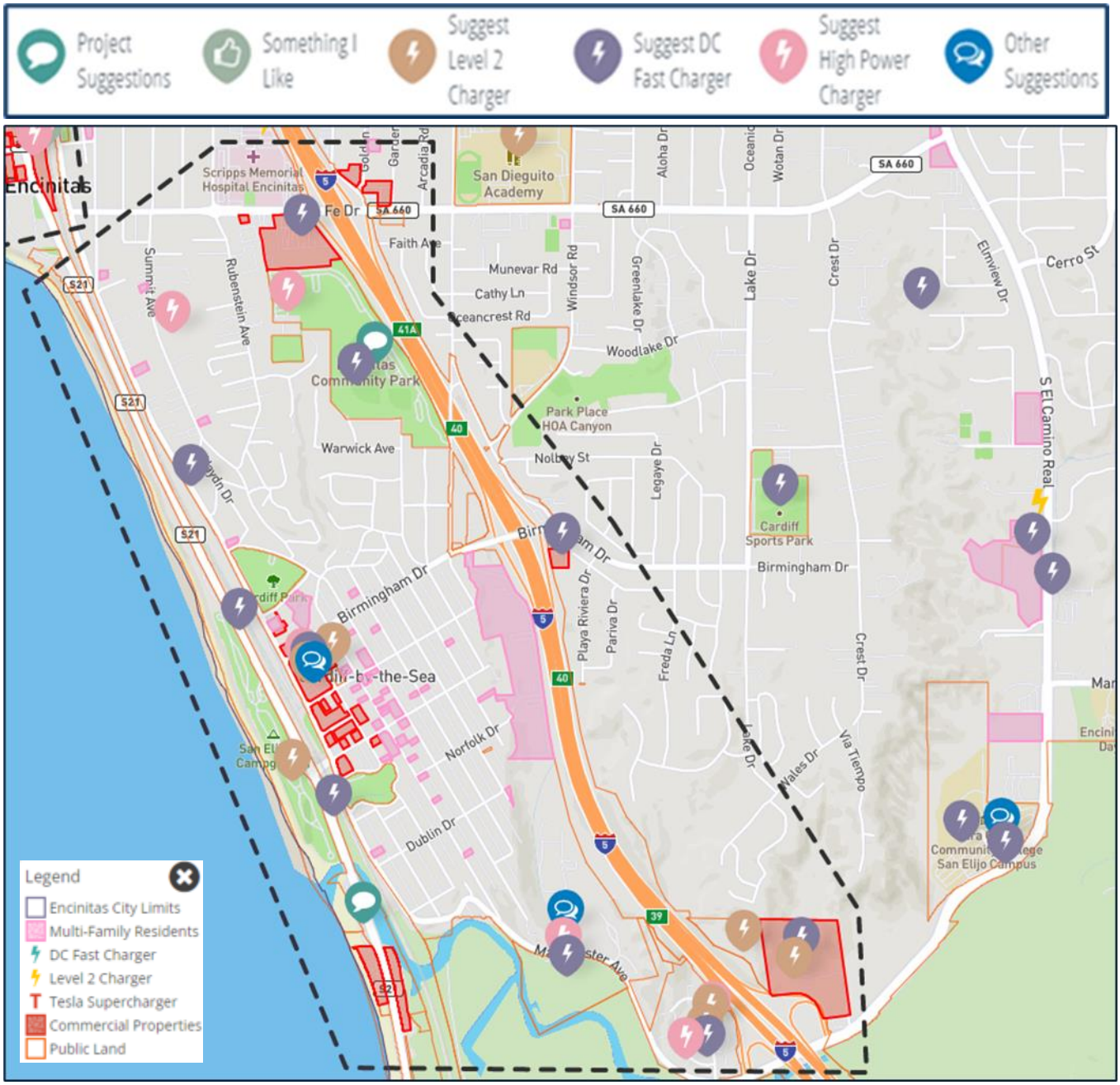


FIGURE 21: SOUTH COAST HWY 101 - CHARGING LOCATIONS SUGGESTED BY THE PUBLIC

I-5/ENCINITAS BLVD & MOONLIGHT MARKETPLACE

The I-5/Encinitas Blvd & Moonlight Marketplace focus area is the commercial node centered around the I-5/Encinitas Boulevard interchange encompassing Moonlight Marketplace and anchored by popular commercial destinations such as Lazy Acres and Smart & Final. Nearby public destinations include Cottonwood Creek Park, Paul Ecke Sports Park, and San Diego Botanic Garden. There are also several large senior living facilities and other multi-unit housing complexes.

This centrally located focus area is projected to need 9 Level 2 and 3 DC fast chargers by 2025 and 23 Level 2 and 4 DC fast chargers by 2030. The challenge for the City will be that it only operates two facilities suitable for public charging in this focus area-- the Ecke Sports Park and the Public Works/San Dieguito Water District complex, both of which would be appropriate for Level 2 charging and for DC Fast Chargers, possibly including NEVI-funded high-power chargers. However, Ecke Sports Park is on leased land, so adding chargers would be contingent on lease negotiations with the YMCA. Unfortunately, Cottonwood Creek Park is very parking constrained and San Diego Botanic Garden is not managed directly by the City. Specific charging opportunities and recommendations are described below for public parks and commercial shopping centers along this corridor especially suitable for adding EV chargers.

- **Ecke Sports Park** is a City park on land leased from YMCA with a shared parking lot that could support Level 2 charging for use by park and YMCA visitors. However, this would be subject to the terms of the City's lease with YMCA.
- **Public Works/San Dieguito Water District complex** has a public parking lot located close to the I-5 interchange making it potentially eligible for NEVI-funded high-power chargers and close to numerous fast food and retail attractions for EV drivers while charging.
- **Commercial areas** along the Encinitas Boulevard corridor would be very appropriate for EV chargers. Three Level 2 chargers, and a dual head 50kW DC Fast Charger and a 50kW Tesla charger are located in front of Lazy Acres, Moonlight Marketplace's anchor tenant. This privately-owned commercial site as well as others located in the focus area could potentially be eligible for NEVI-funded DC High-powered Chargers, something the City should encourage.

San Diego Botanic Garden is a San Diego County-owned regional destination with three existing, but non-operating Level 2 chargers located in the parking lot for the garden which is City-owned. The availability of these chargers should be monitored. In the future, additional chargers could be added due to the large size of the parking lot if demand warrants.

TABLE 17: CHARGING ALLOCATIONS FOR I-5/ENCINITAS BLVD & MOONLIGHT MARKETPLACE

LOCATION	TYPE	2025 CHARGERS	2030 CHARGERS
ECKE SPORTS PARK	Sports field/park parking lot	4 L2[16]	12 L2
PUBLIC WORKS/ SDWD	Near commercial	3 DCFC	4 DCFC
COMMERCIAL	Private, publicly available	5 L2	11 L2
TOTAL		9 L2 & 3 DCFC	23 L2 & 4 DCFC

[16] Charger quantity would be contingent on Lease Agreement

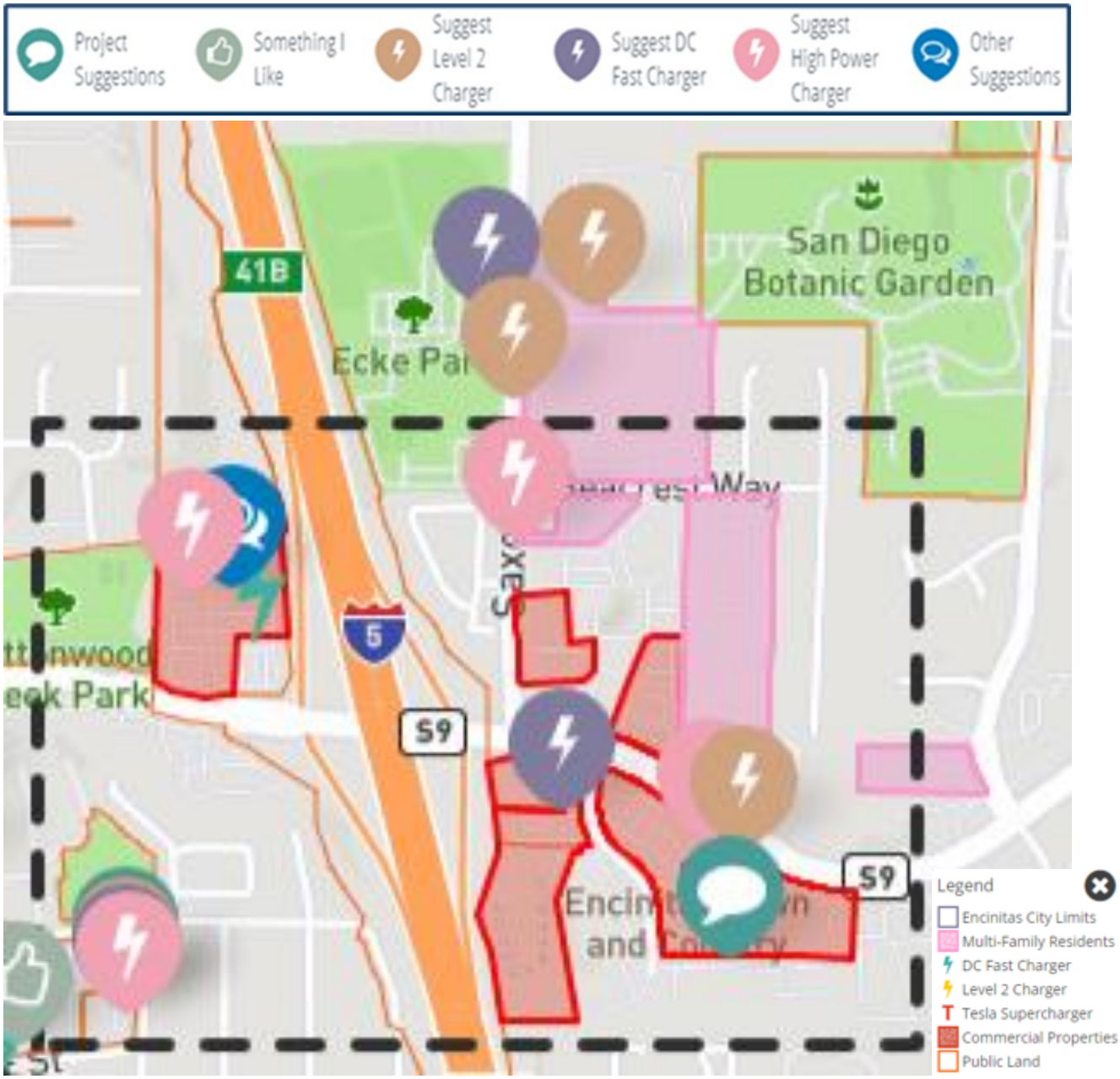


FIGURE 22: I-5 & ENCINITAS BLVD - CHARGING LOCATIONS SUGGESTED BY THE PUBLIC

OTHER AREAS (25% OF TOTAL)

Other areas outside of the focus areas were assigned 25% of the total projected charger quantities for 2025 and 2030. They are projected to need 22 Level 2 and 7 DC fast chargers by 2025 and 59 Level 2 and 11 DC fast chargers by 2030. Potential locations include the following public agency-owned sites.

- **Manchester Avenue Park and Ride** is a planned commuter facility that would be appropriate for DC Fast and possibly bus charging.
- **Schools** such as San Dieguito High School and some middle, elementary, and private schools have relatively large parking lots that will need increasing quantities of Level 2 chargers for teachers and students of driving age. The City should recommend that the San Dieguito Union High School District prepare their own transportation decarbonization plan, including EV charging for campus commuters and visitors.
- **Encinitas Ranch Golf Course** is owned and managed by the Encinitas Ranch Golf Authority. Given the time needed to play a round of golf and the large parking lot, this would be an excellent location for Level 2 chargers.
- **Public Rights of Way** are the City's largest real estate asset. As has been demonstrated by cities around the world, EV charging can be added to public parking, allowing cities and utilities to site chargers in locations accessible to EV drivers, especially those without access to home or workplace charging. In general, off-street parking or at least angle parking works better than parallel parking in the public right-of-way due to operational and infrastructure installation and maintenance concerns.
- **Commercial and Retail** are appropriate for Level 2 charger installations, installed within commercial parking lots or potentially the public street right-of-way.
- **Workplace** charging should be required or at least encouraged to provide charger access to commuting employees, typically through installation of Level 2 chargers to be shared by commuters.

CONCLUDING CONSIDERATIONS ON CHARGER QUANTITIES

The required number of charging stations needed to support electric vehicle adoption in the City of Encinitas heavily depends on future EV adoption, meaning that this is a mutual relationship. More chargers available to the public, especially at common destinations or around multi-family dwellings can facilitate EV adoption. EV adoption induced by other factors implies that more chargers would be needed to meet EV drivers' needs. This suggests that, either way this relationship is viewed, future EV charging stations will be needed.

The required number of charging stations and composition of different charger types (such as Level 2 vs. DCFC) is influenced by future technological pathways, including the vehicle electric range mix. If future EVs commonly reach electric ranges of 400 miles and more, then fewer public charging stations would be needed as opposed to a mix of EVs with lower battery capacities and electric ranges. The City will continue to track general market trends, including the development of battery technology.

POTENTIAL CHARGING INFRASTRUCTURE 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.

The cost of charging can vary depending on the location and the charging network. For example, Blink charges its network members $0.49 per kwh while non-members pay $0.59 per kwh for Level

2 charging at 600 South Vulcan Avenue (Parking Lot B). While the San Elijo Water Campus only charges $0.3564 per kWh. As summarized in Table 18 below, DC Fast Charging can cost EV drivers significantly more than Level 2 charging and price can vary by time of day as well as location. Such fees collected by chargers at City-owned facilities can be considered revenue to offset electricity and other expenditures.

TABLE 18: EVGO CHARGING PAYMENT RATES, PRICE PER KWH[17]

CITY HALL	LAZY ACRES	CHARGING TIME
$0.99	$0.99	Flat Rate
$0.39	$0.43	12:00AM - 7:59AM
$0.51	$0.55	8:00AM - 3:59PM
$0.59	$0.64	4:00PM - 8:59PM
$0.51	$0.55	9:00PM - 11:59PM

Revenues can also be generated indirectly through the sale of Low Carbon Fuel Standard credits as explained below.

The Low Carbon Fuel Standard (LCFS) is a market-based approach to incentivizing clean energy administered by the California Air Resources Board[18]. 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, as long as the EV charging is metered, outlined by **Figure 23** 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 as long as the charger is publicly available. While in the case of residential charging, the base LCFS credit (similar to 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.

[17] Source: Plugshare: https://www.plugshare.com/location/407518

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

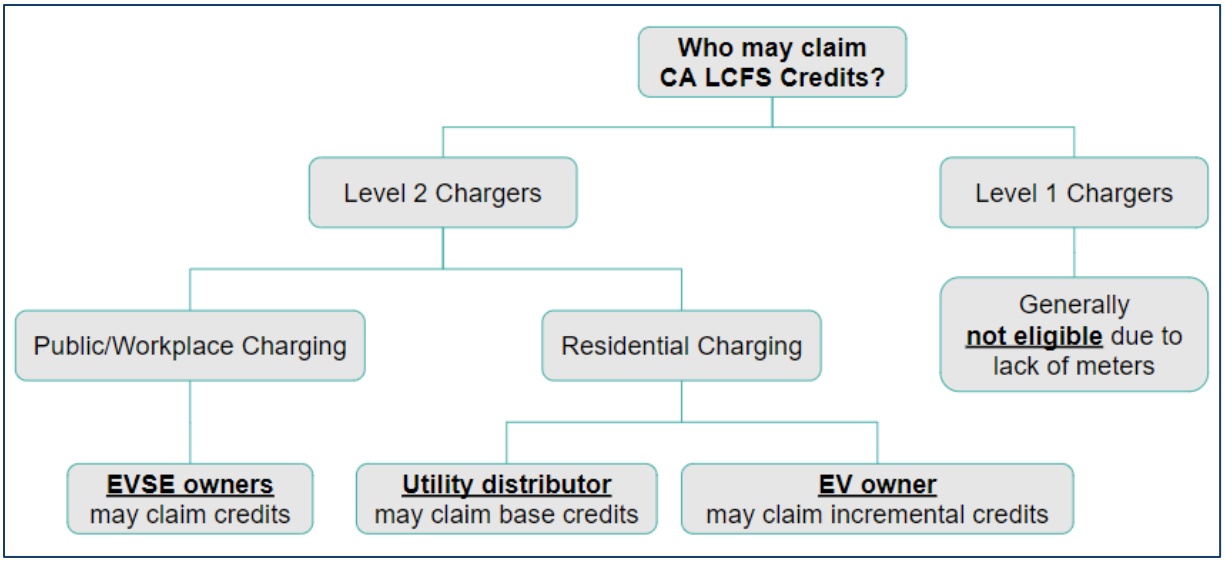


FIGURE 23: WHO MAY CLAIM CALIFORNIA LCFS CREDIT[19]

Based on the current LCFS market, assuming $200 per LCFS credit, each kWh of electrical energy equates to approximately $0.16[20] though LCFS credit value is subject to market fluctuation and has been appreciating in recent years.[21] This translates into the following hourly LCFS credits based on charging speed.

[19] Note: In certain circumstances, such as when networks own the chargers, charging networks can claim LCFS credits.

[20] Official LCFS Calculator 2020. California Air Resources Board.

[21] SREC Trade. LCFS Credit Fluctuations.

TABLE 19: SAMPLE HOURLY LCFS CREDIT ESTIMATES BY CHARGING SPEED

CHARGER TYPE	CHARGING SPEED (KW)	SAMPLE HOURLY LCFS BASE CREDIT
3.8 KW SLOW L2	3.8	$0.61
7.2 KW MEDIUM L2	7.2	$1.15
12W KW FAST L2	12.0	$1.92
19.2 KW VERY FAST L2	19.2	$3.07
50 KW TYPICAL DC FC	50.0	$8.00
125 KW HIGH POWER CHARGER	125.0	$20.00
160 KW HIGH POWER CHARGER	160.0	$25.60

* Assuming 95% electrical charging efficiency

To put this into context, if a 7.2 kW Level 2 charger is utilized for an average of 30 hours per week (7-8 hours a day and 3-5 days a week) for 50 weeks per year, the charger could generate $1,725 of LCFS credits annually. This would make the LCFS credit a modest revenue stream that could potentially offset some of the operating costs.

PROJECT IMPLEMENTATION AND POLICY IMPLICATIONS

CHARGING INFRASTRUCTURE POLICIES, CODES, AND REGULATIONS

POLICIES AND REGULATIONS

This section presents different local, regional, state, and national policies and regulations related to EV charging infrastructure.

Local

The basis for all climate change mitigation measures in the City of Encinitas is the Climate Action Plan (CAP), adopted in 2018 and updated in 2020. The CAP requires the City to "Complete and implement an Electric Vehicle Charging Station Master Plan to increase the use of Zero-Emission vehicles by the community", which corresponds to this Master Plan document. The CAP's Goal 4.3 to "increase the use of alternative fuels" include EV charging expansion goals.

In response to these CAP goals, in 2019, the City adopted an ordinance which enacted local building regulations that go beyond state building code regulations and aim to increase EV charging station installation triggered by certain building permit applications. Beginning January 1, 2020, EV charging infrastructure is required to be installed on all building projects listed in Table 20. More detail regarding these regulations can be found on the City's Electric Vehicle Charging Fact Sheet.[22]

TABLE 20: LOCAL EV CHARGING REGULATIONS

PERMIT TYPE	EV CHARGING EQUIPMENT REQUIRED
NEW ONE- AND TWO-FAMILY DWELLINGS	EV-Ready (Dedicated 208/240-volt branch circuit installed in the raceway, rated at 40amps)
NEW MULTI-FAMILY DWELLINGS	At least 15% of total parking spaces must be equipped with EV charging stations
NEW NONRESIDENTIAL BUILDINGS	At least 8% of total parking spaces must be equipped with EV charging stations
ADDITIONS AND MODIFICATIONS TO NONRESIDENTIAL BUILDINGS	At least 8% of total parking spaces must be equipped with EV charging stations

Adopting and continually updating building codes that support, simplify, and accelerate the provision of residential charging infrastructure is a crucial task to meet the goals of the City's CAP and reduce citywide greenhouse gas emissions. Doing so helps promote access to reliable charging infrastructure for existing, new, and potential upcoming EV owners, independent of proximity to public charging stations. In the future, multi-family apartment buildings should be the focus of such building codes, since this their residents have had the least access to charging in the past and, at the same time, hold the least power to change just that. In attention to regulations, the city should consider developing and offering attractive incentives for building developers and owners to install charging infrastructure. This could be done in collaboration with the local utility, San Diego Community Power, the city's community choice energy provider, or charging equipment vendors.

State

In California, the state bills AB 1236 (2015) and AB 970 (2021) set the standards for EV charging station development in the state and what processes cities and counties need to put in place to support the efficient expansion of EV charging infrastructure across California.[23] AB 1236 was passed in 2015 and is in effect since 2017. It requires all cities and counties to provide an expedited permitting process for EV charging stations (including a streamlining ordinance and

[22] A fact sheet on these regulations can be found at this link: https://encinitasca.gov/LinkClick.aspx?fileticket=lqKlHTFoUk8%3D&portalid=0

[23] An overview of AB 1236 and AB 970 can be found at this link: https://static.business.ca.gov/wp-content/uploads/2021/11/EV-Charger-Permit-Streamlining-AB-1236-Fact-Sheet-Version-1.pdf

checklist). AB 970 builds on that and was passed in September 2021. It is in effect since January 2022 for large cities/counties (>200,000 population) and will be in effect beginning in January 2023 for small (<200,000 population) cities/counties, including Encinitas. The bill requires cities and counties in California to limit project review for EV charging stations to health and safety requirements. It also sets specific timelines to that review period based on the size of the project, differentiating between 1-25 stations and 26 or more stations per project site. For a 1-25-station project, EV charging station applications must be deemed complete 5 business days upon receipt, unless the city or county issues a written deficiency notice detailing all changes to be made to make the application consistent with the permitting checklist. This process is visualized in Figure 24.

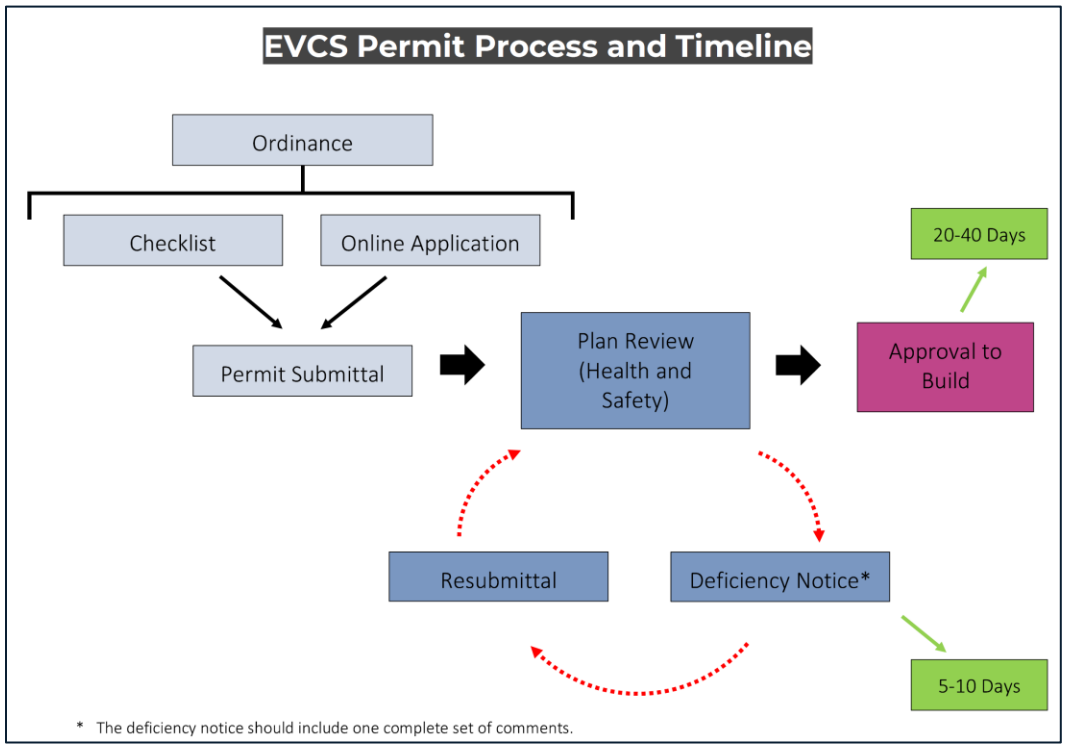


FIGURE 24: EVSE PERMIT PROCESS AND TIMELINE IN CALIFORNIA, ACCORDING TO AB 1236 AND AB 970 [10]

The City of Encinitas adopted Ordinance No. 2022-14 on October 26, 2022, which includes the incorporation of requirements consistent with AB 1236 and AB 970 into the City's local building code. These regulations, which became effective as of January 1, 2023, streamline and clarify the specific requirements for the permitting of new EV chargers. The contents of the relevant sections of the ordinance are summarized in Table 21 below.

TABLE 21: ORDINANCE NO. 2022-14 CONTENT SUMMARY

SECTION	TITLE	CONTENT SUMMARY
102.4.1	Purpose	To expedite permitting consistent with state requirements
102.4.2	Definitions	Clarification of key terms
102.4.3	Permit application process	Provides overview of each part of permitting process
102.4.4	Permit Application Submittal Requirements	Identifies documents required for permit application and provides direction to applicants on how to submit
102.4.5	Permit Review and Issuance	Summarizes City's permitting responsibilities and actions
102.4.6	Technical Review	Clarifies City's authority
102.4.7	**Electric Vehicle Charging Station Installation Requirements**	**Lists** and summarizes key **provisions** of relevant codes and standards

State Building Codes

California's 2022 Building Energy Efficiency Standards (Title 24, Part 6)[24] apply to newly constructed buildings, additions, and alterations. This so-called Energy Code encourages efficient electric heat pumps, establishes electric-ready requirements for new homes, expands solar photovoltaic and battery storage standards. State building codes are updated tri-annually. 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).

California's 2022 Green Building Standards (Title 26, Part 11),[25] known as CALGreen, were first incorporated into the states building code in 2007 in an effort to support the states greenhouse emissions reduction goals as part of AB 32, the California Global Warming Solutions Act. The goal of CALGreen is (1) reduce greenhouse gas emissions (GHG) from buildings; (2) promote environmentally responsible, cost-effective, healthier places to live and work; (3) reduce energy and water consumption; and (4) respond to the environmental directives of the administration. The 2016 CALGreen Code addressed clean air vehicles and introduced increased requirements for electric vehicle charging infrastructure. The 2022 CALGreen nonresidential updates include significant changes to electric vehicle sections to support the implementation of California governors' executive orders (EO) to achieve the goals of having over 1.5 million zero-emission vehicles (ZEVs) on California roadways by 2025 (EO B-16-2012), 5 million ZEVs on California

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

[25] https://www.dgs.ca.gov/BSC/CALGreen

roadways by 2030 (EO B-48-2018), and in-state sales of passenger cars and trucks will be 100 percent ZEVs by 2035 (EO N-79-20). California is the first state in the country with a building code that requires electric vehicle charging stations to be installed in new construction.

POTENTIAL CHARGING INFRASTRUCTURE PROJECT FUNDING AND INCENTIVES

The electromobility space is rapidly growing and so are related funding opportunities. Covered expenses include the purchase or lease of EVs, the purchase and installation of EV charging infrastructure, and expenses for hydrogen fuel cell electric vehicles (FCEVs) and their refueling infrastructure. Several dozen 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 are typically fixed term and have limited allocated funds. However, the range of funding options has vastly expanded over the past couple of years. Information on specific programs can change quickly and the identified funding sources should be monitored regularly.

Incentive programs have very specific requirements for applications, including specific requirements for eligible vehicles and charging equipment, data reporting, and special considerations for public fleets. Some programs are very competitive and "sell out" quickly and others take time and persistence.

Examples of the most relevant programs with substantial funding resources are summarized below.

FEDERAL PROGRAMS

National Electric Vehicle Infrastructure (NEVI) Program

The federal governments most recent infrastructure bill provides a total of $7.5 billion of 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).[26] Specifically, NEVI will fund charging sites consisting of four 150kW DC Fast chargers located within one mile of interchanges on designated AFCs like I-5. The NEVI program is part of the Infrastructure Investment and Jobs Act, a $1 trillion infrastructure bill passed by Congress in November 2021.[27] The bill required states to submit their respective NEVI implementation plans to the newly established Joint Office of the Departments of Energy and Transportation[28] by August 2021. California submitted their NEVI plan

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

[27] 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

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

August of 2022.[29] 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 distributing of funding and eligibility have not been released.

Volkswagen Settlement Funds

The Volkswagen settlement funds are the result of the allegations that Volkswagen violated the Clean Air Act by the sale of approximately 590,000 model year 2009 to 2016 diesel motor vehicles equipped with so-called defeat devices. The settlement has different elements, one of which are zero-emission vehicle investments, which amount to more than $2.8 billion.

California's portion of these funds amounts to $423 million, assigned to different project categories as shown in Table 3. As of August 2022, about $70 million of these have been awarded to projects across the state. The different project categories have different eligibility criteria and are administered by Air Quality Management Districts. The San Diego County Air Pollution Control District manages Volkswagen settlement funds for the San Diego region. Generally, the funds can be used for projects in the heavy-duty vehicle sector (except the one project category that reserves funds for the light-duty vehicle sector), including on-road freight trucks, transit and shuttle buses, school buses, forklifts and port cargo handling equipment, commercial marine vessels, and freight switcher locomotives. More than 50% of the funds are planned to benefit low-income or disadvantaged communities.

References:

- https://www.4cleanair.org/volkswagen_settlement_information/
- https://ww2.arb.ca.gov/our-work/programs/volkswagen-environmental-mitigation-trust-california
- https://www.californiavwtrust.org/ev-infrastructure/

[29] 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

TABLE 22: 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% (avg.)**	**$423 million**

Source: https://ww2.arb.ca.gov/resources/documents/californias-beneficiary-mitigation-plan

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)[30] or the California Energy Commission (CEC).[31] Some of the funding available in California-specific programs derives from revenue continually generated in the state's greenhouse gas emissions cap-and-trade program[32] or the Low Carbon Fuel Standard (LCFS).[33]

[30] California Air Resources Board: https://ww2.arb.ca.gov/

[31] California Energy Commission: https://www.energy.ca.gov/

[32] California Air Resources Board: Cap-and-Trade Program: https://ww2.arb.ca.gov/our-work/programs/cap-and-trade-program

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

California Electric Vehicle Infrastructure Project (CALeVIP)

The California Electric Vehicle Infrastructure Project (CALeVIP) offers rebates for the purchase and installation of Level 2 (up to $5,000) and DCFC (up to $70,000) charging stations. The rebates can be increased by $1,500 (for Level 2 chargers) and $10,000 (DCFC) per charger if the installation is planned inside a disadvantaged community (census tracts in the top 50% of CalEnviroScreen scores[34]). In multi-unit dwellings, an additional up to $1,000 of funding per charging connector can be provided. The program 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 CALeVIP San Diego County Incentive Project. 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 some areas, only Level 2 charger funding remains. Eligible applicants include public agencies, businesses, non-profits, tribal governments, and other site owners.[35]

The City of Encinitas lies in San Diego County and thus falls under the geographic scope of the San Diego County branch of the CALeVIP program. However, the branch's funds are currently exhausted and additional applications are not accepted as of August 2022. An additional $1.9 million were made available to the program, but these funds will only serve existing applicants on the waiting list. Encinitas should monitor the status of the program at the provided link and be aware of current funding availability.[36]

Additional resources are listed 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/
- PlugStar searchable database by ZIP code: https://plugstar.com/tools/incentives
- DSIRE (database of clean energy programs): https://programs.dsireusa.org/system/program

GRID IMPACTS

As illustrated below on Figure 25, the capacity of California's electrical grid varies widely by electrical utility service territory and geography. This is especially true during peak periods during evening hours when power demand spikes and solar power production has waned for the day. As the transportation sector transitions from fossil fuels to electricity, the grid could be further

[34] California Office of Environmental Health Hazard Assessment: CalEnviroScreen 4.0: https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-40

[35] CAL eVIP: https://calevip.org/

[36] CAL eVIP: San Diego County Incentive Project: https://calevip.org/incentive-project/san-diego-county

impacted, especially if EV charging occurs during peak demand times. Solutions to this challenge include the following:

- 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 is facilitated by charge management software.
- Bidirectional charging, a feature common to the Nissan Leaf as well as most newer EVs allows the EV battery to be discharged back to the grid (known as vehicle-to-grid or V2G) in order 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.

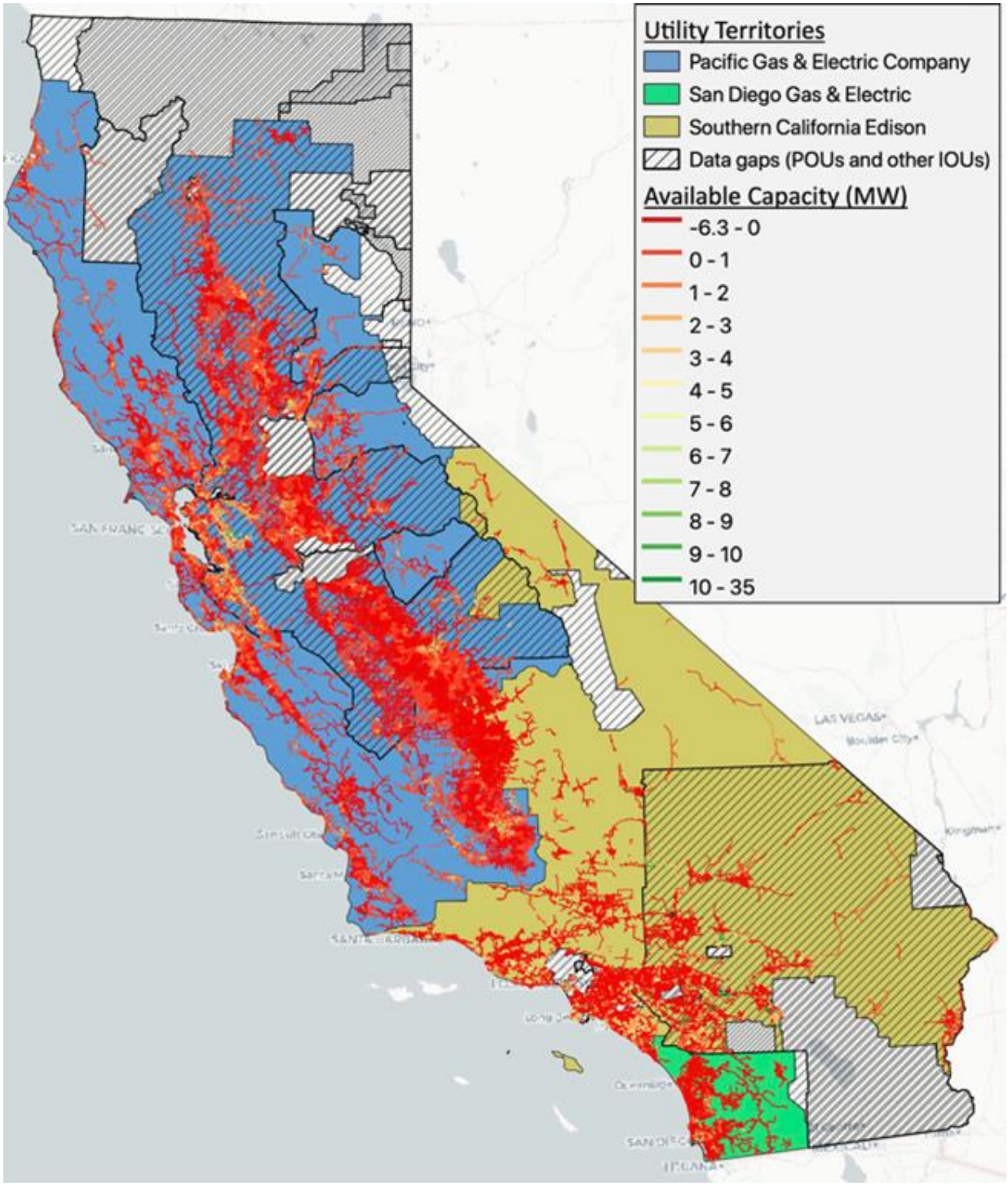


FIGURE 25: CALIFORNIA ELECTRICAL CAPACITY (SOURCE: NREL)

CONCLUSION AND RECOMMENDATIONS

The purpose of this master plan is to facilitate the transition to electrified transportation for the City of Encinitas' citizens, employees, and visitors by planning the deployment of public EV charging stations consistent with the City's Climate Action Plan which aims to significantly reduce greenhouse gas emissions in the community and lessen the City's impact on climate change.

The EV Charging Station Master Plan identifies existing electric vehicle charging stations within the City of Encinitas and the surrounding vicinity, provides a plan to install EV charging stations at nearly all City-owned worksites and public facilities, and provides recommendations that would generally support the residential transition from fossil fuel vehicles to electric clean transportation options.

The plan recommends that that City implement the following overarching strategies to support EV charging station installation and increased EV ownership:

1. The City should install or partner with others to install chargers at popular public destinations, especially parks, libraries, the community and senior center, beaches, schools and other institutions, over time concurrent with EV adoption to minimize the impacts of parking displacement.

2. EV charger types (Level 2, or low or high-power DC Fast Chargers) should be selected based on anticipated dwell times of EVs.

3. Faster chargers such as mid to high output Level 2 and high-power DC Fast Chargers should be deployed when feasible in terms of electrical capacity and funding availability.

4. The City and its partners should provide for future expansion of additional chargers by sizing electrical infrastructure upgrades with capacity to double the number of chargers in the future to meet anticipated EV adoption.

5. The City should prioritize installation of public EV chargers to meet the needs of residents of multifamily housing and other EV drivers lacking access to home charging.

6. The City should encourage employers and commercial property owners and managers to provide EV chargers at worksites for commuters.

7. The City should encourage or partner with private commercial and multifamily property owners and other public agencies and institutions to provide equitable geographic distribution of EV chargers.

8. The City should prioritize the needs of disadvantaged populations by working with businesses that cater to lower income residents to install chargers for use by their patrons as well as supporting the transportation electrification needs of social service agencies and shared mobility providers.

9. The City should encourage and assist private property owners and managers to apply for grants and incentives offered by CEC, SDG&E, San Diego County Air Pollution Control District and other funding sources.

If these recommendations are implemented over the next several years, the City will have a high likelihood of increasing the number of publicly accessible chargers to 120 EV chargers by 2025 (90 Level 2 and 30 DCFC), and 280 chargers by 2030 (238 Level 2 and 43 DCFC). This would support the anticipated 3,500 fully electric vehicles owned in Encinitas by 2025 (6.6% of all light-duty vehicles) and approximately 15,000 owned by 2030 (28% of all light-duty vehicles) and achieve substantial greenhouse gas emissions reduction.

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[10] State of California, "Electric Vehicle Charging Station Permit Streamlining Fact Sheet - Version 1." https://static.business.ca.gov/wp-content/uploads/2021/11/EV-Charger-Permit-Streamlining-AB-1236-Fact-Sheet-Version-1.pdf (accessed Jul. 19, 2022).