ELECTRIFYING THE ROAD TO SUSTAINABILITY

TEAM ELECTRIC BLUE

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PROBLEM STATEMENT

STRATEGIC PLACEMENT OF L2 CHARGERS AND ELECTRICAL OUTLETS TO SUPPORT L2 CHARGING

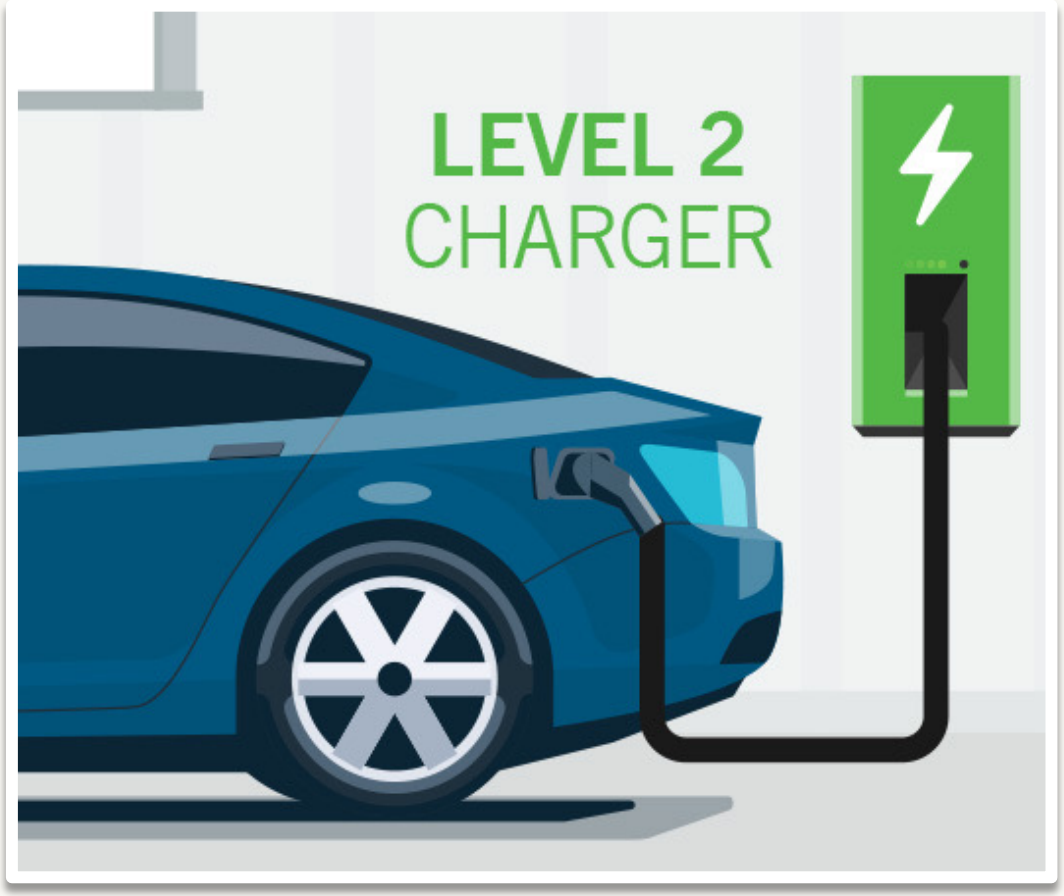
California aims to reach its sustainability goals by promoting the adoption of Electric Vehicles.

At present the charging capability in California does not meet the demands of the EV market

We recommend strategic placement of L2 chargers and L2 supported electrical outlets to addresses this problem which will encourage people to buy ZEVs.

* Although ZEVs include all alternative fuels including hydrogen fuel cell, we will assume they will all be electric vehicles for the purpose of our analysis.

WHY LEVEL 2 CHARGERS



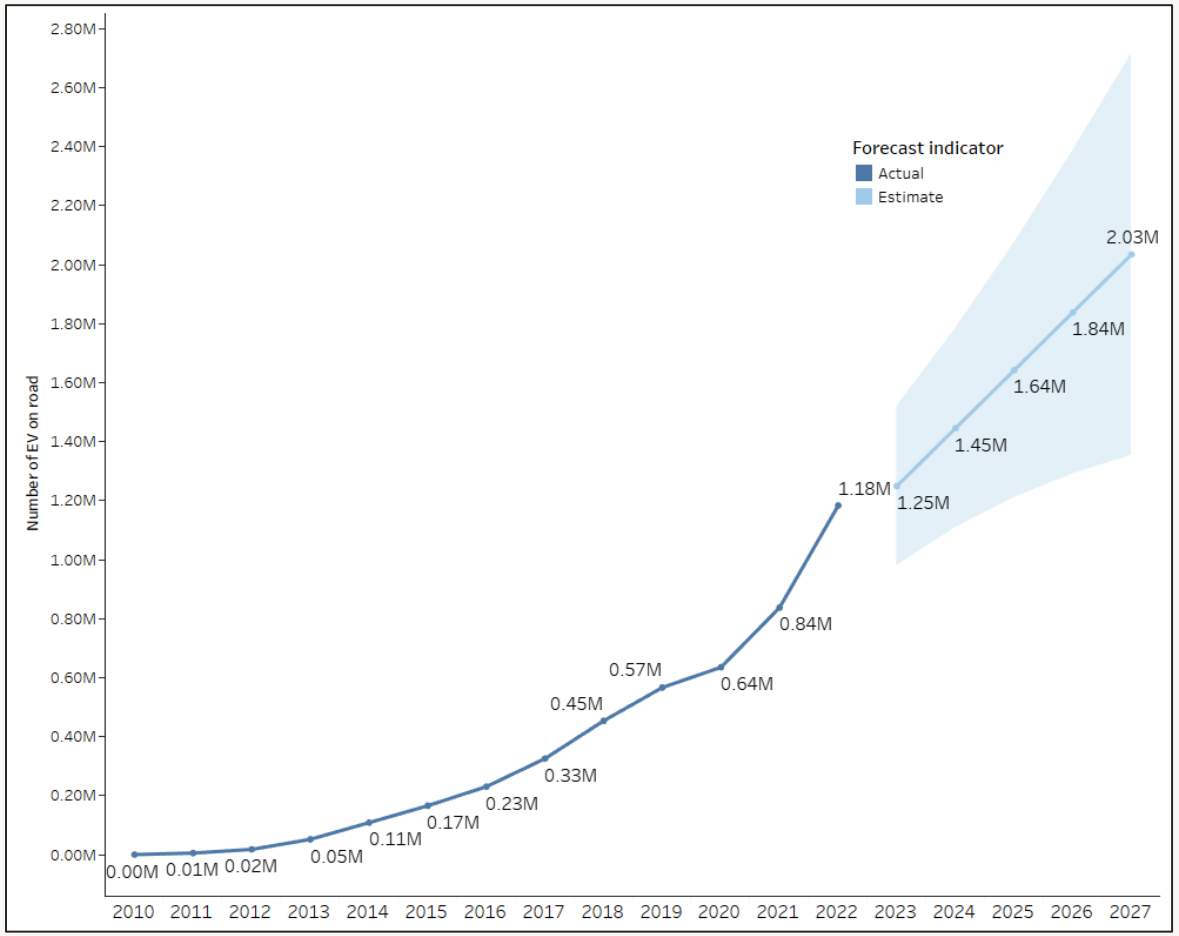
The median household income in California is $ 84,907 and the median price of a house is $829,760[2]. Many Californians live in rental homes and lack access to reliable L2 charging options which dissuades new buyers from purchasing a ZEV.

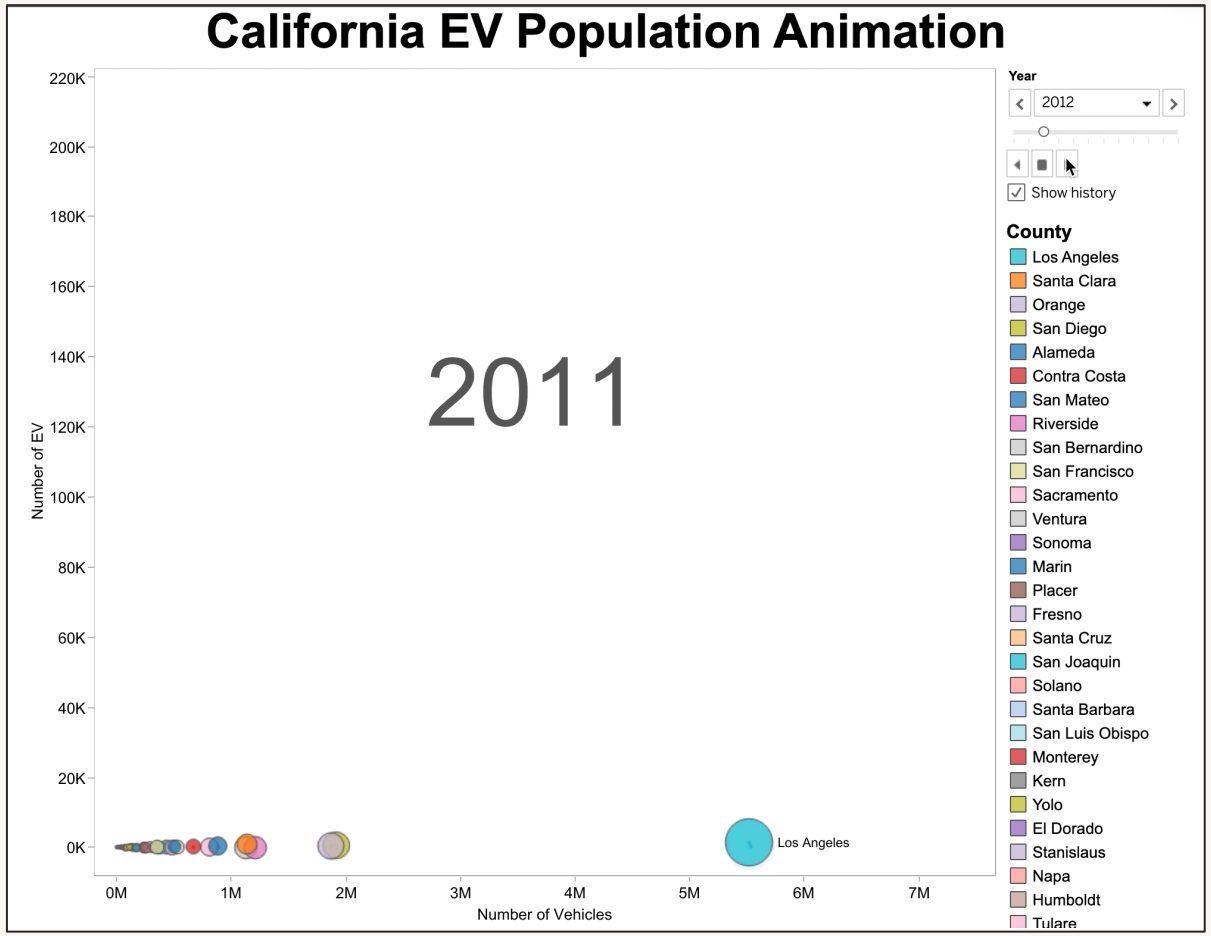
Studies show the negative effects of DC fast charging on long-term battery life. Not only is replacing a battery expensive it also comes with an environmental cost. Therefore, it is important to have access to L2 chargers in order to reduce the turnover of EV batteries.

Our solution is to install additional public L2 chargers and provide access to electrical outlets that support L2 charging with a personal mobile connector which can be purchased with the car at nominal cost.

1. https://www.geotab.com/blog/ev-battery-health/

FORECASTED EVS IN CALIFORNIA





RESEARCH ANALYSIS

Average cost of a mobile connector is $200

Average cost of an electric vehicle is $56,437

California has a 2023 budget of $81,720,595 for Electric Vehicle Charging

On average, 1 charger is required per 13 EVs[1]

(1) https://driving.ca/column/motor-mouth/motor-mouth-how-many-ev-charging-stations-will-we-really-need
(2) Budget 2023: https://www.fhwa.dot.gov/bipartisan-infrastructure-law/evs_5year_nevi_funding_by_state.cfm
(3) https://ev-lectron.com/collections/ev-adapters
(4) https://www.cnbc.com/2021/12/29/electric-vehicles-are-becoming-more-affordable-amid-spiking-gas-prices.html

OUR SOLUTION

- Today most of the L2* chargers are units whose average cost is $2,200 per unit.
- The cost of installing an electrical outlet that supports L2 charging is $400 per unit.
- Our solution is to increase access to L2 charging by installing a mix of these two types of charging options.
- This will lower installation costs
- We will implement our new solution in one county with the highest disparity between the number of EV cars and L2 chargers.
- This will help us evaluate our solution at micro level which can then be scaled and applied at a macro level to all of California.

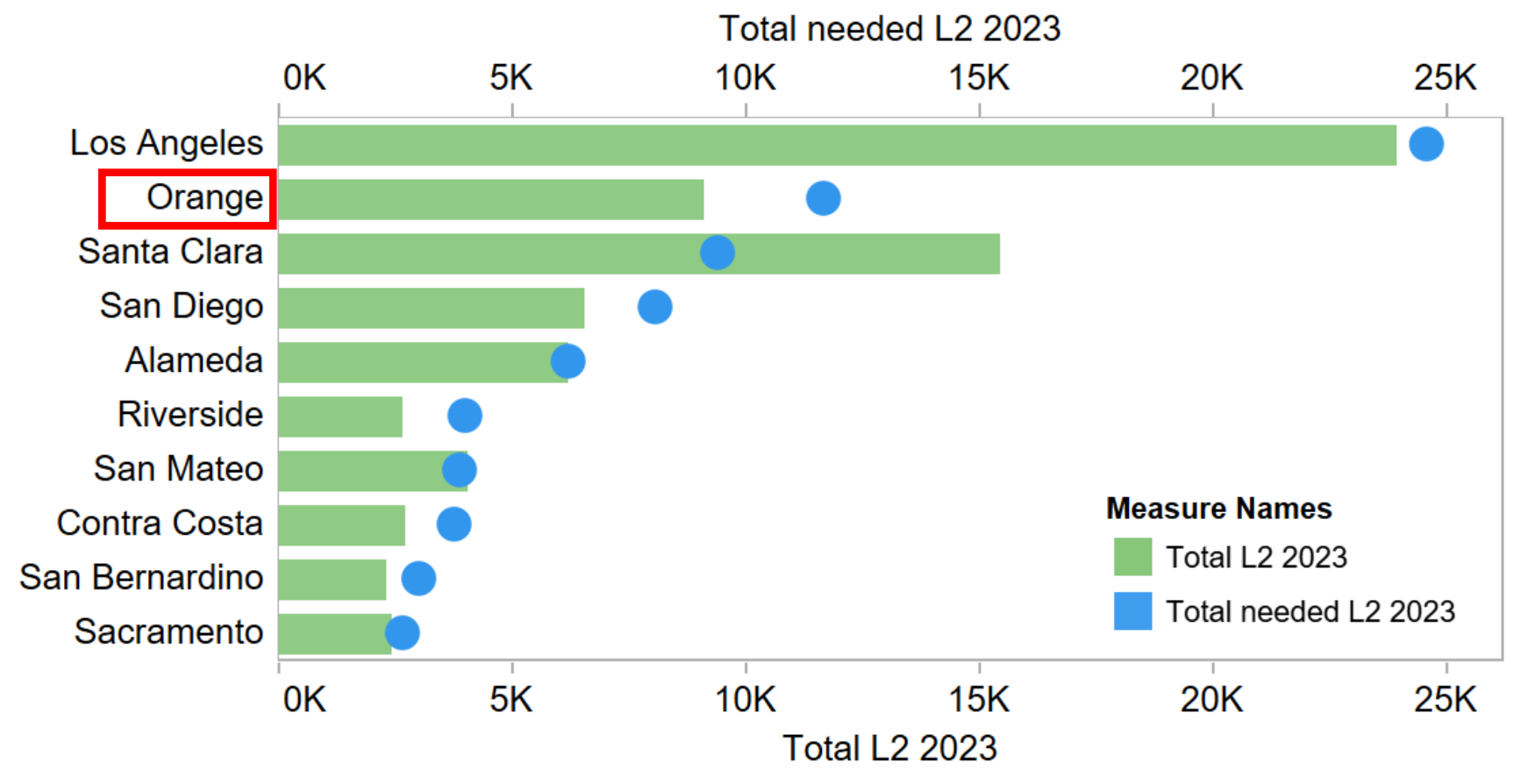
L2 OUTLET

L2 CHARGER

* L2 chargers are slow chargers that use AC current.

1. https://www.cnbc.com/2021/12/29/electric-vehicles-are-becoming-more-affordable-amid-spiking-gas-prices.html
2. Average cost to install a L2 charger $2200: https://blog.carvana.com/2021/07/how-much-does-it-cost-to-install-an-ev-charger/
3. Average Cost of installing an electrical outlet to support L2 charging: https://www.orangecharger.com

DISPARITY OF L2 CHARGERS PER COUNTY



We will apply our proposed solution to Orange County as it has the highest disparity between number of EV cars and L2 chargers.

We propose a 70/30 split between traditional L2 chargers and Electrical outlet to support L2 charging.

REQUIRED LEVEL 2 CHARGERS FOR 2023

TOP 10 COUNTIES

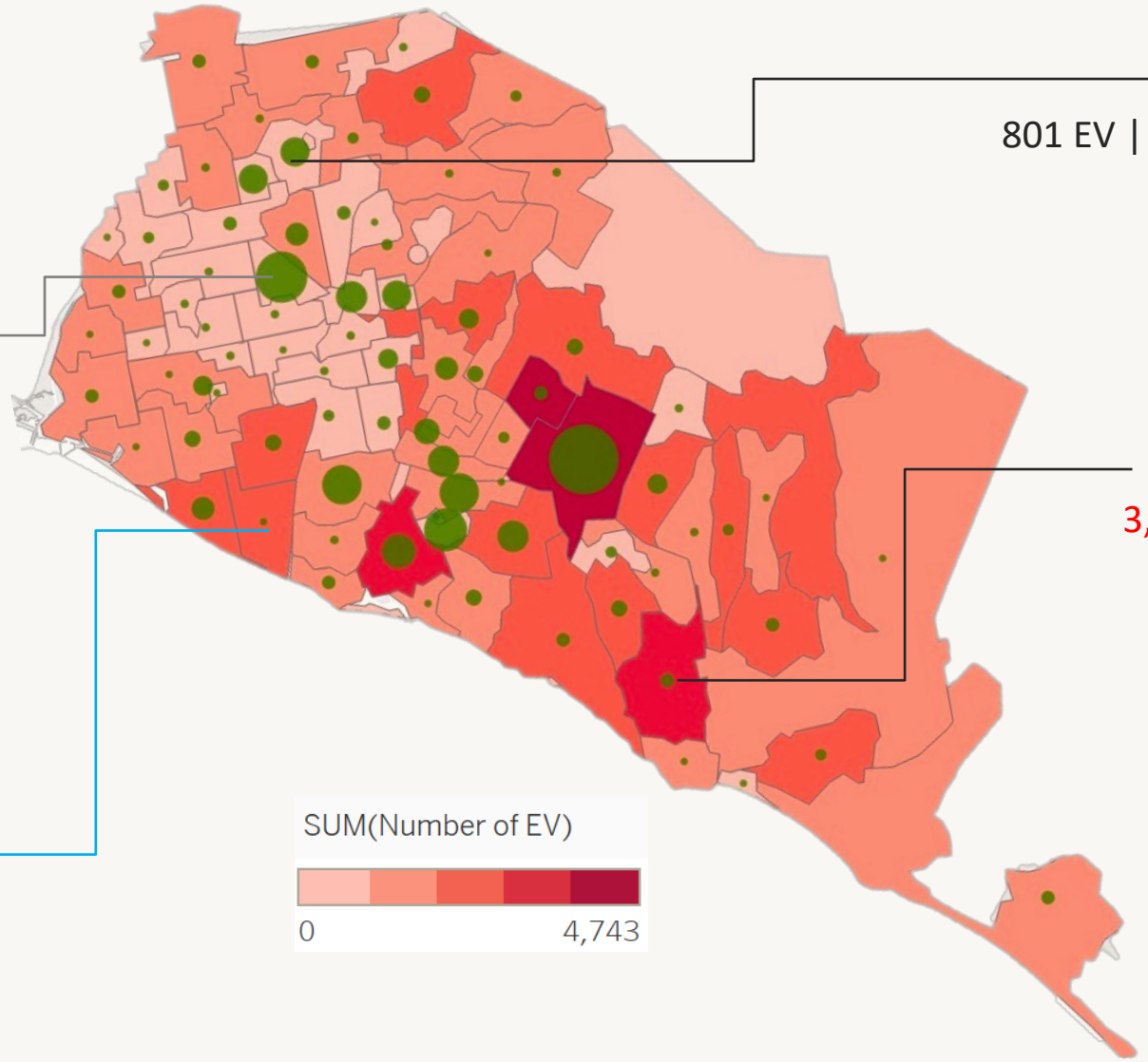
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
County	Number of EV 2022	Total L2 2022	Number of EV/charger 2022	Est Number of EV 2023	Est Required L2 2023	Need to add L2	Est Budget 2023	Budget for L2 (70%)	Budget for Outlet L2 (30%)	To add L2 2023	To add Outlet 2023	Total chargers 2023	Number of EV/charger 2023
Los Angeles	301,825	23,938	13	319,730	24,595	657	$ 1,699,118	$ 1,189,383	$ 509,735	541	1,274	25,753	12
Orange	143,055	4,547	31	151,541	11,657	7,110	$ 18,387,716	$ 12,871,401	$ 5,516,315	5,851	13,791	24,189	6
Santa Clara	115,822	15,475	7	122,693	9,438	0	$ -	$ -	$ -	-	-	15,475	8
San Diego	99,356	3,383	29	105,250	8,096	4,713	$ 12,188,650	$ 8,532,055	$ 3,656,595	3,878	9,141	16,402	6
Alameda	76,201	3,799	20	80,721	6,209	2,410	$ 6,232,686	$ 4,362,880	$ 1,869,806	1,983	4,675	10,457	8
Riverside	49,166	1,098	45	52,083	4,006	2,908	$ 7,520,602	$ 5,264,421	$ 2,256,180	2,393	5,640	9,131	6
San Mateo	47,718	4,086	12	50,549	3,888	0	$ -	$ -	$ -	-	-	4,086	12
Contra Costa	45,994	1,238	37	48,722	3,748	2,510	$ 6,491,303	$ 4,543,912	$ 1,947,391	2,065	4,868	8,171	6
San Bernardino	37,296	1,136	33	39,508	3,039	1,903	$ 4,921,494	$ 3,445,046	$ 1,476,448	1,566	3,691	6,393	6
Sacramento	32,479	1,374	24	34,406	2,647	1,273	$ 3,292,203	$ 2,304,542	$ 987,661	1,048	2,469	4,891	7

Calculation detail:

(3) = (1)/(2)
(4) = (1)*1.25/1.18
(5) = (4)/13 (average 13 EV / charger)
(6) = (5) – (2)
(7) = $81,720,595 * Need_to_add_L2 / Sum(Need_to_add_L2)
(8) = 0.7*(7)
(9) = 0.3*(7)
(10) = (8)/2,200 ($2,200 per L2 charger)
(11) = (9)/400 ($400 per outlet)
(12) = (2) + (10) + (11)
(13) = (4)/(12)

(1) https://driving.ca/column/motor-mouth/motor-mouth-how-many-ev-charging-stations-will-we-really-need
(2) Number of EV 2022: https://www.energy.ca.gov/files/zev-and-infrastructure-stats-data
(3) Level 2 2022: https://afdc.energy.gov/data_download
(4) Budget 2023: https://www.fhwa.dot.gov/bipartisan-infrastructure-law/evs_5year_nevi_funding_by_state.cfm

UNEVEN DISTRIBUTION OF EV STATIONS



92831

801 EV | 39 EV Stations

92802

455 EV| 138 EV Stations

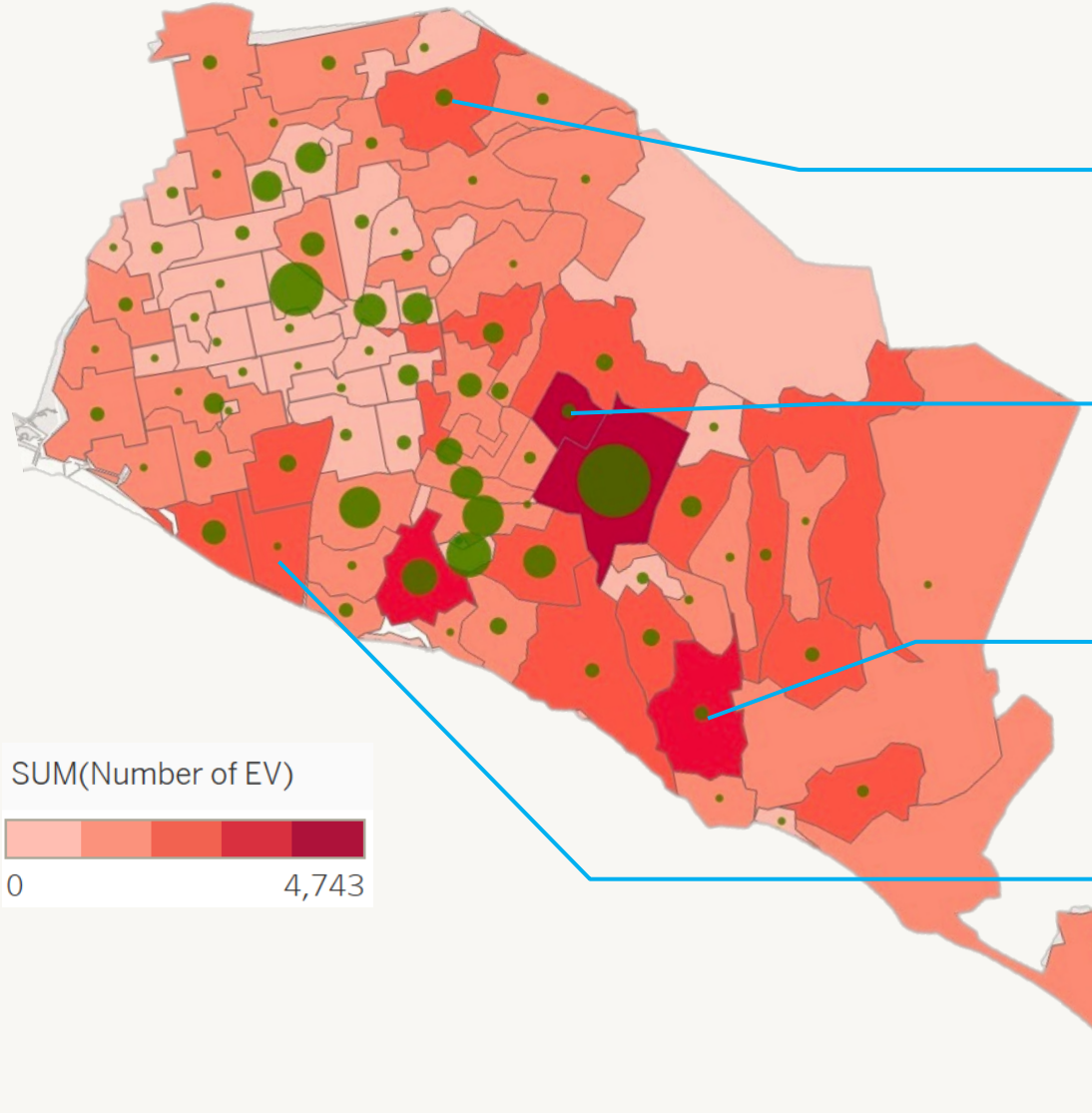
92677

3,063 EV | 12 EV Stations

92646

1,752 EV | 2 EV Stations

ZIP CODES TO CONSIDER FOR NEW L2 CHARGERS



92886 | 2,408 EV | 14 EV Stations

92620 | 3,690 EV | 10 EV Stations

92677 | 3,063 EV | 12 EV Stations

92646 | 1,752 EV | 2 EV Stations

INSTALLATION PLAN

24,189 CHARGERS (5,851 L2 CHARGERS AND 13,791 L2 OUTLETS) IN ORANGE COUNTY 2023

ZIP	Number of EV 2022	Number of EV Stations	To add chargers 2023
92646	1752	2	1476
92688	1485	2	1252
92649	1338	2	1127
92843	642	1	1082
92865	567	1	955
92629	1127	2	950
92625	992	2	836
90720	964	2	812
92675	1320	3	741
92869	1116	3	627
92833	1481	4	623
92620	3690	10	622
92845	356	1	600
92627	1529	6	430
92677	3063	12	430
92691	1526	6	428
92807	1498	6	421
92808	986	4	416
92653	1230	5	414

ZIP	Number of EV 2022	Number of EV Stations	To add chargers 2023
92692	1914	8	403
92804	945	4	398
92624	230	1	387
92673	1655	8	349
92840	803	4	339
92835	1102	6	310
92694	2367	13	307
92870	1380	8	291
92886	2408	14	290
92651	1865	11	286
92867	1344	8	283
90623	501	3	281
92841	602	4	254
92610	719	5	243
92821	1437	10	243
92887	1011	7	243
92708	2099	15	236
92604	1099	8	231
92656	2166	16	227

ZIP	Number of EV 2022	Number of EV Stations	To add chargers 2023
92630	2408	19	214
90620	880	7	212
90630	1384	11	212
92602	2022	16	212
92704	893	8	189
90631	1187	11	182
92672	1280	12	180
92844	422	4	179
92823	411	4	174
92782	1719	17	170
92683	1885	20	158
92647	1317	15	148
92679	1917	0	148
92705	1737	21	140
90621	732	9	136
92706	484	6	136
92657	1189	15	133
92663	1021	13	133
90740	823	11	126

OUR RECOMMENDATION

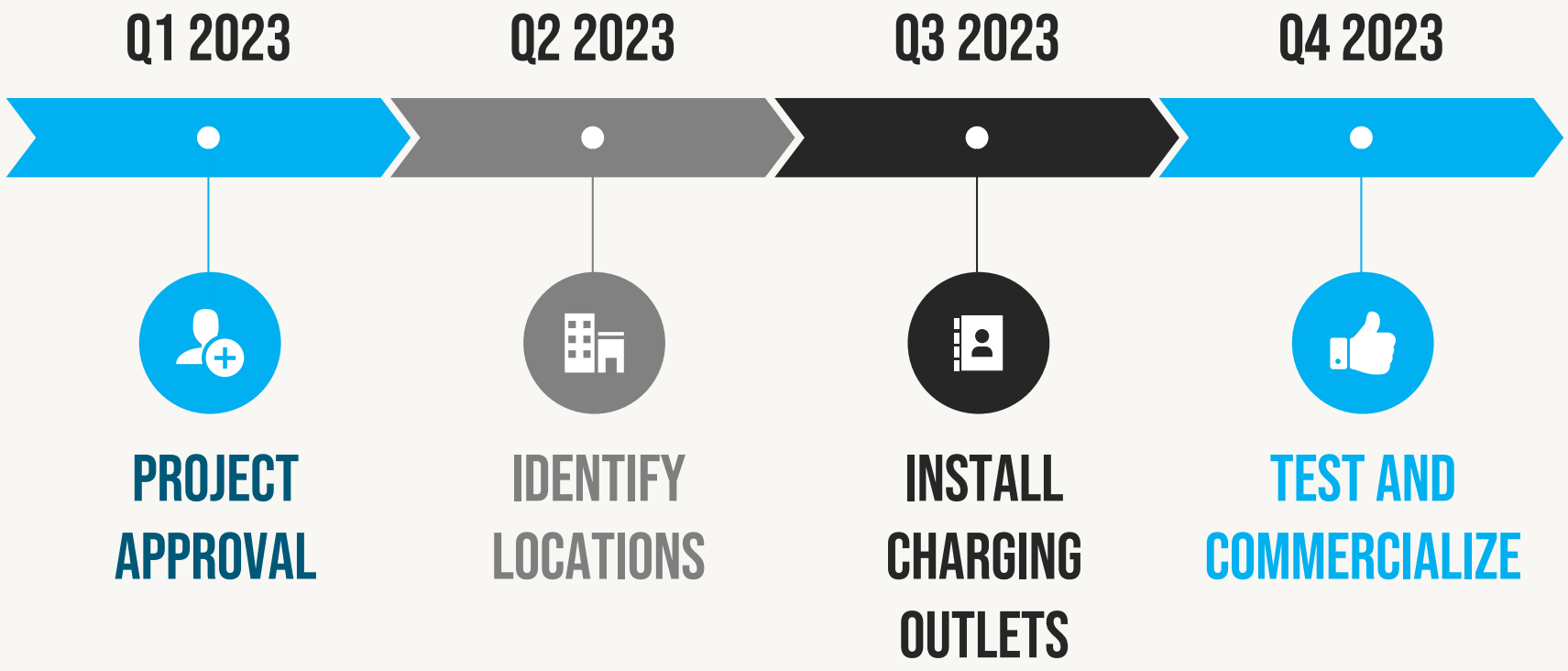
INSTALLING L2 CHARGERS/OUTLETS

- INSTALLING L2 OUTLETS IN MULTI-FAMILY DWELLING UNITS AND WORKPLACE PARKING STRUCTURE
- INSTALLING L2 OUTLETS AND CHARGING UNITS IN COMMERCIAL COMPLEX AND MALLS
- INSTALLING L2 OUTLETS AND CHARGING UNITS IN CENTRALIZED PUBLIC PARKING STRUCTURE FOR DENSE NEIGHBORHOOD
- COORDINATING WITH PRIVATE COMPANIES TO EXPAND INSTALLTIONS WHERE POSSIBLE

IMPACT OF IMPLEMENTING RECOMMENDATIONS

- INCREASED AVAILABILITY OF L2 CHARGING AND ATTRACTING MORE EV BUYERS
- PROVIDING EQUAL L2 CHARGING ACCESS TO LOW-INCOME NEIGHBORHOOD
- REDUCING THE COST OF INSTALLING AND MAINTAINING L2 CHARGERS
- WILL REDUCE THE NUMBER OF GAS CARS AND THE CARBON FOOTPRINT

OUR PROJECTED TIMELINE



THANK YOU!

DATA SOURCES-APPENDIX

VEHICLES POPULATION SINCE 2010

NUMBER OF LEVEL 2 CHARGERS AND LOCATIONS

BUDGET FOR EV SEGMENTS 2022 - 2026

POPULATION, HOUSING, MEDIAN INCOME SINCE 1980

CALIFORNIA ZIP CODES