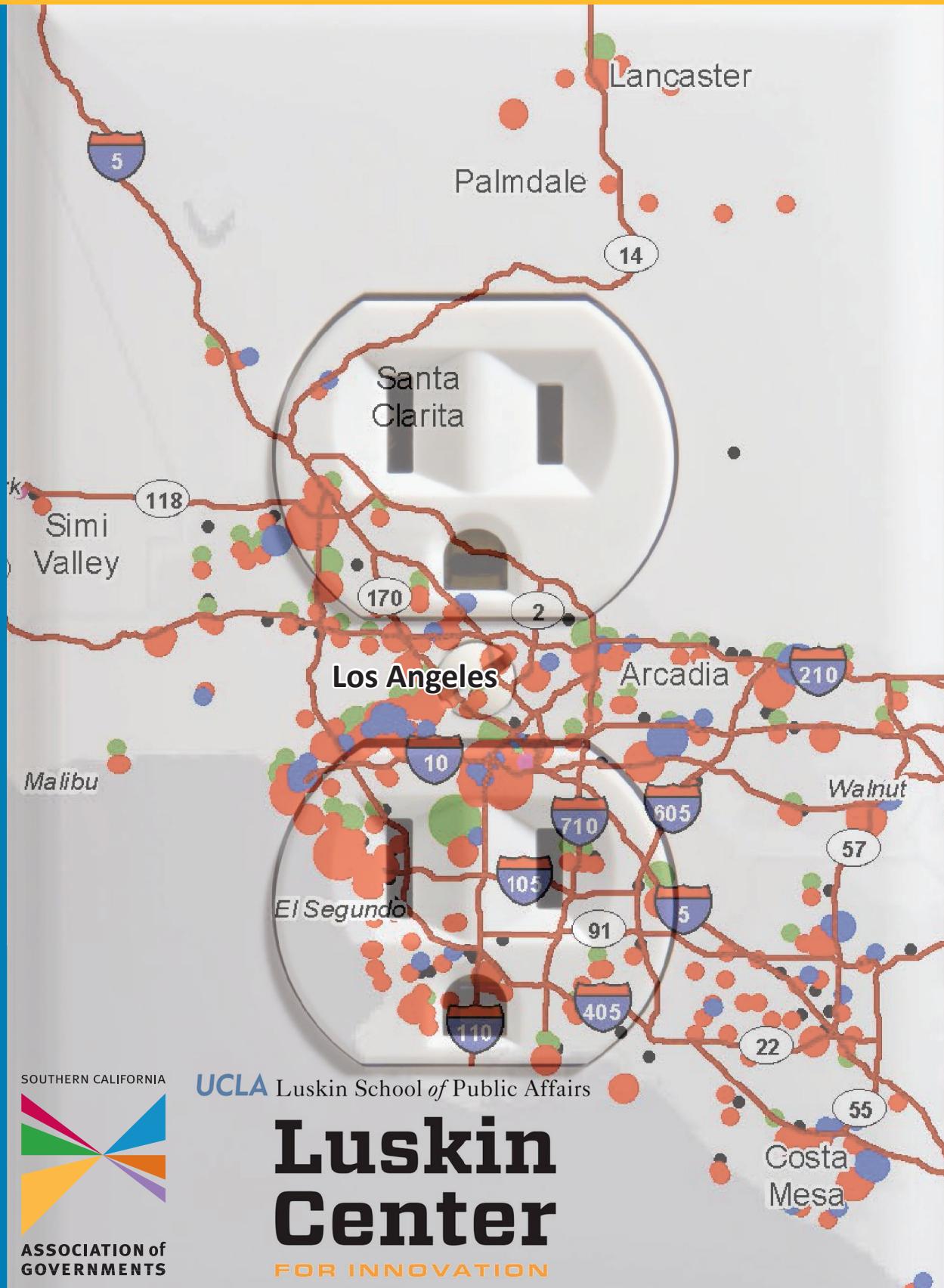


Southern California Plug-in Electric Vehicle Atlas



SOUTHERN CALIFORNIA PLUG-IN ELECTRIC VEHICLE READINESS ATLAS

American Planning Association Award Winner for Planning Excellence (Los Angeles)

About this Document

This document was prepared for the Southern California Association of Governments (SCAG) by the UCLA Luskin Center for Innovation. It constitutes Deliverable 11 of SCAG contract 12-021-C1 to support regional planning for plug-in electric vehicle (PEV) adoption. SCAG is coordinating a multi-stakeholder group of government agencies, utilities, and university researchers to prepare multi-faceted and interdisciplinary regional PEV readiness plans. Among other purposes, these plans will help illuminate and guide strategic infrastructure investment, PEV-related economic development, and supportive policy design in Southern California.

Disclaimer

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**Luskin
Center**
FOR INNOVATION



SOUTHERN CALIFORNIA
PLUG-IN ELECTRIC VEHICLE READINESS ATLAS

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SOUTHERN CALIFORNIA PLUG-IN ELECTRIC VEHICLE READINESS ATLAS

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PREFACE

Council of government-level maps

Plug-in Electric Vehicles (PEVs) may provide a range of important benefits. For drivers, PEVs are a way to save money on fuel, avoid trips to the gasoline station, contribute to energy independence, and improve local air quality. For utilities, PEVs represent a new source of demand for power even as they support efficient use of energy produced during overnight hours. For state and regional air-quality regulators, PEVs help reduce criteria air pollutants and greenhouse gas (GHG) emissions.

To fully realize the benefits of PEVs, planners must coordinate and facilitate the growth of two complementary markets: one for PEVs and another for the electric charging opportunities that these vehicles need to refuel. This Atlas describes how many PEVs are in a given neighborhood and how their spatial concentrations vary over the course of a day as their drivers travel to workplaces and retail destinations. This Atlas also projects PEVs growth over the next ten years within neighborhoods and municipalities in each of the 15 councils of government (COGs) within the Southern California Association of Governments region.

This Atlas also maps potential charging infrastructure opportunities to support and complement growth in the PEV market. It identifies the locations and sizes of workplaces, multi-unit residences and retail establishments that could potentially host PEV charging. Lastly, the Atlas includes maps of other resources that support PEV charging, such as existing publicly-accessible charging stations and stand-alone parking facilities.

This spatial information enables to planners to know where PEVs are currently and where growth will occur in the future. This will help them prioritize the municipal planning reforms such as those described in the Southern California PEV Readiness Plan. It describes where latent PEV demand is constrained because of the challenges of installing charging opportunities in multi-unit residences. It also describes the locations of workplaces and retail establishments that are in neighborhoods with a higher density of PEVs during the day and evening. With this information, planners can take the next steps to provide the targeted technical assistance to these sites as described in the Southern California PEV Readiness Plan.

The technical appendix that follows the Atlas provides detailed information on data sources and analyses used to generate each map. This Atlas features the following maps of the neighborhoods and municipalities within each COG in the SCAG region:

1. **PEV registration density as of 2012.** Knowing how many PEVs are currently registered in a given area will indicate the location of current and near-future demand for residential charging. By extension, this information can help planners and utilities anticipate locations that will carry additional nighttime electrical load.
2. **PEV morning travel to work, providing spatial daytime PEV density at or near workplaces.** Understanding where PEVs are concentrated during morning peak hours (6:00 a.m. to 9:00 a.m.) can help planners and utilities identify neighborhoods where there will be demand for daytime charging.

3. **Workplaces identified by numbers of employees.** Planners can target the largest employers for workplace charging initiatives, as they presumably host the largest numbers of parking spaces on-site and can potentially serve the highest numbers of employees.
4. **Workplaces overlaid with morning peak PEV density.** Planners and utilities can use these maps to assess the potential utilization of workplace charging by comparing the spatial distribution of employers and weekday morning peak travel destinations for PEVs.
5. **Publicly-accessible charging locations, identified by power level and number of stations per location.** Planners can use these maps to compare the location of existing publicly-accessible charge stations with the locations of employment centers, retail centers and PEV daytime destinations, also mapped at the COG level in the Atlas. The maps can also be used to identify where there are gaps in meeting demand for charging. For MUDs that do not have parking, publicly-accessible sites will become important charging options. The maps identify the number of charging units/cords available at each location along with the level of service (Level 1, Level 2, etc., or “Unknown” where there is charging available but the quantity of connectors and their level of service could not be immediately determined). The maps are based on information collected during the summer and fall of 2012.
6. **Multi-unit dwellings (MUDs) by number of units and density.** City planners can use these maps to identify specific buildings and/or MUD owners that could potentially host charging on-site. Planners can use the maps to compare spatial distributions of MUD density with employment and commercial density, publicly accessible charging stations, and stand-alone parking areas to assess the potential for these other PEV sites to serve the charging needs of MUD residents. Mapping the precise location of MUDs and knowing the density of units on a site will be of particular use in utility planning. Utilities can use such maps to anticipate where upgrades may be needed for transformers and distribution stations to accommodate PEV charging at MUDs.
7. **Retail destinations, from strip development to regional centers.** Many PHEV drivers find it valuable to charge when visiting retail destinations in order to maximize electric miles driven. After locating general categories of retail charging opportunities on the map, planners can turn to Chapter 8 of the Southern California PEV Readiness Plan for more detailed descriptions of how long cars are typically parked at specific types of retail destinations.
8. **Retail destinations overlaid with PEV mid-day travel, providing spatial retail PEV density at or near retail centers.** Planners and utilities can use these maps to assess potential for retail charging by comparing the spatial distribution of retail centers and mid-day travel destinations (9:00 a.m. to 3:00 p.m.) for PEVs.
9. **Stand-alone parking facilities.** Publicly-accessible parking facilities can fill a gap in PEV charging, particularly in older urban cores where retail stores and even some workplaces and multi-unit dwellings do not have dedicated parking. Park and ride lots in particular may substitute for Level 1 workplace charging if workers leave their PEVs parked all day. Parking lots and structures greater than 2.5 acres that are not attached to other land uses are mapped at the COG level.

The Atlas provides this suite of spatial tools for PEV readiness planning for the following COGs:

Arroyo Verdugo Subregion	San Bernardino Associated Governments
City of Los Angeles	San Fernando Valley Council of Governments
Coachella Valley Association of Governments	San Gabriel Valley Council of Governments
Gateway Cities Council of Governments	South Bay Cities Council of Governments
Imperial County Transportation Commission	Ventura Council of Governments
Las Virgenes Malibu Council of Governments	Western Riverside Council of Governments
North Los Angeles County	Westside Cities Council of Governments
Orange County Council of Governments	

Utility PEV growth projections

The Southern California Plug-in Electric Vehicle Atlas also provides projections of PEV growth and electric miles driven over 10 years by utility service territory for the following utilities¹:

Azusa Light and Power	Imperial Irrigation District
Burbank Water and Power	Los Angeles Department of Water and Power
Cerritos Electric Utility	Riverside Public Utilities
Glendale Water and Power	Southern California Edison
Pasadena Water and Power	Anza Electric Cooperative
Vernon Light and Power	Moreno Valley Electric Utility
Anaheim Public Utilities Department	Rancho Cucamonga Municipal Utility
City of Banning Electric Utility	San Diego Gas & Electric (portion within SCAG)
City of Colton Utilities Services	

These projections are designed to help regional planners and utilities locate current and future demand for PEV charging and coordinate efforts to meet that demand.

¹ Utilities not represented by the Southern California Public Power Authority and that have less than 2 PEVs attributable to their service territories have been excluded from this analysis. They are Bear Valley Electrical Service, Corona Water and Power, Needles Public Utility Authority, and Victorville Municipal Utility Services.

COUNCILS OF GOVERNMENT

PEV Growth

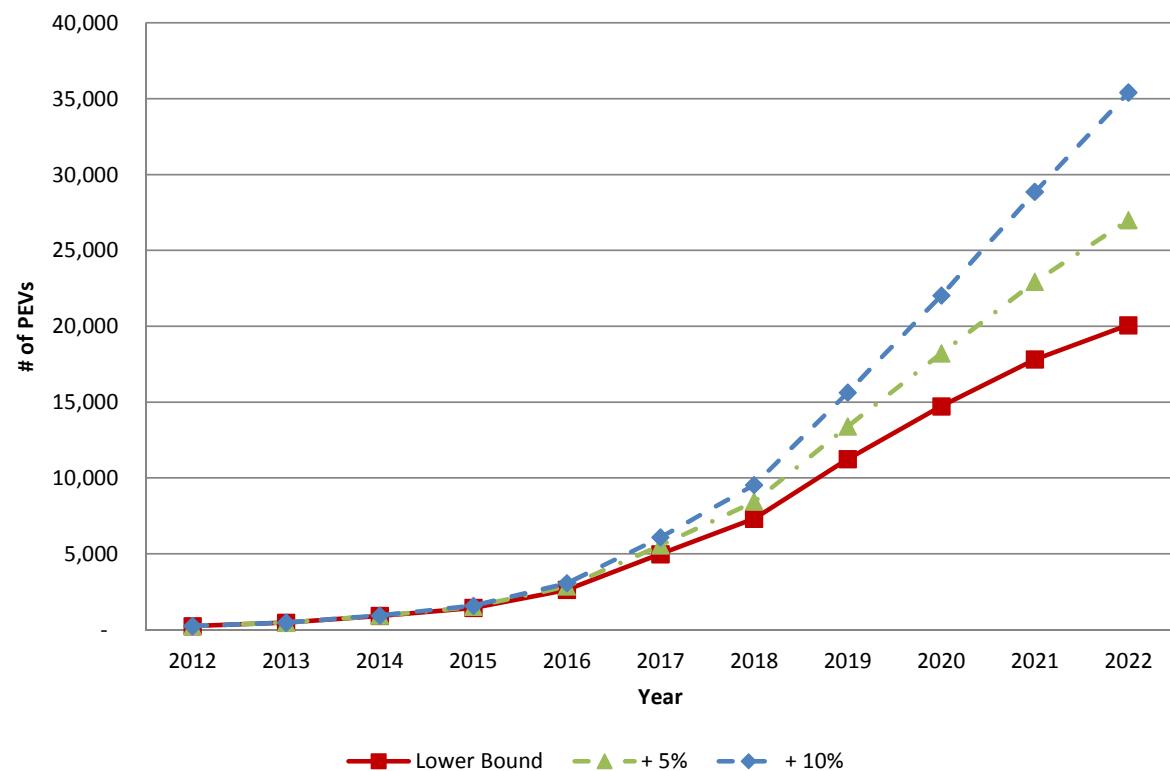
Councils of Government	2012	Number of PEVs					
		2017 (5-year estimate)			2022 (10-year estimate)		
		Lower Bound	+ 5%	+ 10%	Lower Bound	+ 5%	+ 10%
Arroyo Verdugo Subregion	233	4,976	5,552	6,081	20,074	26,997	35,403
City of Los Angeles	1,831	39,106	43,629	47,787	157,752	212,152	278,207
Coachella Valley Association of Governments (CVAG)	115	2,456	2,740	3,001	9,908	13,325	17,473
Gateway Cities Council of Governments (GCCOG)	503	10,743	11,985	13,128	43,336	58,281	76,427
Imperial County Transportation Commission (ICTC)	5	107	119	130	431	579	760
Las Virgenes Malibu Council of Governments	136	2,905	3,241	3,549	11,717	15,758	20,664
North Los Angeles County	215	4,592	5,123	5,611	18,524	24,911	32,668
Orange County Council of Governments (OCCOG)	2,263	48,333	53,923	59,062	194,971	262,206	343,846
San Bernardino Associated Governments (SANBAG)	390	8,330	9,293	10,179	33,601	45,188	59,258
San Gabriel Valley Council of Governments (SGVCOG)	753	16,082	17,942	19,652	64,875	87,248	114,413
San Fernando Valley Council of Governments (SFVCOG)*	1,002	21,401	23,876	26,151	86,328	116,098	152,246
South Bay Cities Council of Governments (SBCCOG)	747	15,954	17,799	19,496	64,359	86,552	113,501
Ventura Council of Governments (VCOG)	405	8,650	9,650	10,570	34,893	46,926	61,537
Western Riverside Council of Governments (WRCOG)	398	8,500	9,484	10,387	34,290	46,115	60,473
Westside Cities Council of Governments (WCCOG)	327	6,984	7,792	8,534	28,173	37,888	49,685
TOTAL	8,321	177,718	198,272	217,169	716,904	964,127	1,264,314

* Not included in total

ARROYO VERDUGO SUBREGION

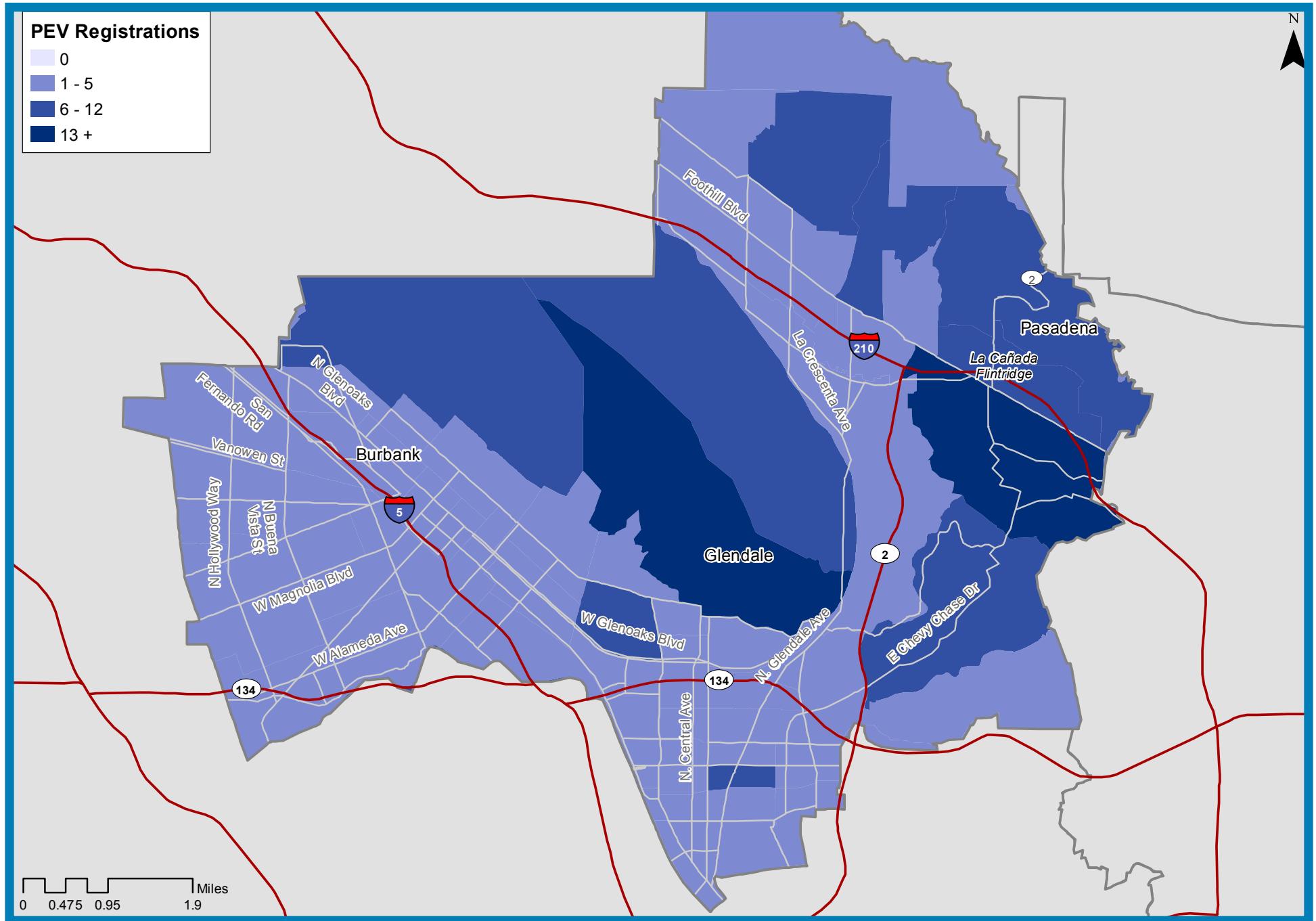
PEV Growth

Year	Cumulative PEV registrations*		
	Lower Bound	+ 5%	+ 10%
2012	233	233	233
2013	466	466	466
2014	900	923	932
2015	1,432	1,515	1,576
2016	2,627	2,856	3,049
2017	4,976	5,552	6,081
2018	7,306	8,429	9,536
2019	11,235	13,383	15,618
2020	14,726	18,210	22,032
2021	17,811	22,935	28,851
2022	20,074	26,997	35,403

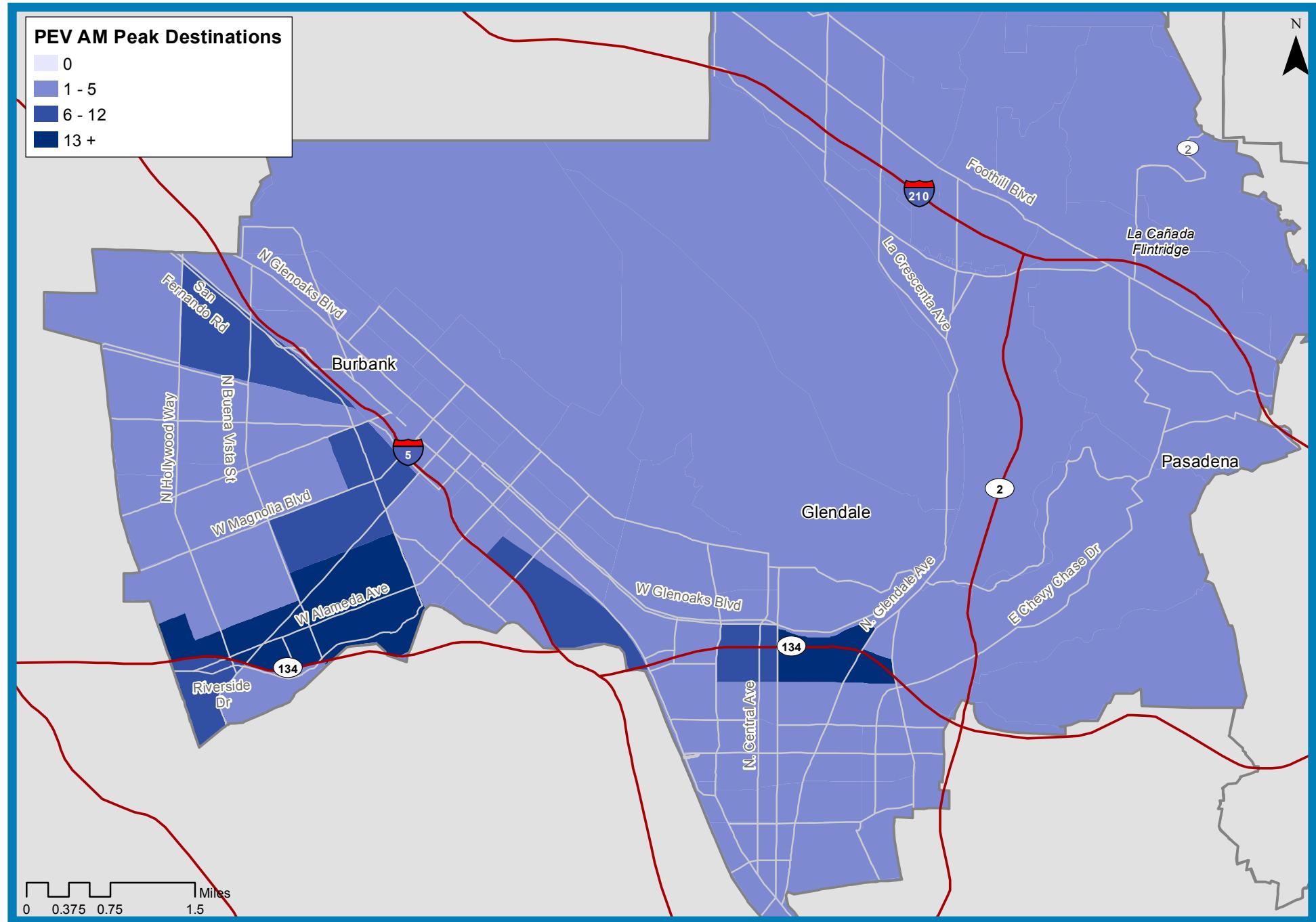


* The +5% and +10% projections begin in 2014, when uncertainty becomes greater.

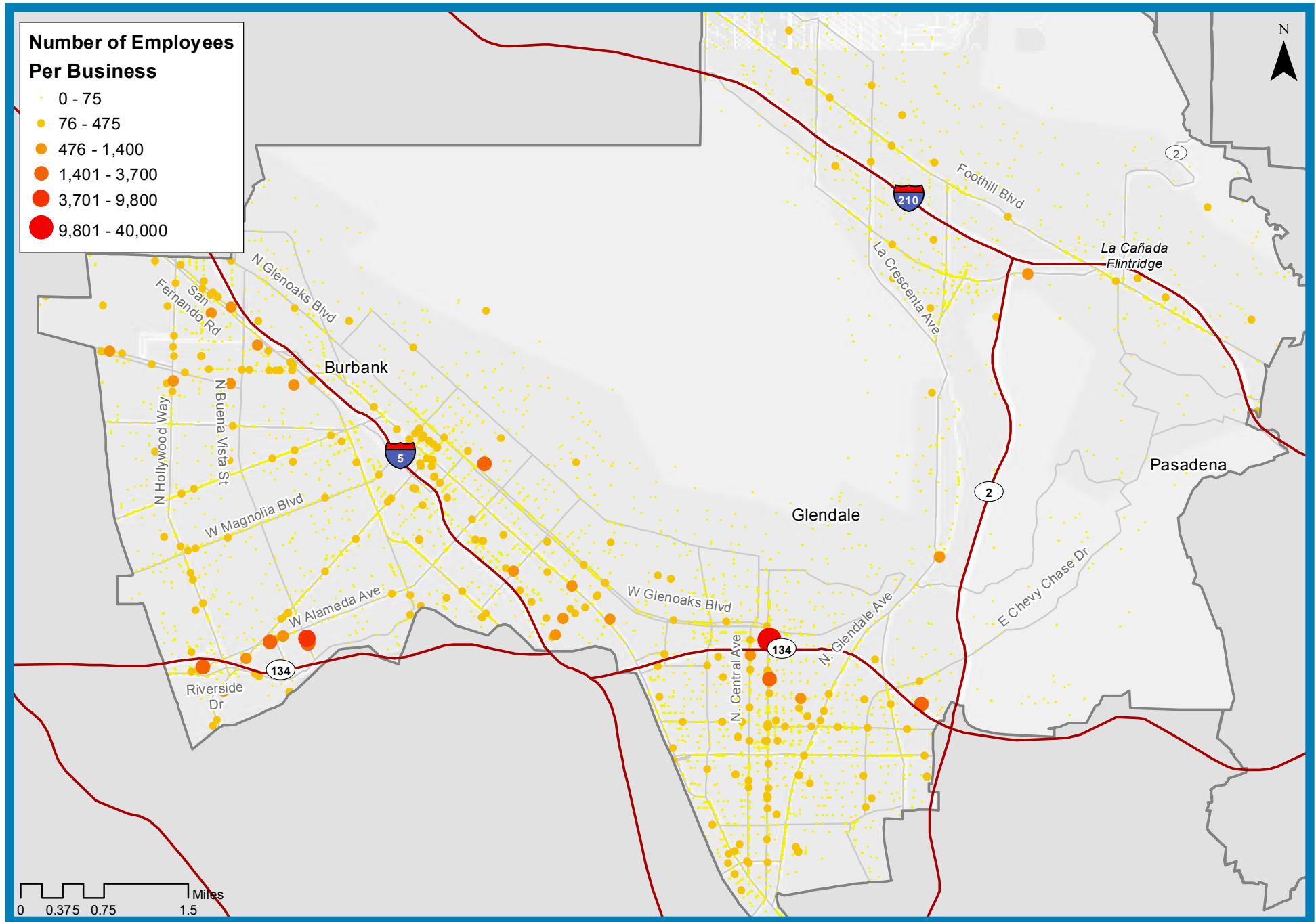
Plug-in Electric Vehicle Registrations



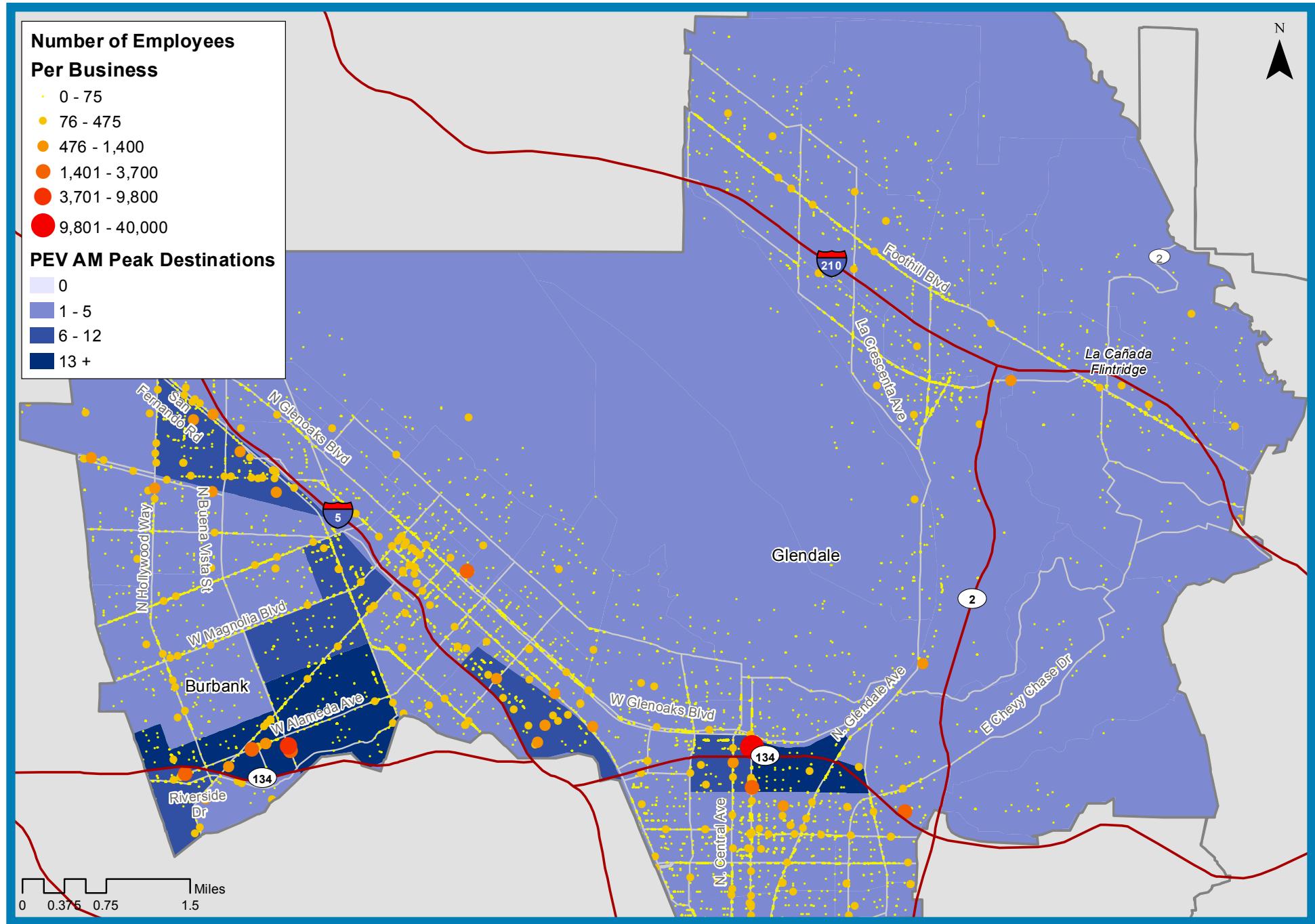
Plug-in Electric Vehicle Morning Peak Destinations



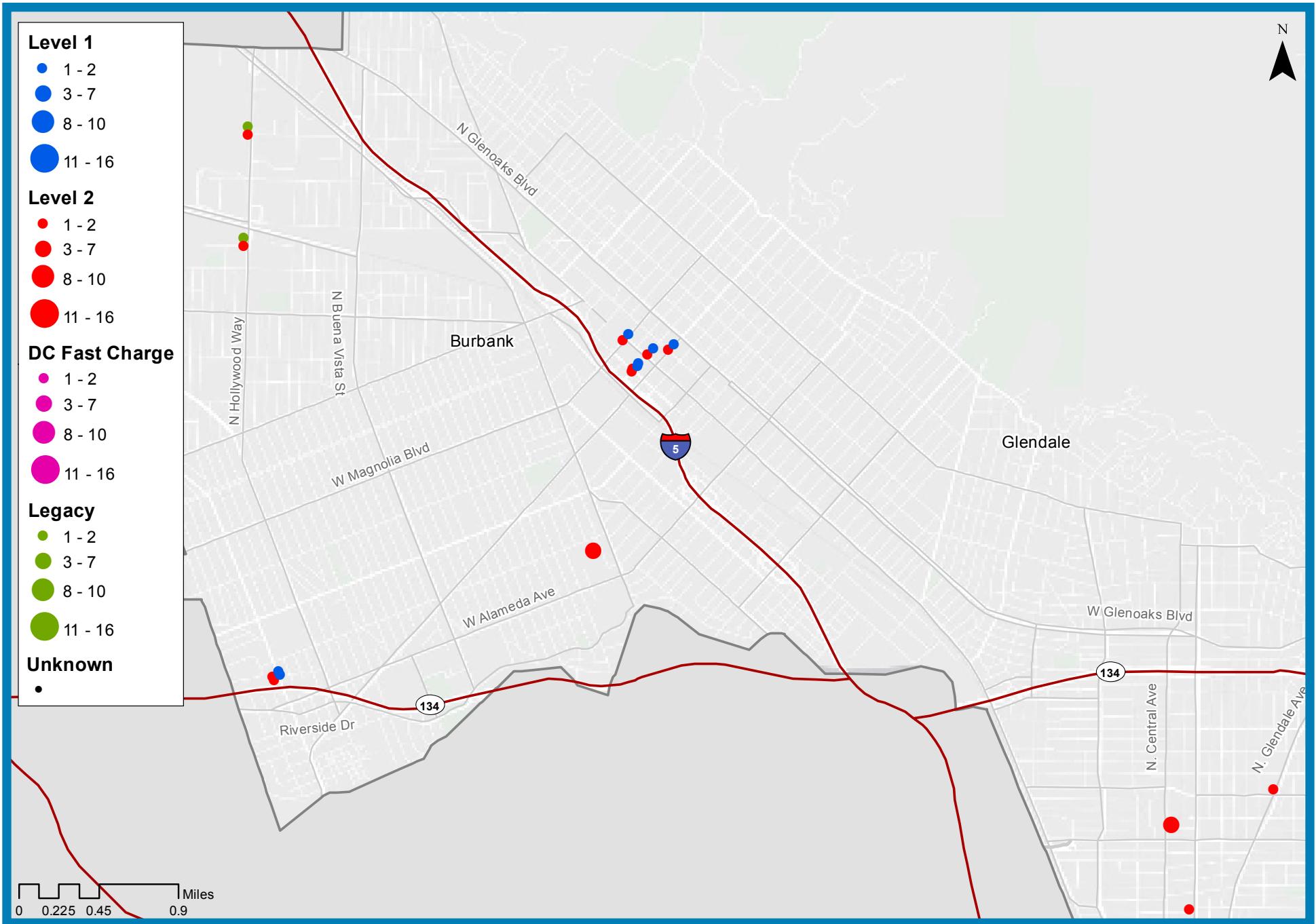
Workplaces by Number of Employees



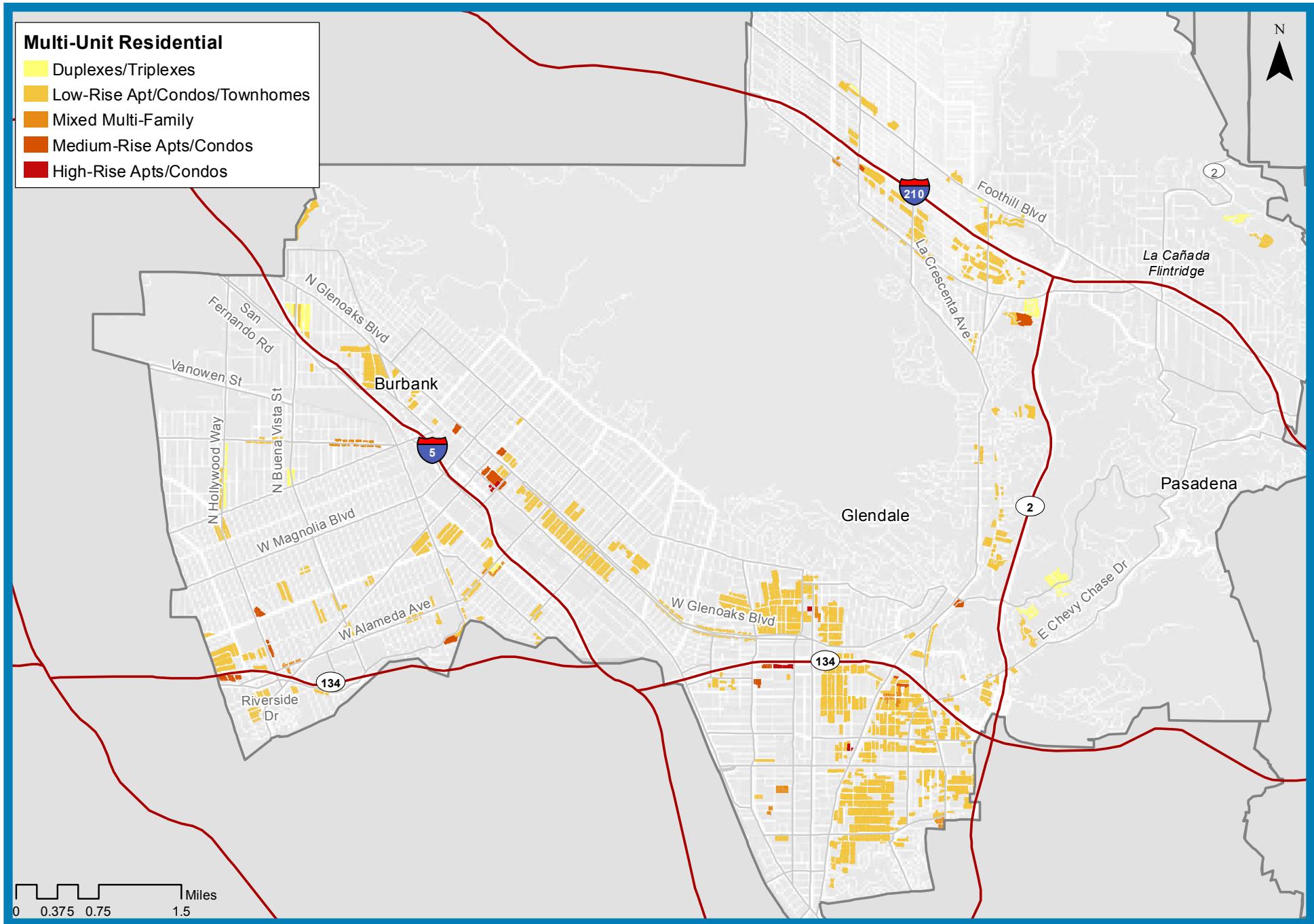
PEV Peak Morning Destinations and Workplaces



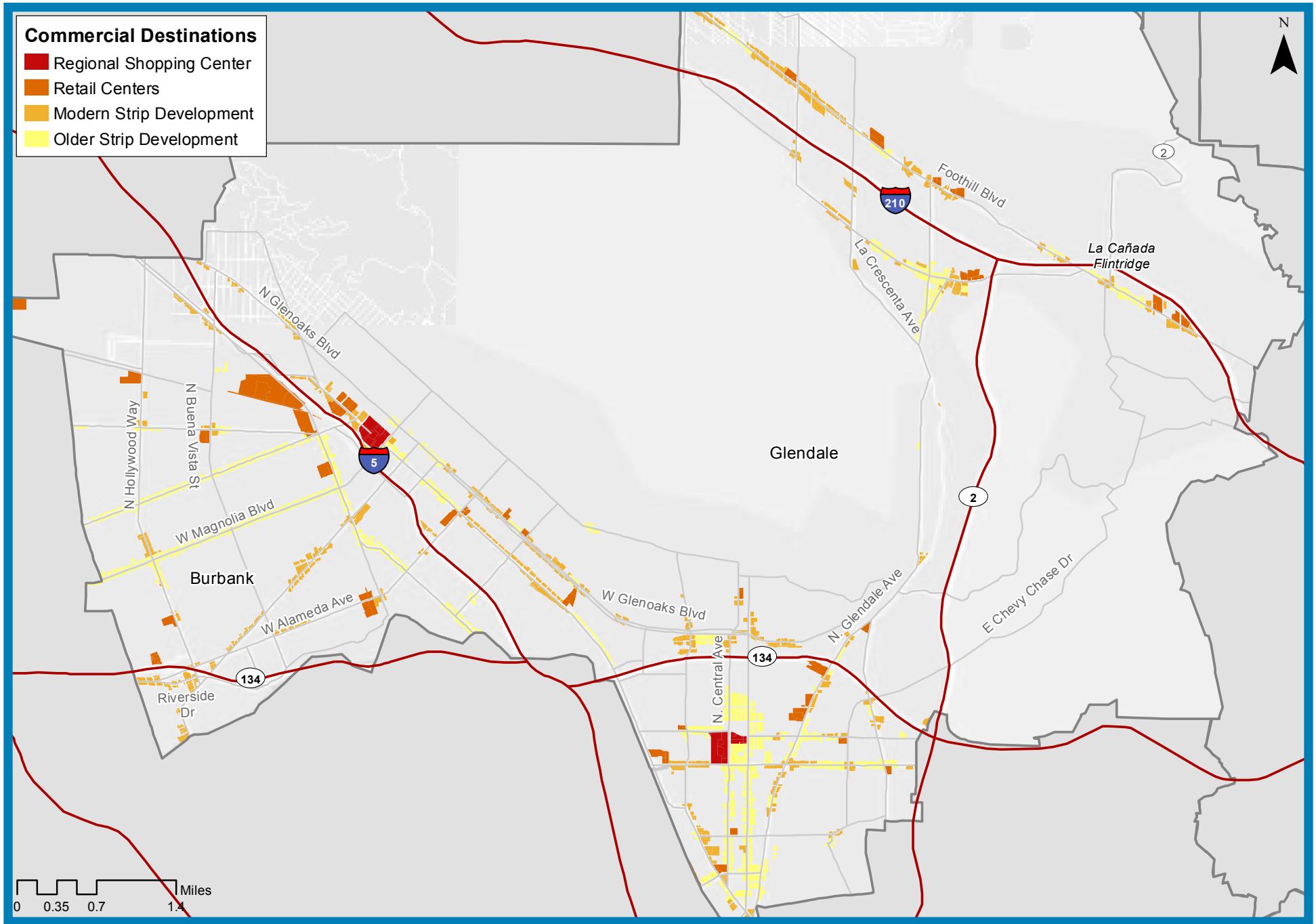
Publicly-Accessible Charging Stations (Summer/Fall 2012)



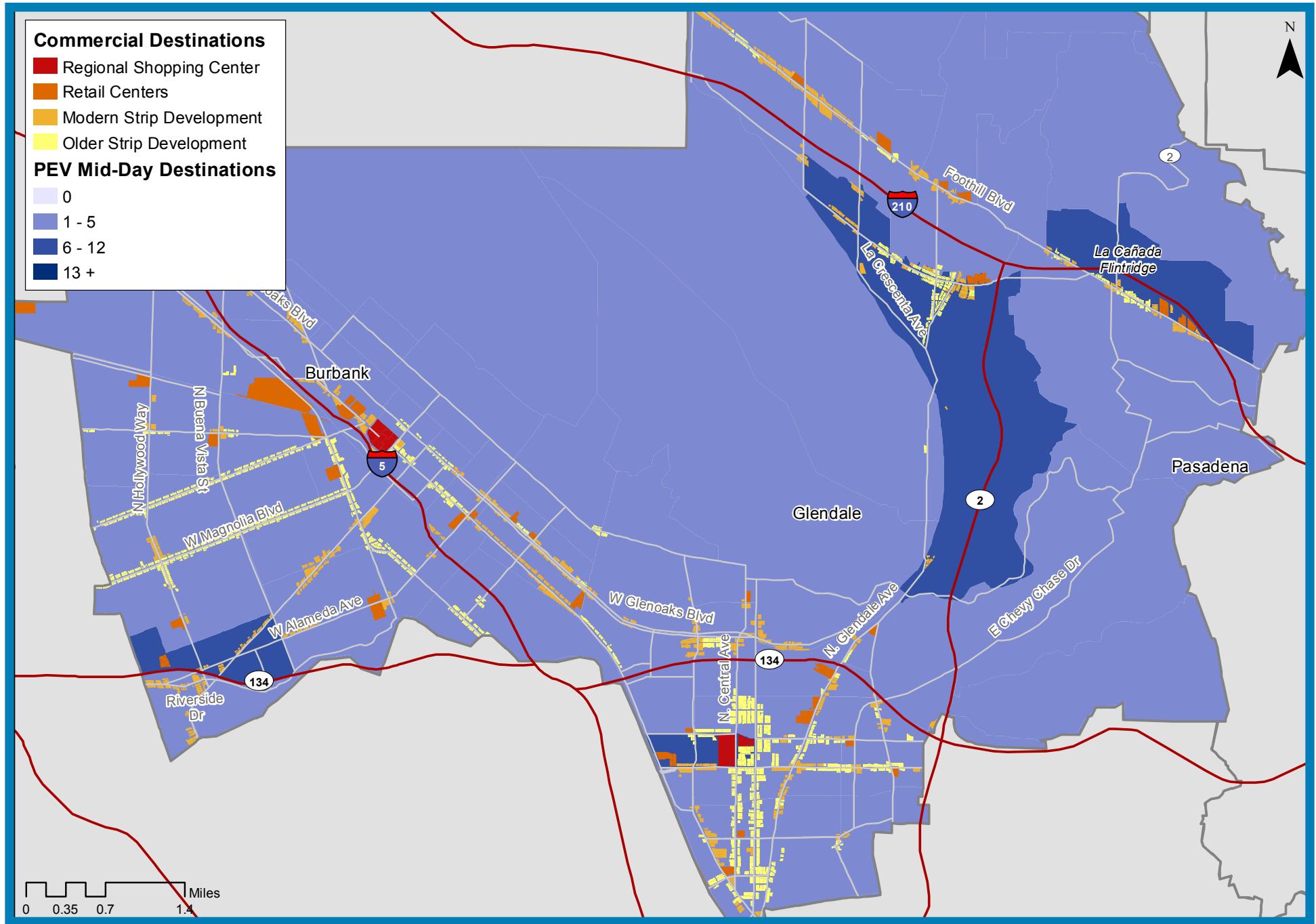
Multi-Unit Residential



Commercial (Retail) Destinations



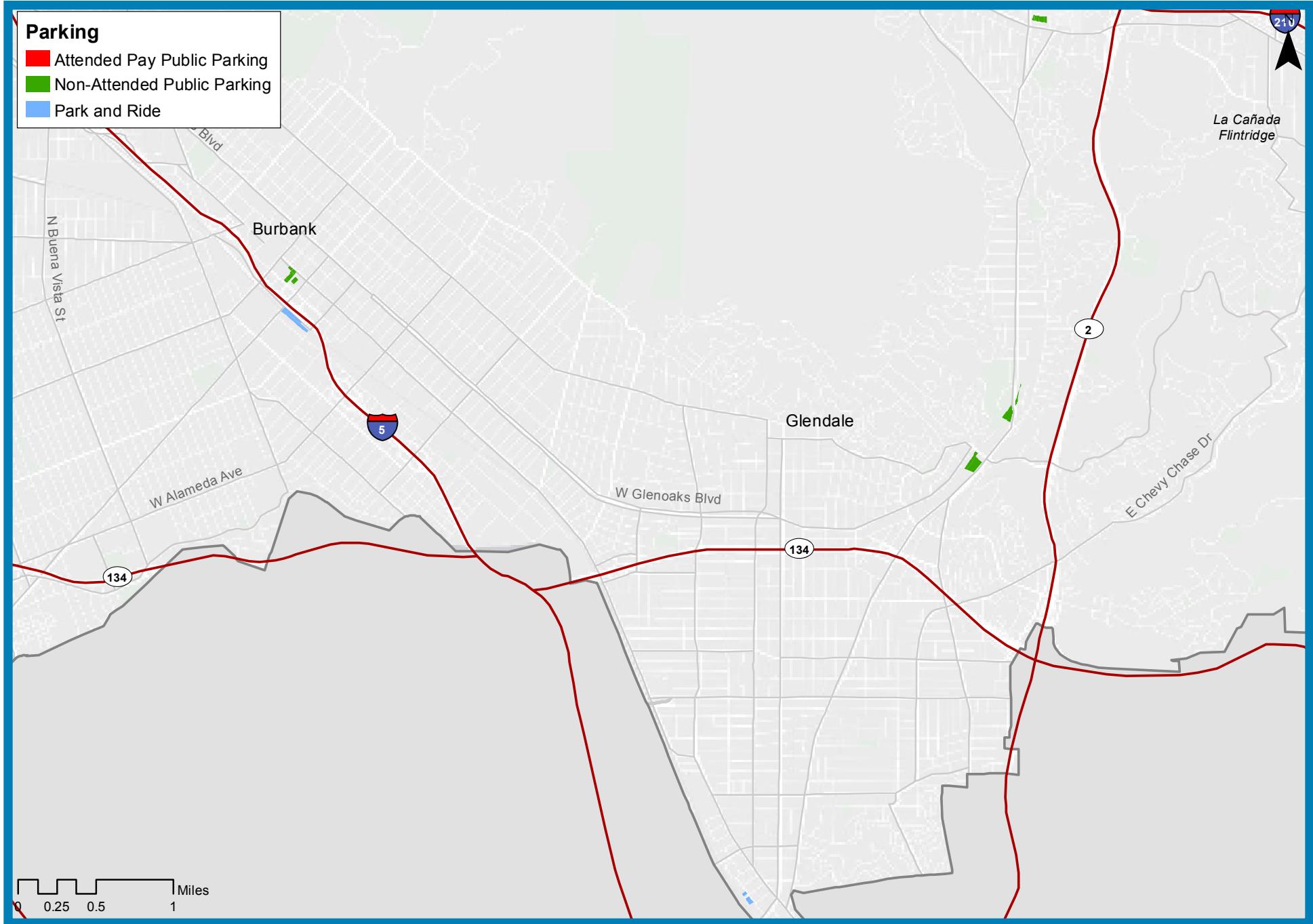
PEV Mid-Day Destinations and Commercial (Retail) Locations



Stand-alone Parking Facilities

11

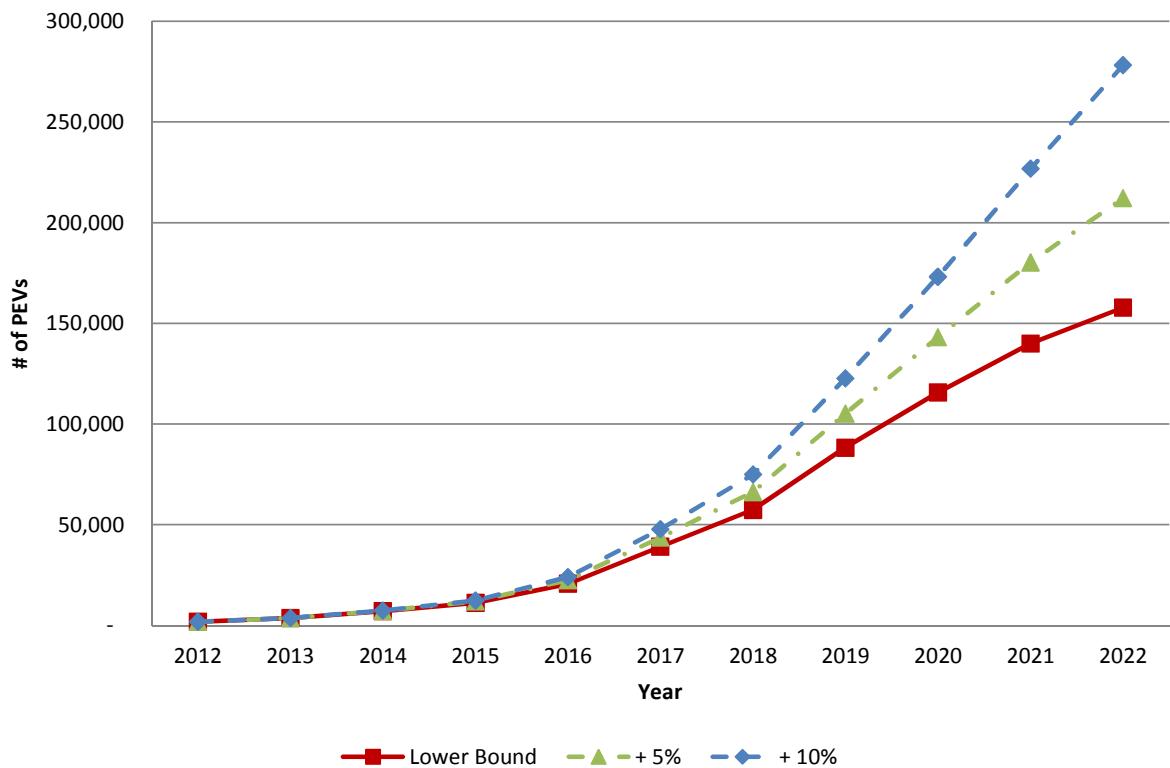
| Arroyo Verdugo Subregion



CITY OF LOS ANGELES

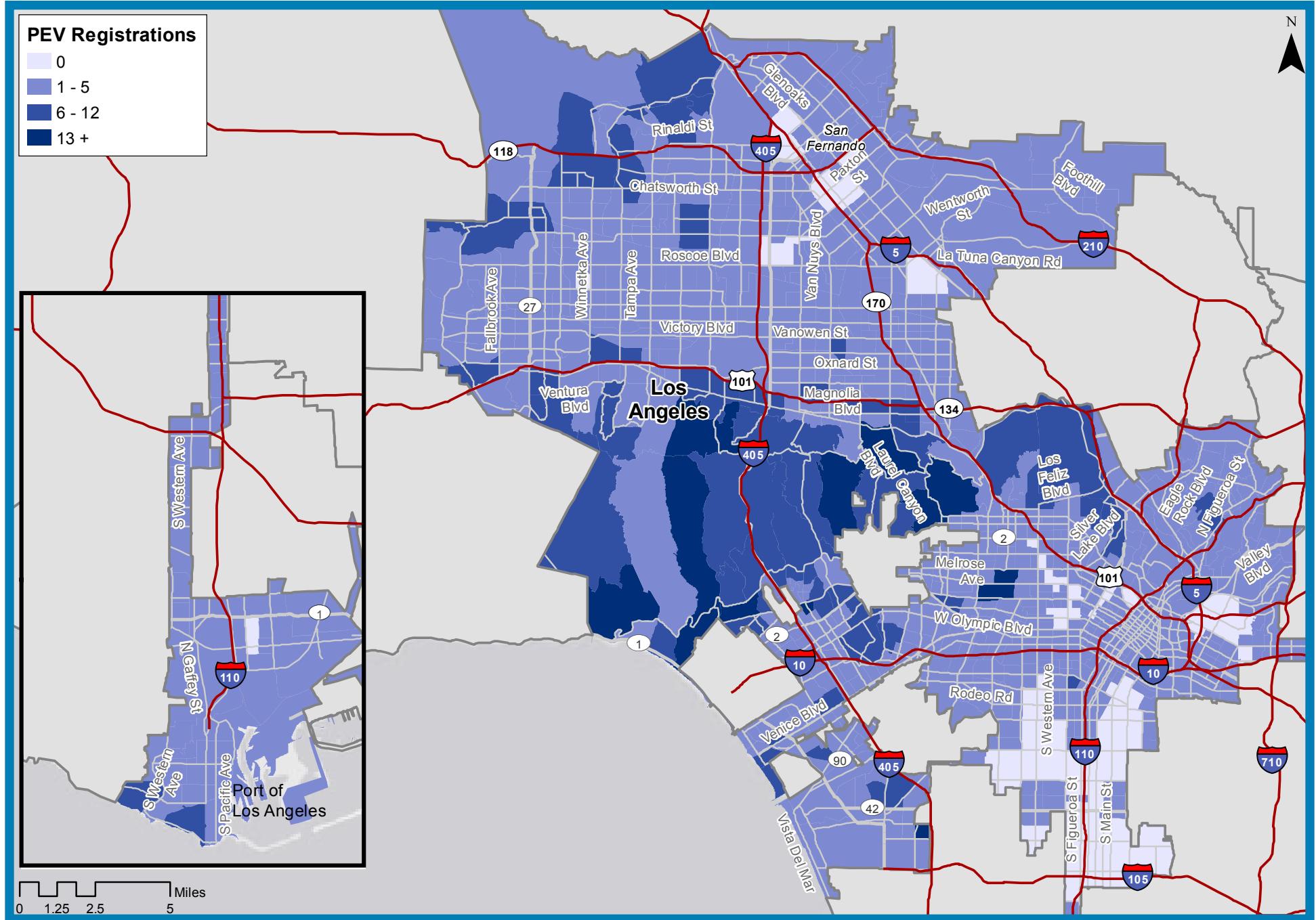
PEV Growth

Year	Cumulative PEV registrations*		
	Lower Bound	+ 5%	+ 10%
2012	1,831	1,831	1,831
2013	3,662	3,662	3,662
2014	7,072	7,255	7,324
2015	11,255	11,909	12,388
2016	20,645	22,440	23,963
2017	39,106	43,629	47,787
2018	57,416	66,238	74,940
2019	88,291	105,169	122,733
2020	115,723	143,103	173,139
2021	139,962	180,233	226,719
2022	157,752	212,152	278,207

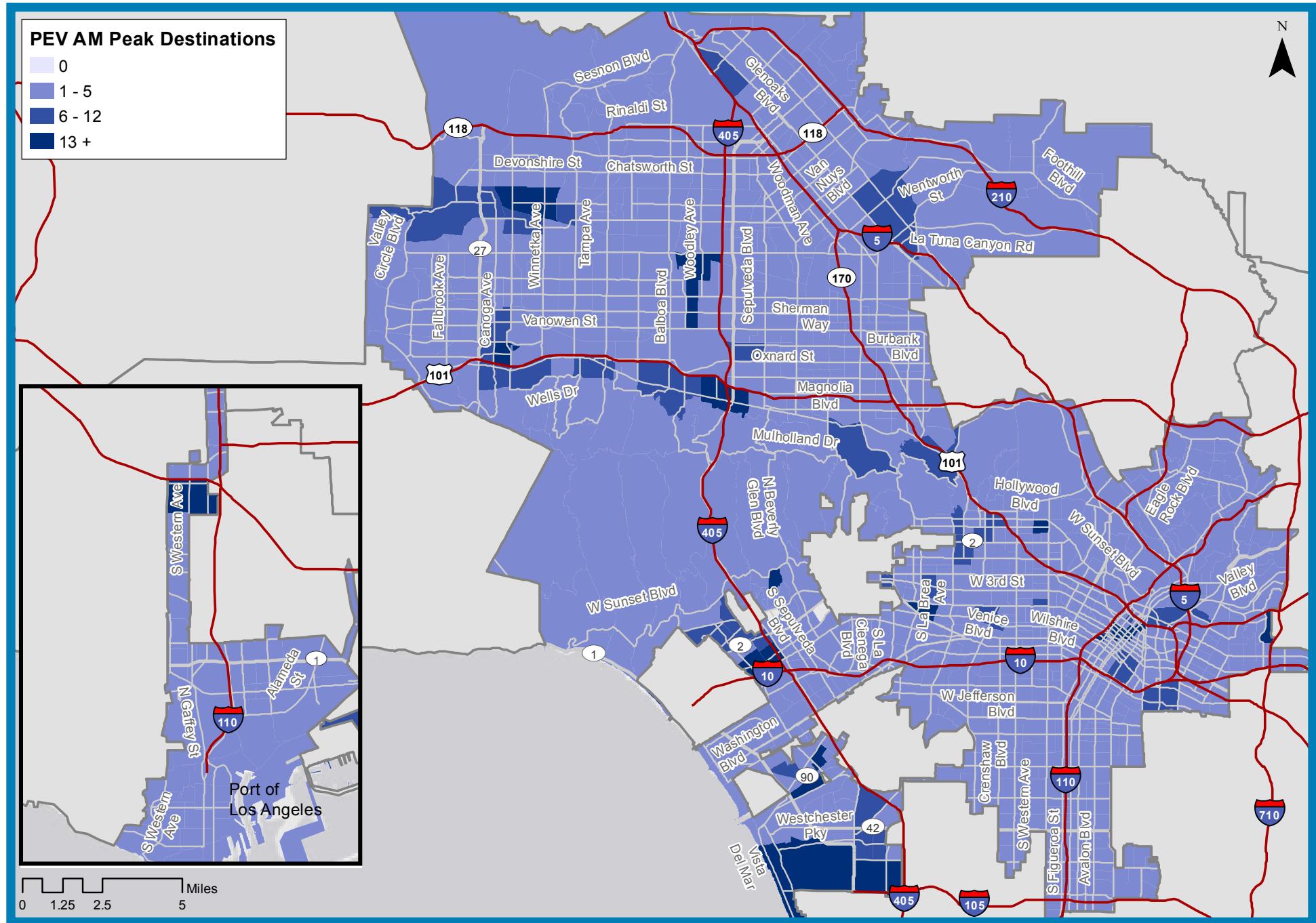


* The +5% and +10% projections begin in 2014, when uncertainty becomes greater.

Plug-in Electric Vehicle Registrations

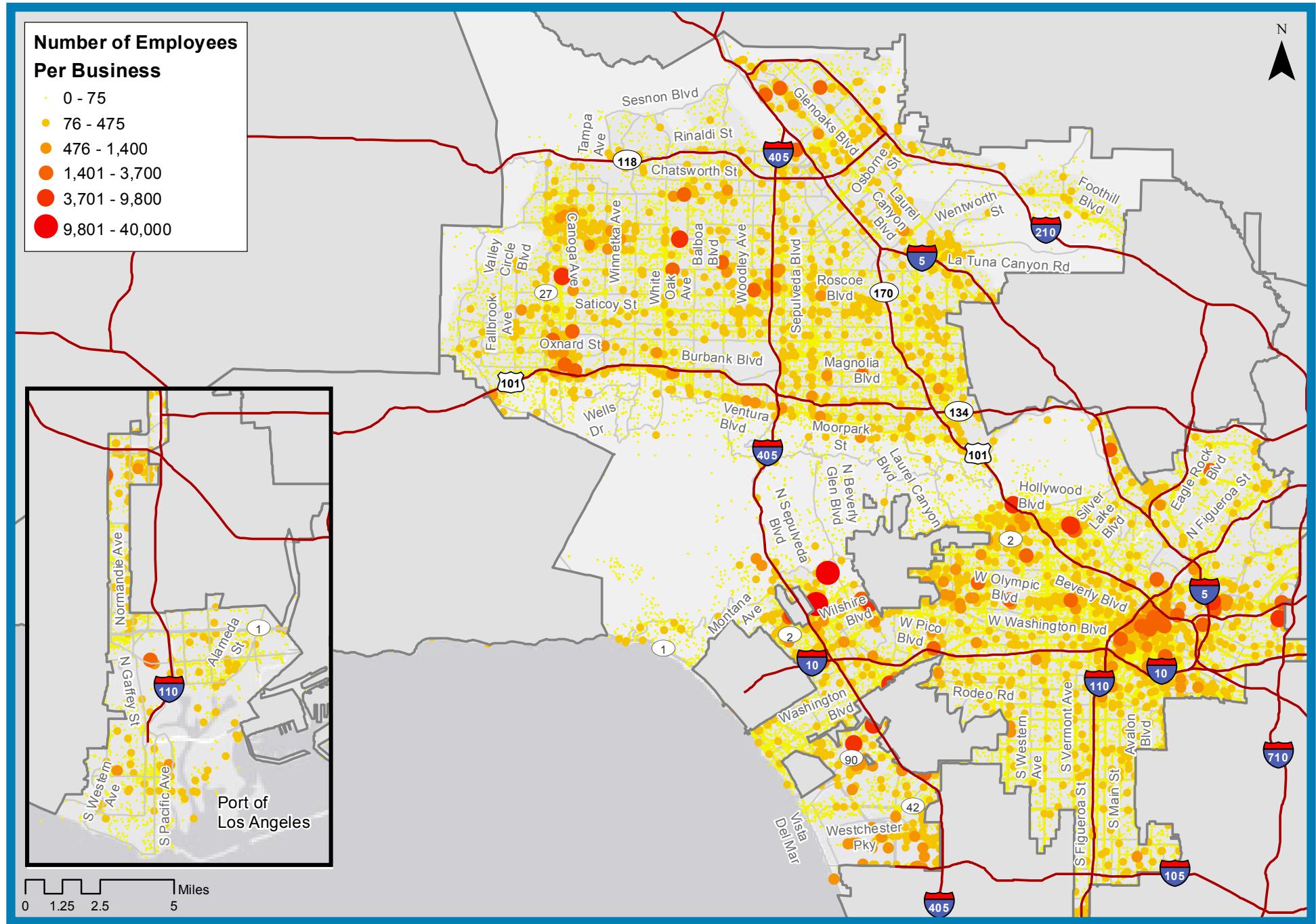


Plug-in Electric Vehicle Morning Peak Destinations

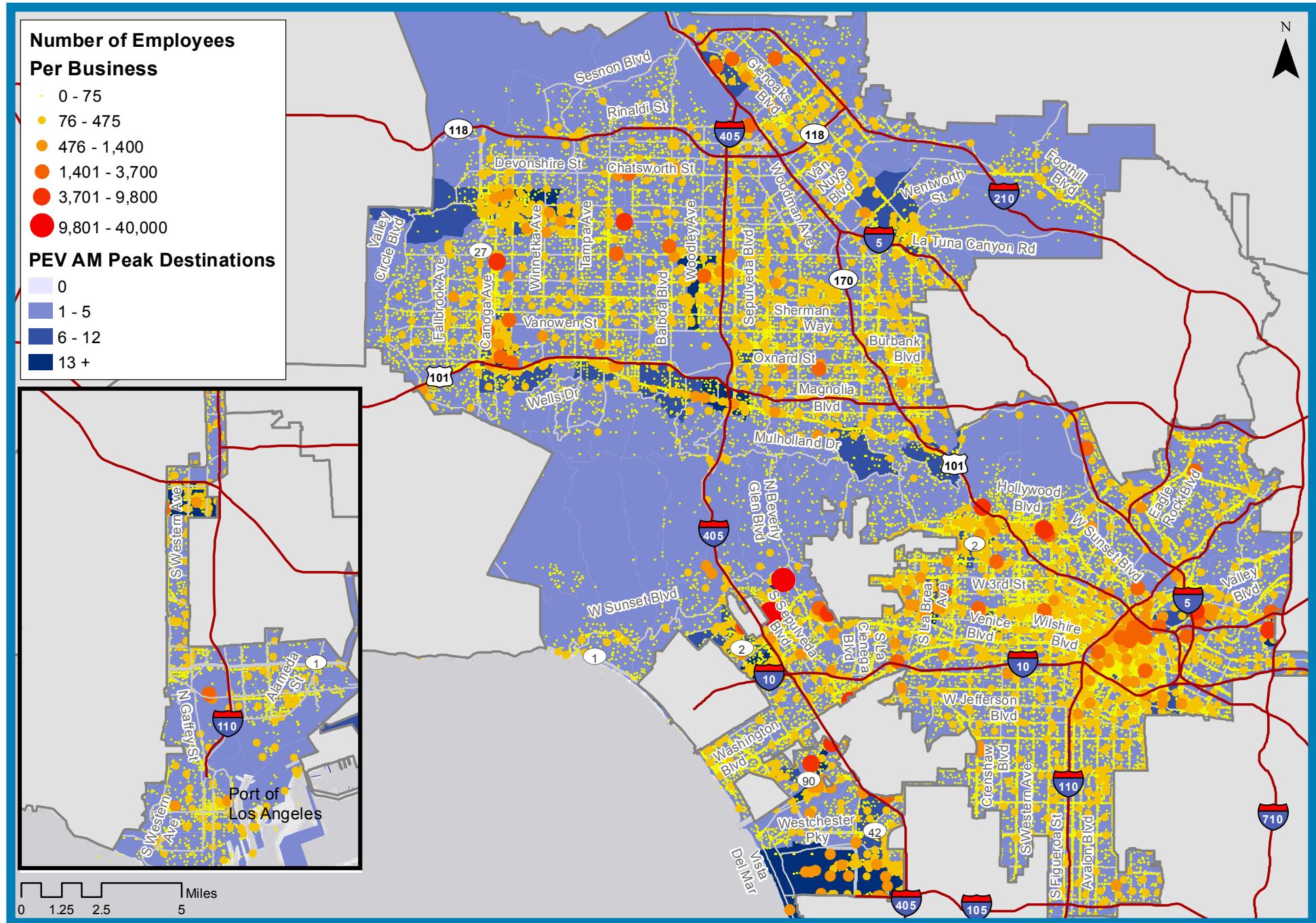


Workplaces by Number of Employees

15 | City of Los Angeles



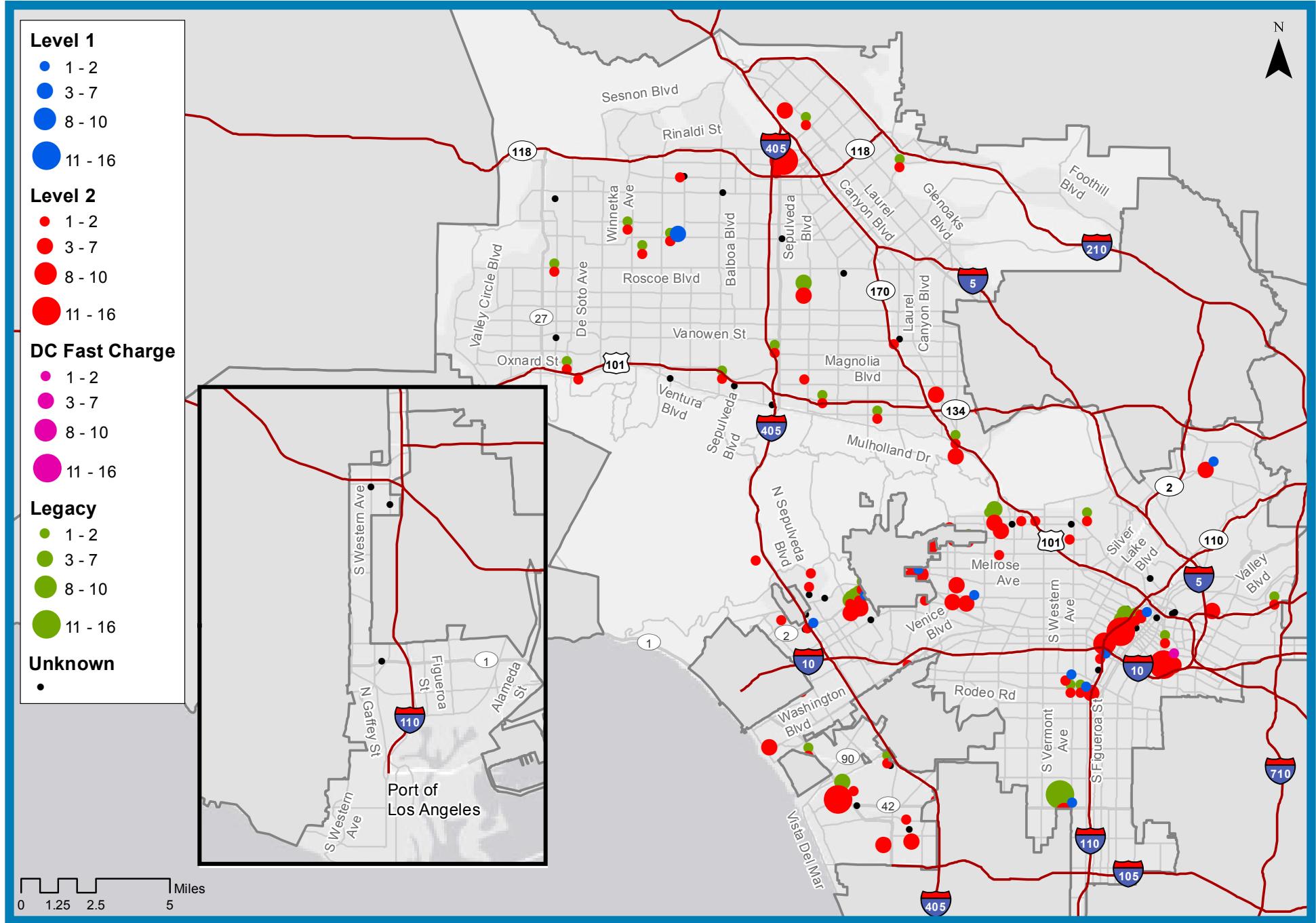
PEV Peak Morning Destinations and Workplaces



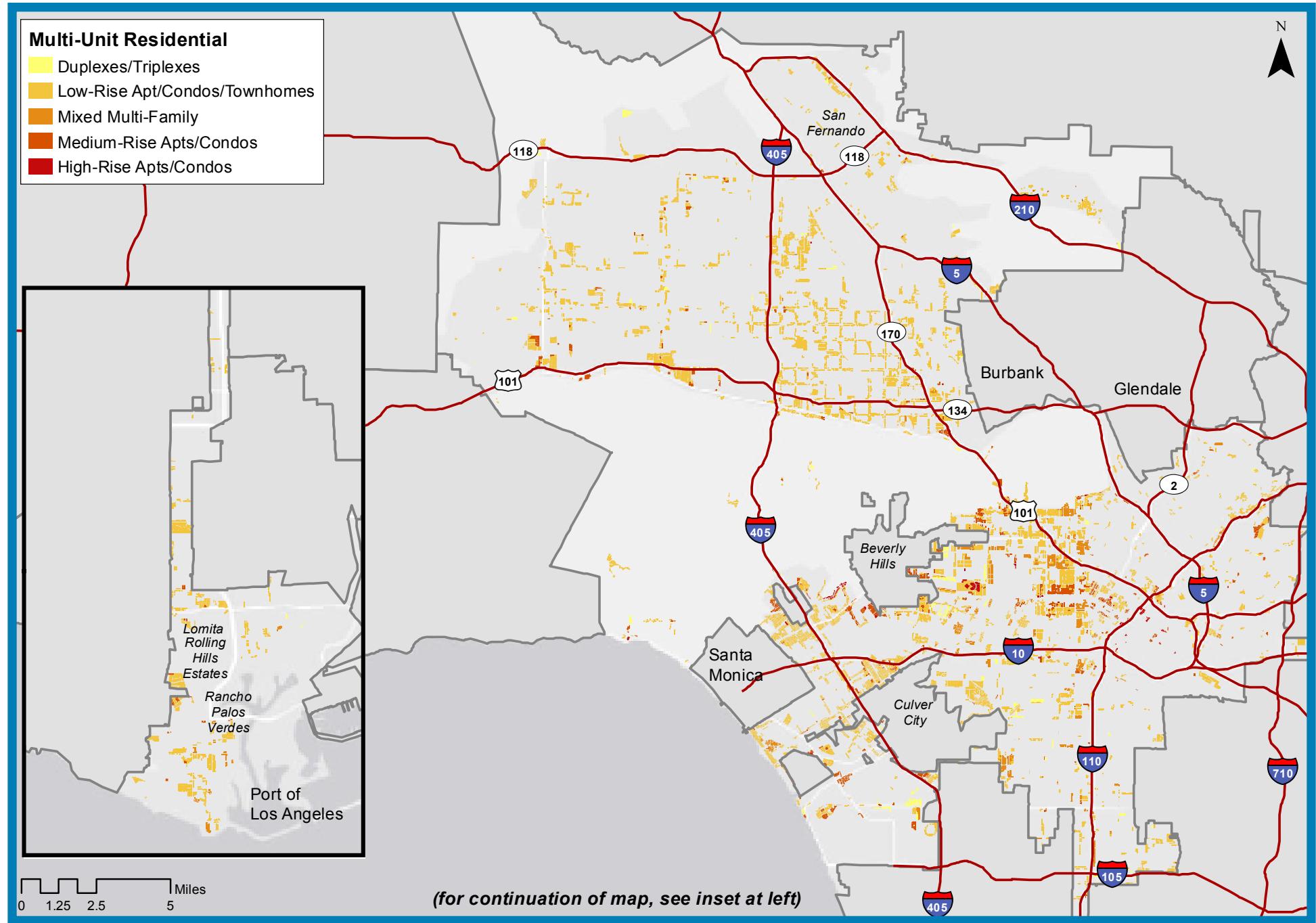
Publicly-Accessible Charging Stations (Summer/Fall 2012)

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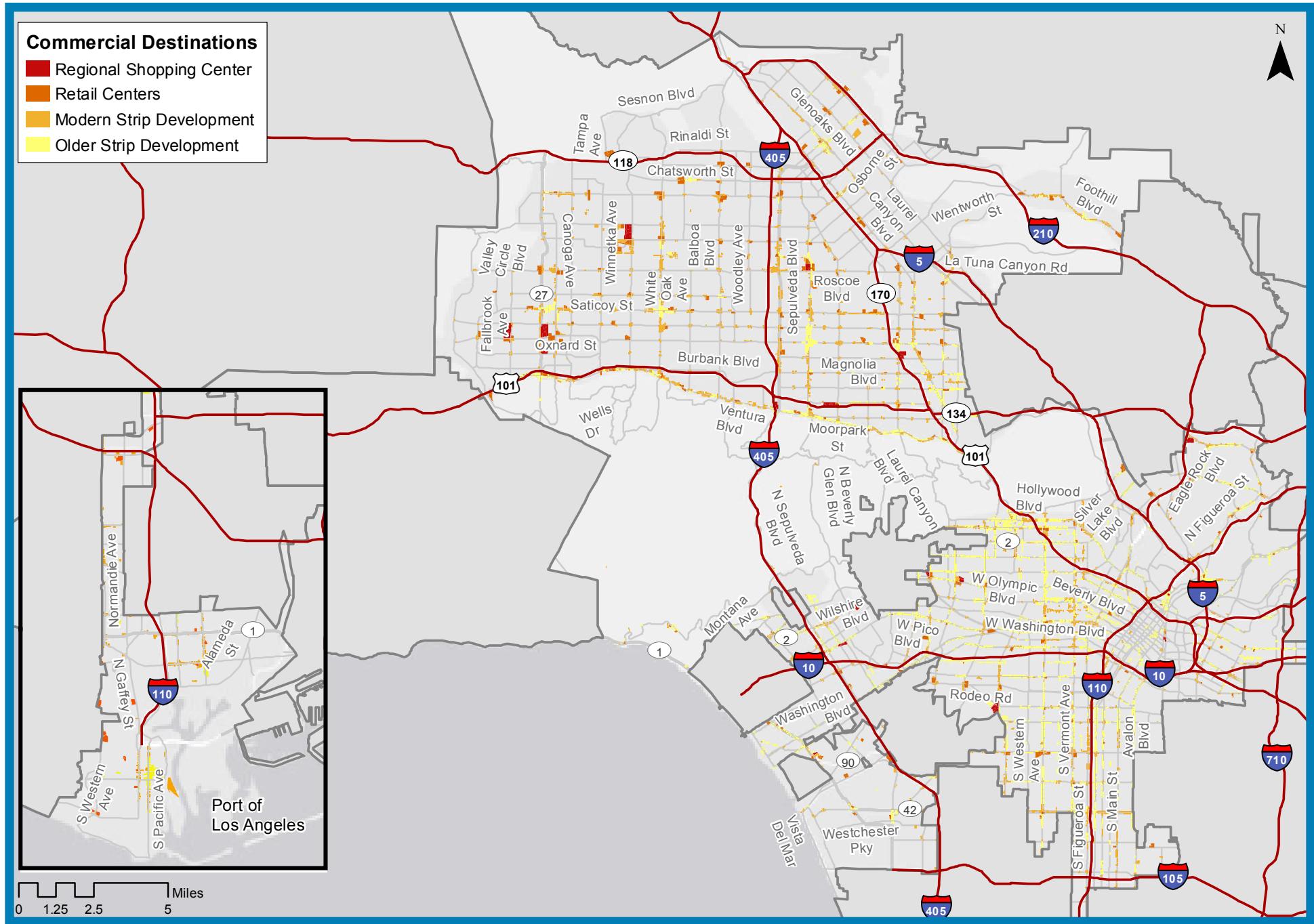
| City of Los Angeles



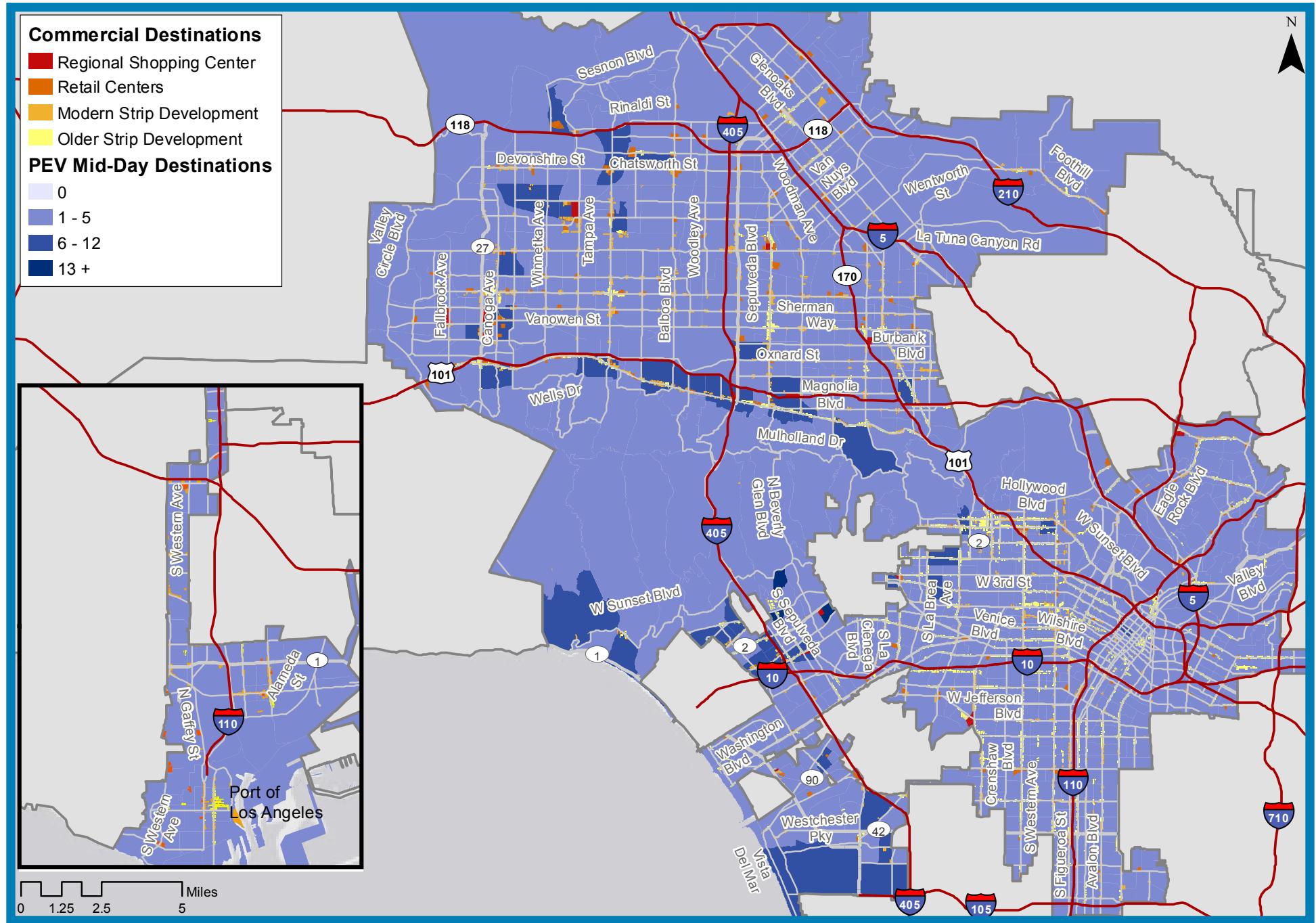
Multi-Unit Residential



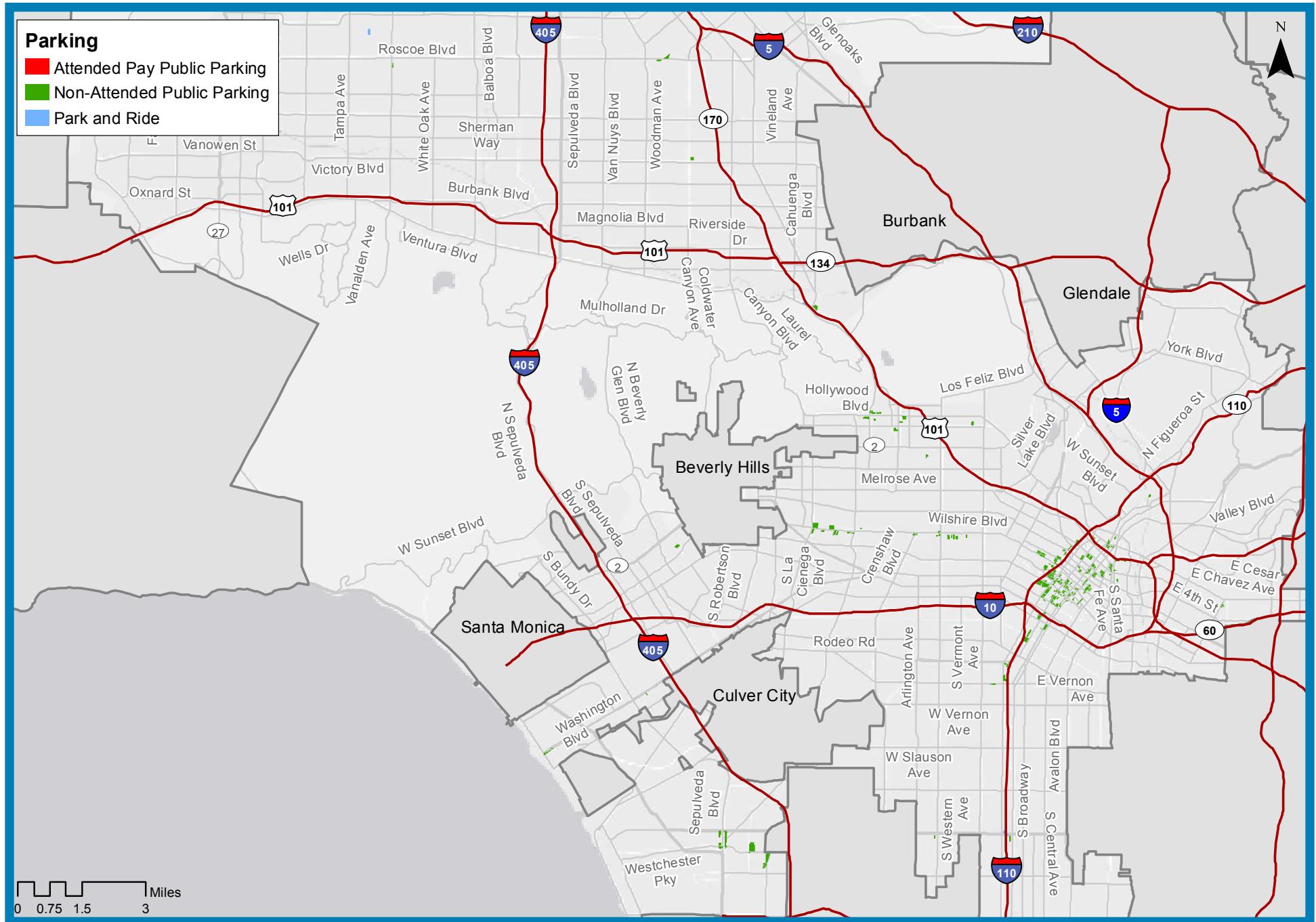
Commercial (Retail) Destinations



PEV Mid-Day Destinations and Commercial (Retail) Locations



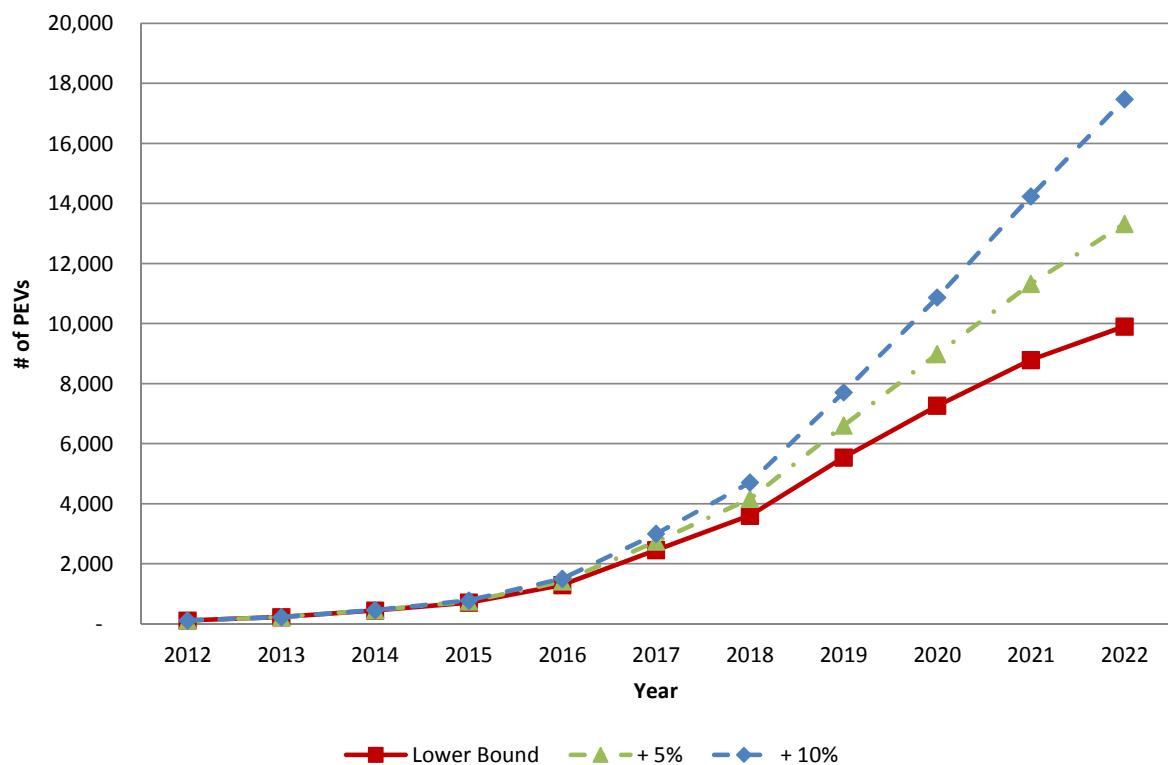
Stand-alone Parking Facilities



COACHELLA VALLEY ASSOCIATION OF GOVERNMENTS

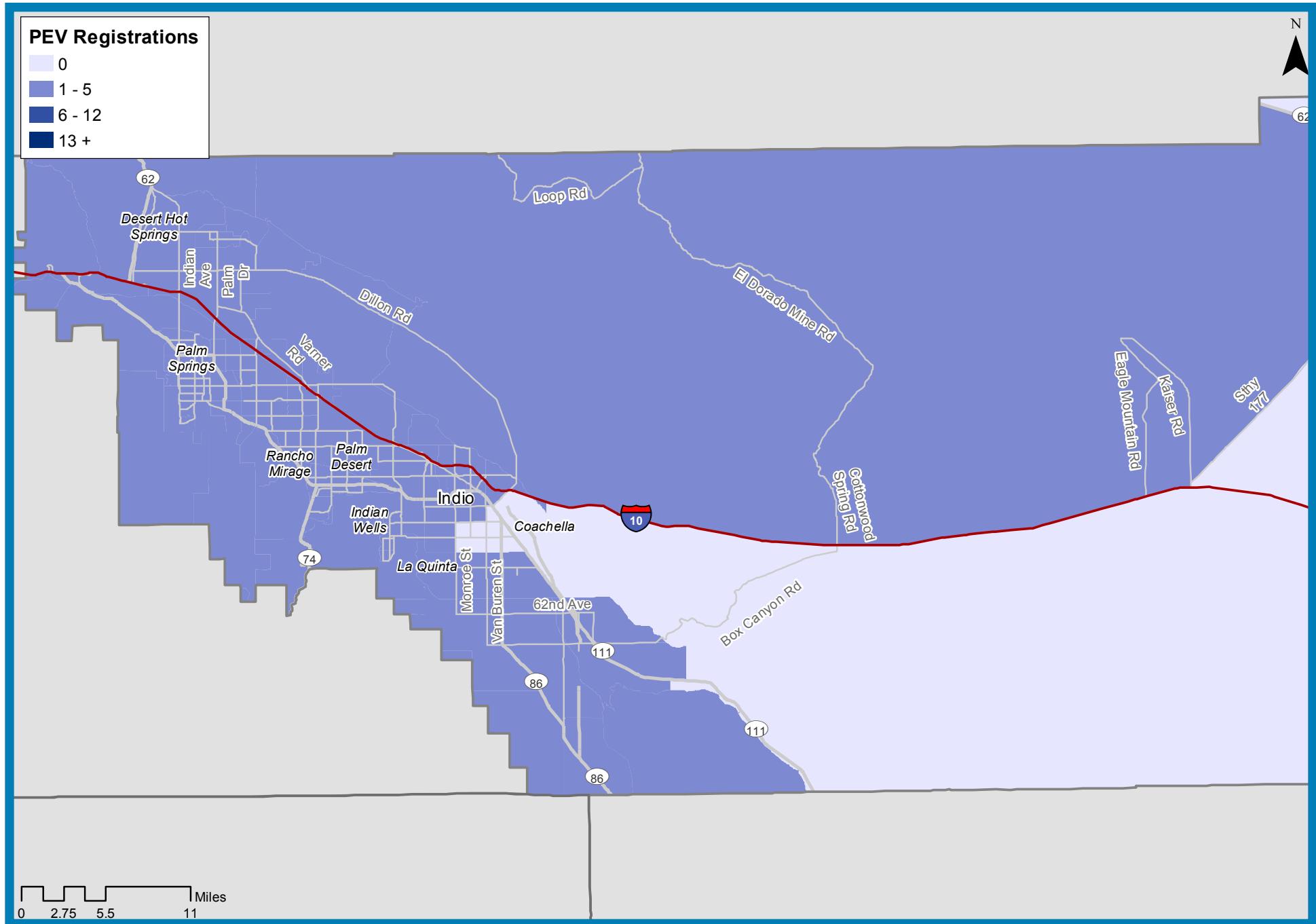
PEV Growth

Year	Cumulative PEV registrations*		
	Lower Bound	+ 5%	+ 10%
2012	115	115	115
2013	230	230	230
2014	444	456	460
2015	707	748	778
2016	1,297	1,409	1,505
2017	2,456	2,740	3,001
2018	3,606	4,160	4,707
2019	5,545	6,605	7,709
2020	7,268	8,988	10,874
2021	8,791	11,320	14,240
2022	9,908	13,325	17,473

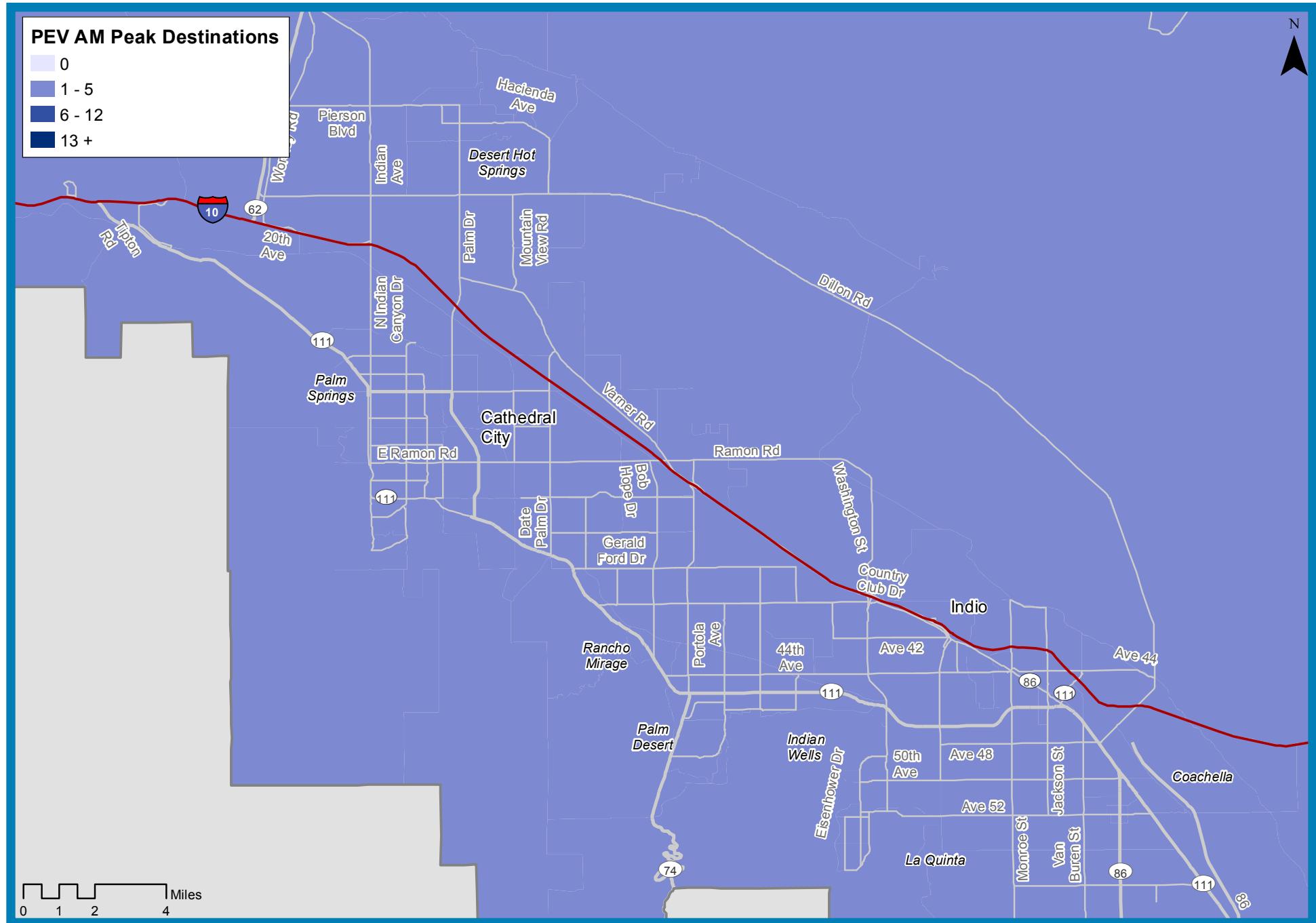


* The +5% and +10% projections begin in 2014, when uncertainty becomes greater.

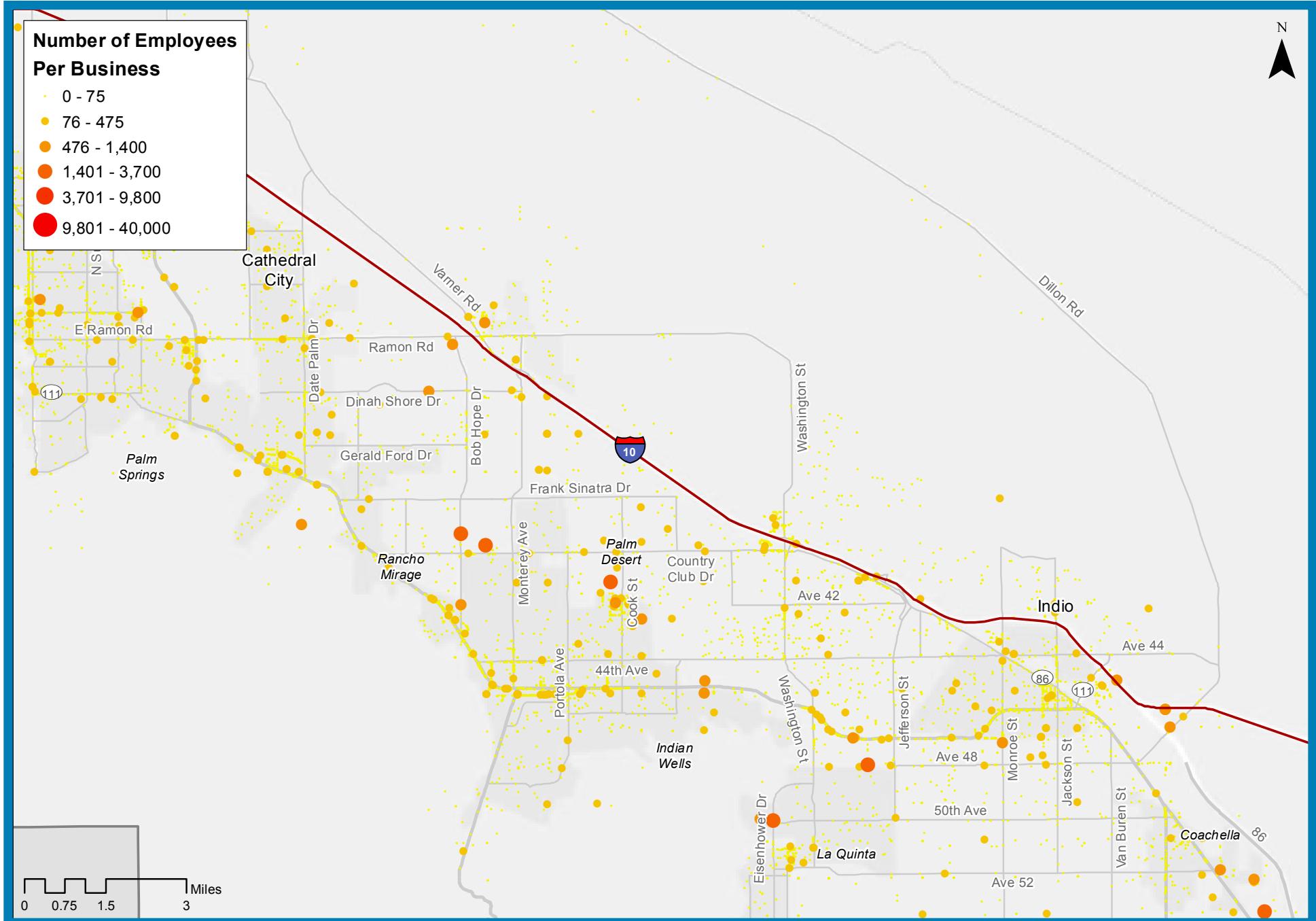
Plug-in Electric Vehicle Registrations



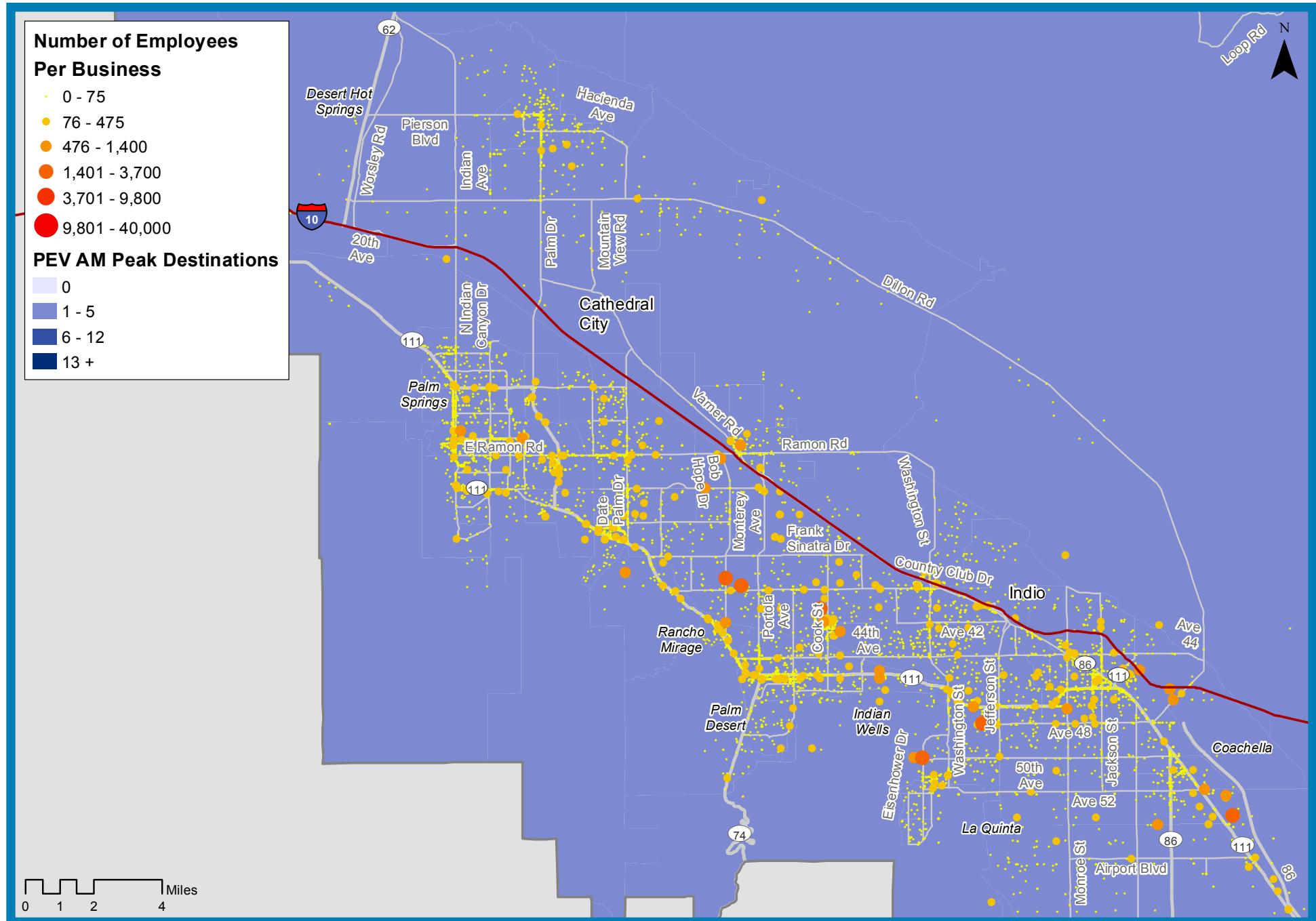
Plug-in Electric Vehicle Morning Peak Destinations



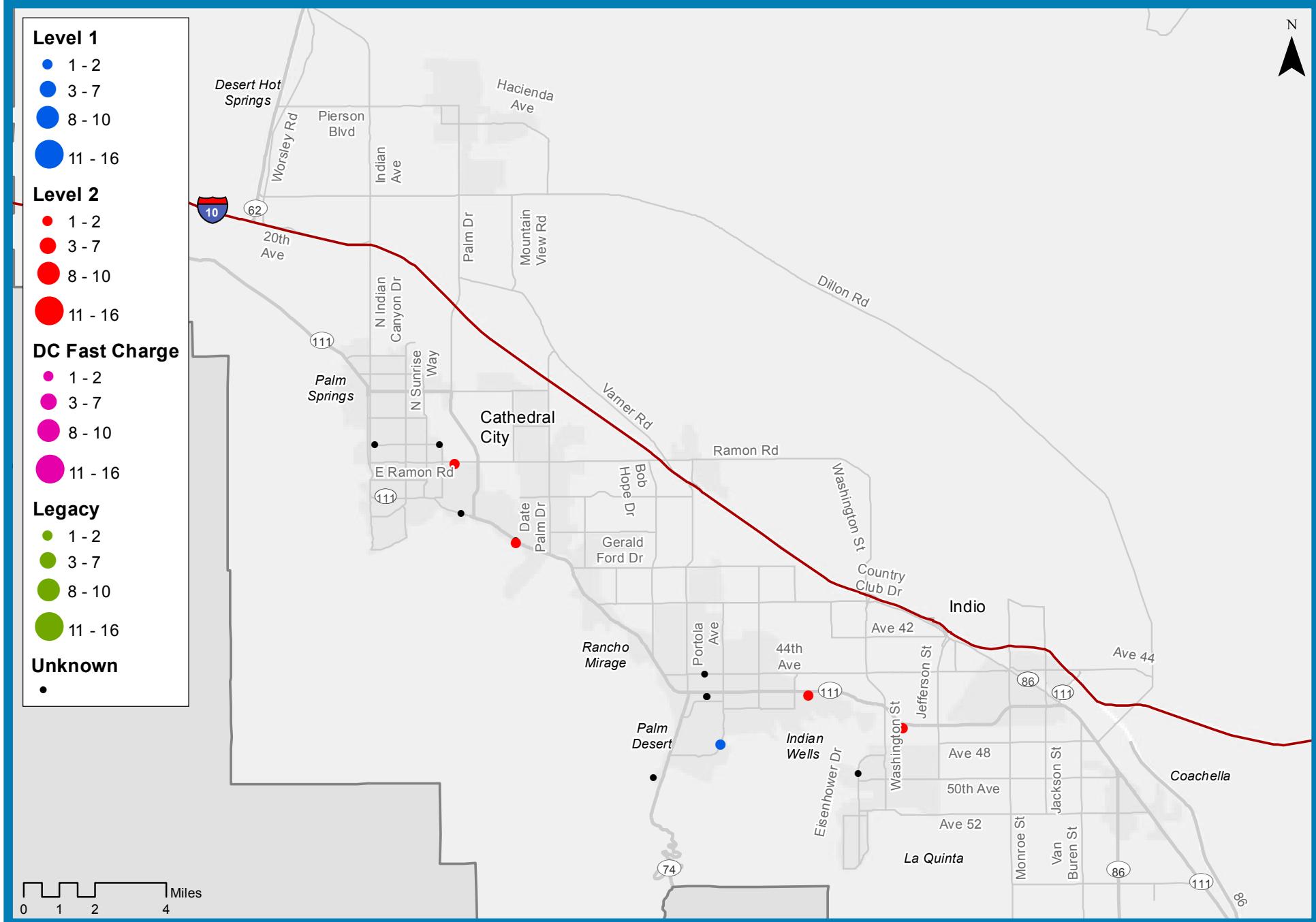
Workplaces by Number of Employees



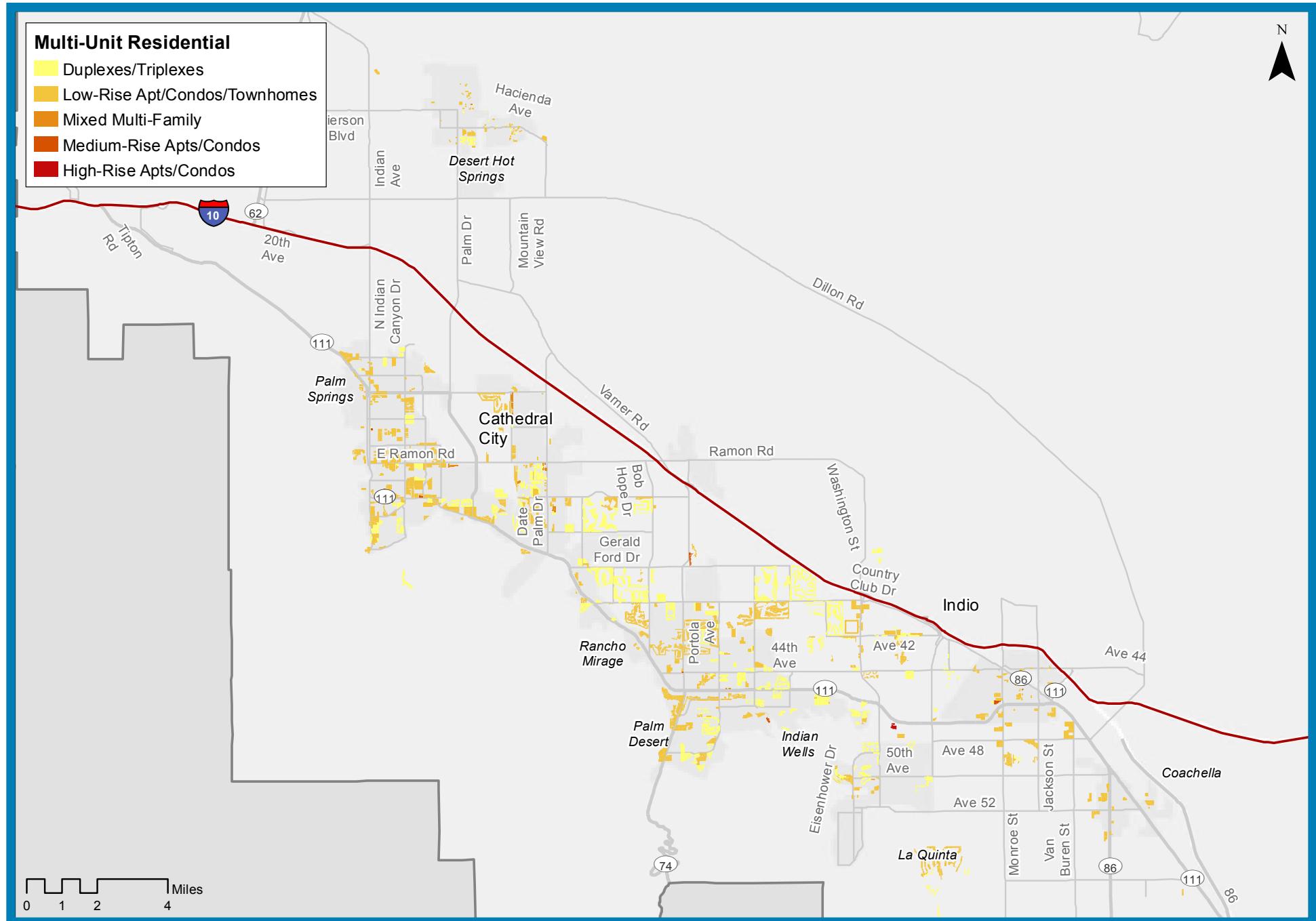
PEV Morning Peak Destinations and Workplaces



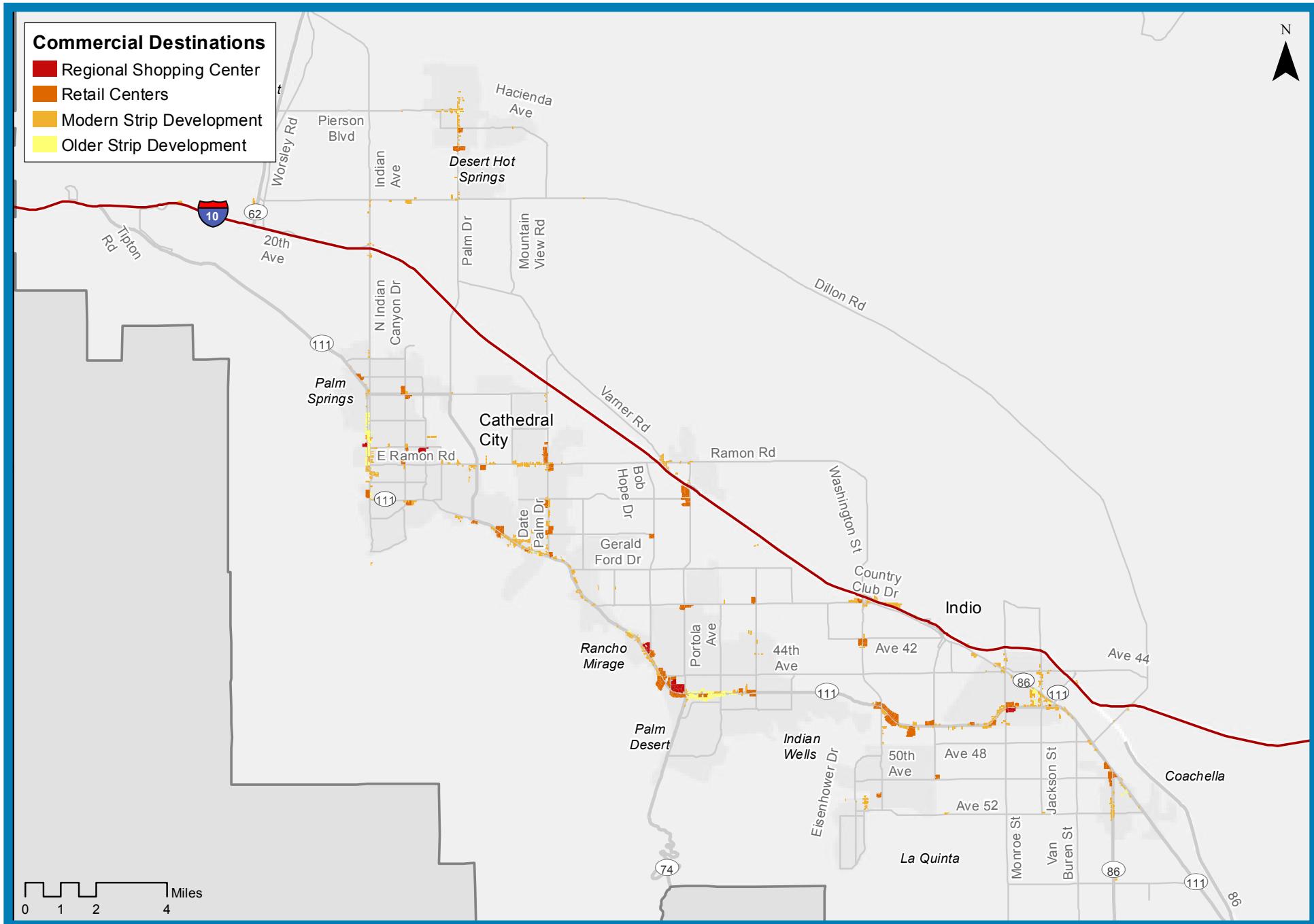
Publicly-Accessible Charging Stations (Summer/Fall 2012)



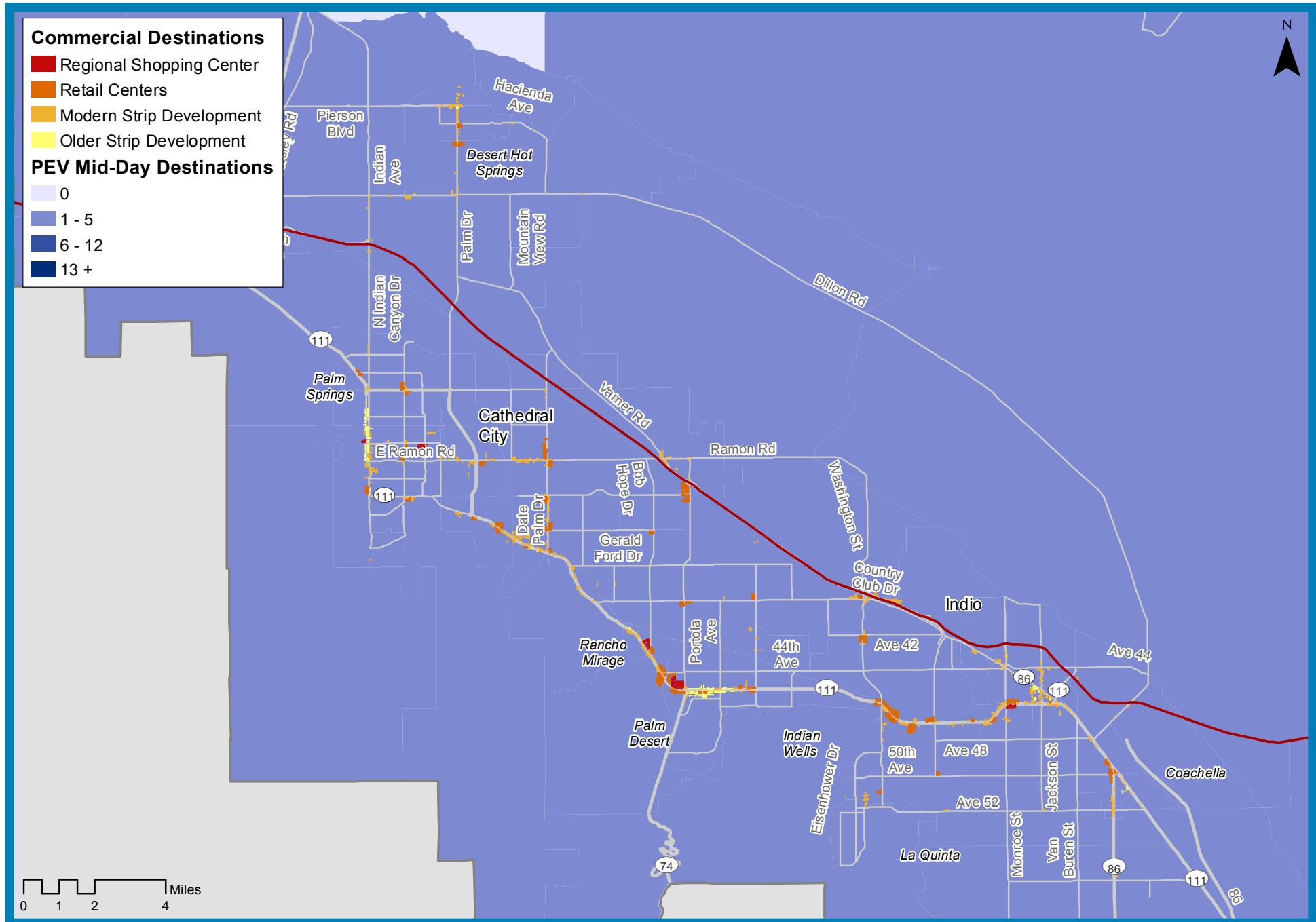
Multi-Unit Residential



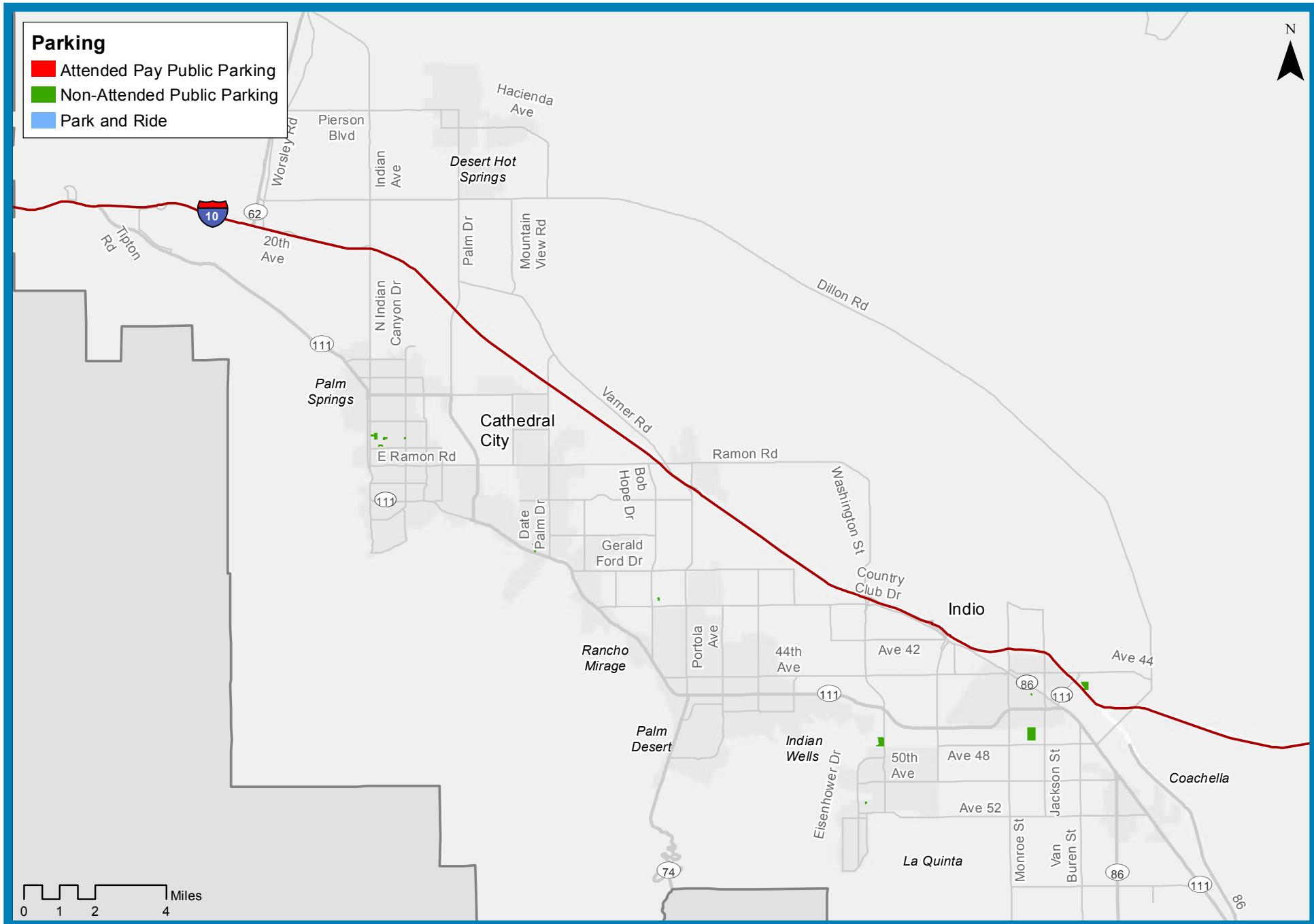
Commercial (Retail) Destinations



PEV Mid-Day Destinations and Commercial (Retail) Locations



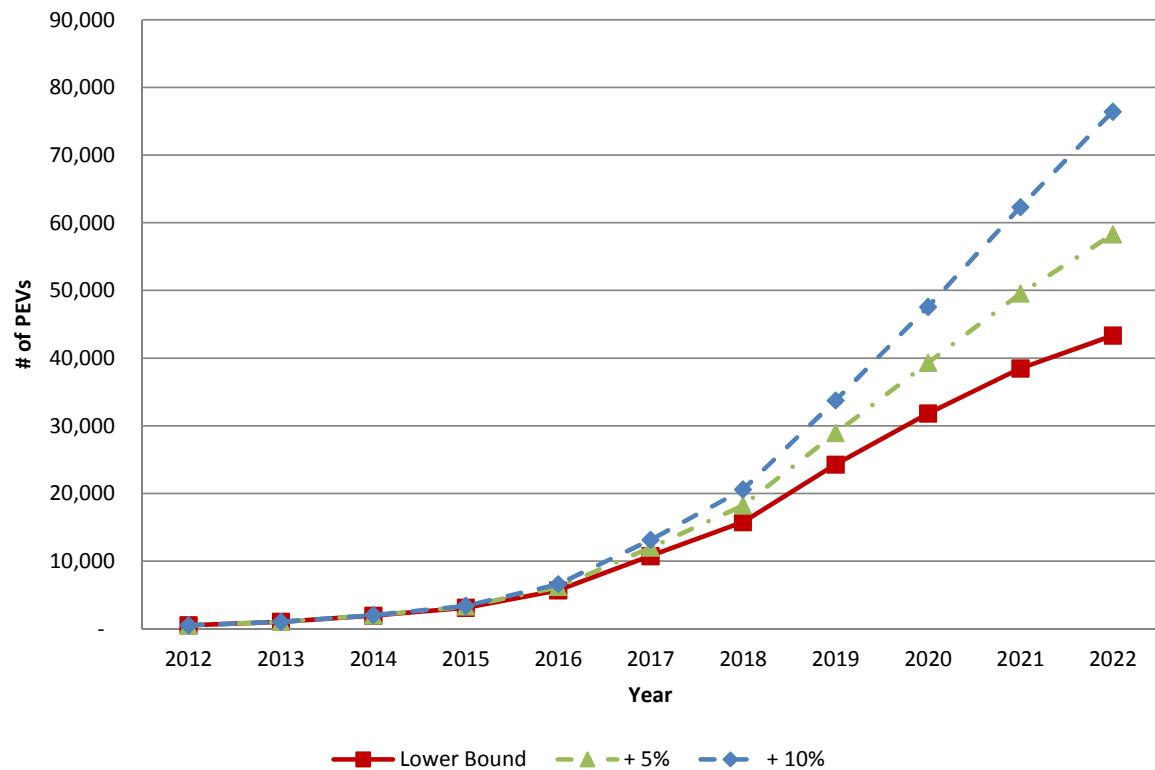
Stand-alone Parking Facilities



GATEWAY CITIES COUNCIL OF GOVERNMENTS

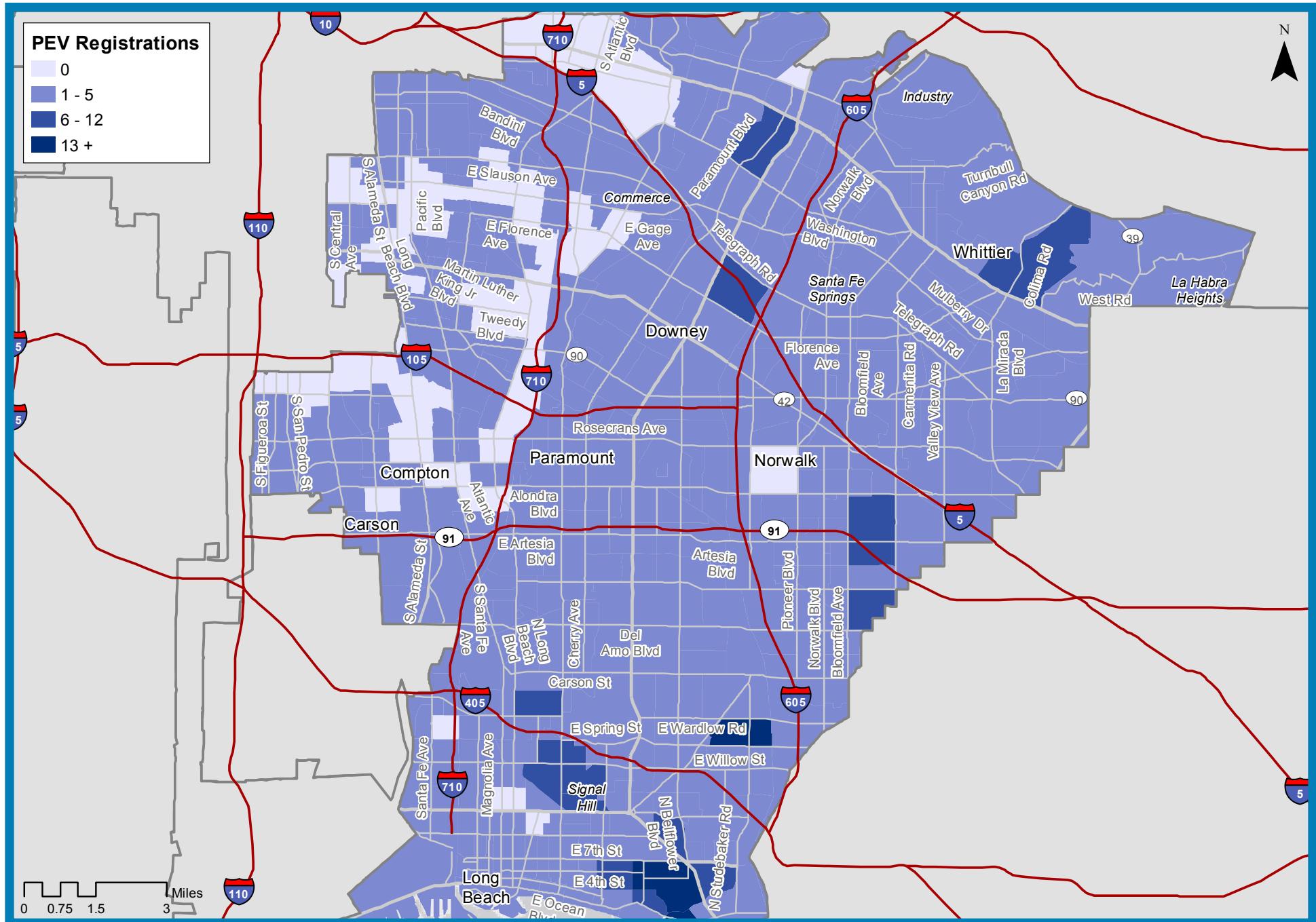
PEV Growth

Year	Cumulative PEV registrations*		
	Lower Bound	+ 5%	+ 10%
2012	503	503	503
2013	1,006	1,006	1,006
2014	1,943	1,993	2,012
2015	3,092	3,272	3,403
2016	5,671	6,165	6,583
2017	10,743	11,985	13,128
2018	15,773	18,196	20,587
2019	24,255	28,891	33,716
2020	31,791	39,312	47,563
2021	38,450	49,512	62,283
2022	43,336	58,281	76,427

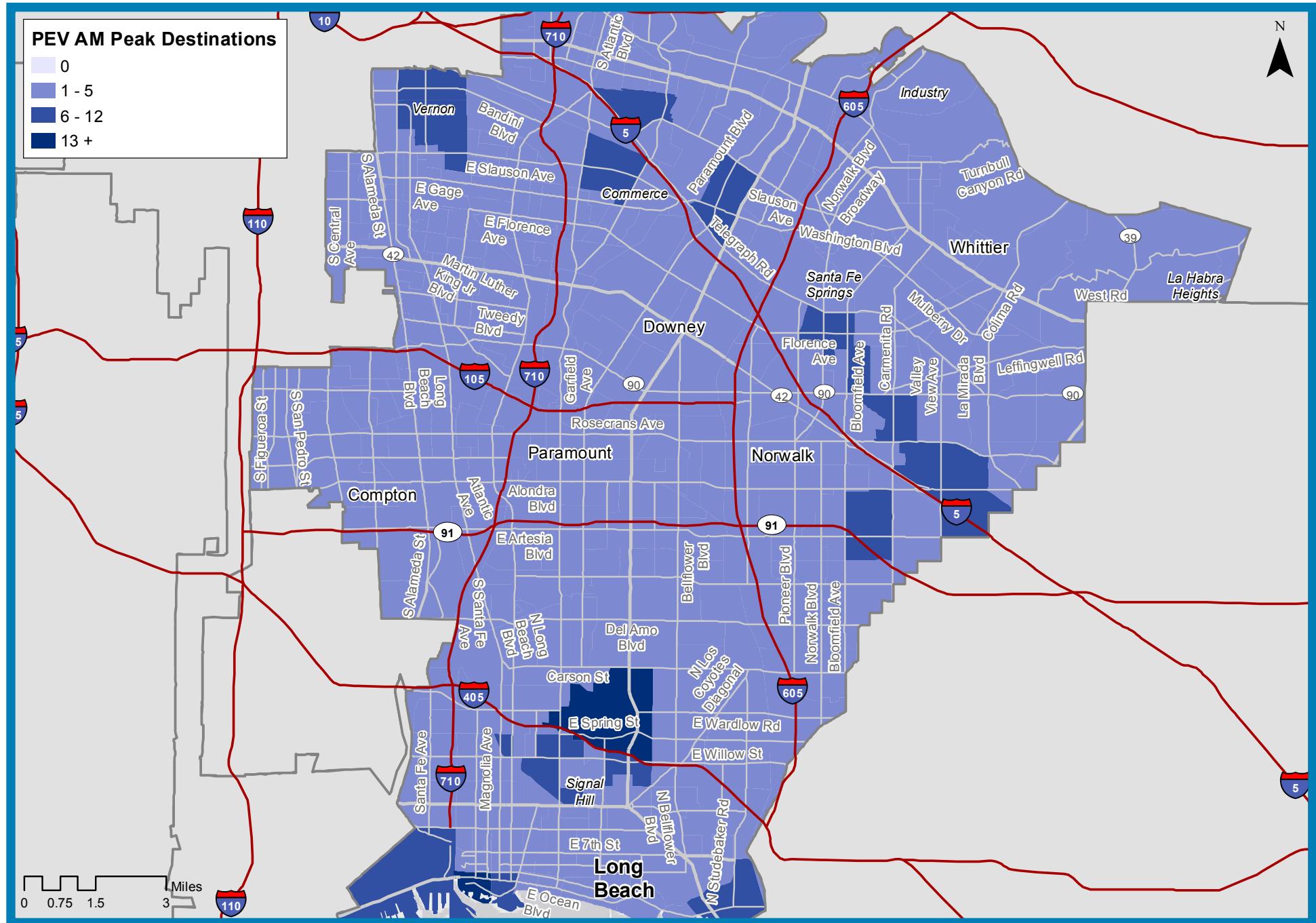


* The +5% and +10% projections begin in 2014, when uncertainty becomes greater.

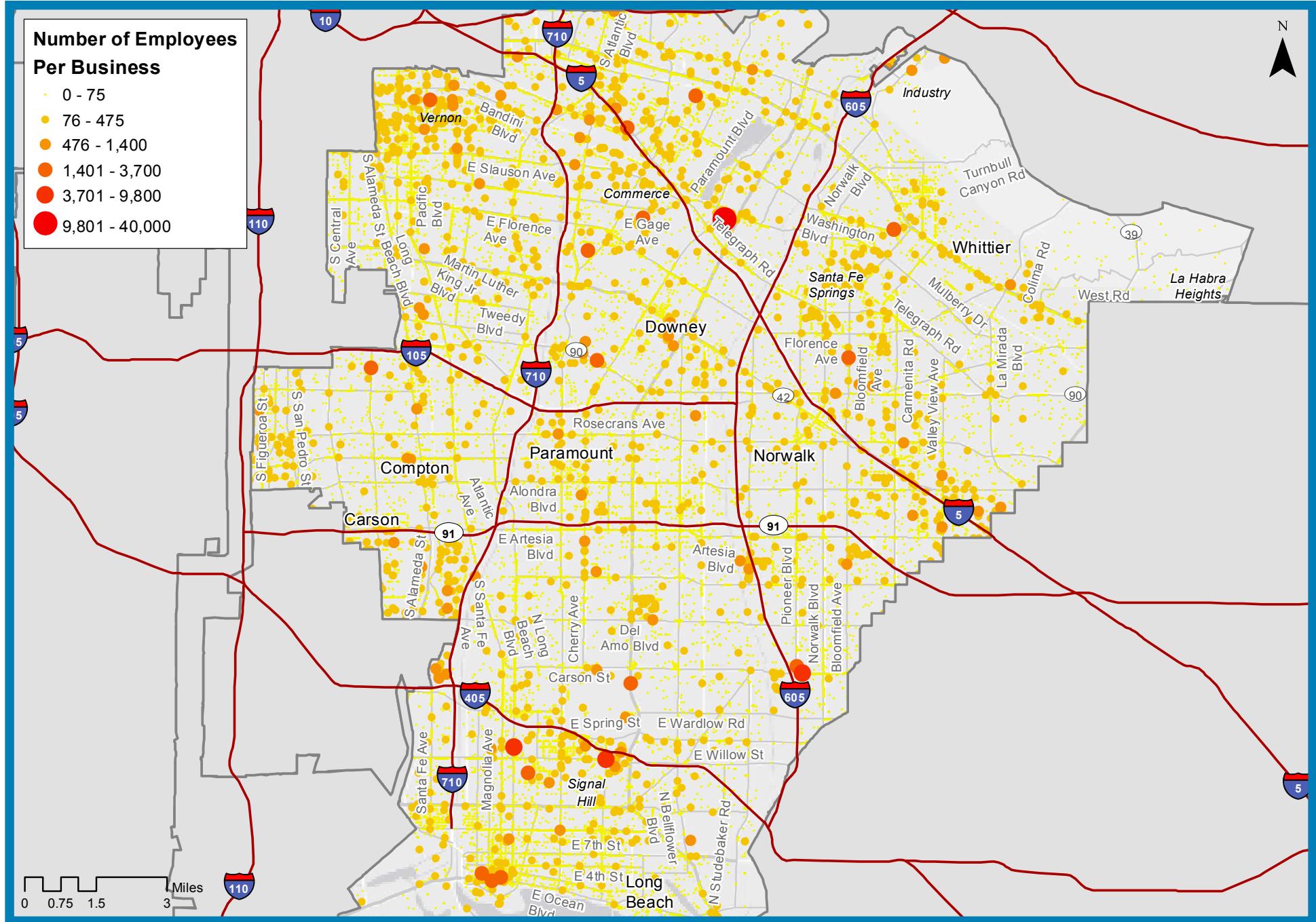
Plug-in Electric Vehicle Registrations



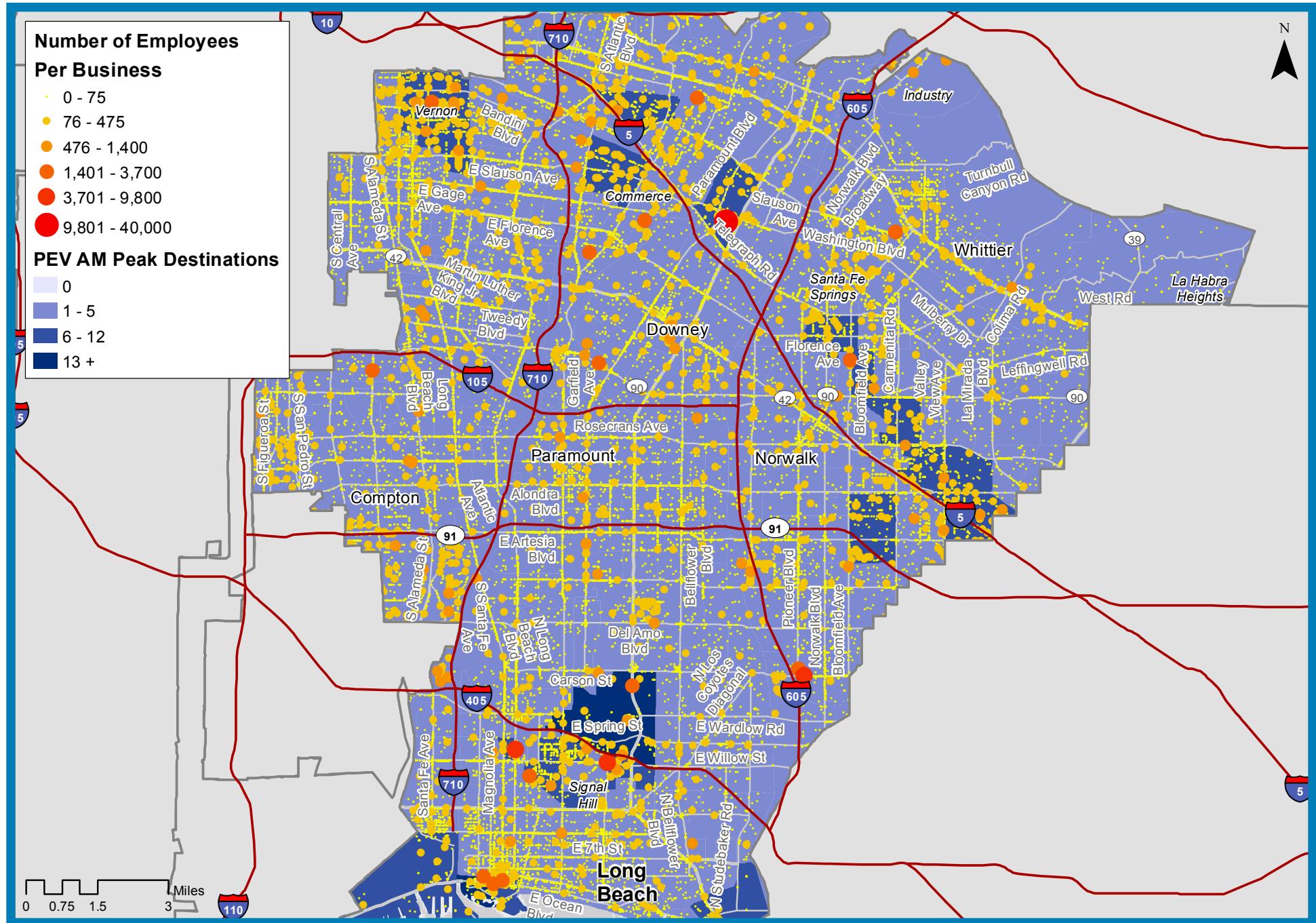
Plug-in Electric Vehicle Morning Peak Destinations



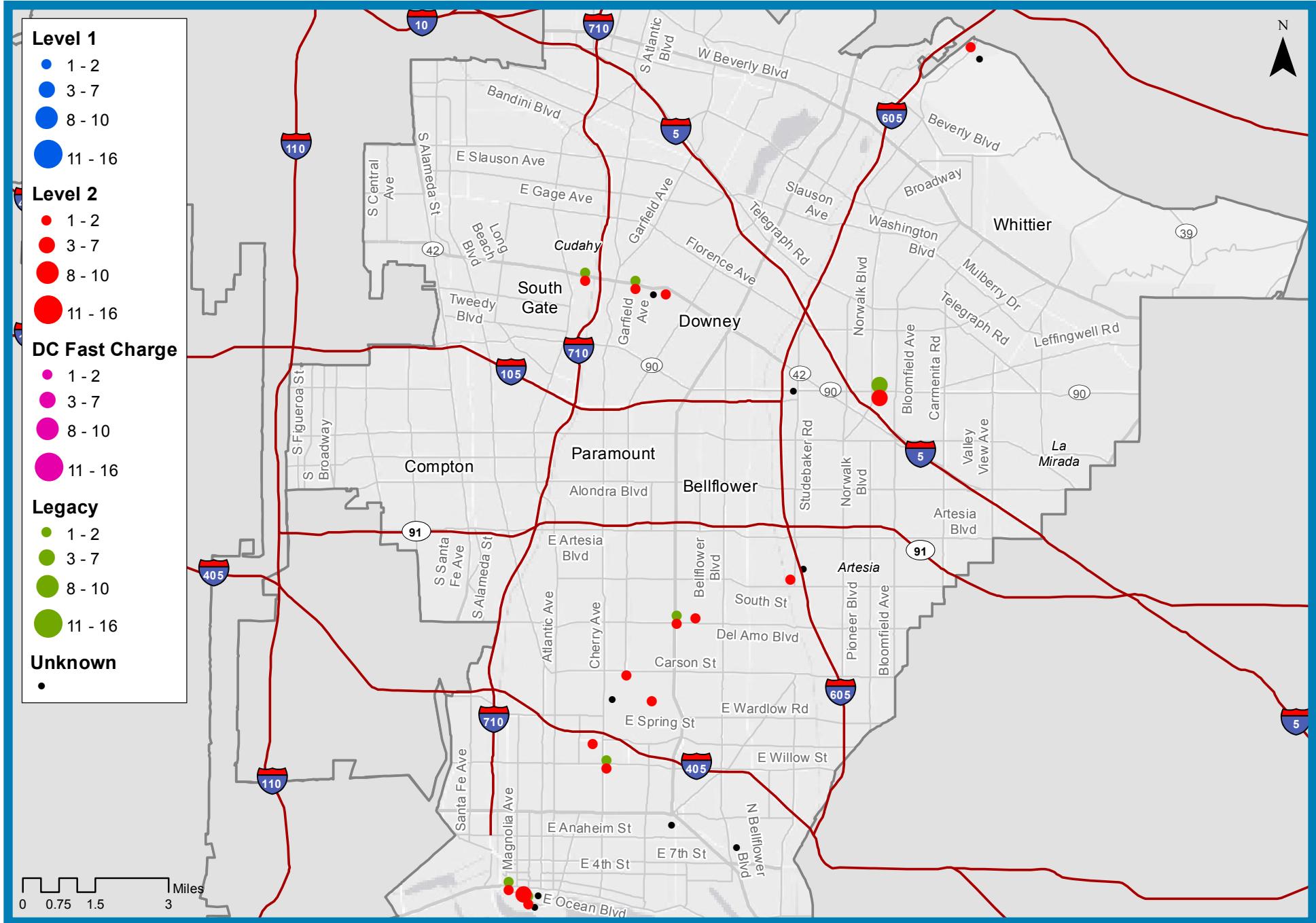
Workplaces by Number of Employees



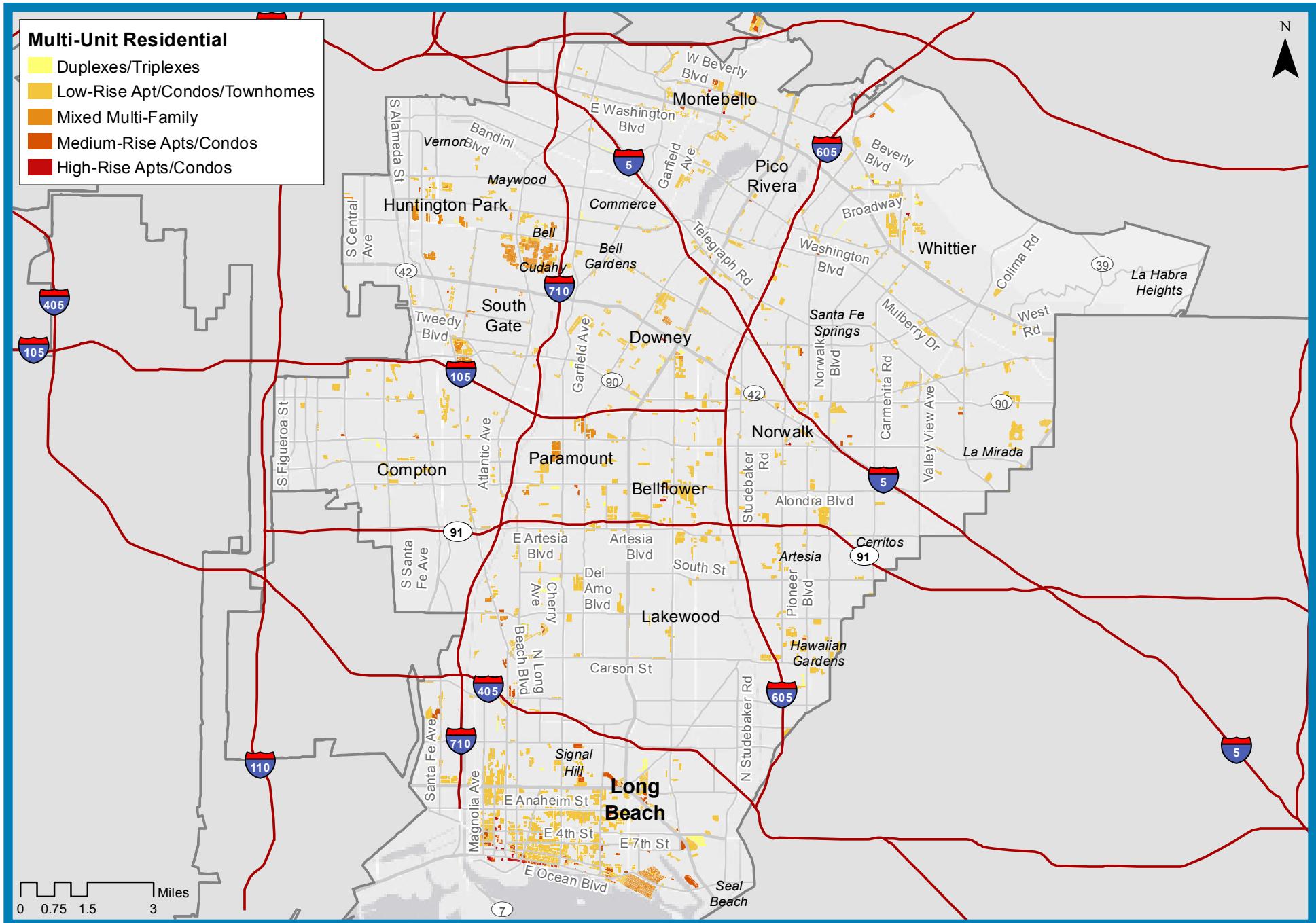
PEV Morning Peak Destinations and Workplaces



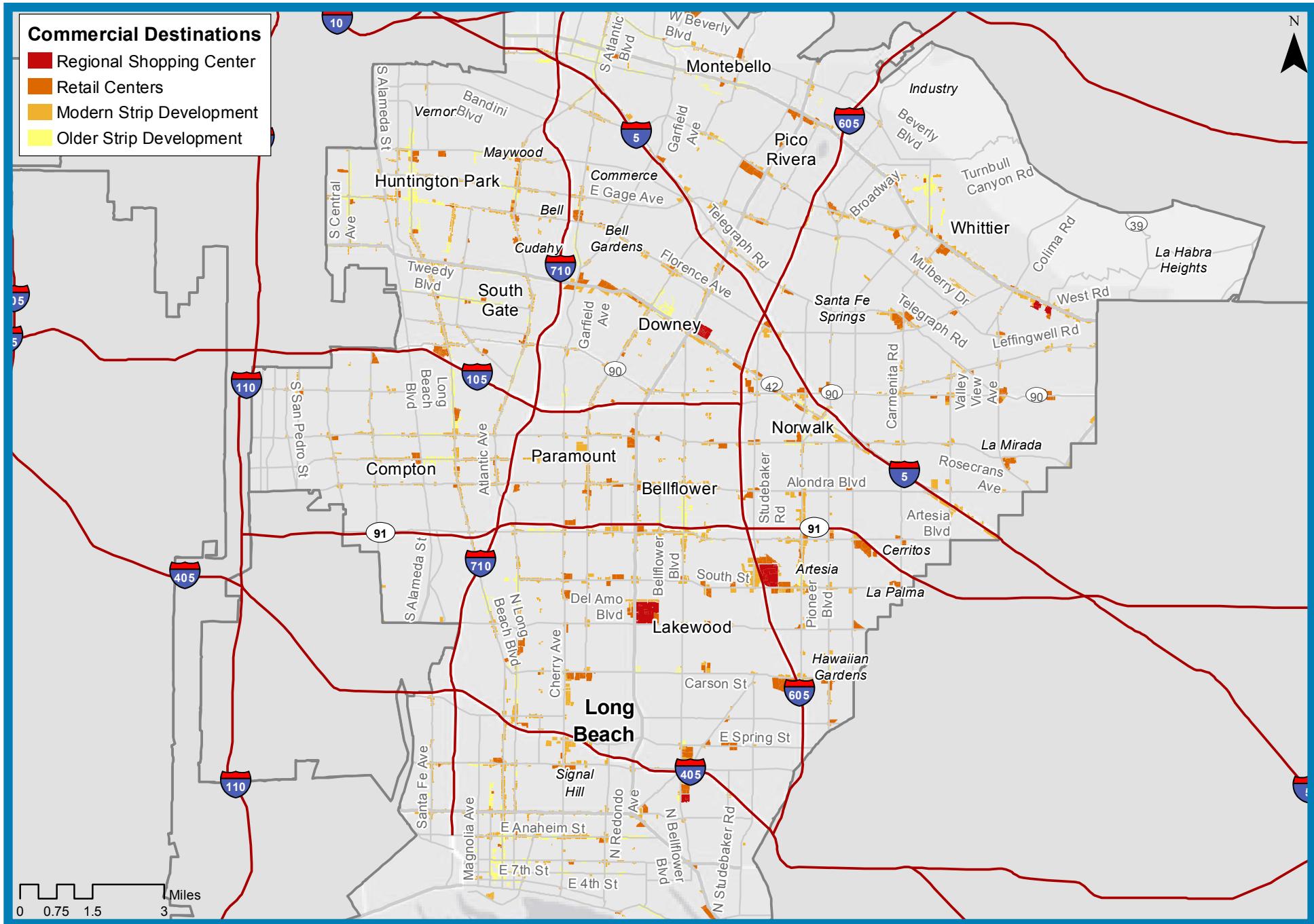
Publicly-Accessible Charging Stations (Summer/Fall 2012)



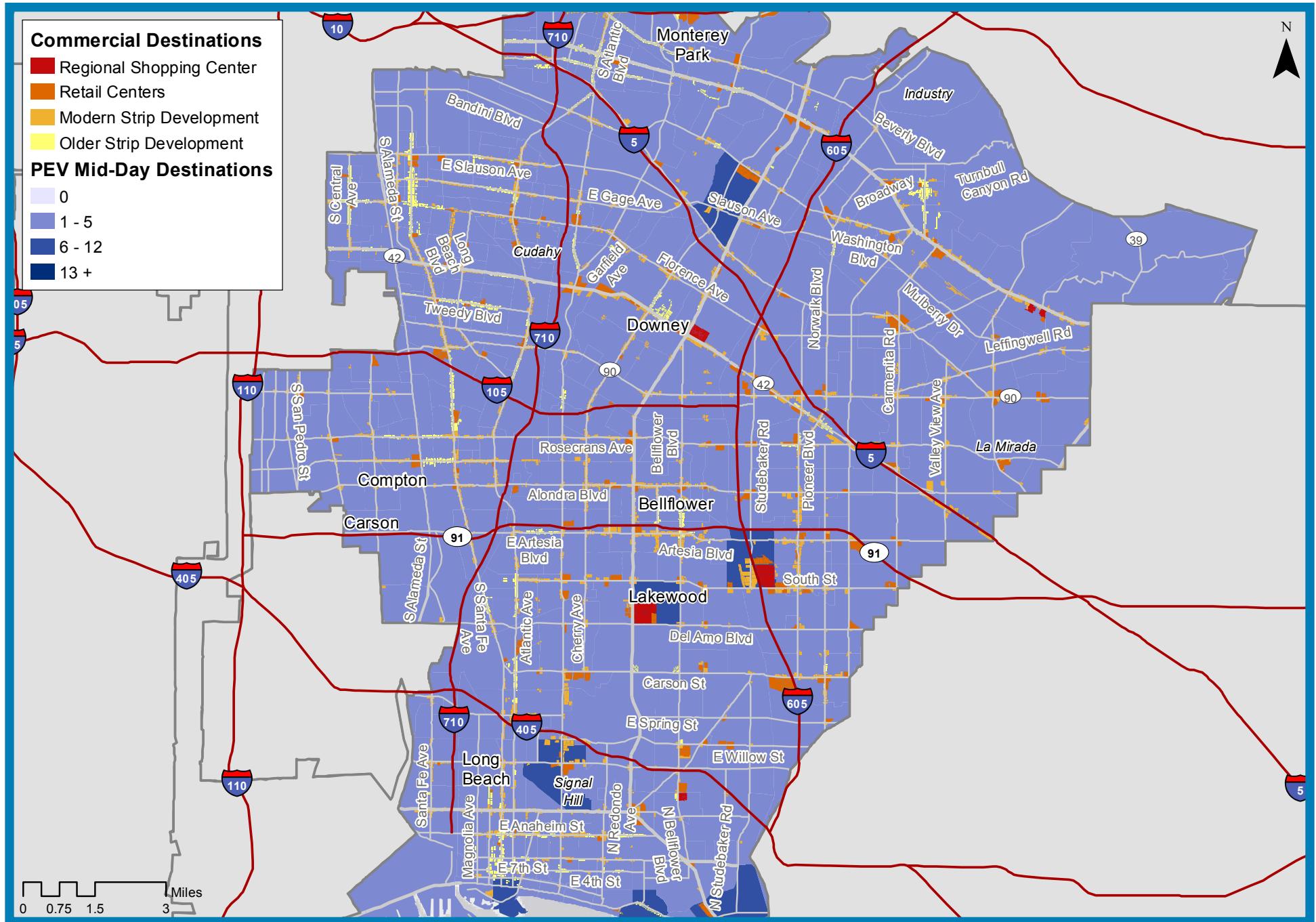
Multi-Unit Residential



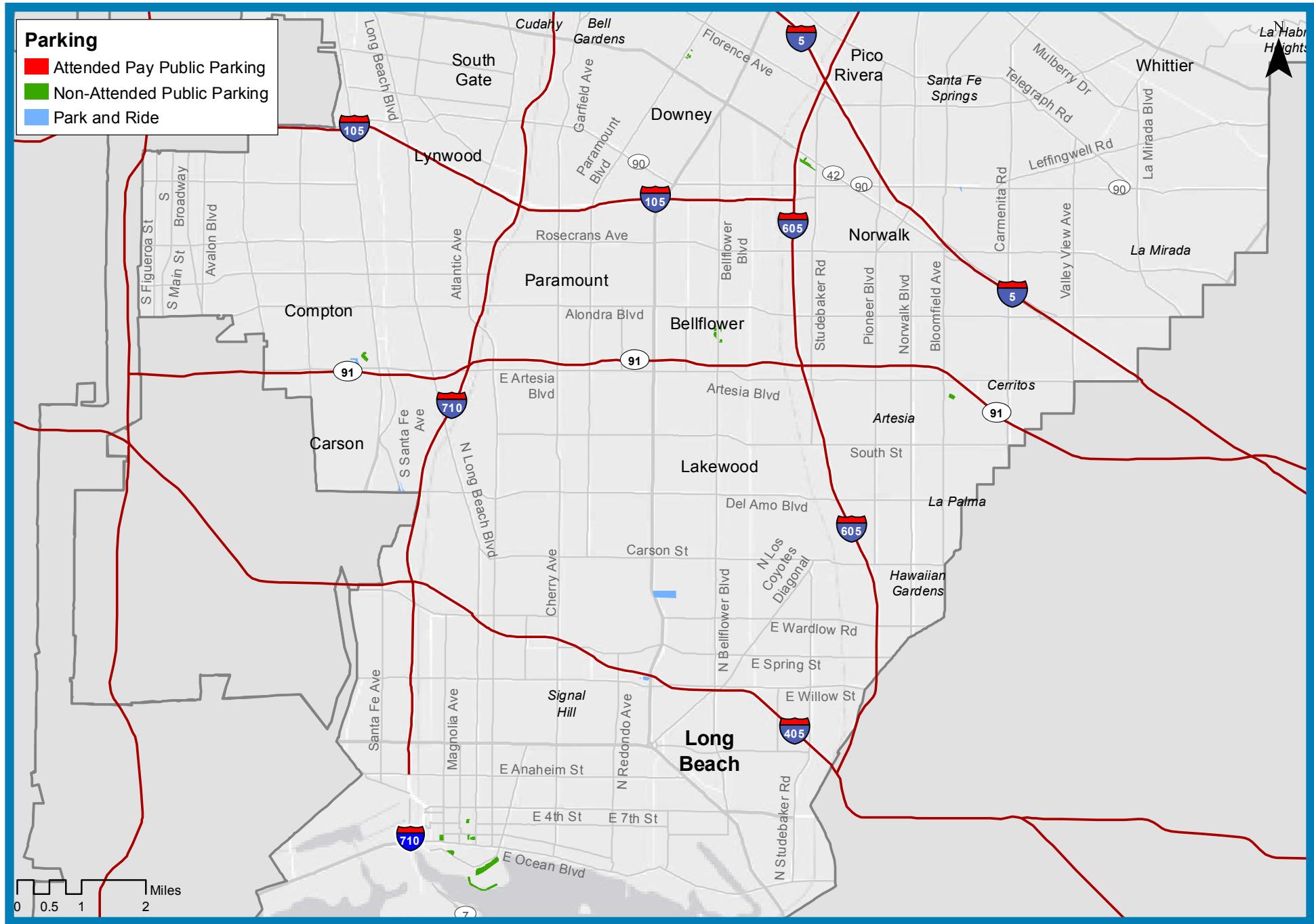
Commercial (Retail) Destinations



PEV Mid-Day Destinations and Commercial (Retail) Locations



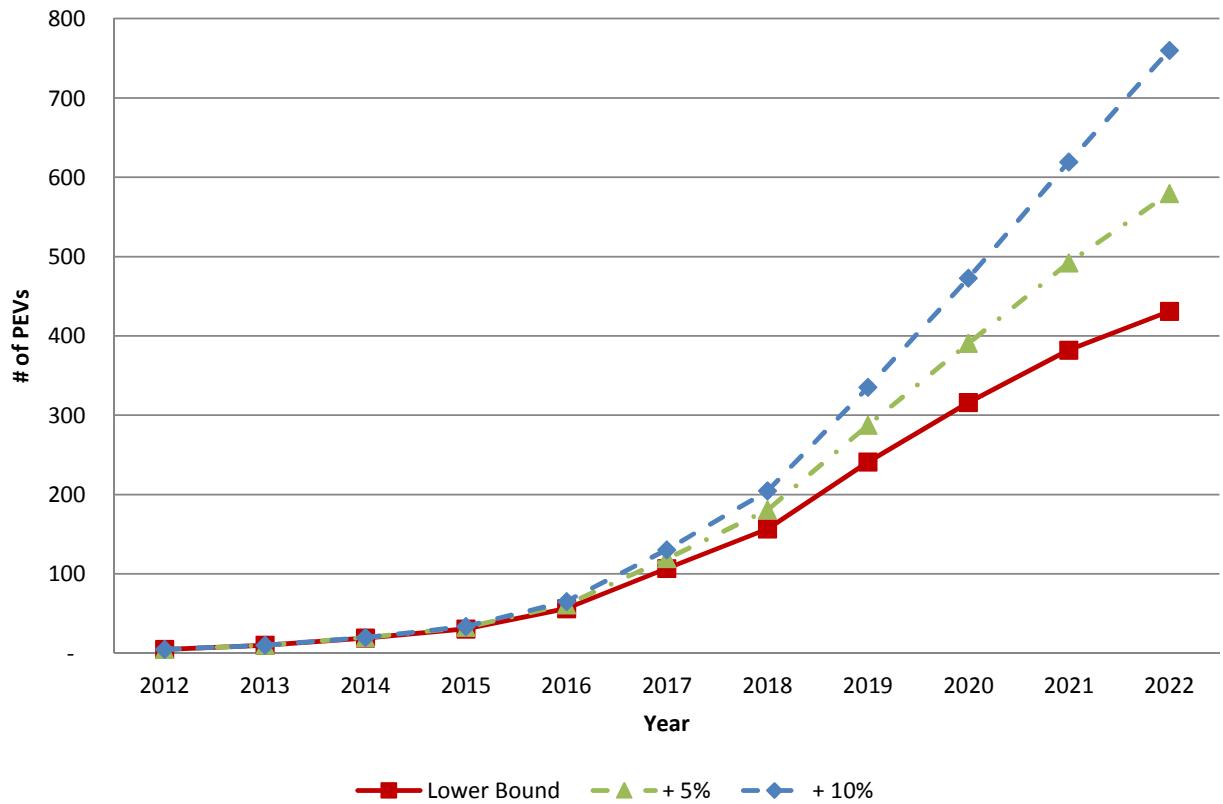
Stand-alone Parking Facilities



IMPERIAL COUNTY TRANSPORTATION COMMISSION

PEV Growth

Year	Cumulative PEV registrations*		
	Lower Bound	+ 5%	+ 10%
2012	5	5	5
2013	10	10	10
2014	19	20	20
2015	31	33	34
2016	56	61	65
2017	107	119	130
2018	157	181	205
2019	241	287	335
2020	316	391	473
2021	382	492	619
2022	431	579	760

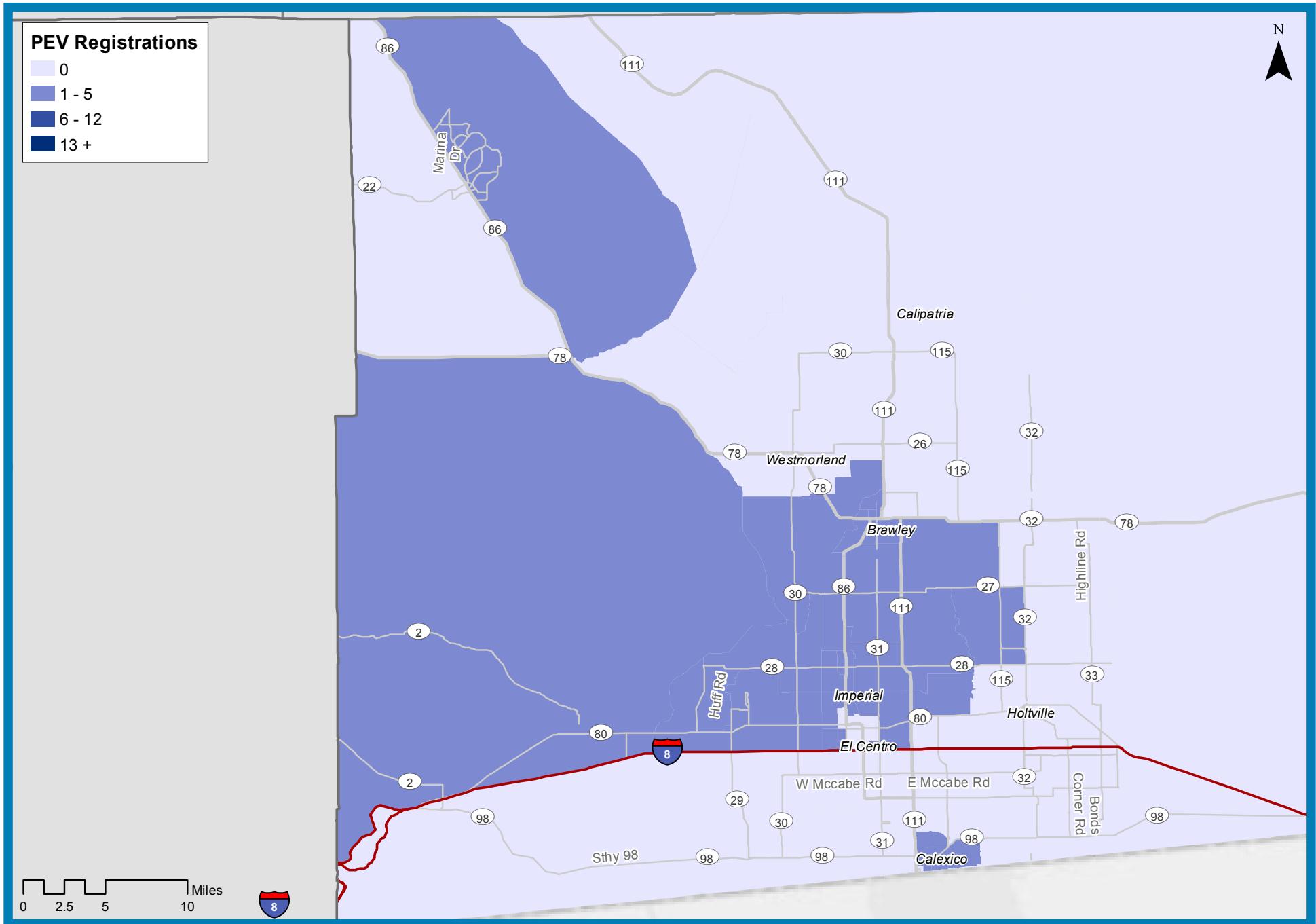


* The +5% and +10% projections begin in 2014, when uncertainty becomes greater.

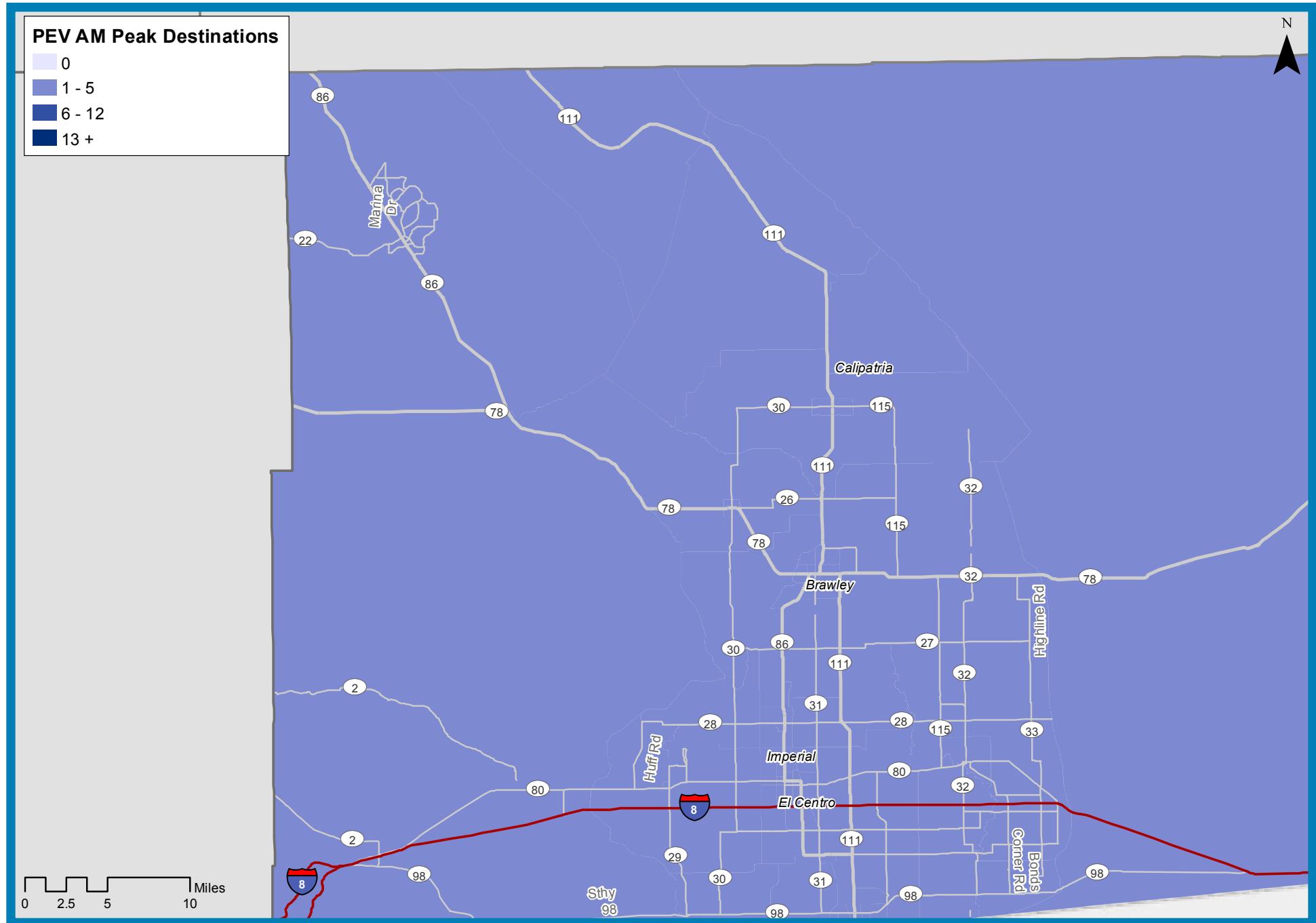
Plug-in Electric Vehicle Registrations

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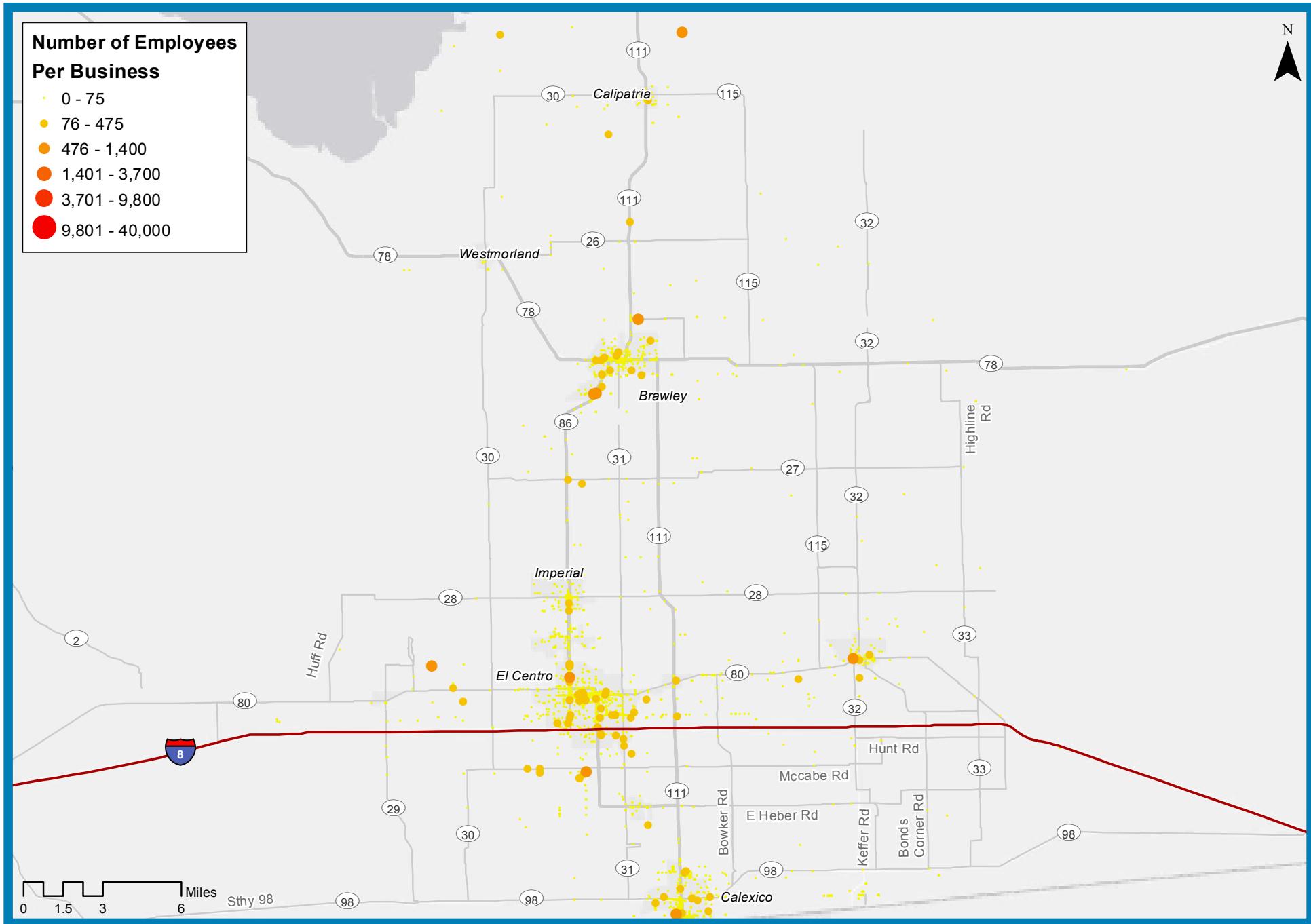
| Imperial County Transportation Commission



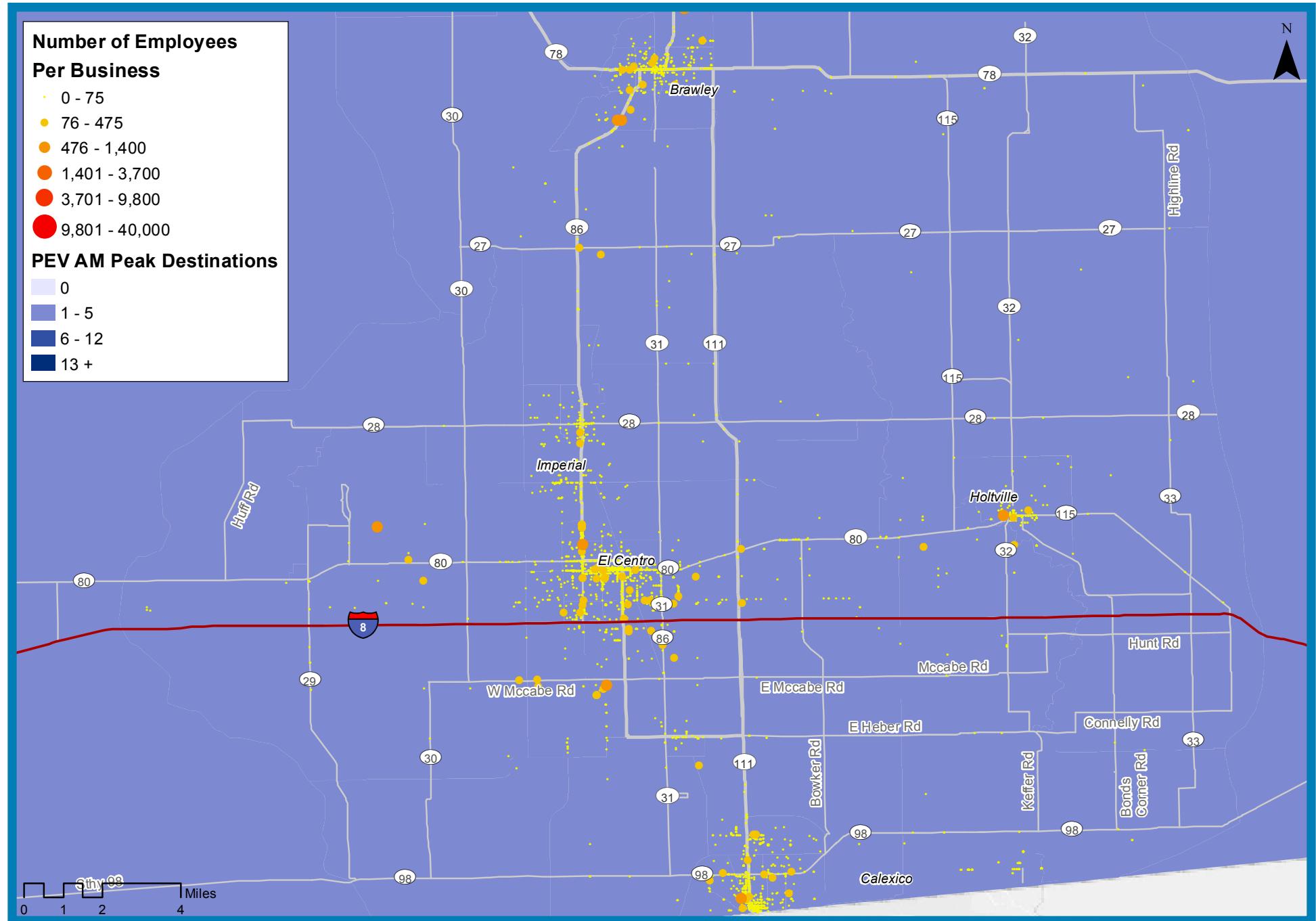
Plug-in Electric Vehicle Morning Peak Destinations



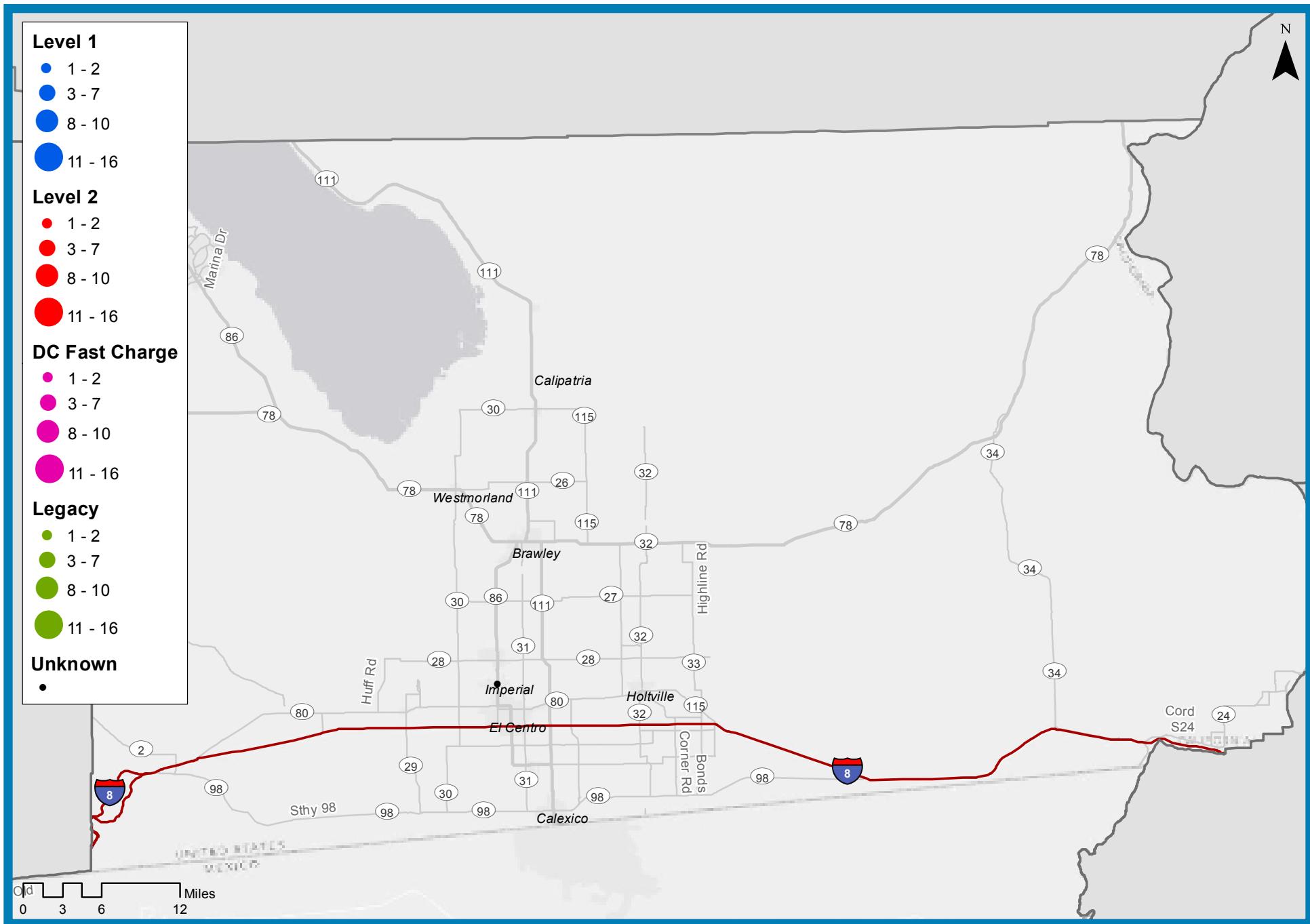
Workplaces by Number of Employees



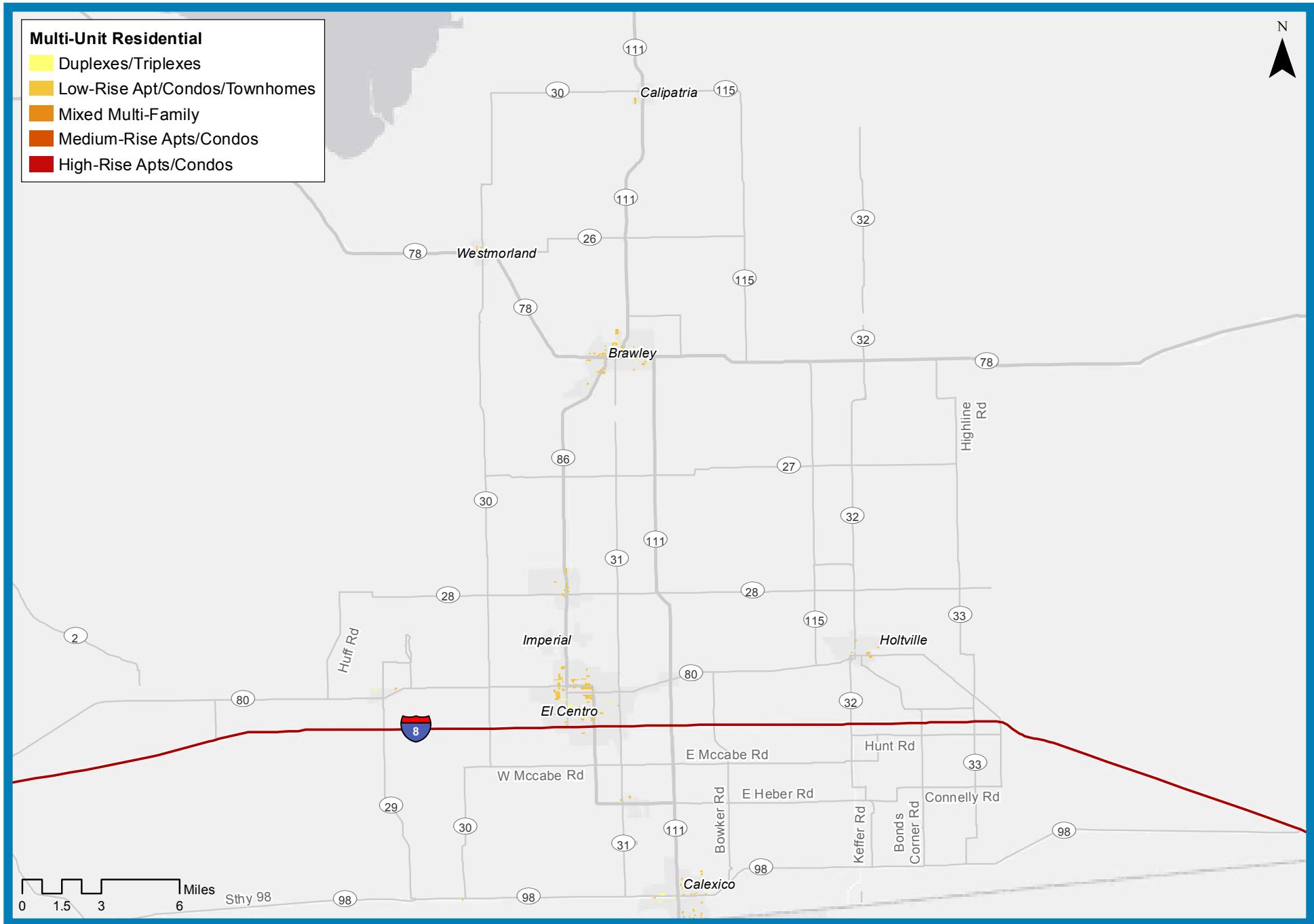
PEV Morning Peak Destinations and Workplaces



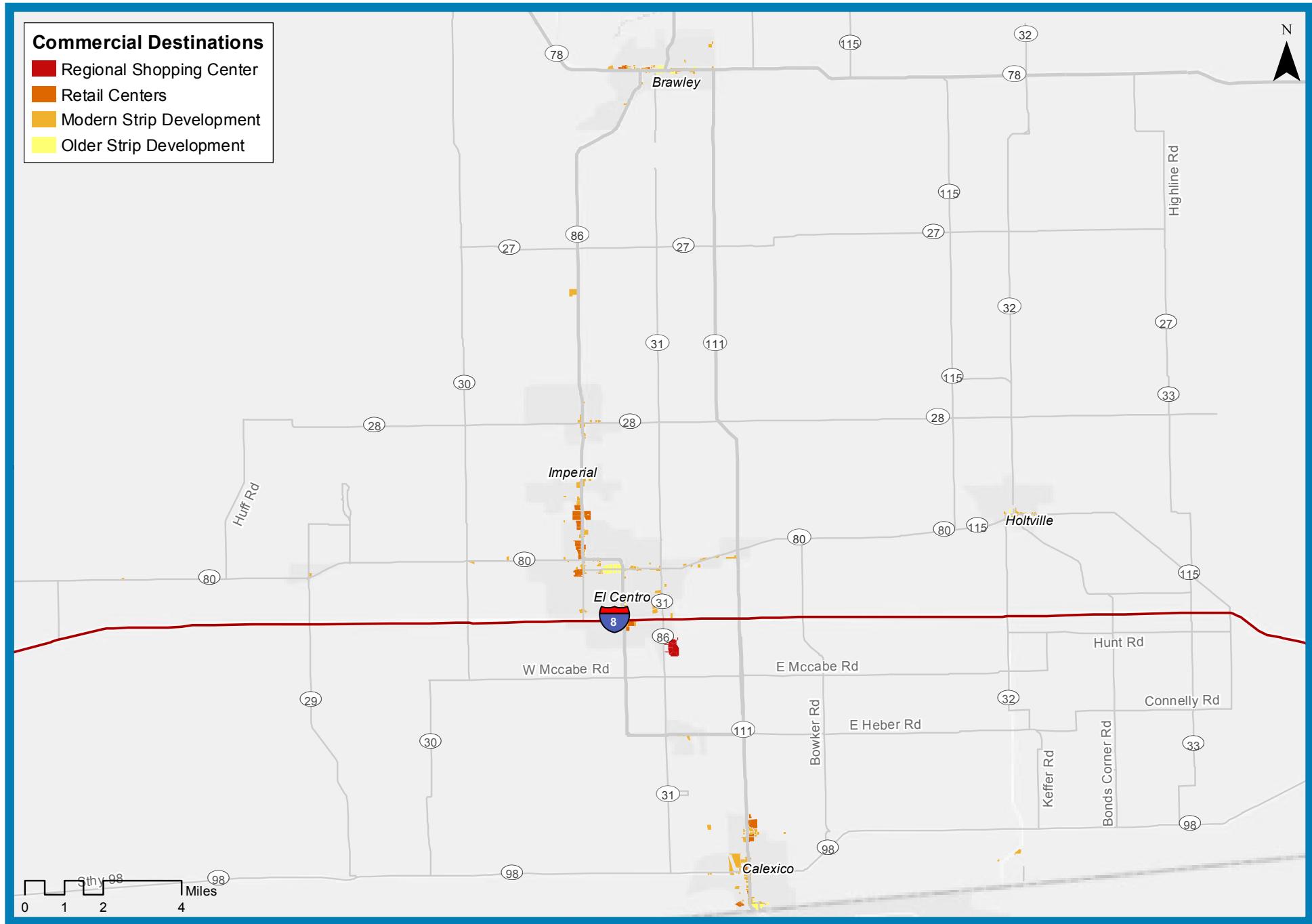
Publicly-Accessible Charging Stations (Summer/Fall 2012)



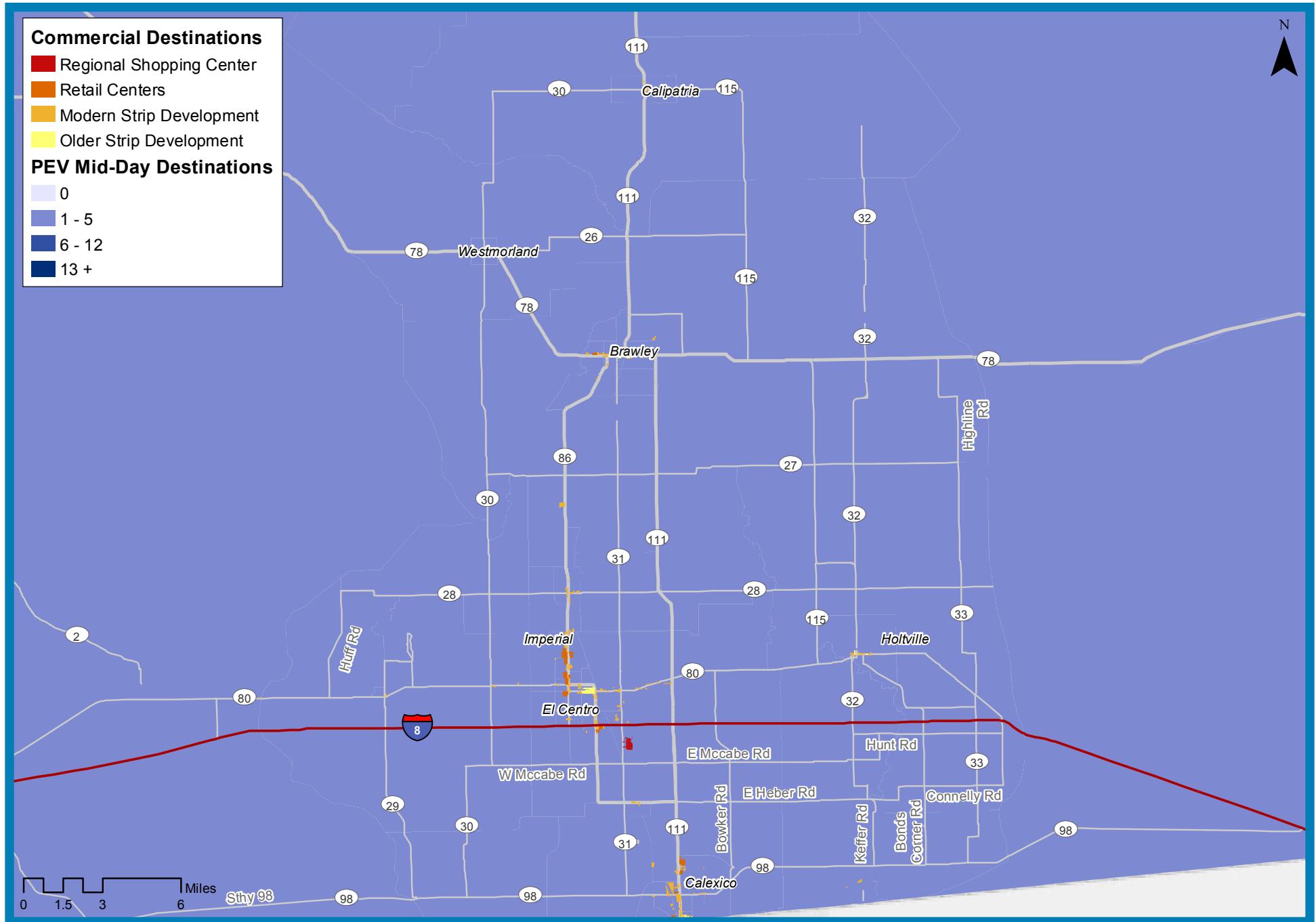
Multi-Unit Residential



Commercial (Retail) Destinations



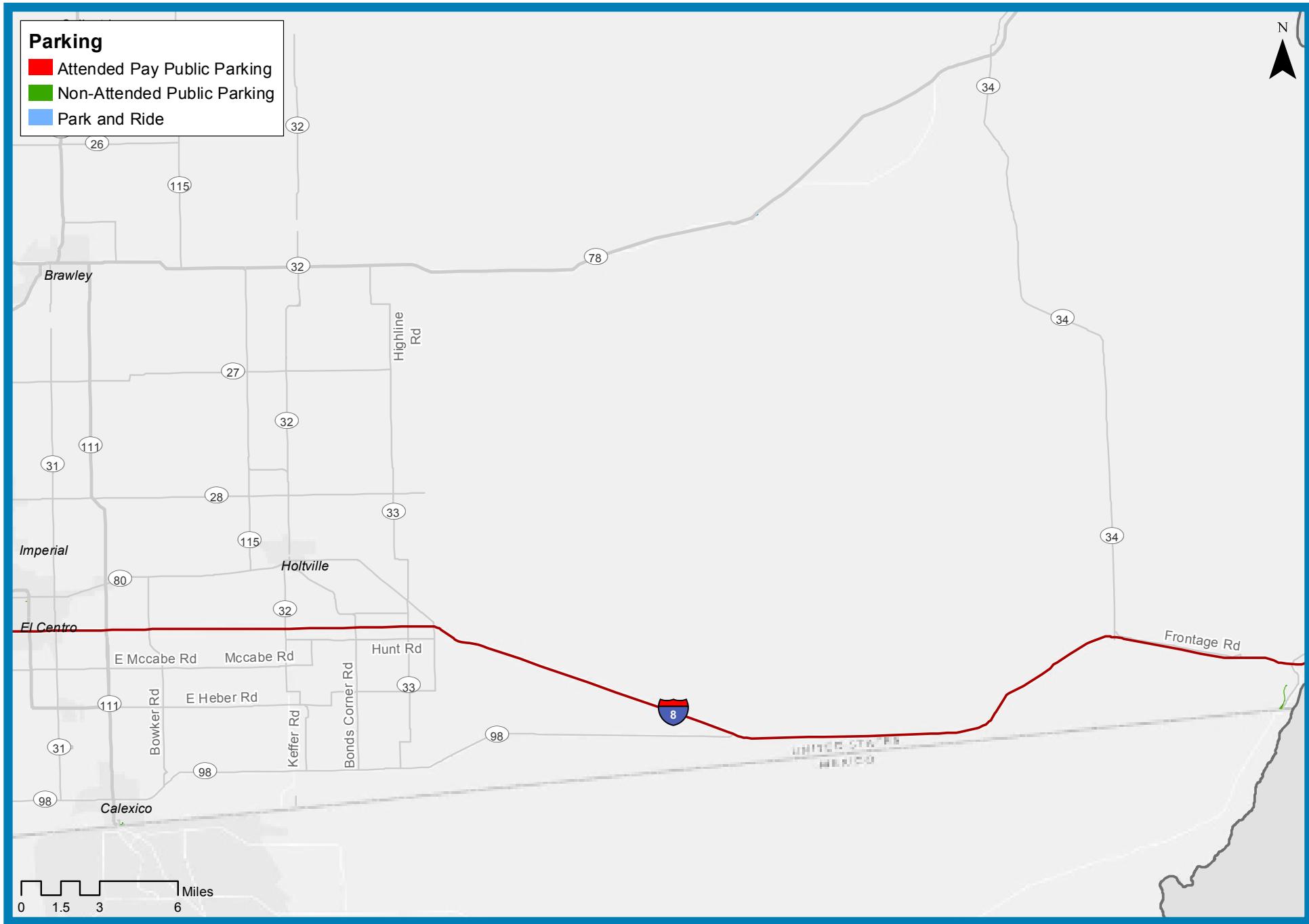
PEV Mid-Day Destinations and Commercial (Retail) Locations



Stand-alone Parking Facilities

51

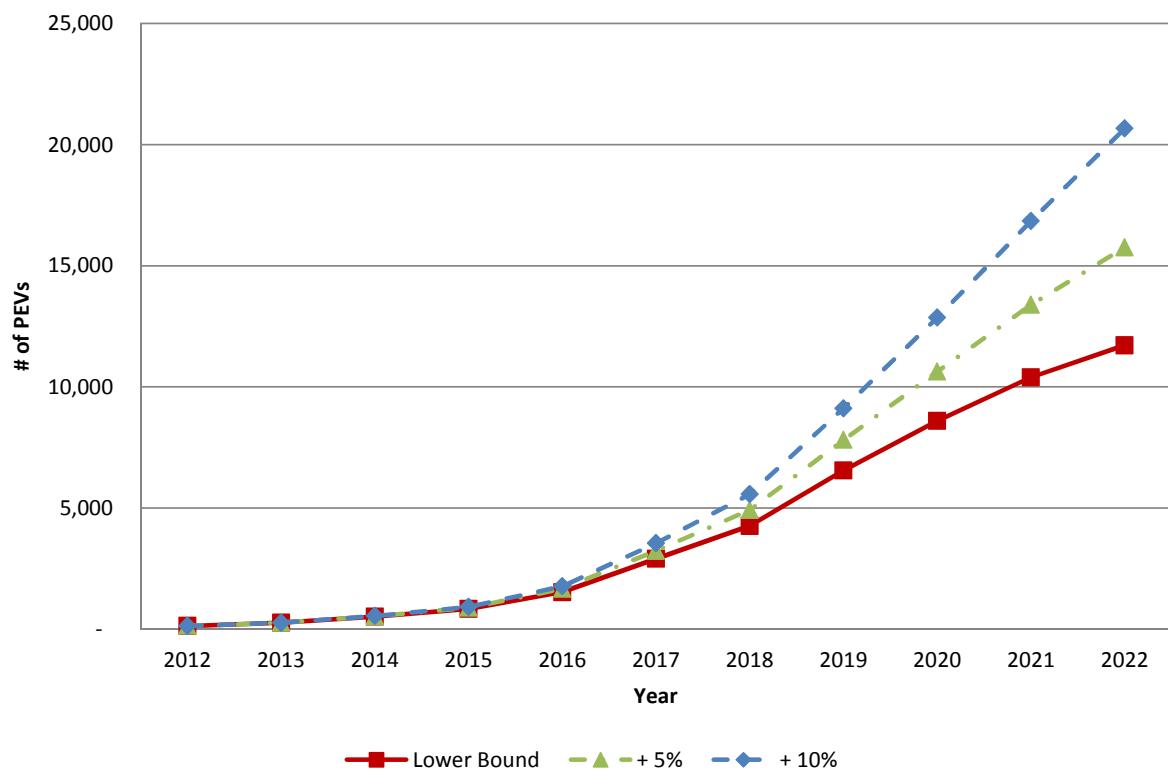
| Imperial County Transportation Commission



LAS VIRGENES MALIBU COUNCIL OF GOVERNMENTS

PEV Growth

Year	Cumulative PEV registrations*		
	Lower Bound	+ 5%	+ 10%
2012	136	136	136
2013	272	272	272
2014	525	539	544
2015	836	885	920
2016	1,533	1,667	1,780
2017	2,905	3,241	3,549
2018	4,265	4,920	5,566
2019	6,558	7,812	9,116
2020	8,595	10,629	12,860
2021	10,396	13,387	16,840
2022	11,717	15,758	20,664

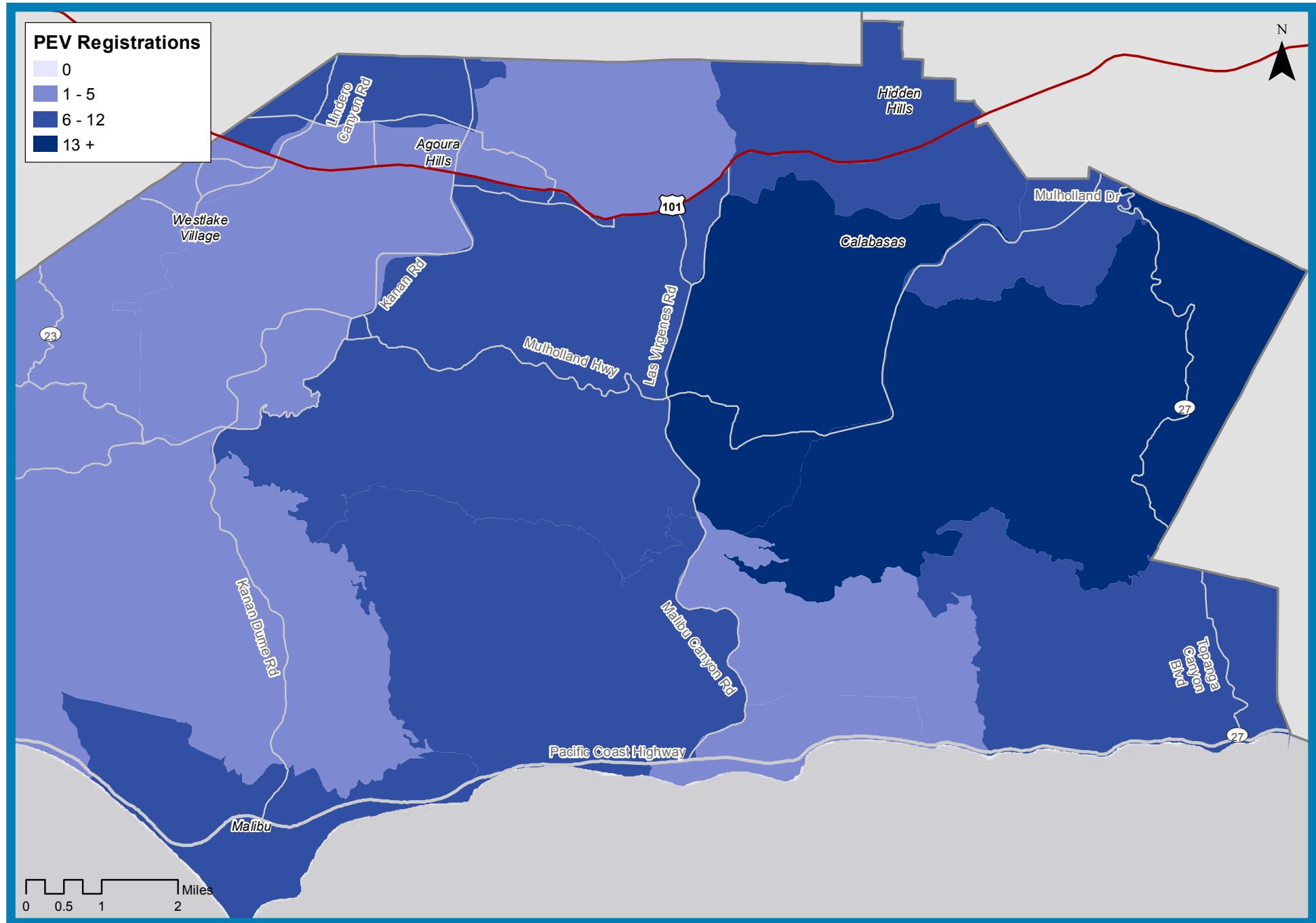


* The +5% and +10% projections begin in 2014, when uncertainty becomes greater.

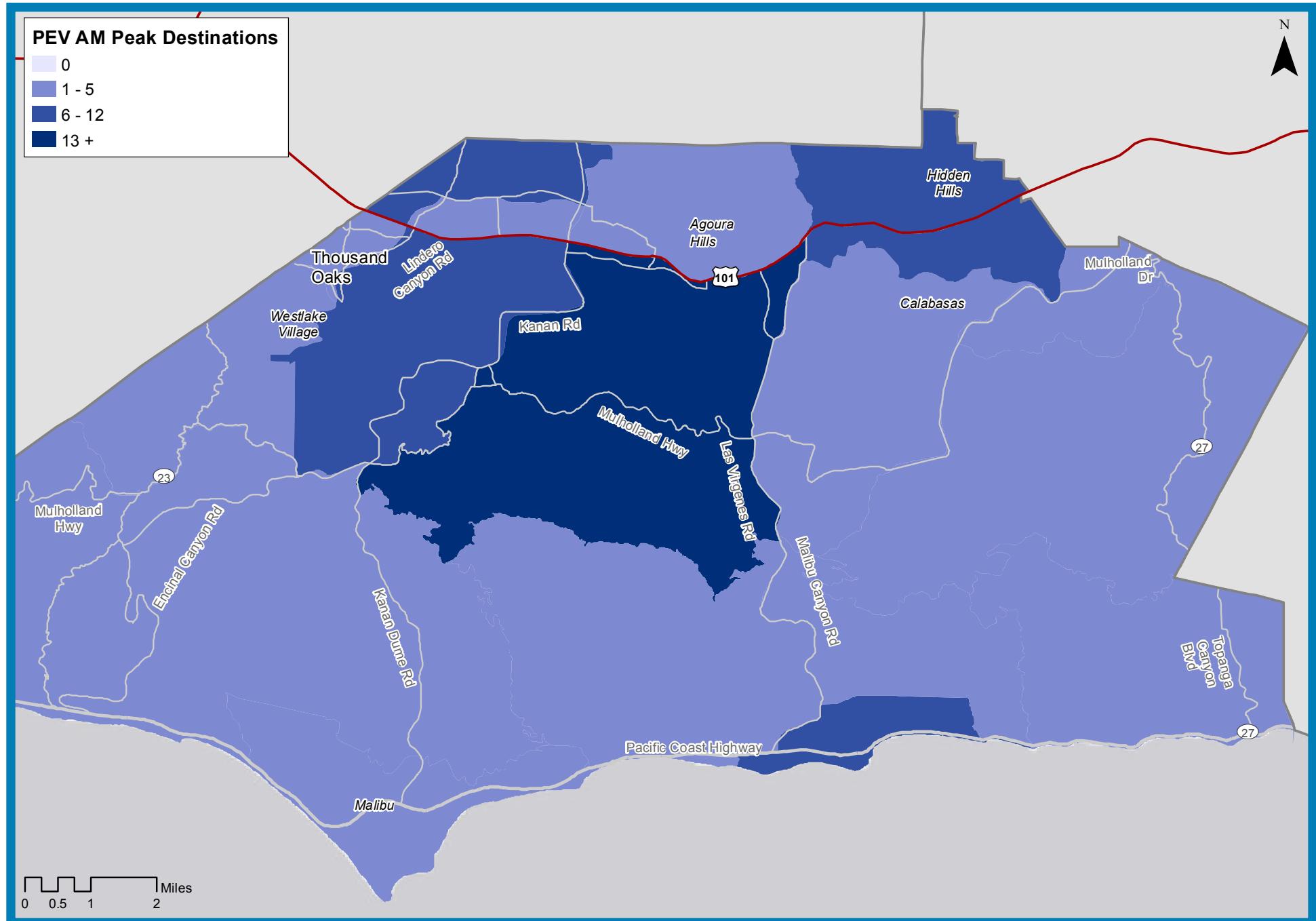
Plug-in Electric Vehicle Registrations

53

| Las Virgenes Malibu Council of Governments



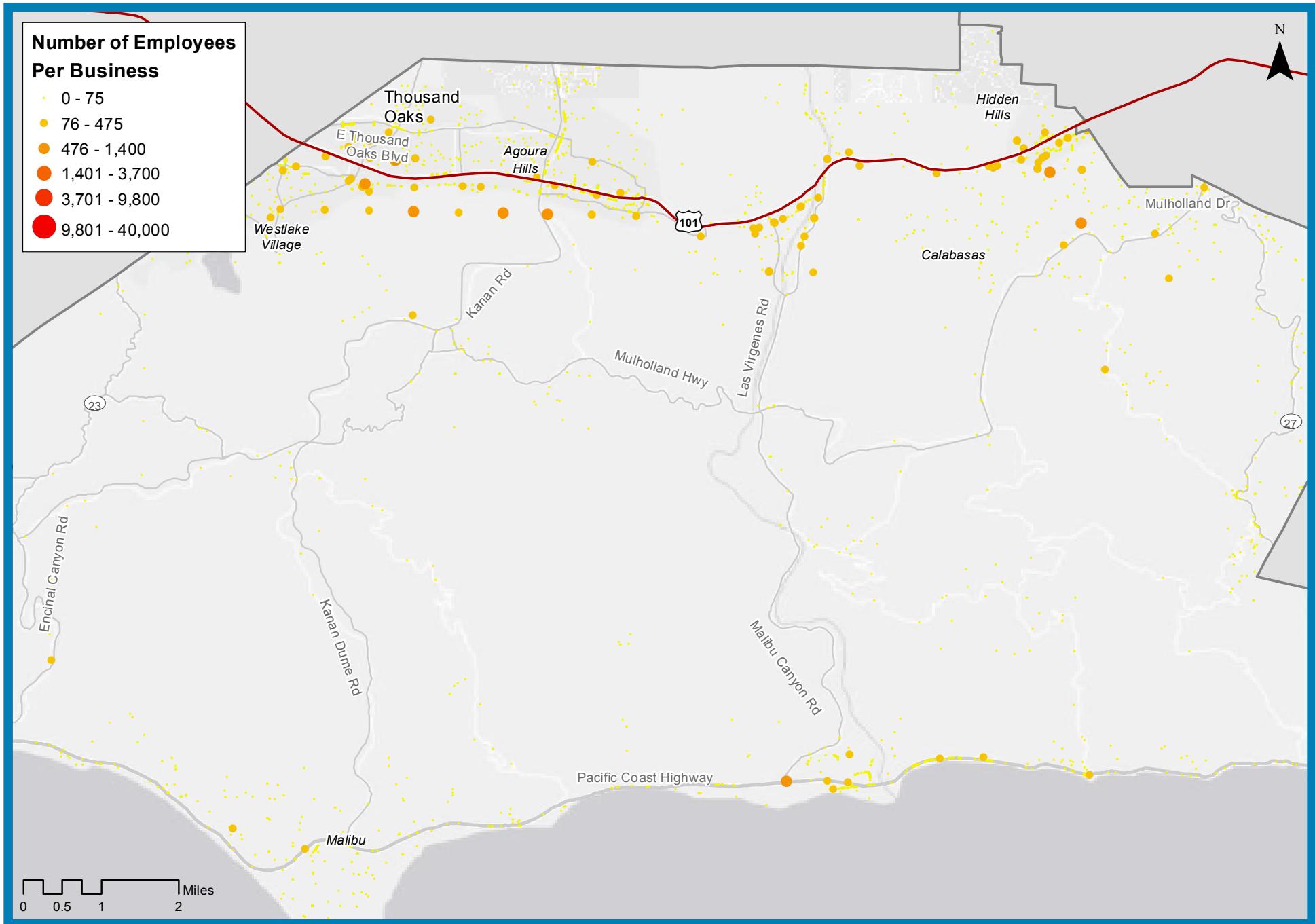
Plug-in Electric Vehicle Morning Peak Destinations



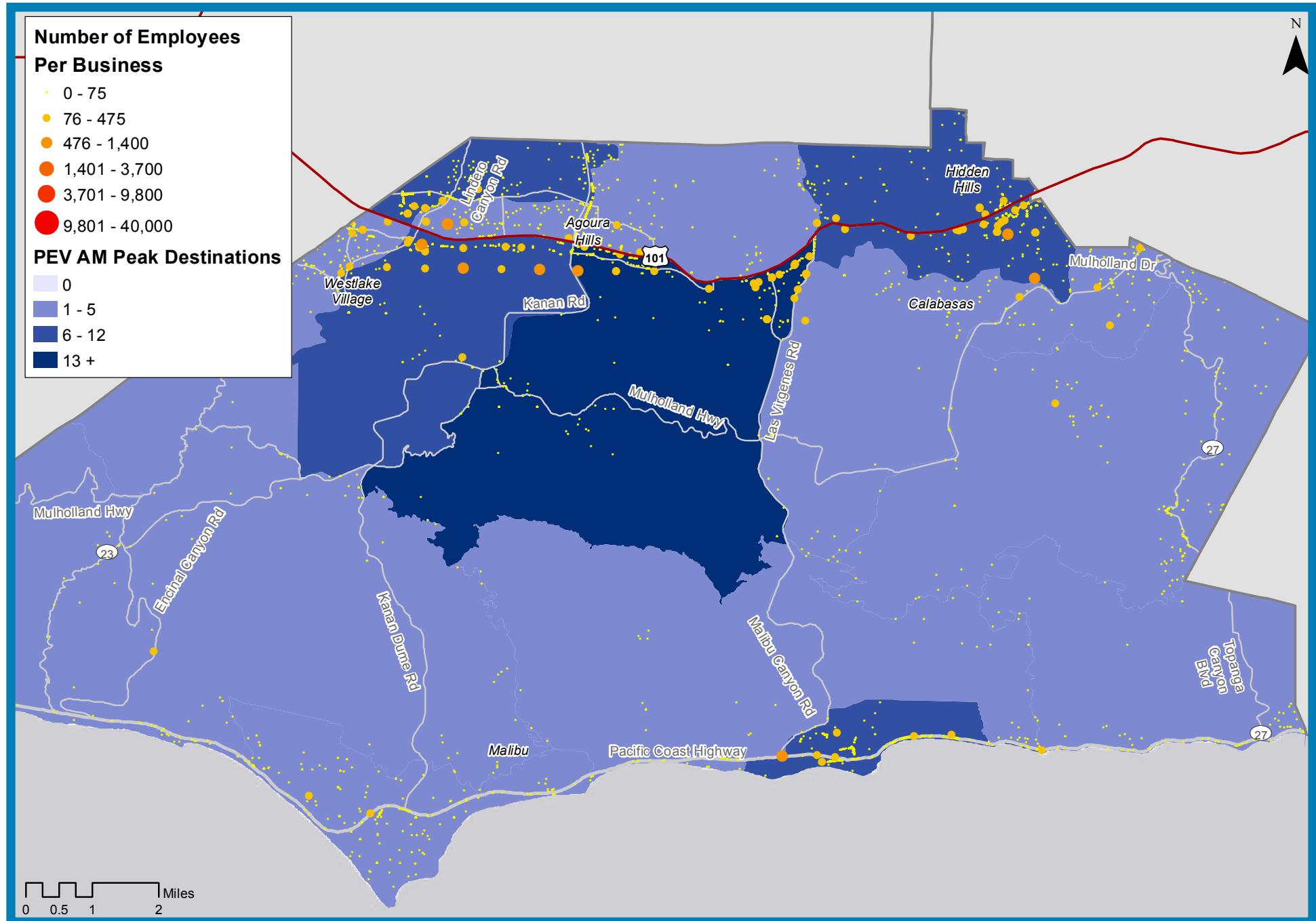
Workplaces by Number of Employees

55

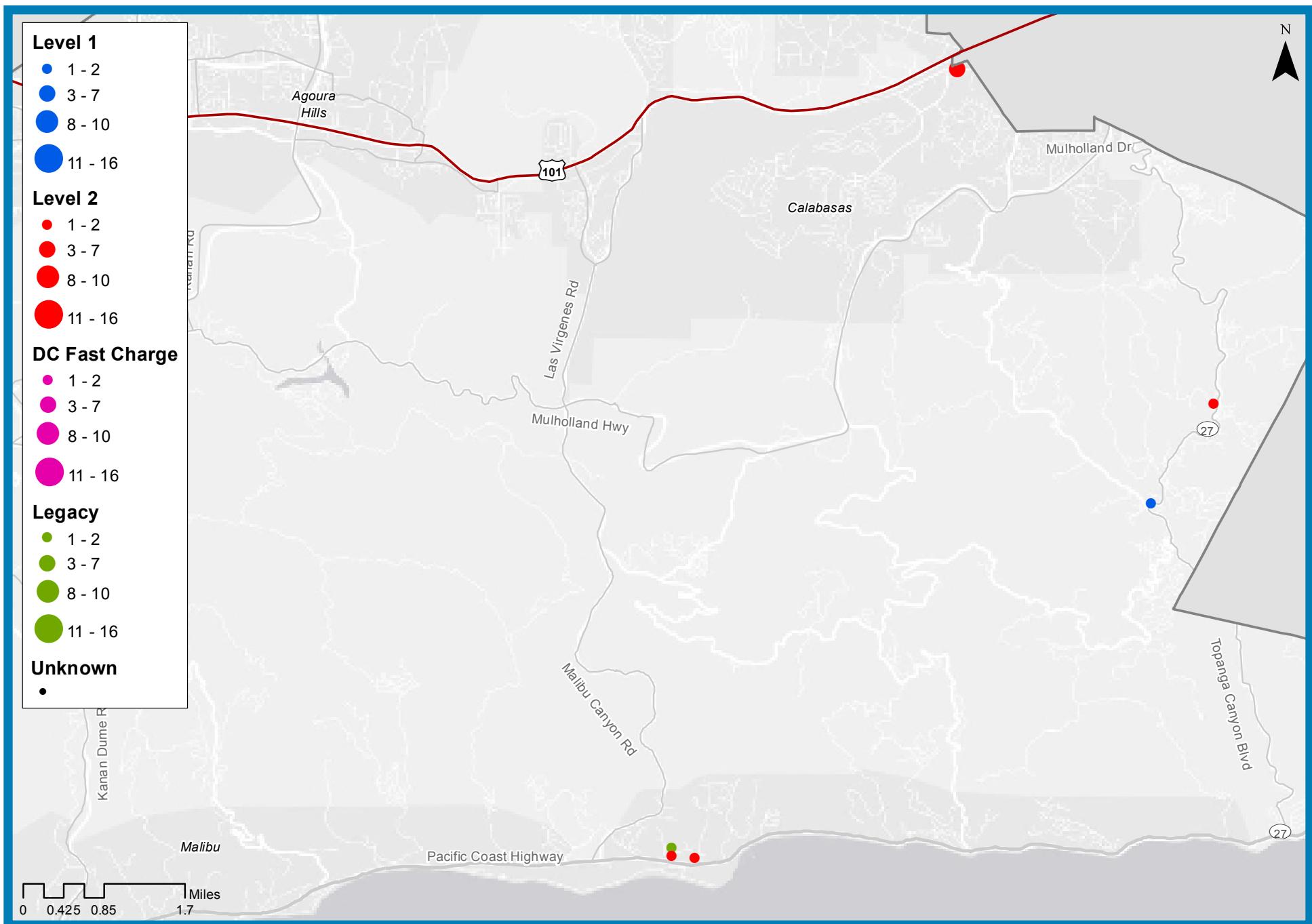
| Las Virgenes Malibu Council of Governments



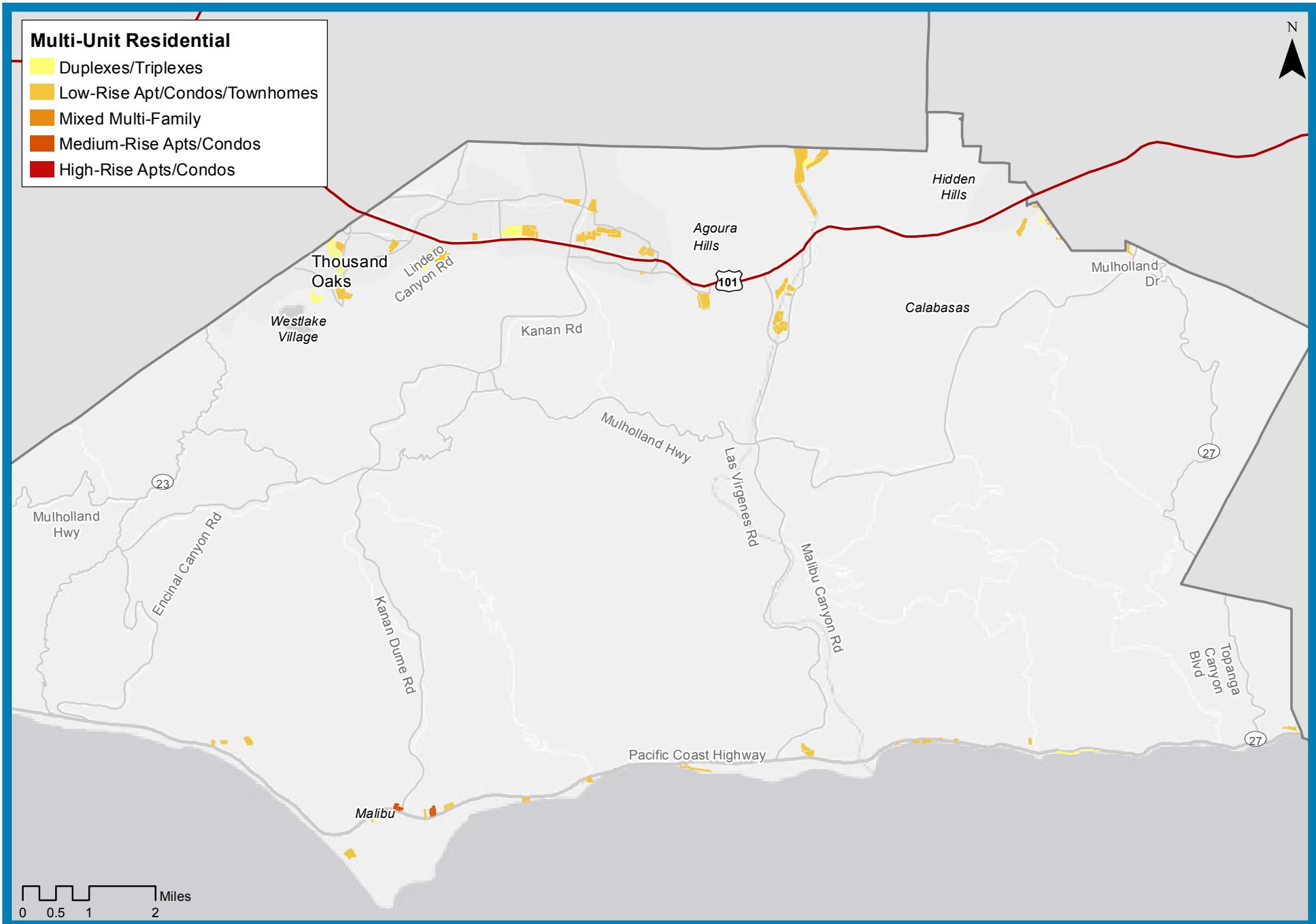
PEV Morning Peak Destinations and Workplaces



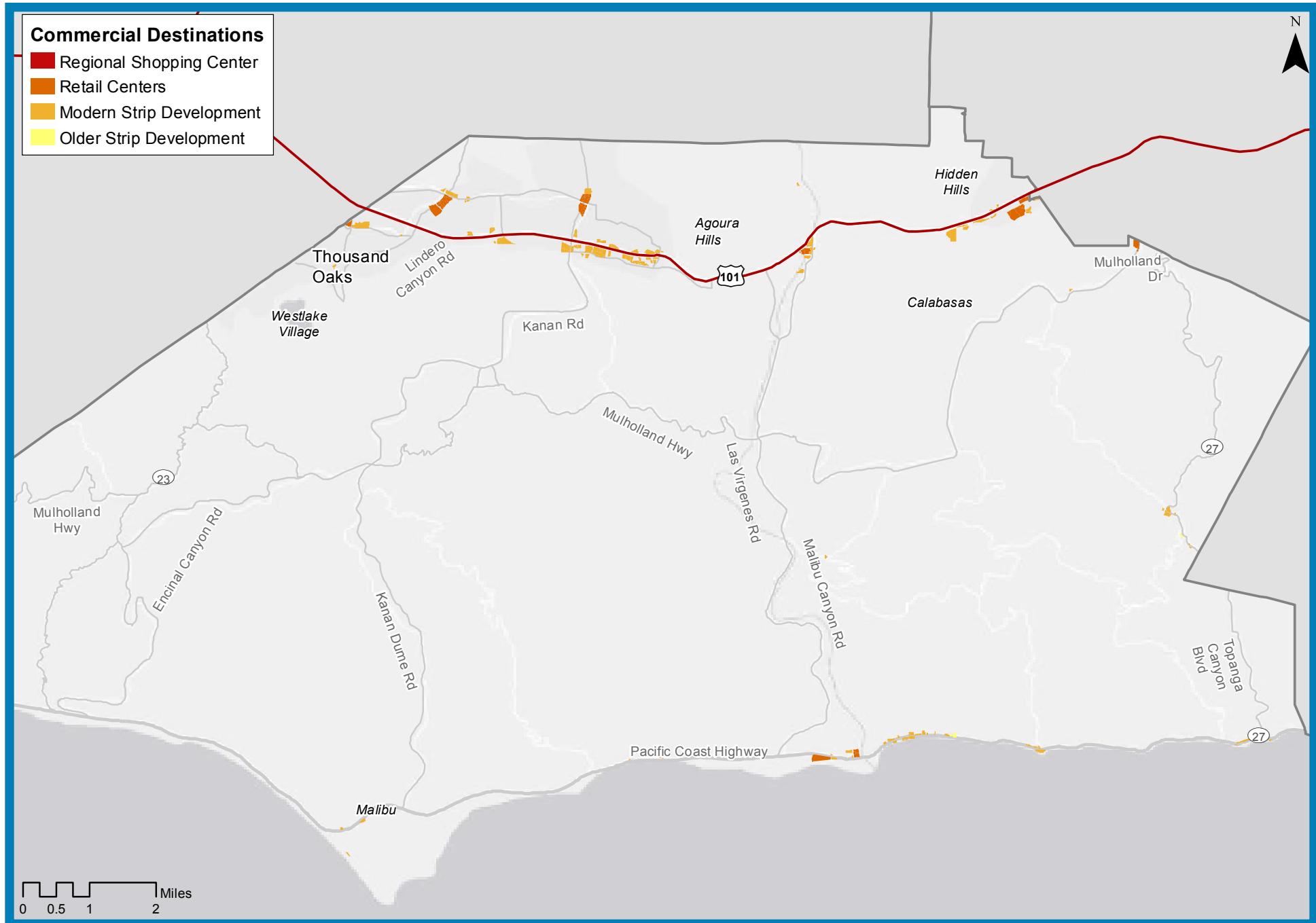
Publicly-Accessible Charging Stations (Summer/Fall 2012)



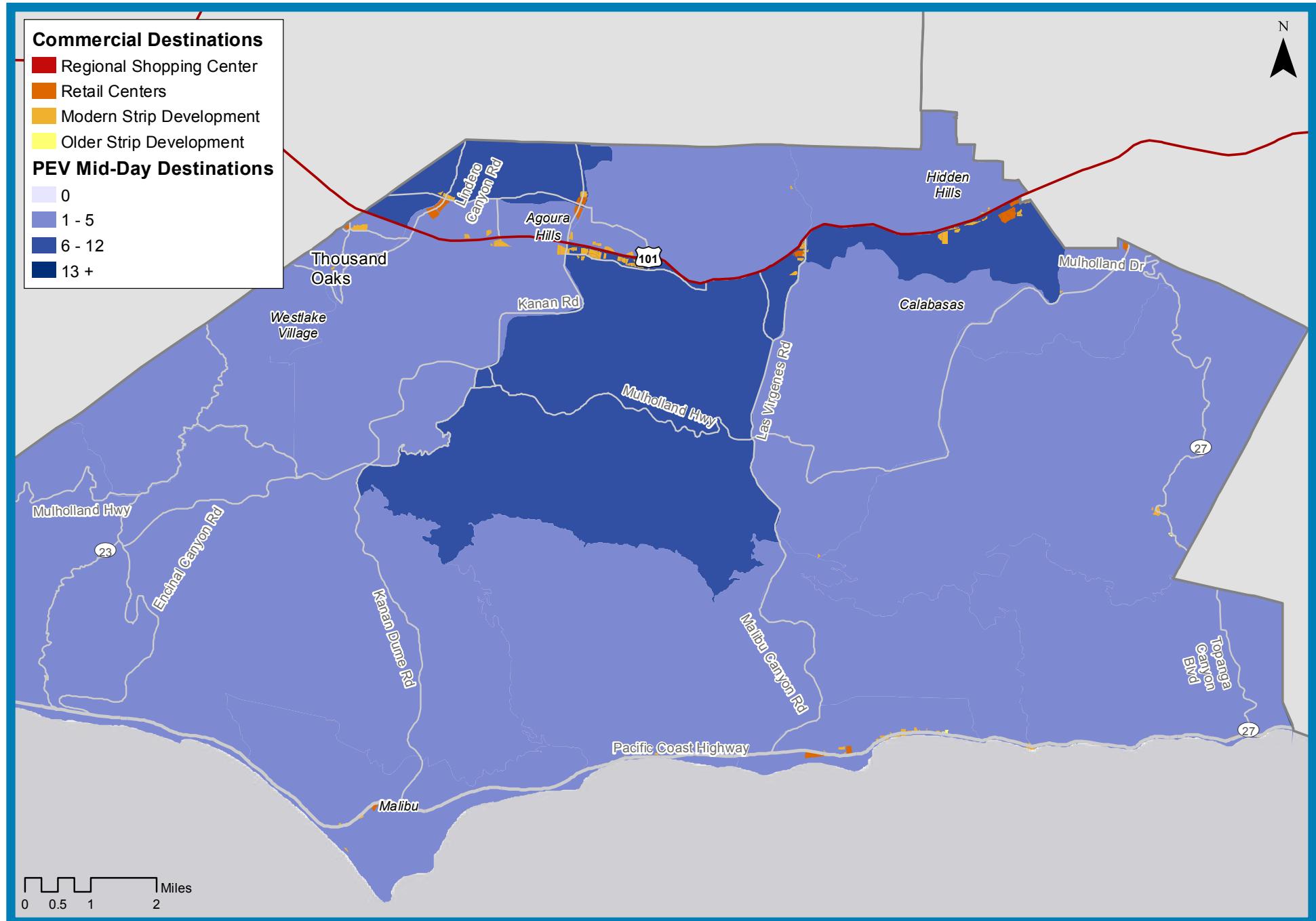
Multi-Unit Residential



Commercial (Retail) Destinations



PEV Mid-Day Destinations and Commercial (Retail) Locations



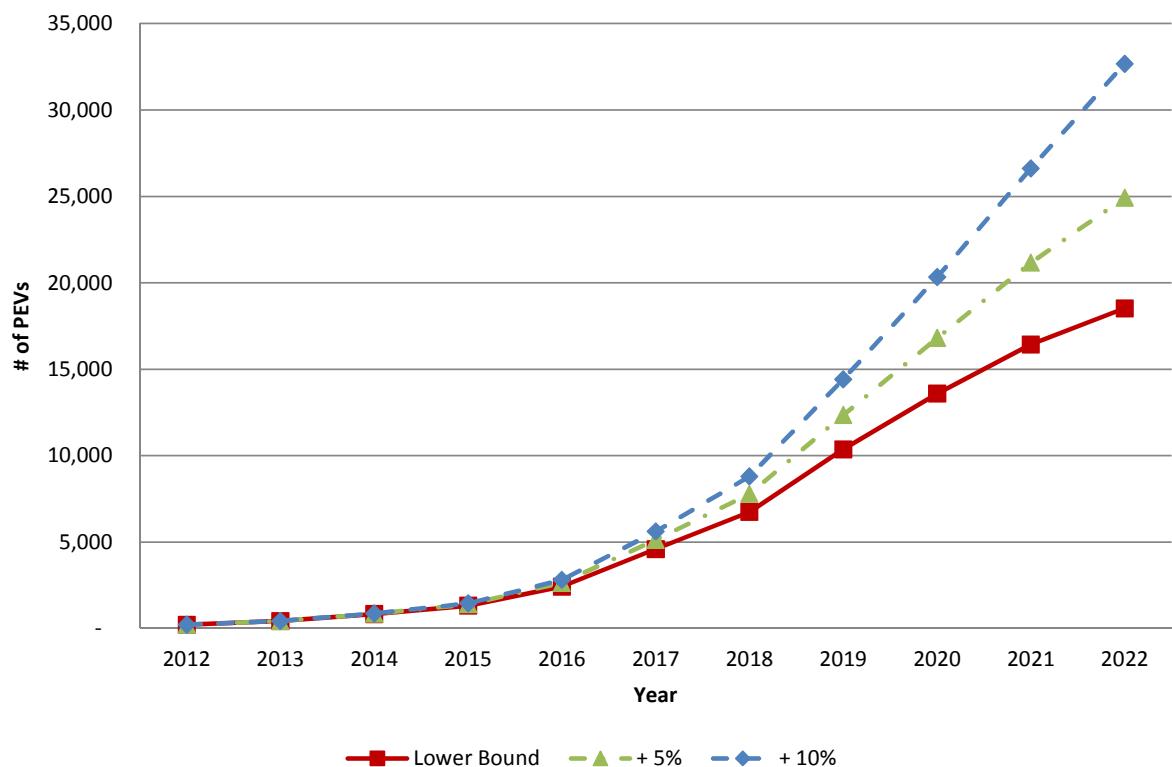
Stand-alone Parking Facilities



NORTH LOS ANGELES COUNTY

PEV Growth

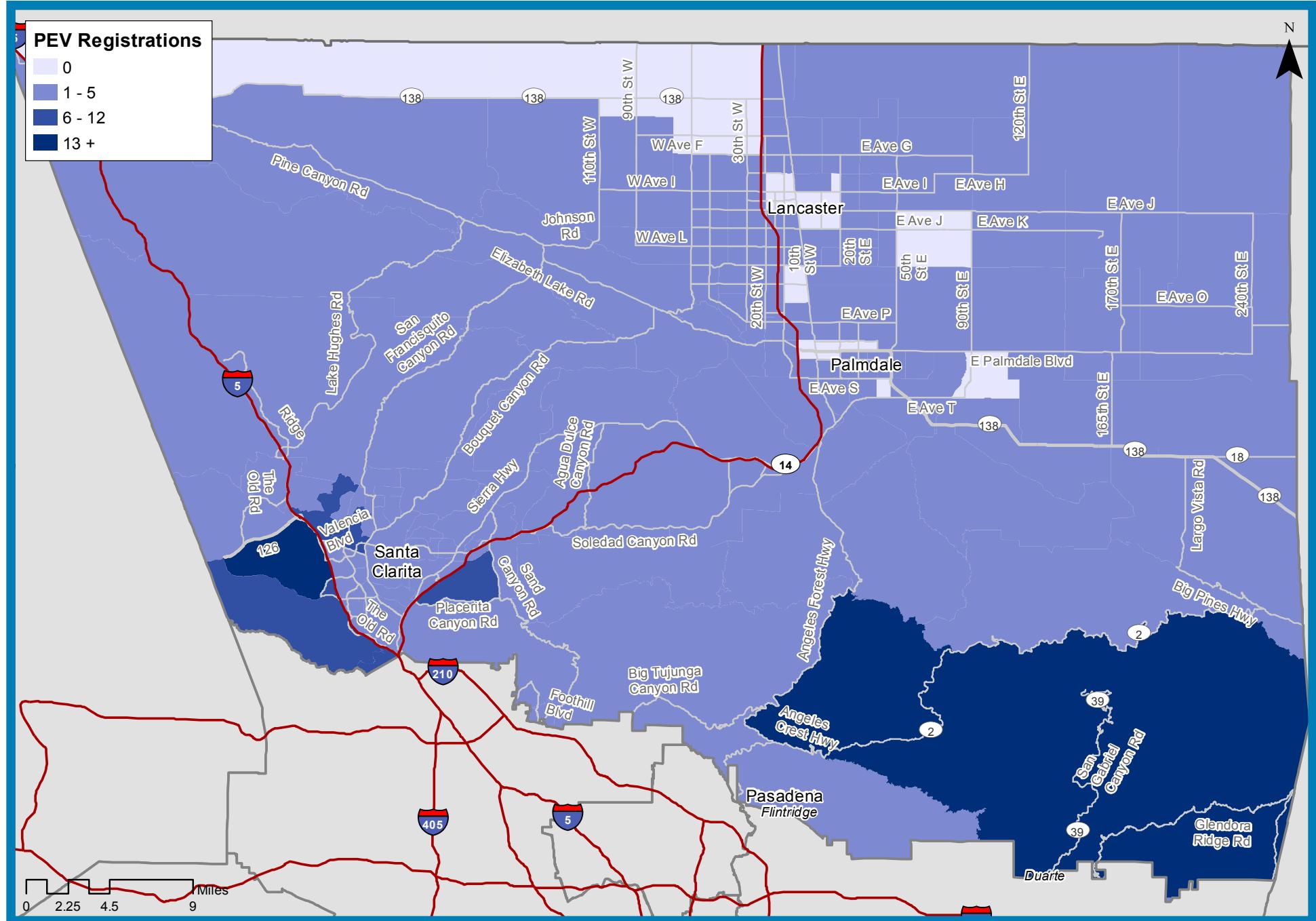
Year	Cumulative PEV registrations*		
	Lower Bound	+ 5%	+ 10%
2012	215	215	215
2013	430	430	430
2014	830	852	860
2015	1,322	1,398	1,455
2016	2,424	2,635	2,814
2017	4,592	5,123	5,611
2018	6,742	7,778	8,800
2019	10,367	12,349	14,412
2020	13,588	16,803	20,330
2021	16,435	21,163	26,622
2022	18,524	24,911	32,668



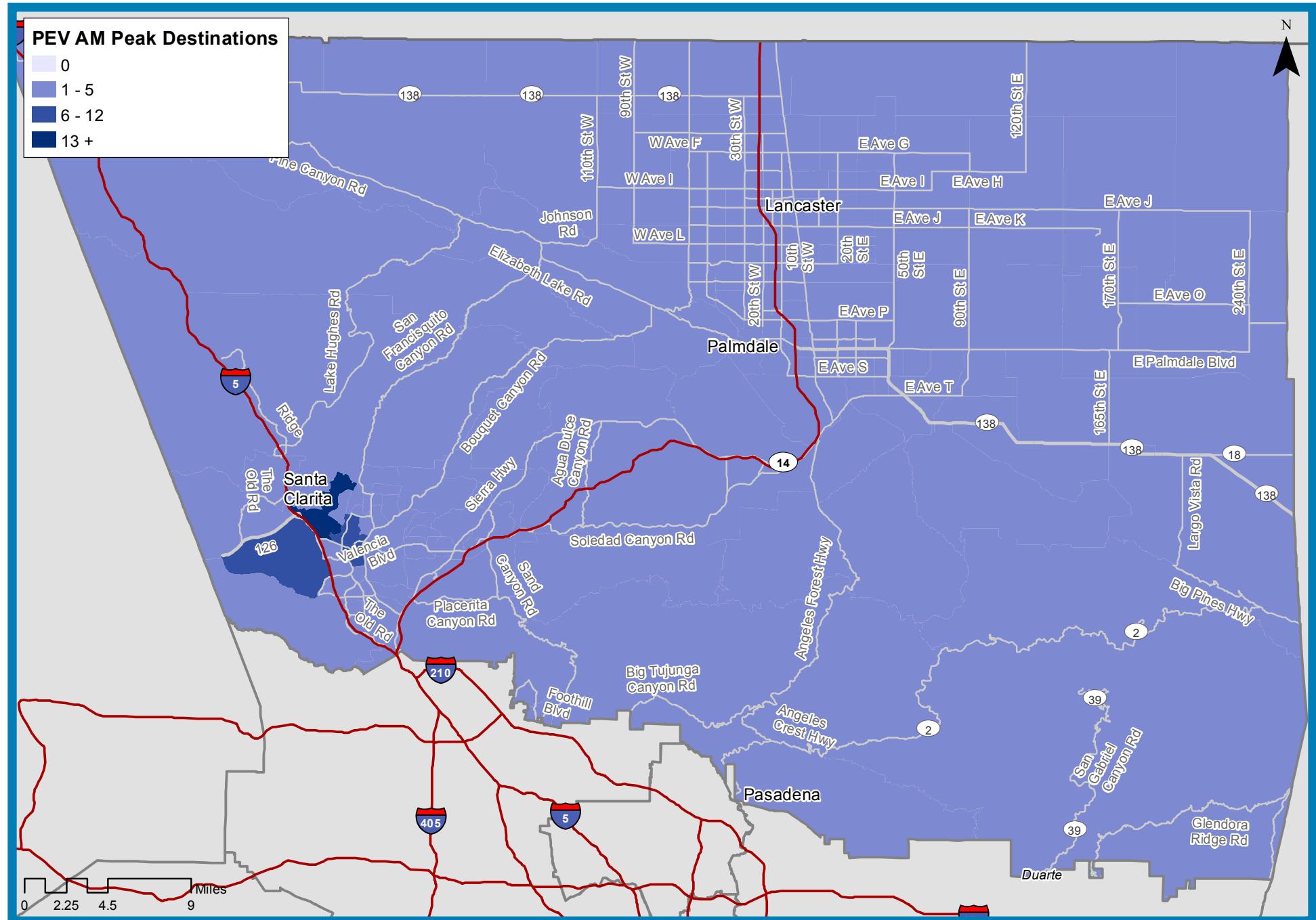
* The +5% and +10% projections begin in 2014, when uncertainty becomes greater.

Plug-in Electric Vehicle Registrations

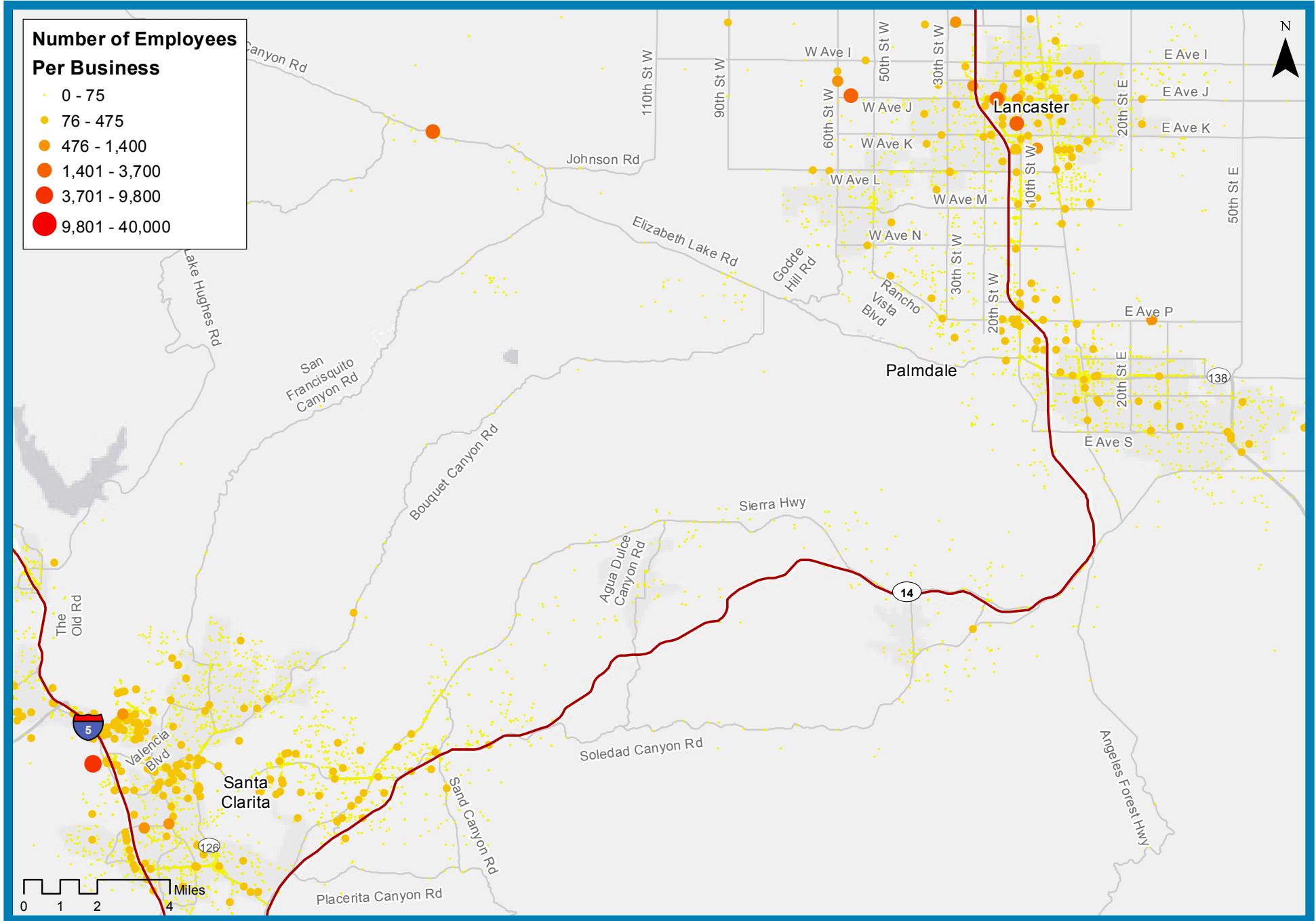
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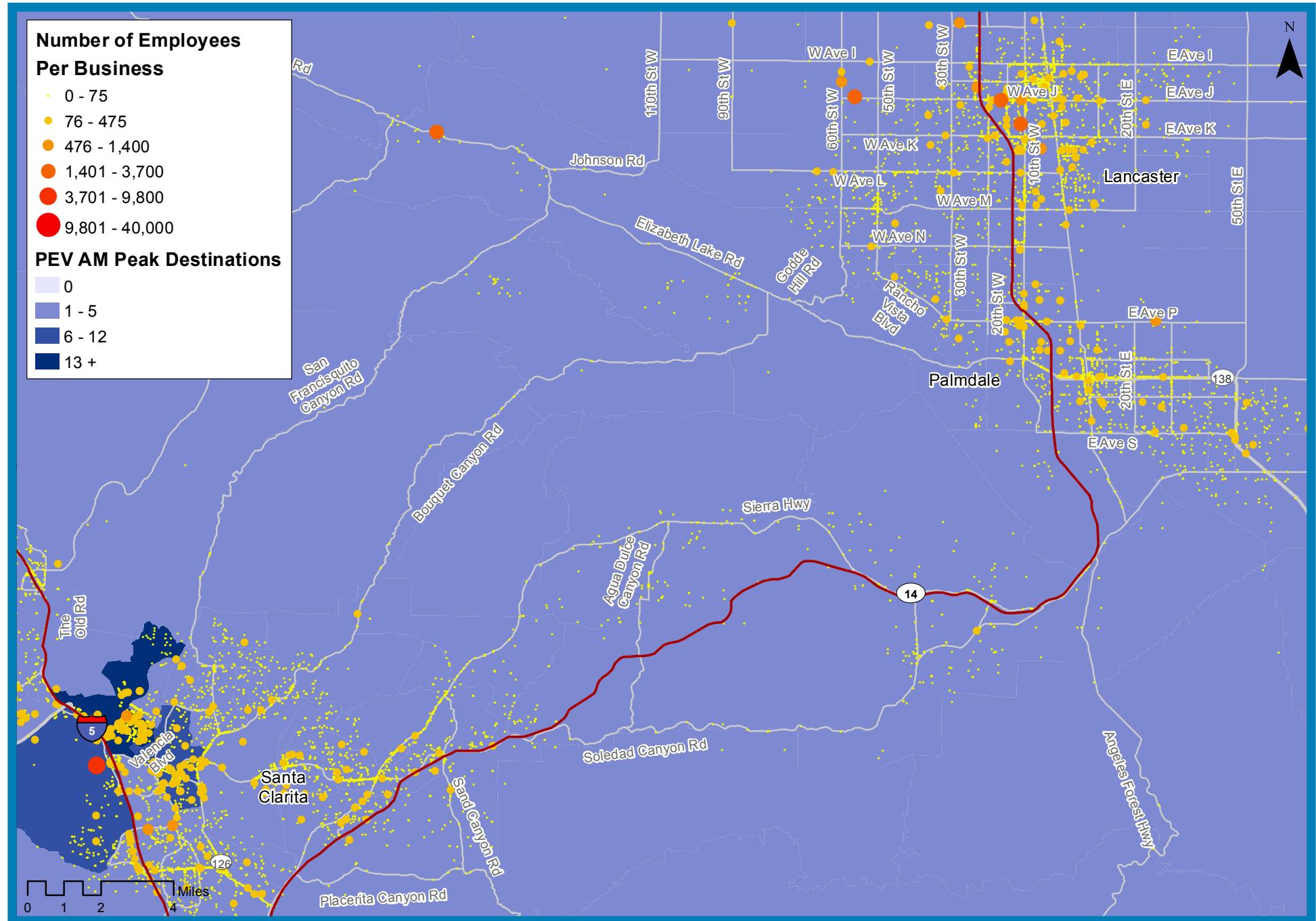
Plug-in Electric Vehicle Morning Peak Destinations



Workplaces by Number of Employees



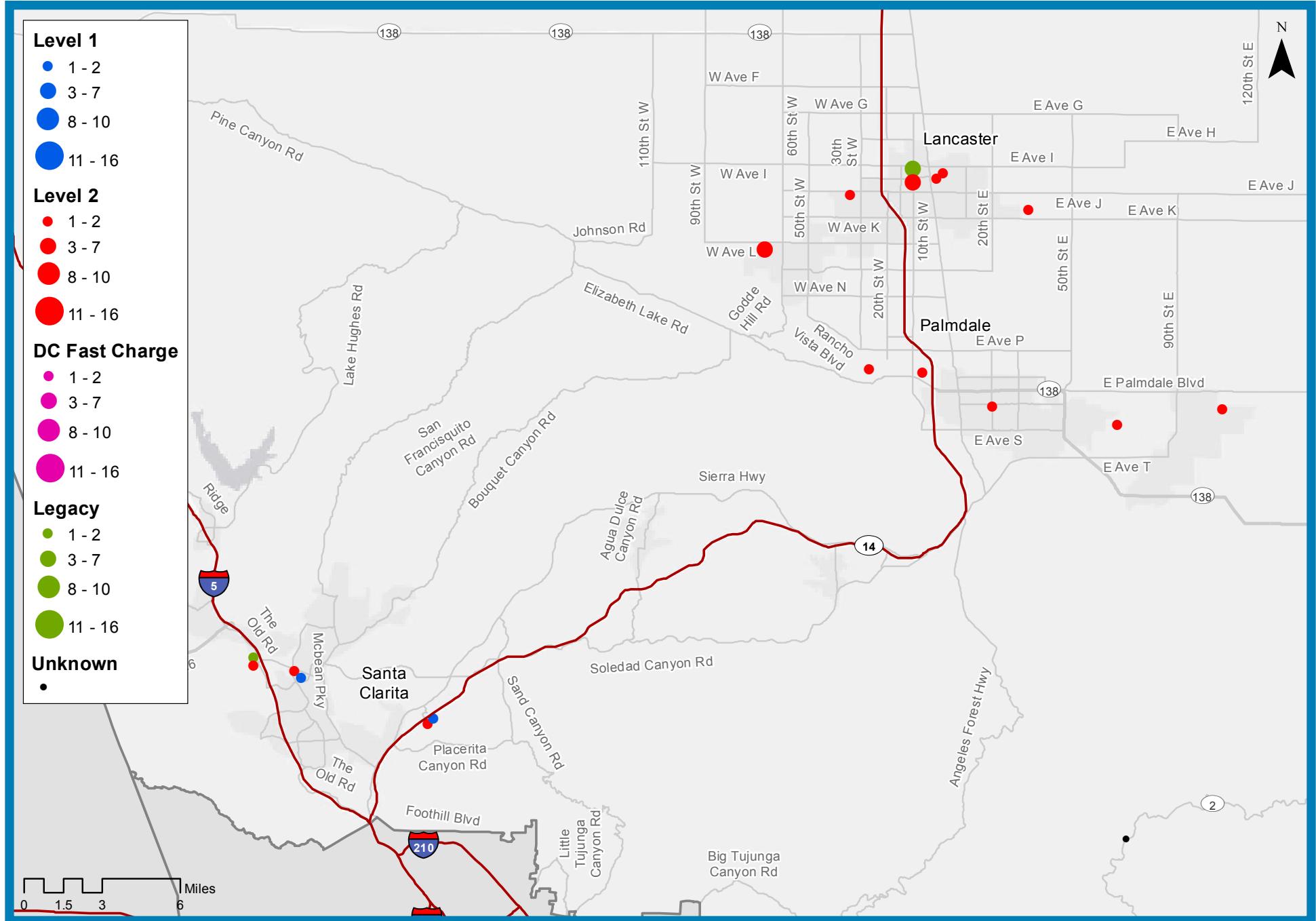
PEV Morning Peak Destinations and Workplaces



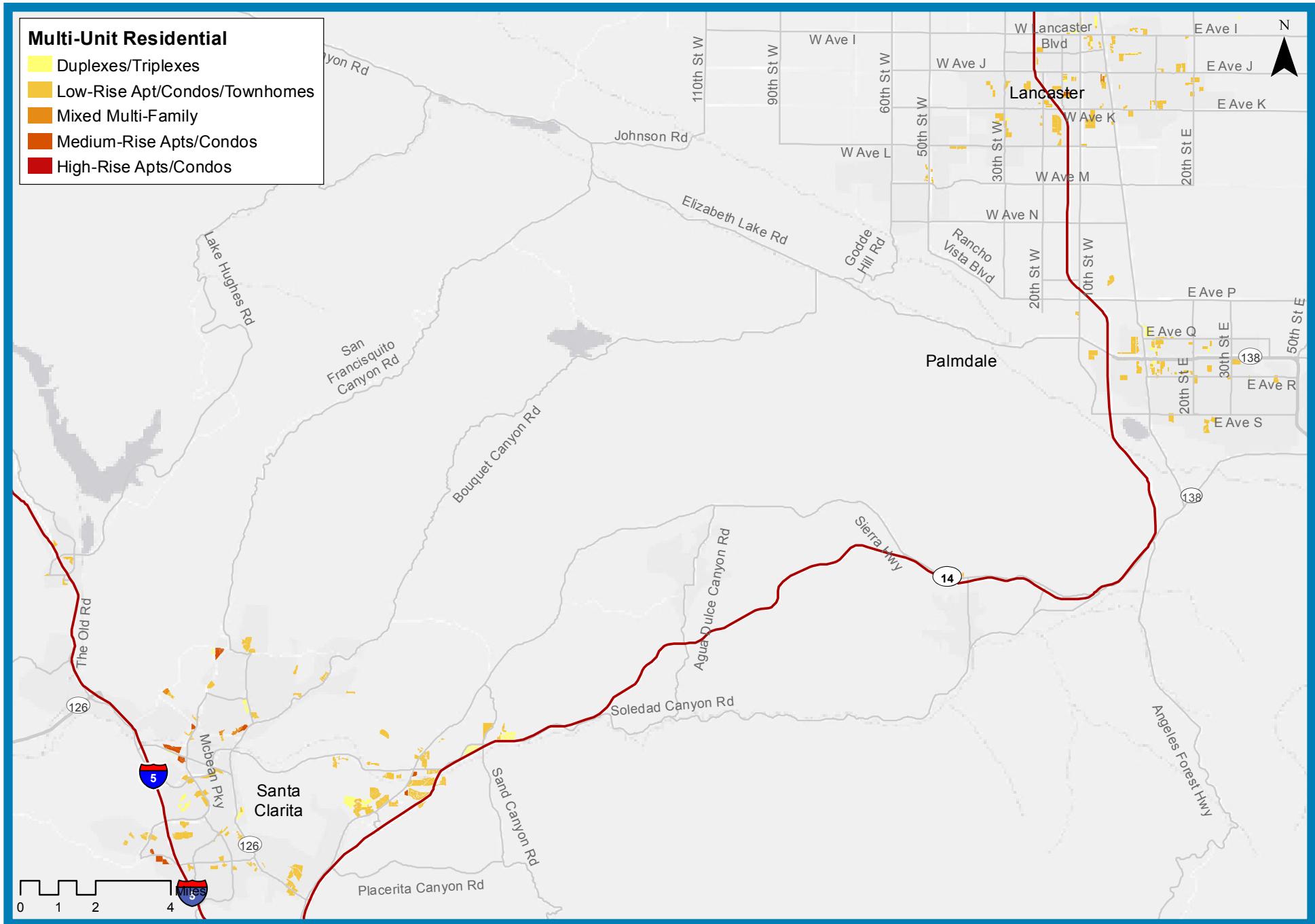
Publicly-Accessible Charging Stations (Summer/Fall 2012)

49

67 | North Los Angeles County



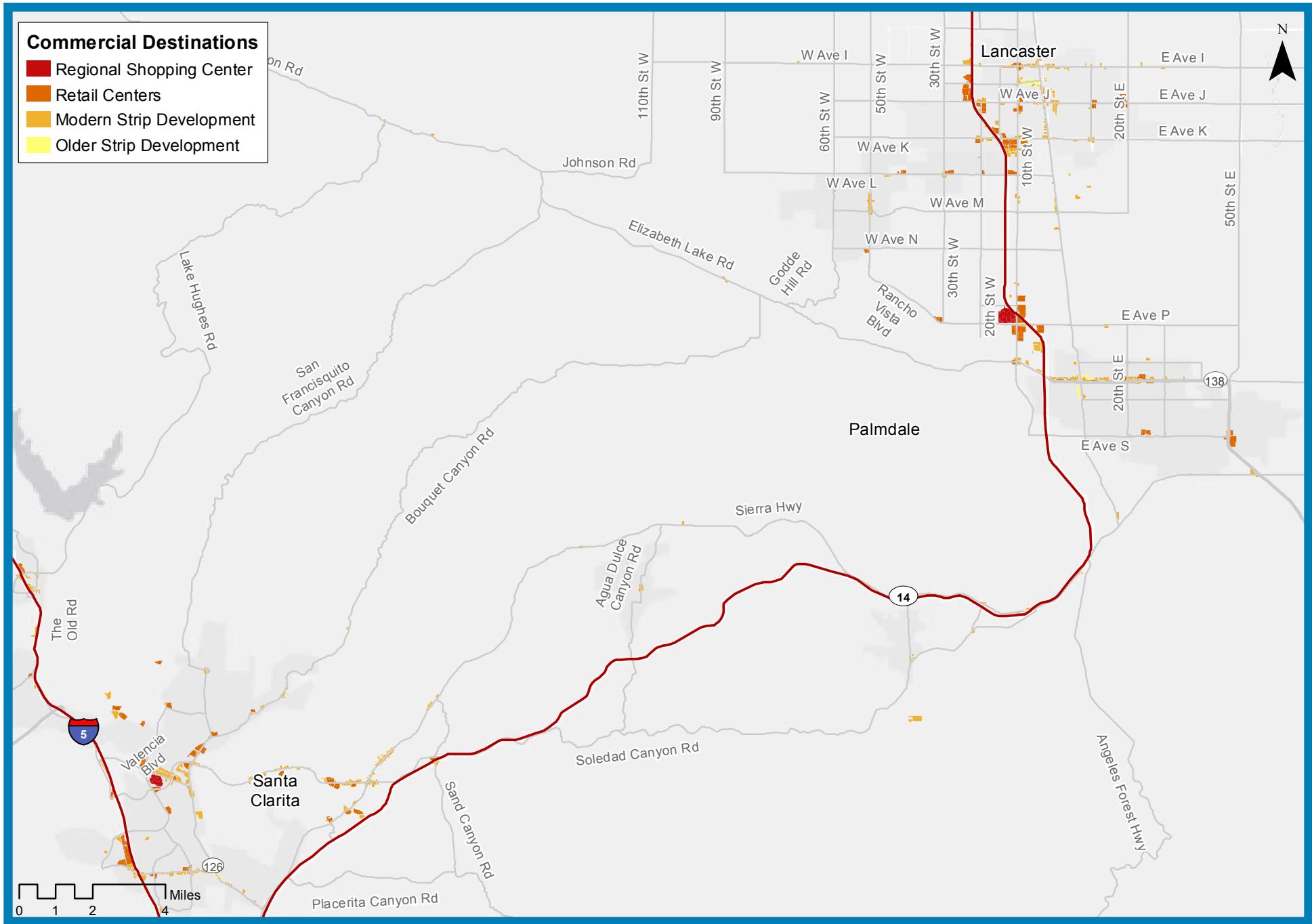
Multi-Unit Residential



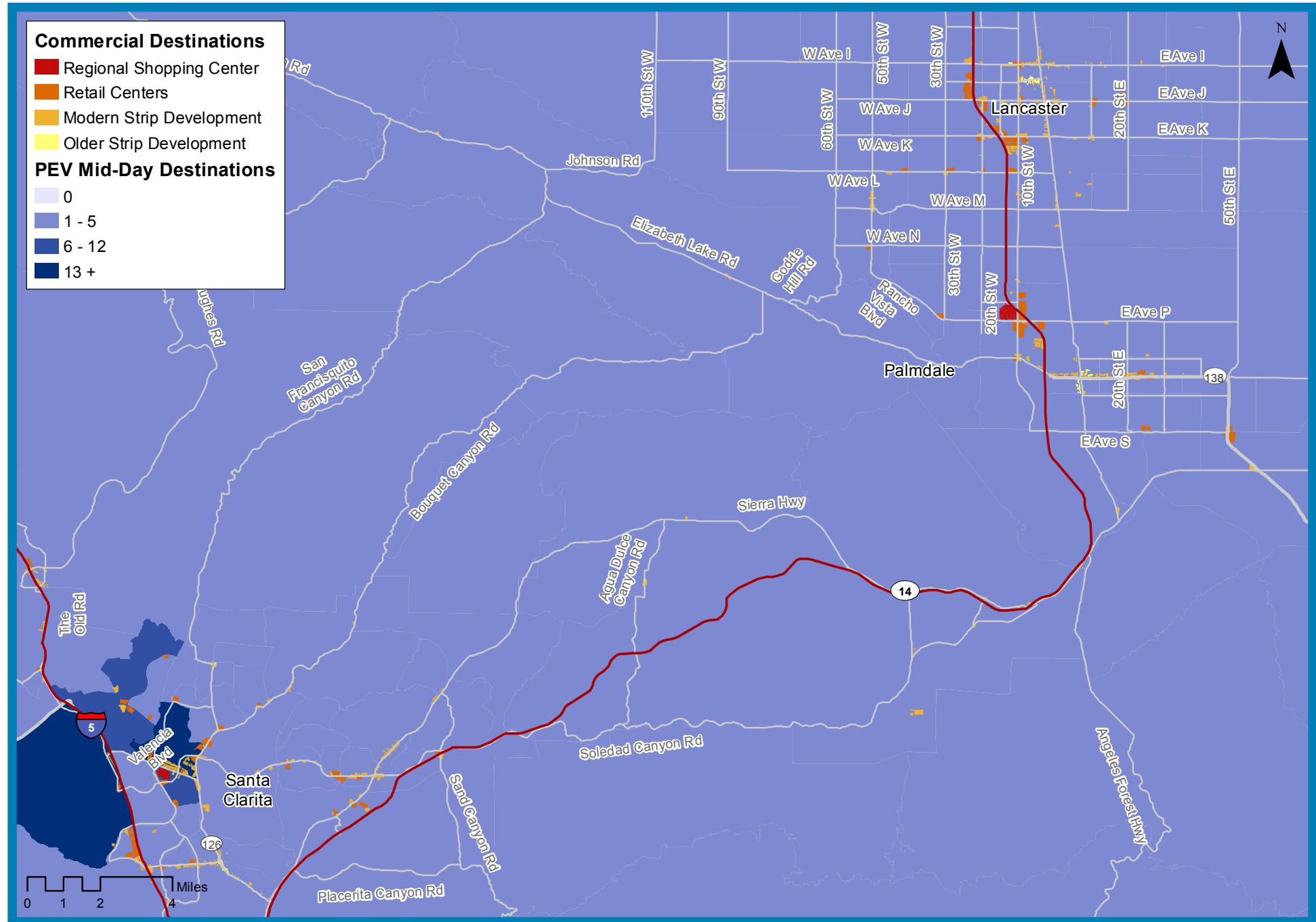
Commercial (Retail) Destinations

69

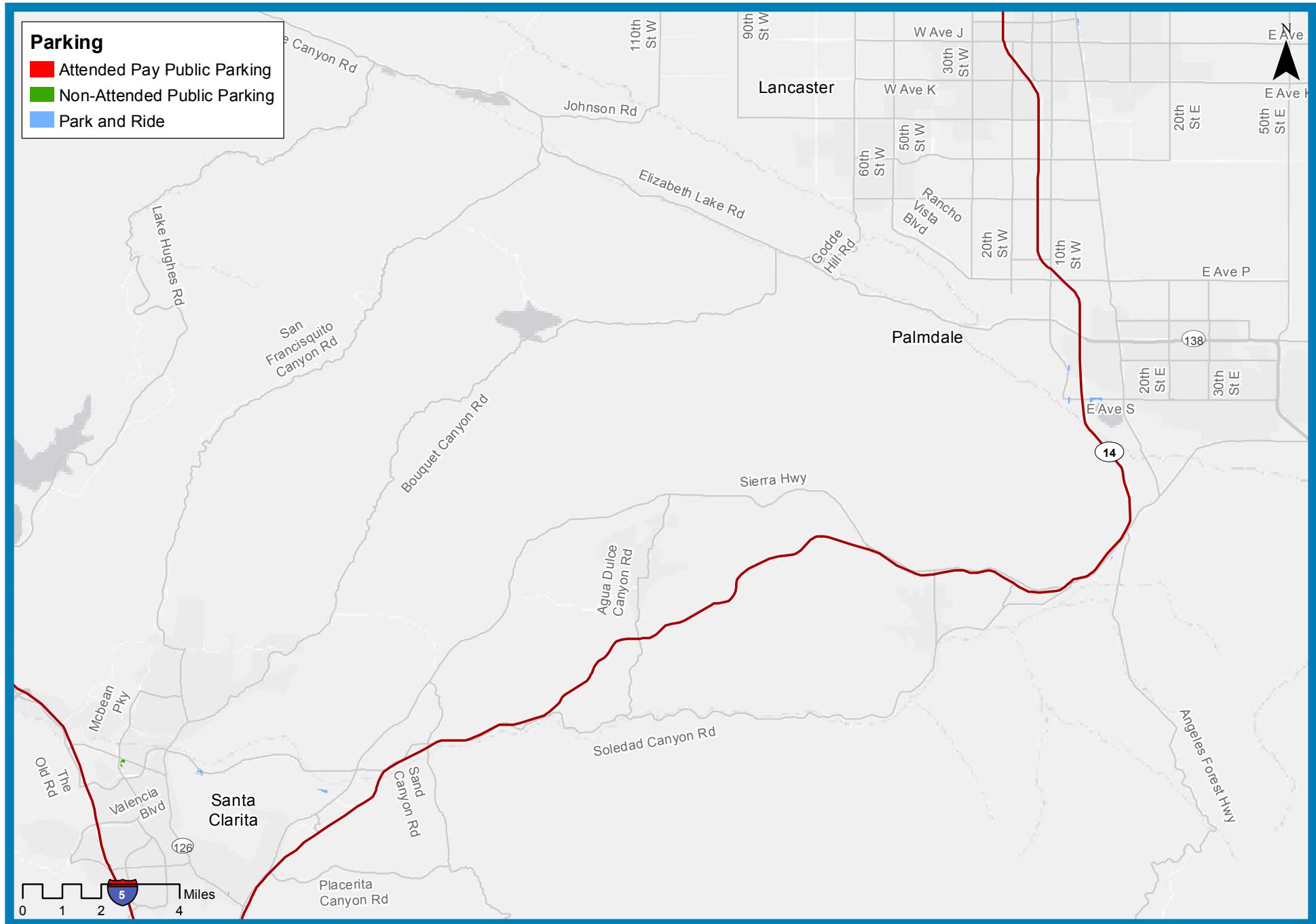
| North Los Angeles County



PEV Mid-Day Destinations and Commercial (Retail) Locations



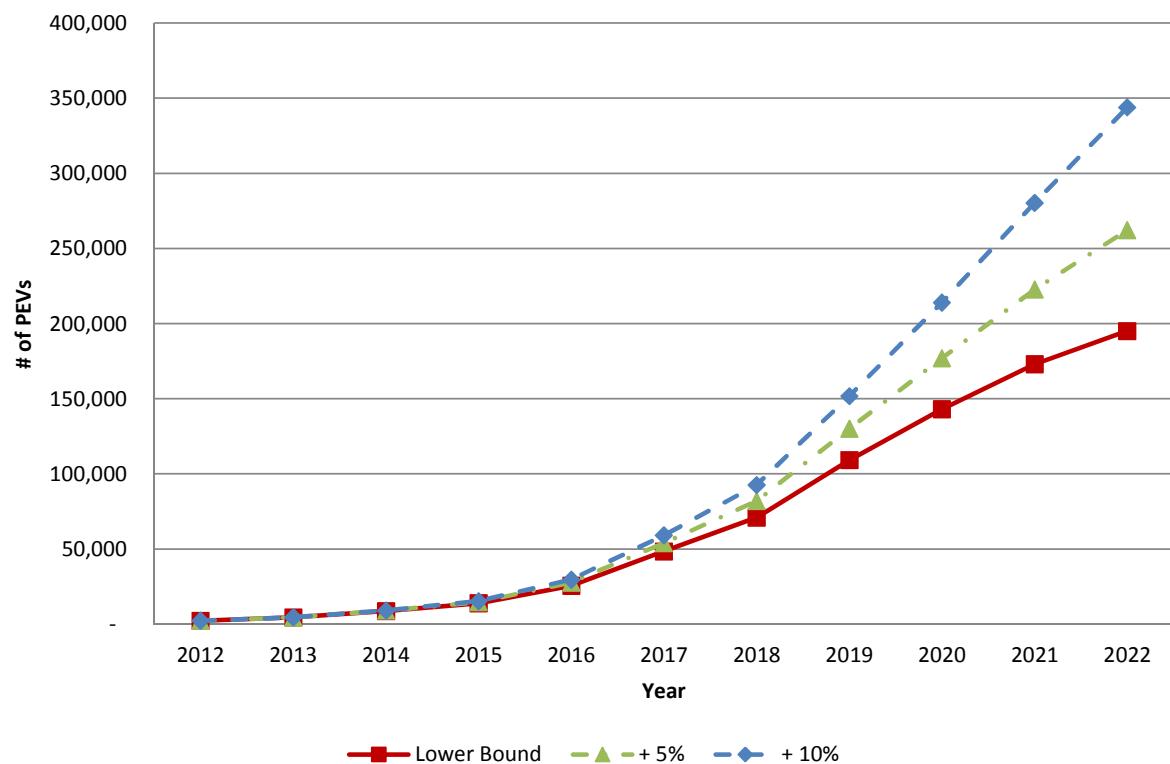
Stand-alone Parking Facilities



ORANGE COUNTY COUNCIL OF GOVERNMENTS

PEV Growth

Year	Cumulative PEV registrations*		
	Lower Bound	+ 5%	+ 10%
2012	2,263	2,263	2,263
2013	4,526	4,526	4,526
2014	8,741	8,967	9,052
2015	13,910	14,719	15,311
2016	25,516	27,735	29,616
2017	48,333	53,923	59,062
2018	70,963	81,866	92,622
2019	109,122	129,982	151,690
2020	143,026	176,866	213,988
2021	172,985	222,756	280,210
2022	194,971	262,206	343,846

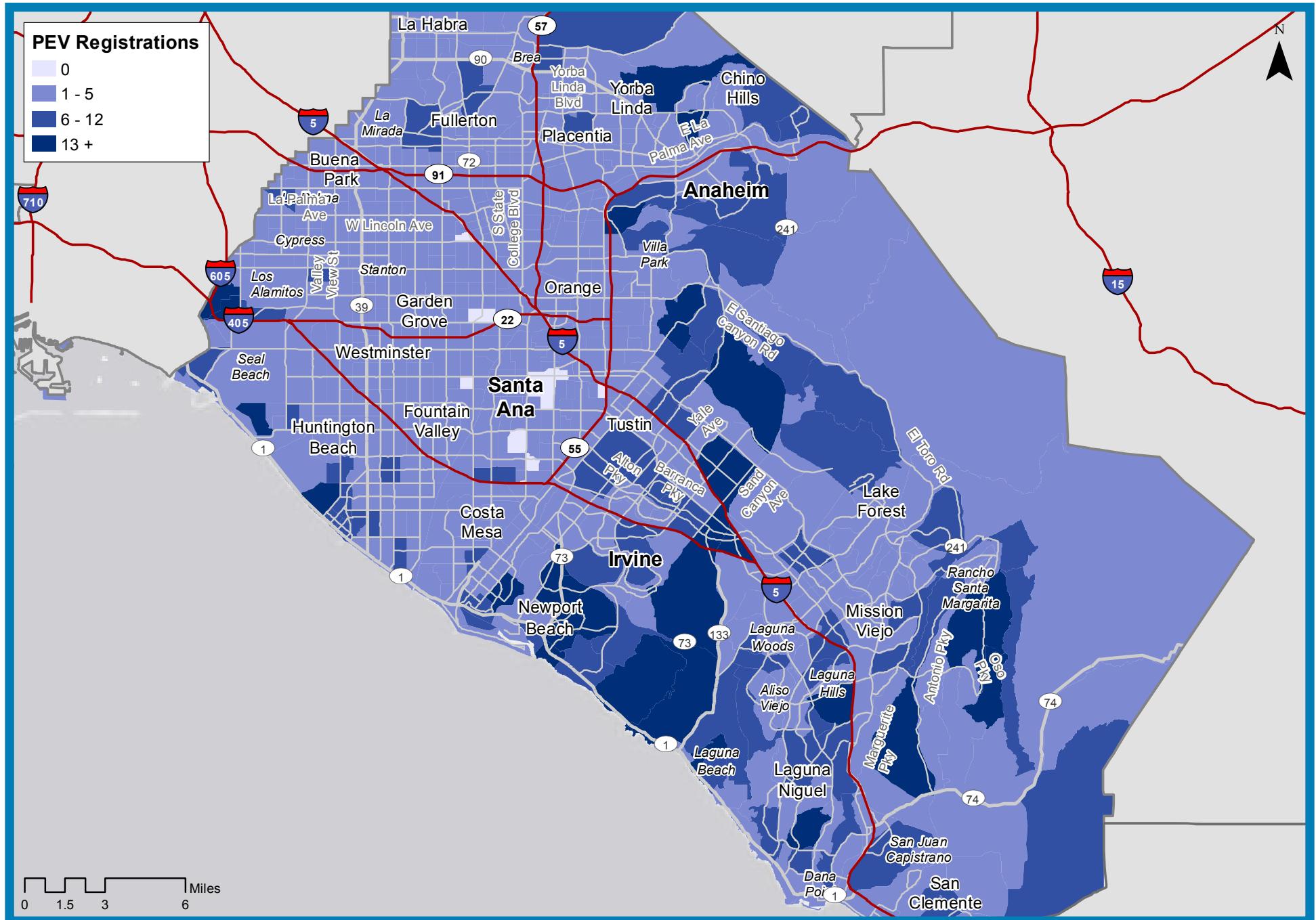


* The +5% and +10% projections begin in 2014, when uncertainty becomes greater.

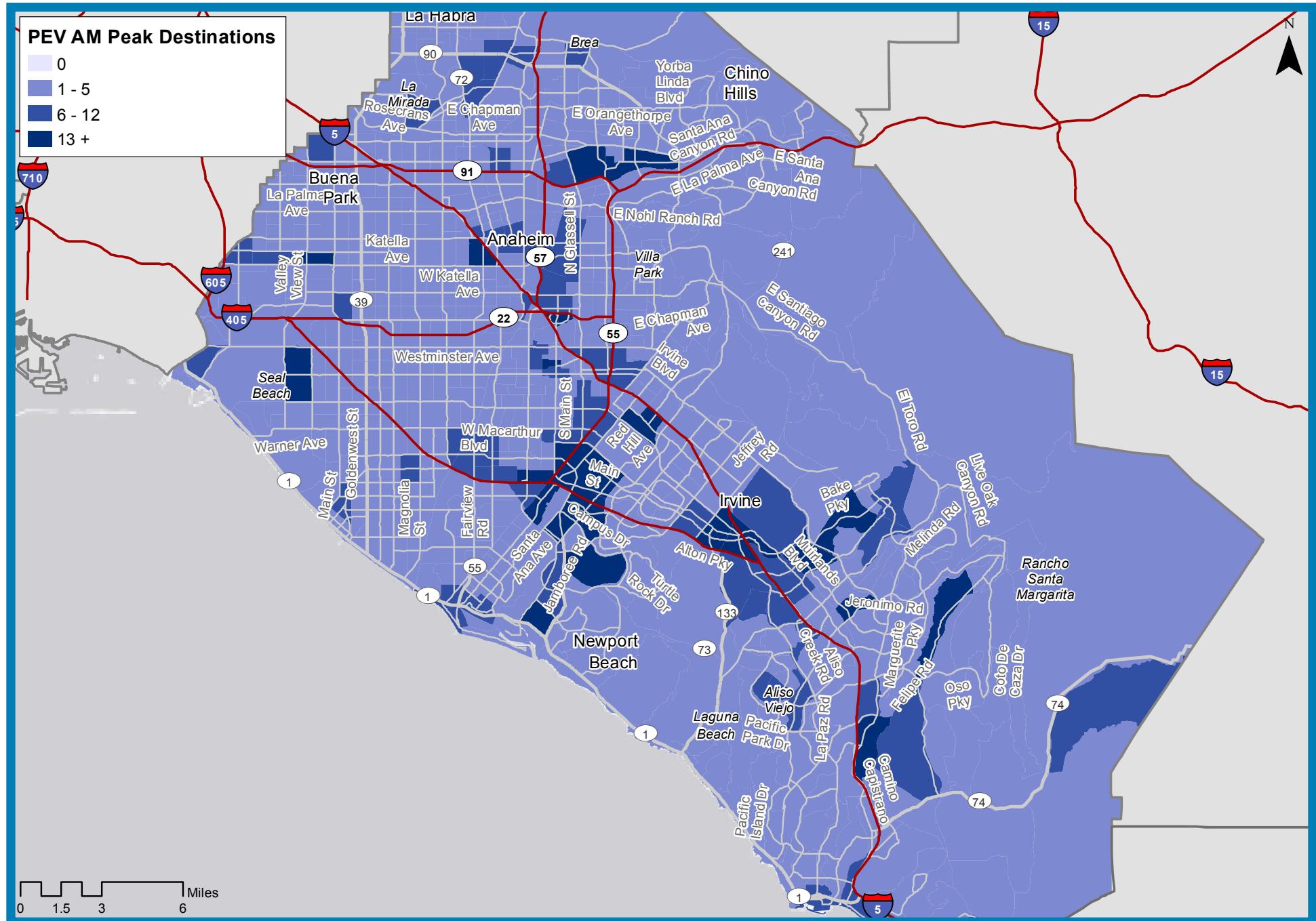
Plug-in Electric Vehicle Registrations

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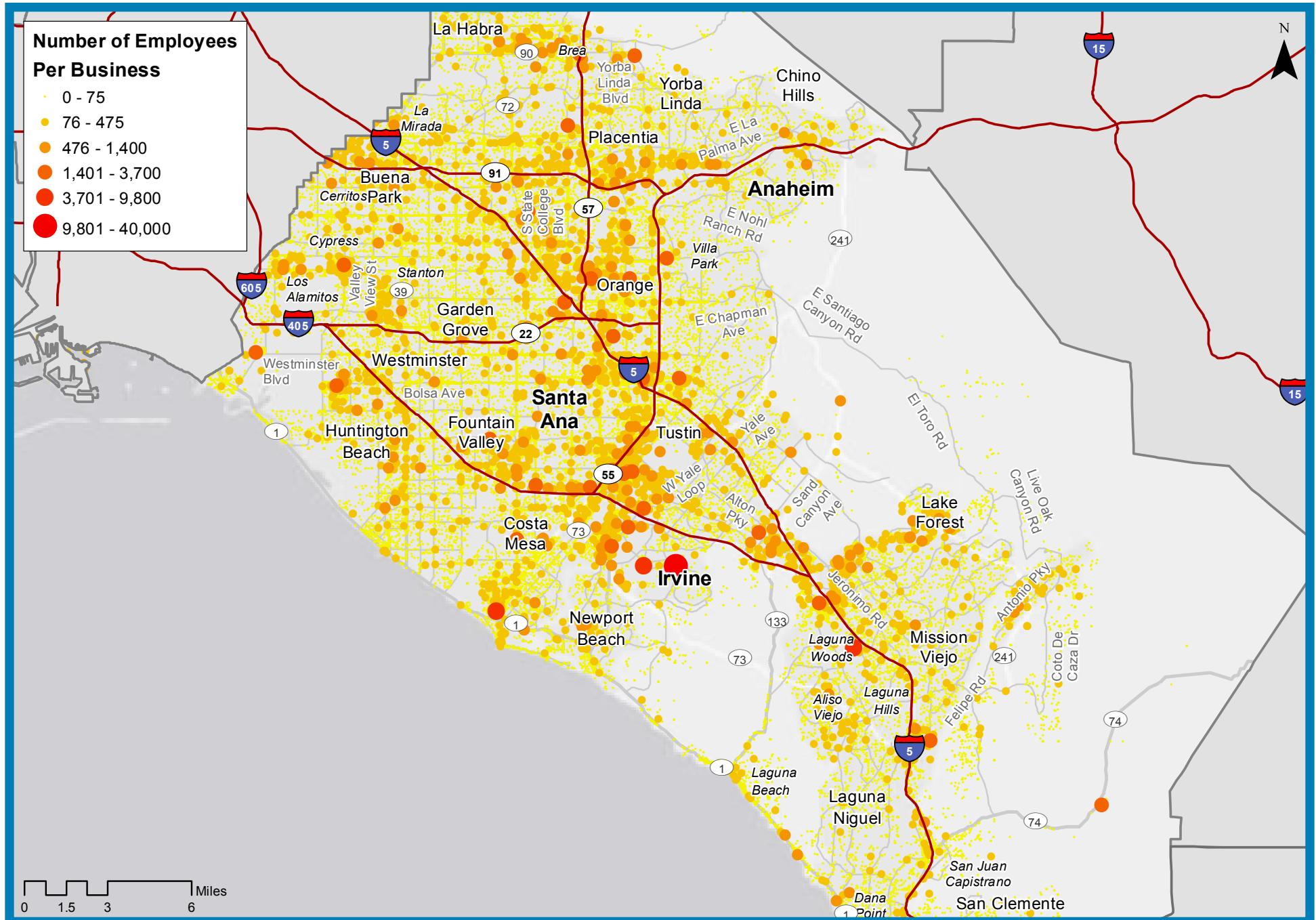
| Orange County Council of Governments



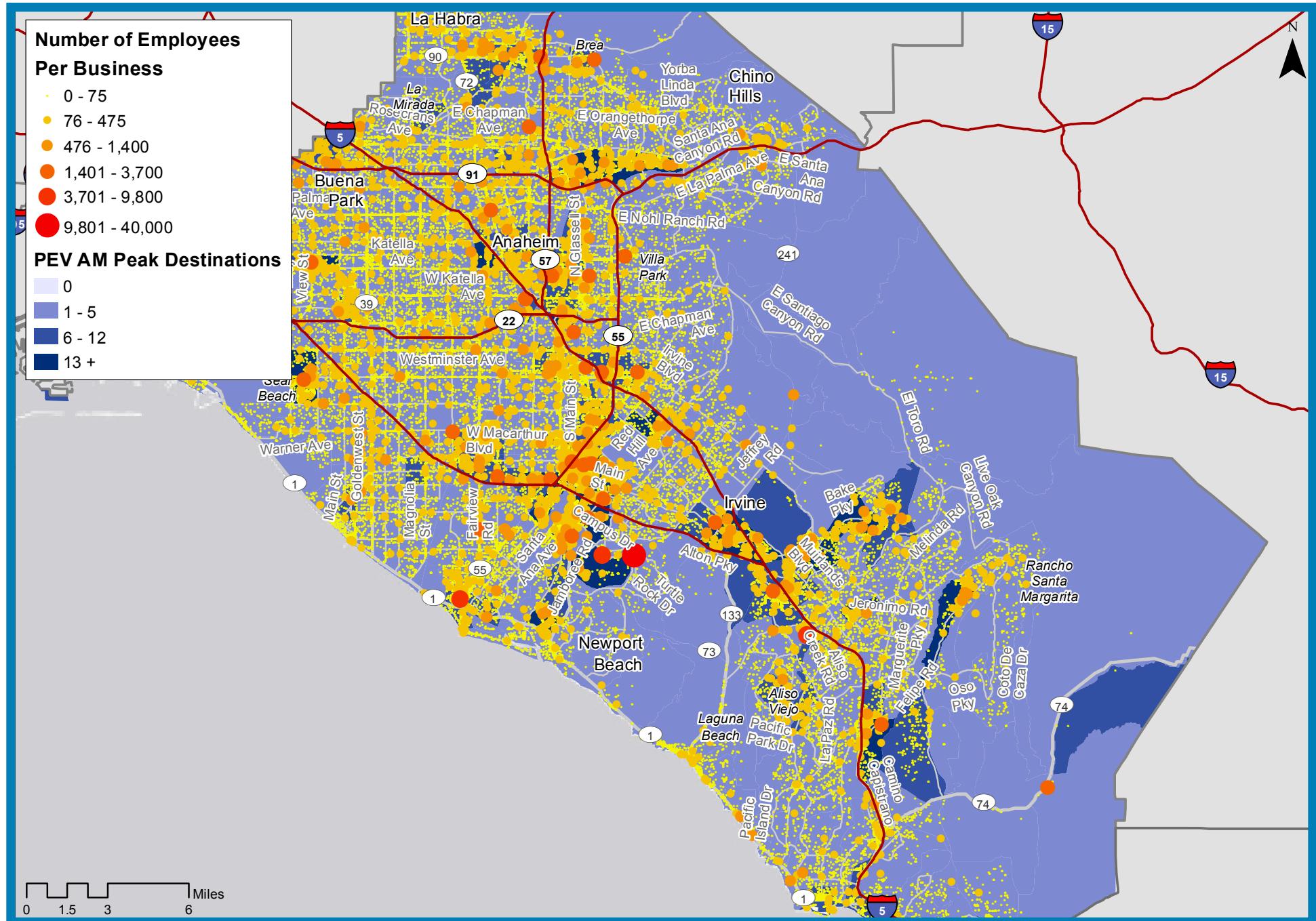
Plug-in Electric Vehicle Morning Peak Destinations



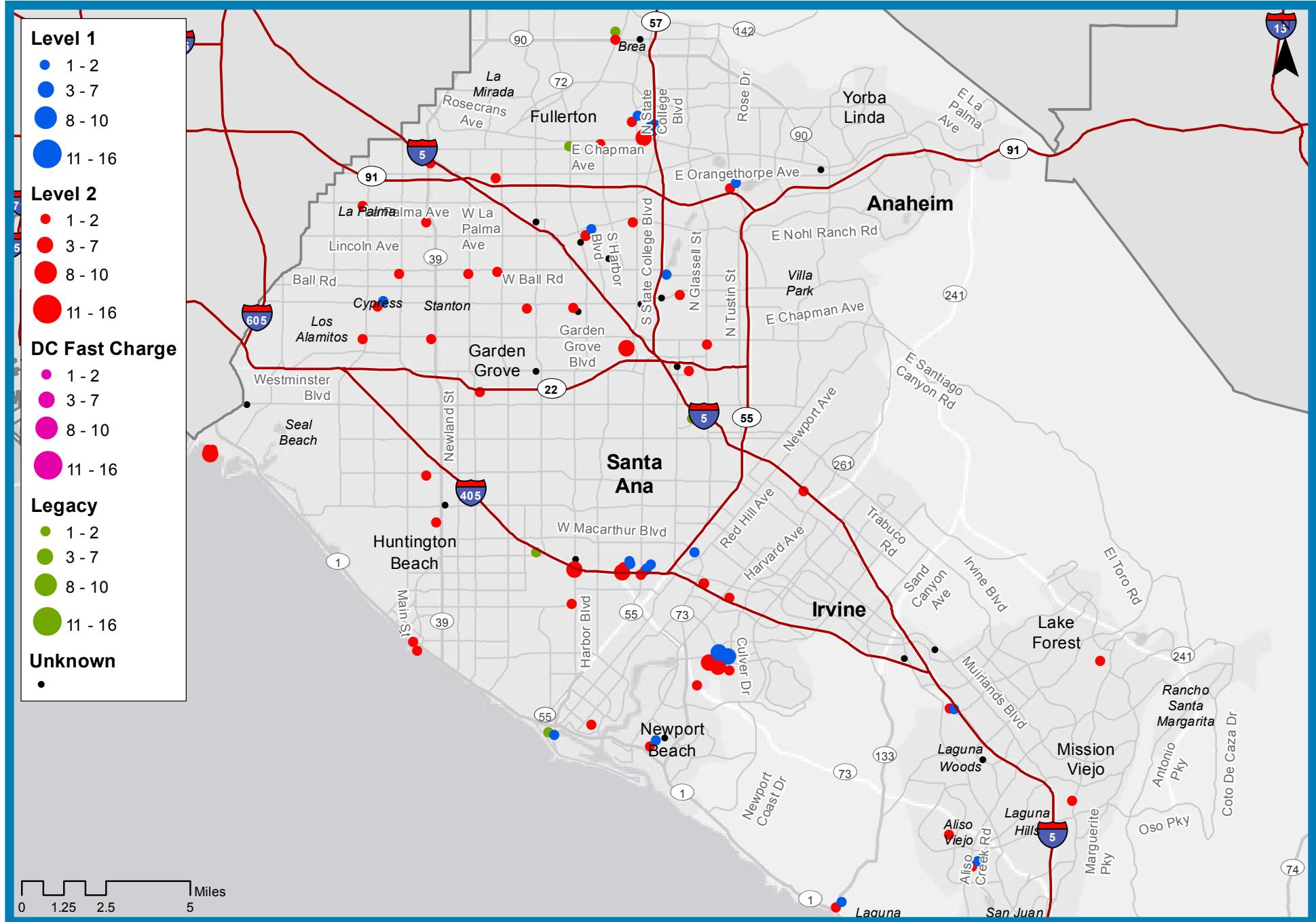
Workplaces by Number of Employees



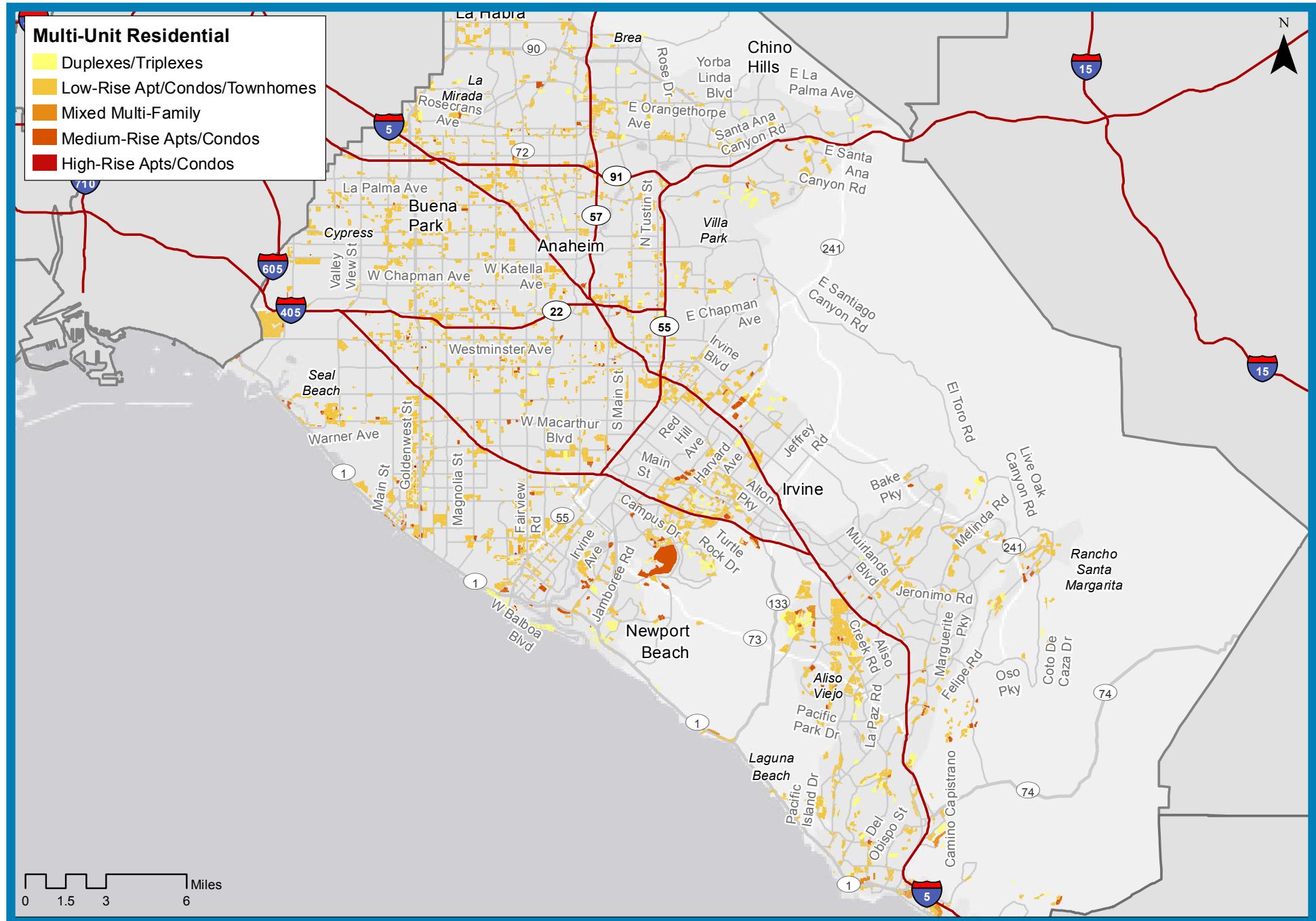
PEV Morning Peak Destinations and Workplaces



Publicly-Accessible Charging Stations (Summer/Fall 2012)



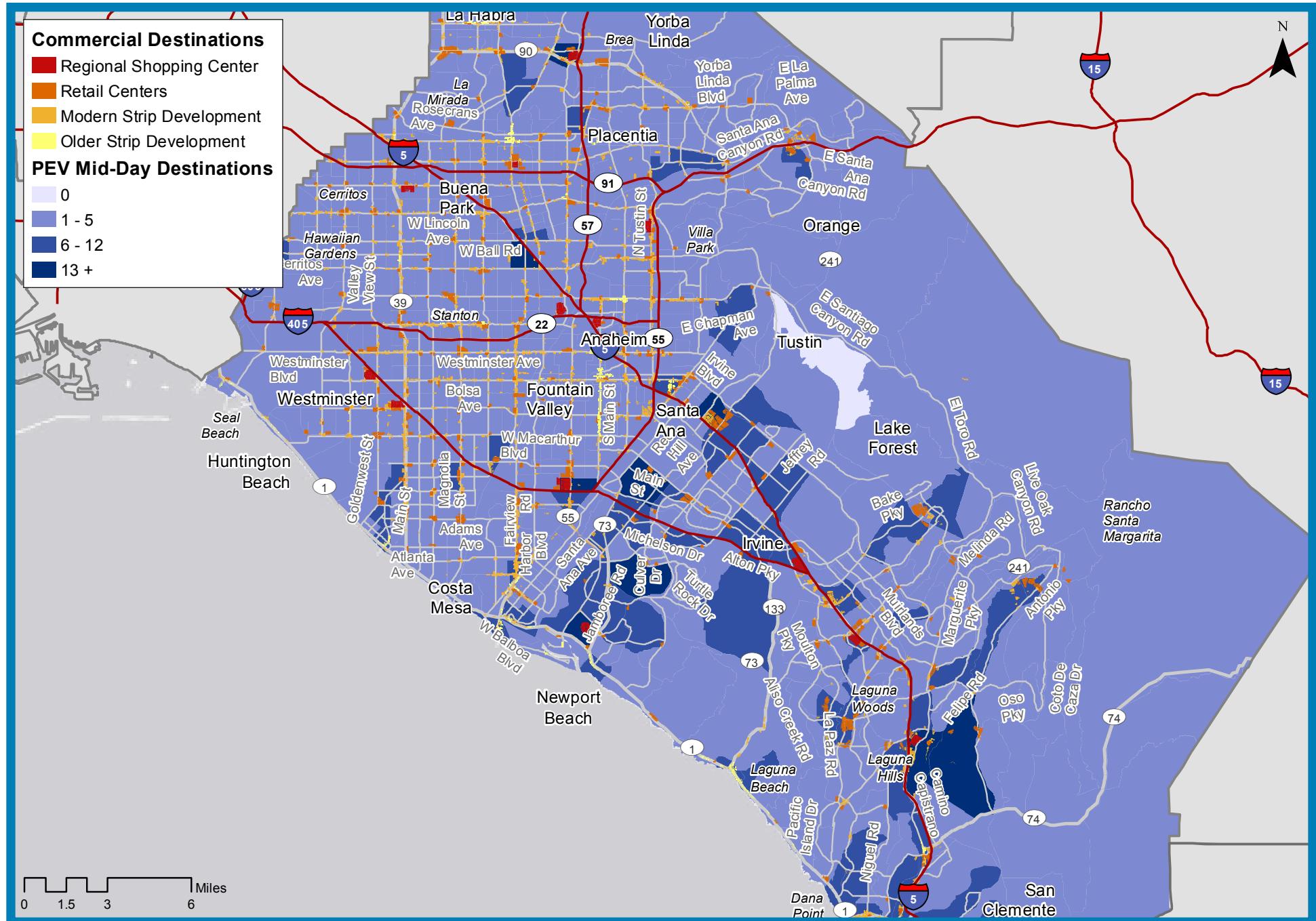
Multi-Unit Residential



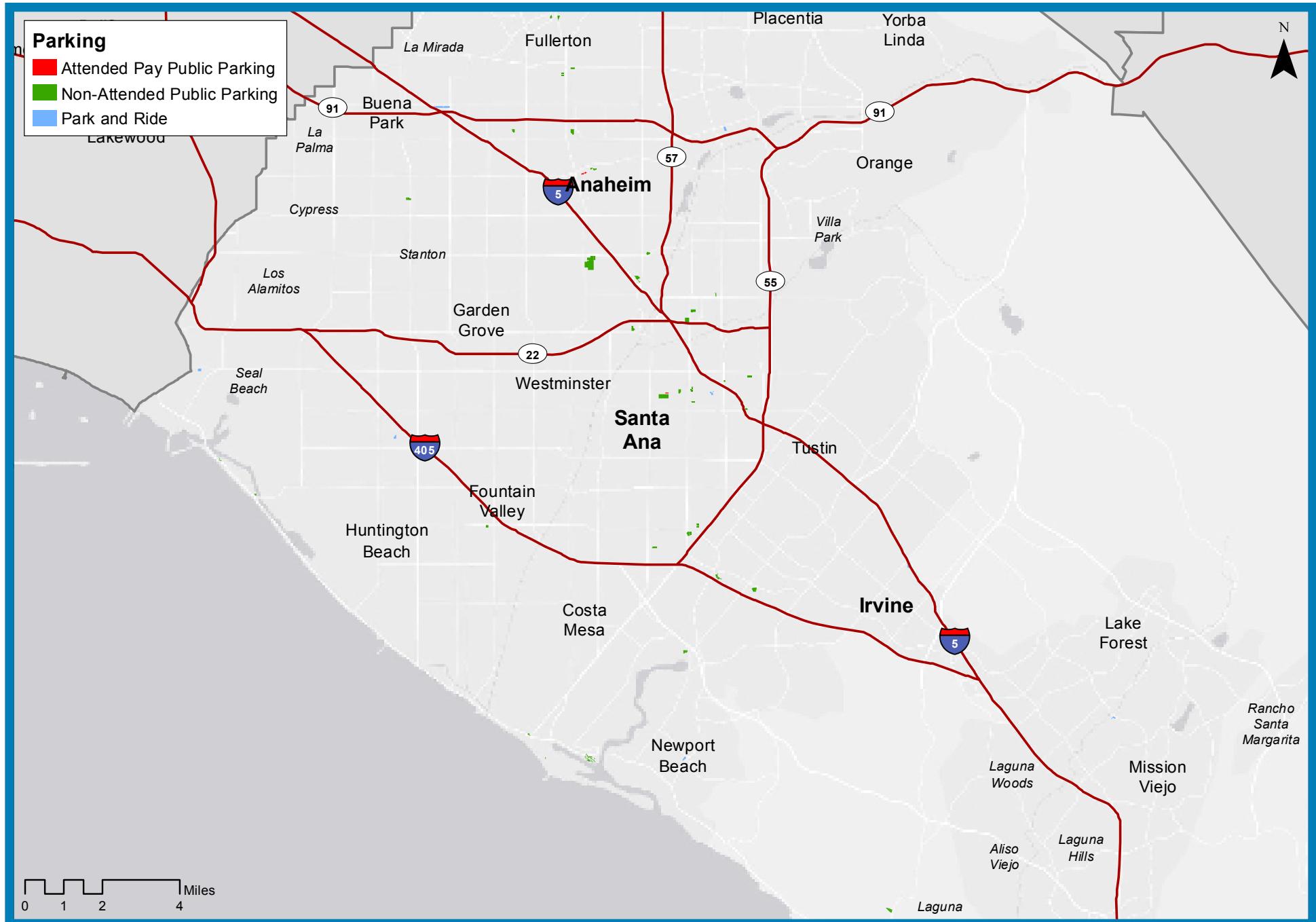
Commercial (Retail) Destinations



PEV Mid-Day Destinations and Commercial (Retail) Locations



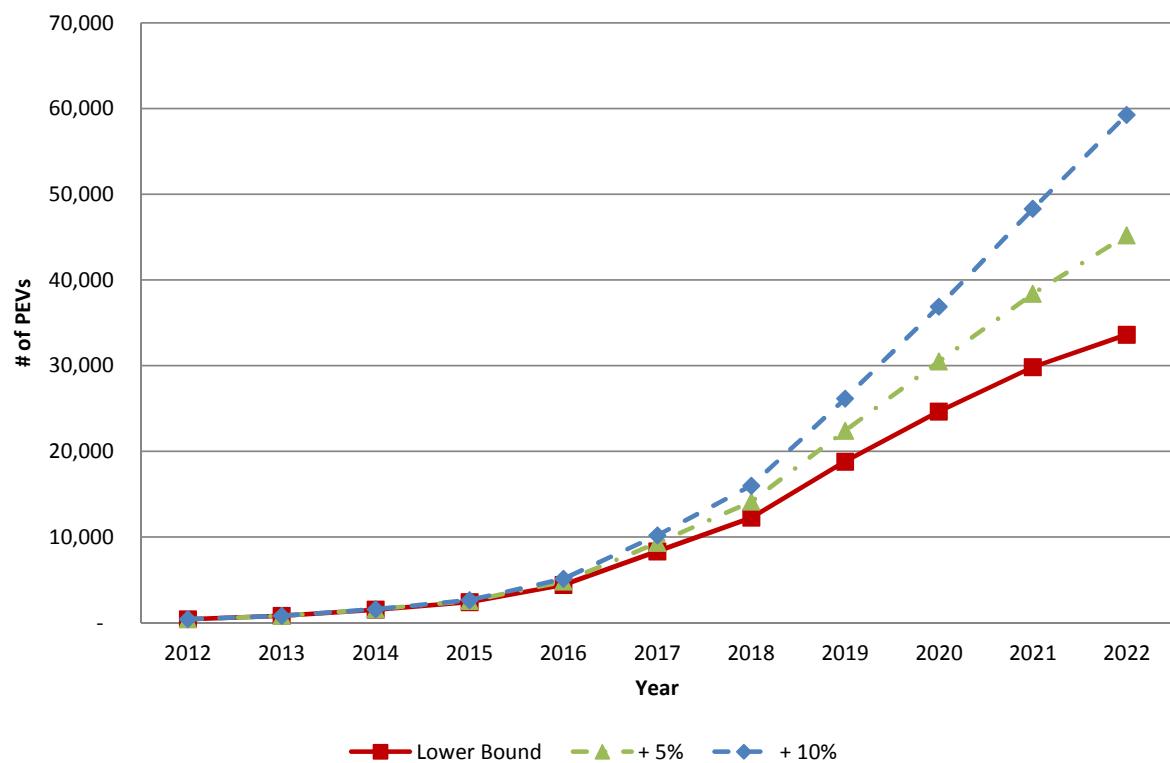
Stand-alone Parking Facilities



SAN BERNARDINO ASSOCIATED GOVERNMENTS

PEV Growth

Year	Cumulative PEV registrations*		
	Lower Bound	+ 5%	+ 10%
2012	390	390	390
2013	780	780	780
2014	1,506	1,545	1,560
2015	2,397	2,537	2,639
2016	4,397	4,780	5,104
2017	8,330	9,293	10,179
2018	12,230	14,109	15,962
2019	18,806	22,401	26,142
2020	24,649	30,481	36,878
2021	29,812	38,389	48,291
2022	33,601	45,188	59,258

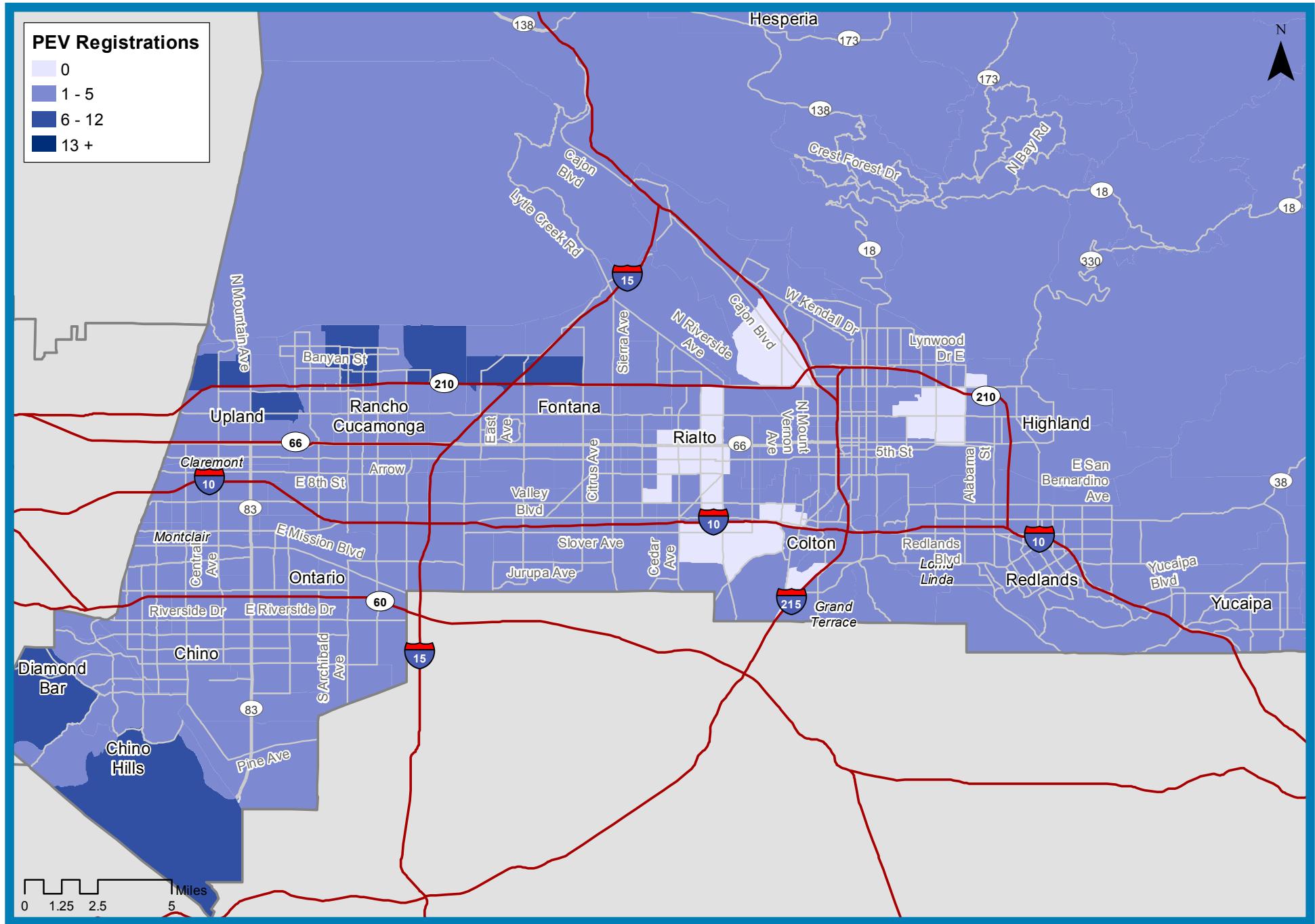


* The +5% and +10% projections begin in 2014, when uncertainty becomes greater.

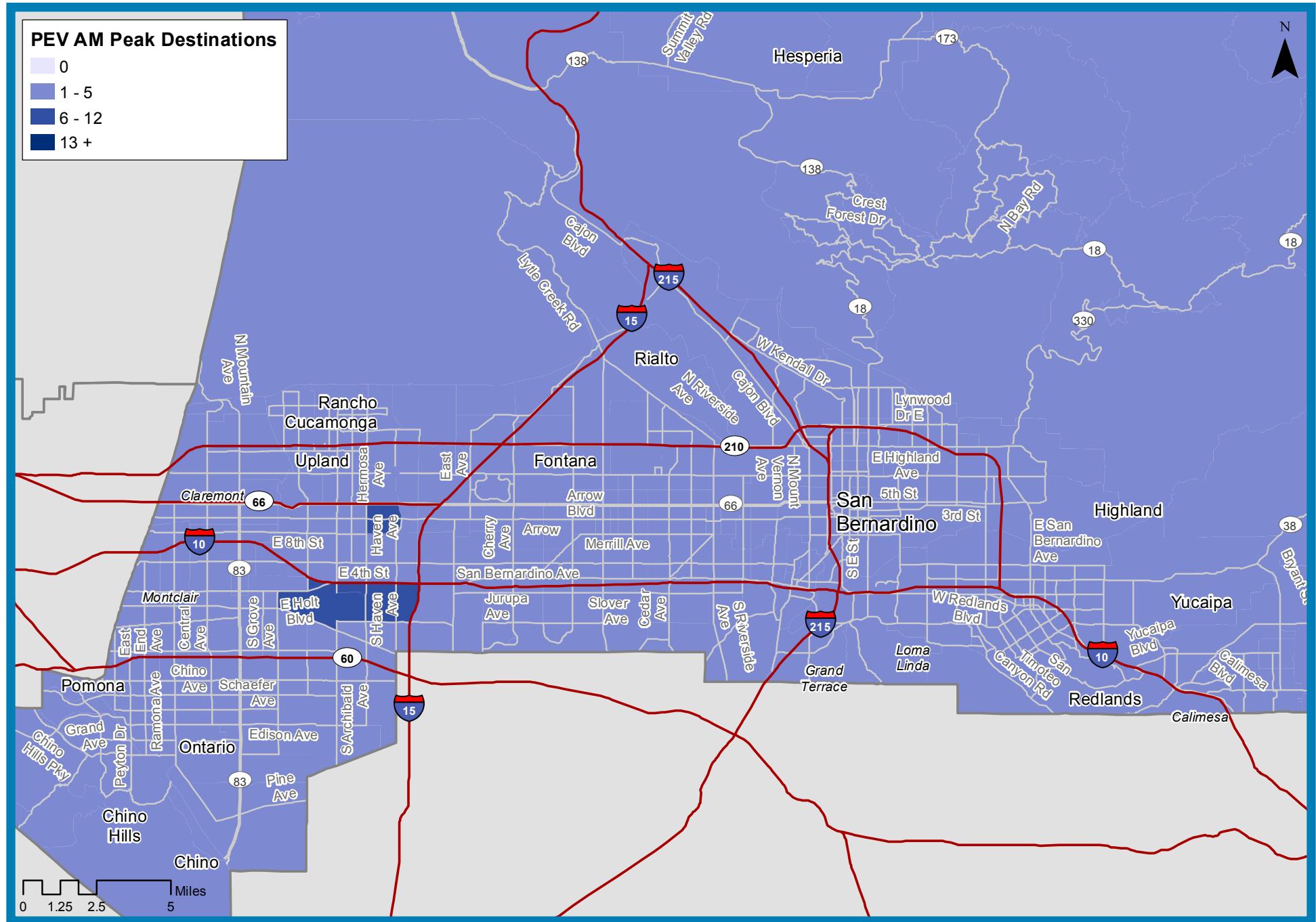
Plug-in Electric Vehicle Registrations

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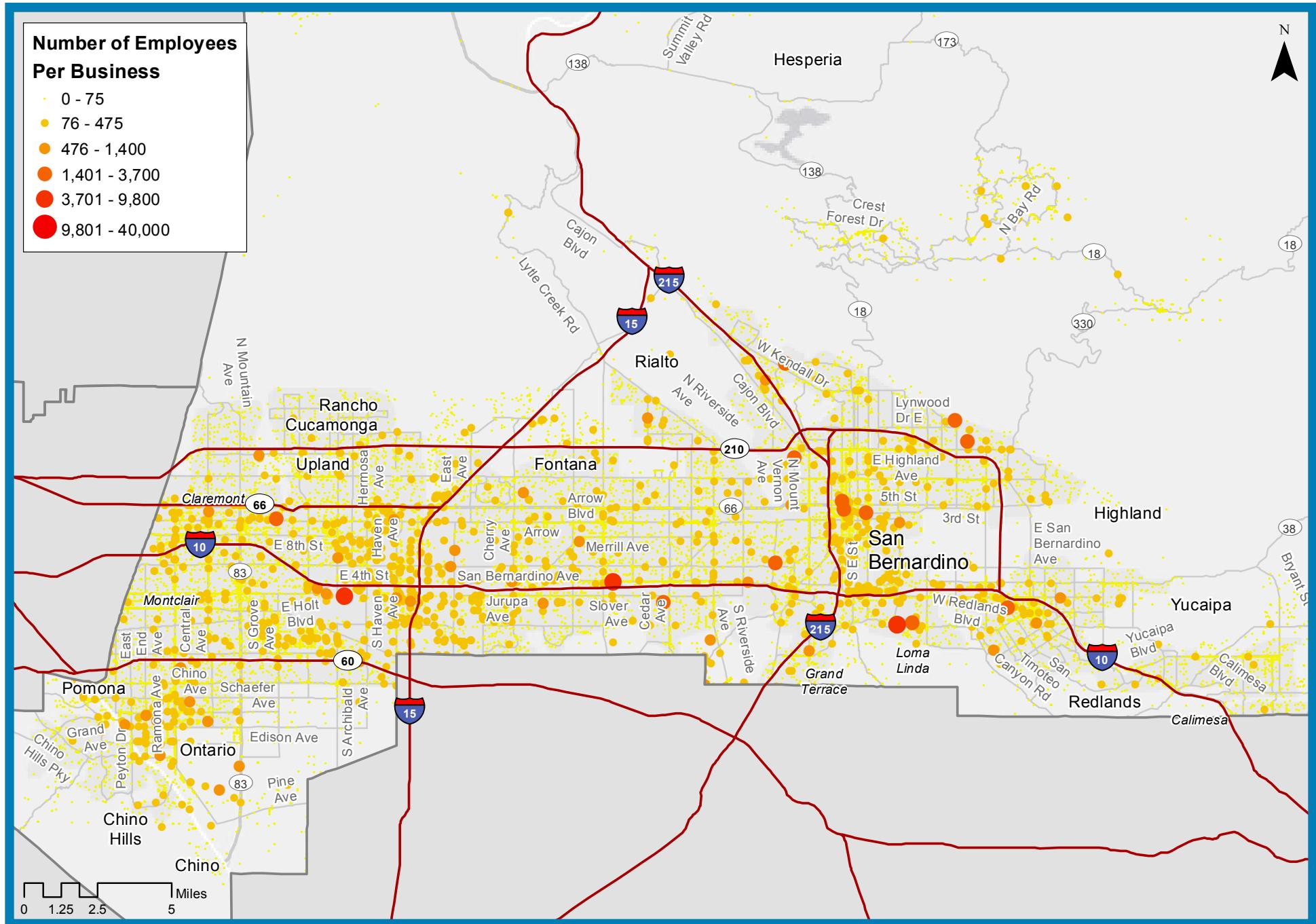
| San Bernardino Associated Governments



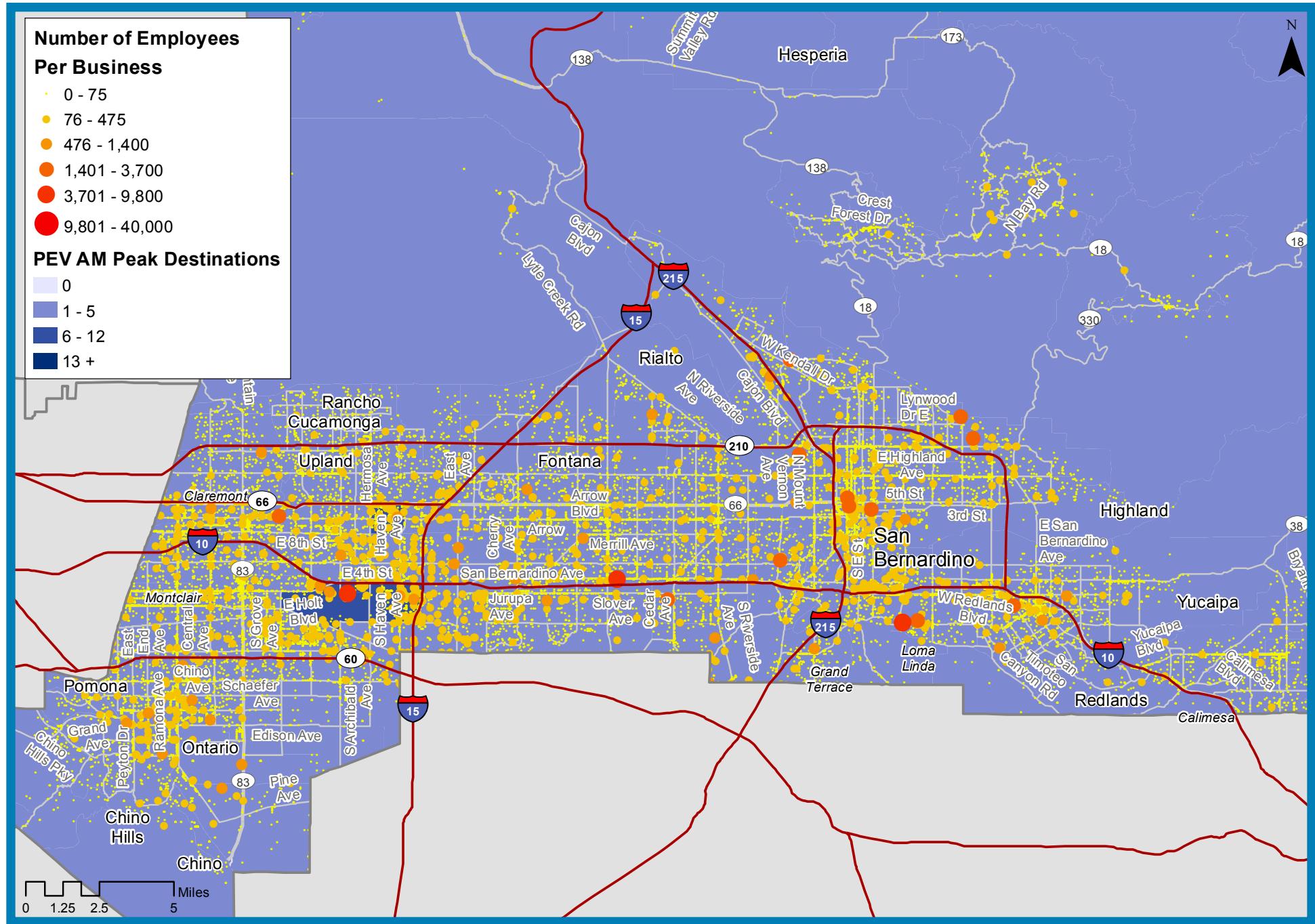
Plug-in Electric Vehicle Morning Peak Destinations



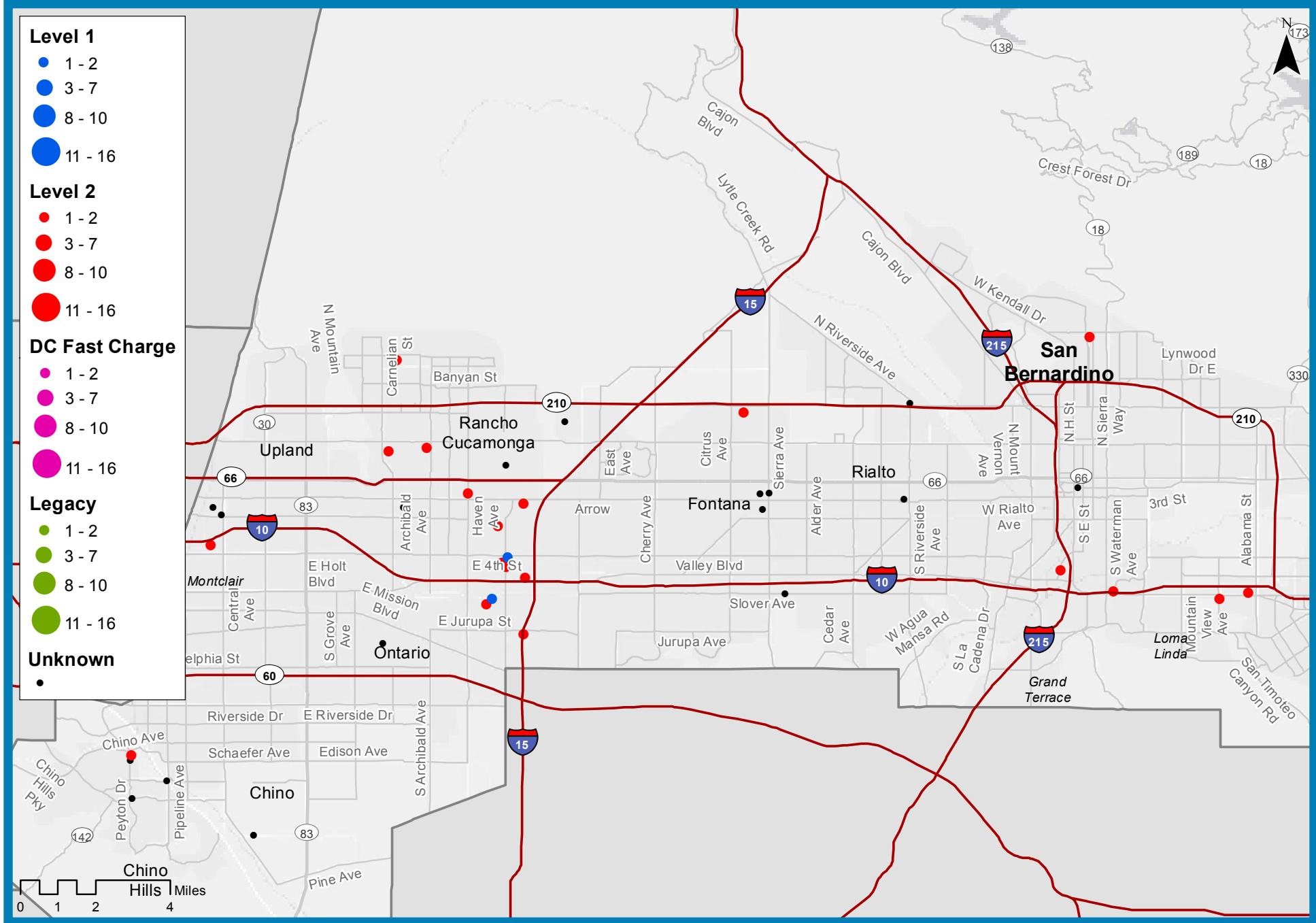
Workplaces by Number of Employees



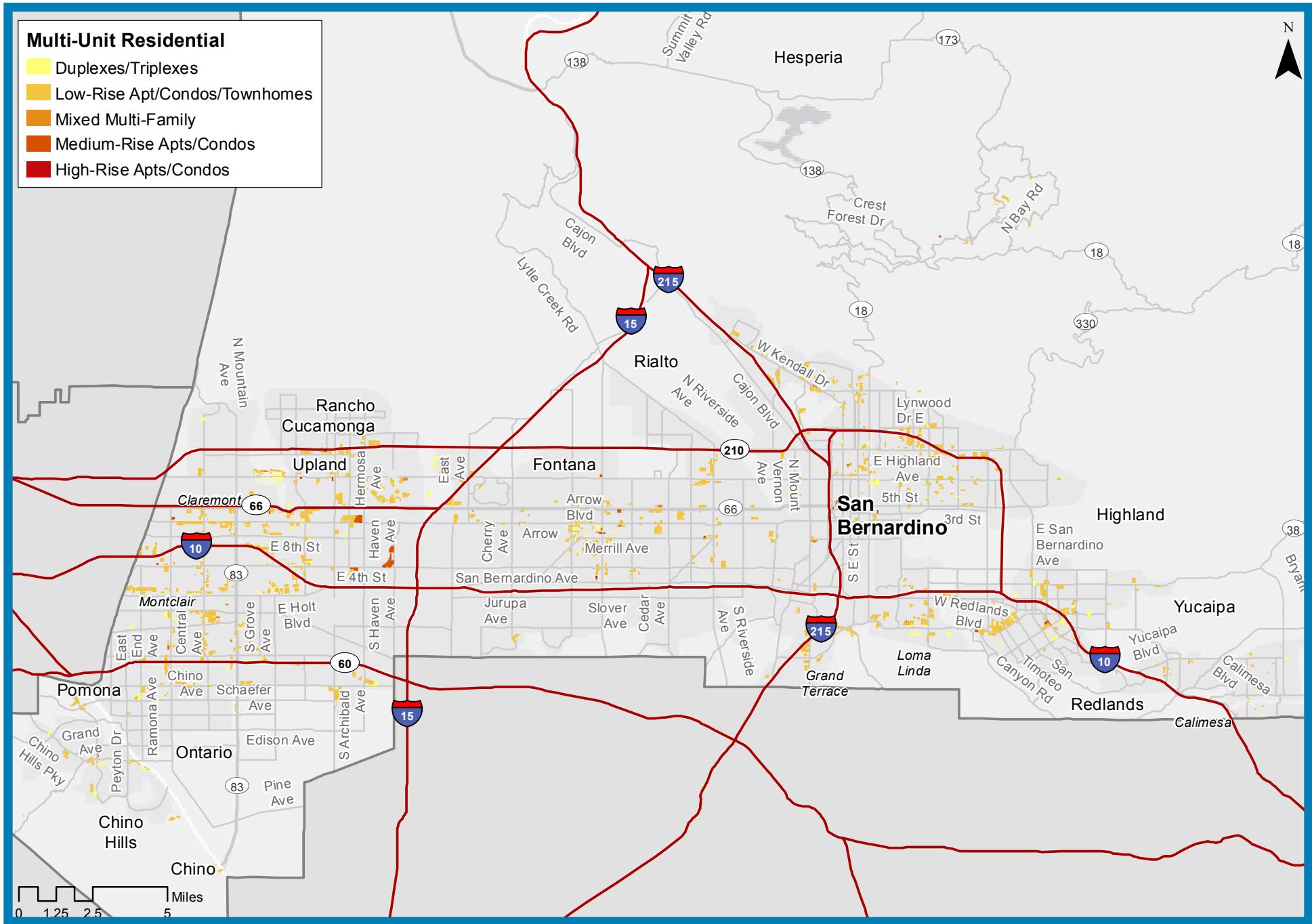
PEV Morning Peak Destinations and Workplaces



Publicly-Accessible Charging Stations (Summer/Fall 2012)



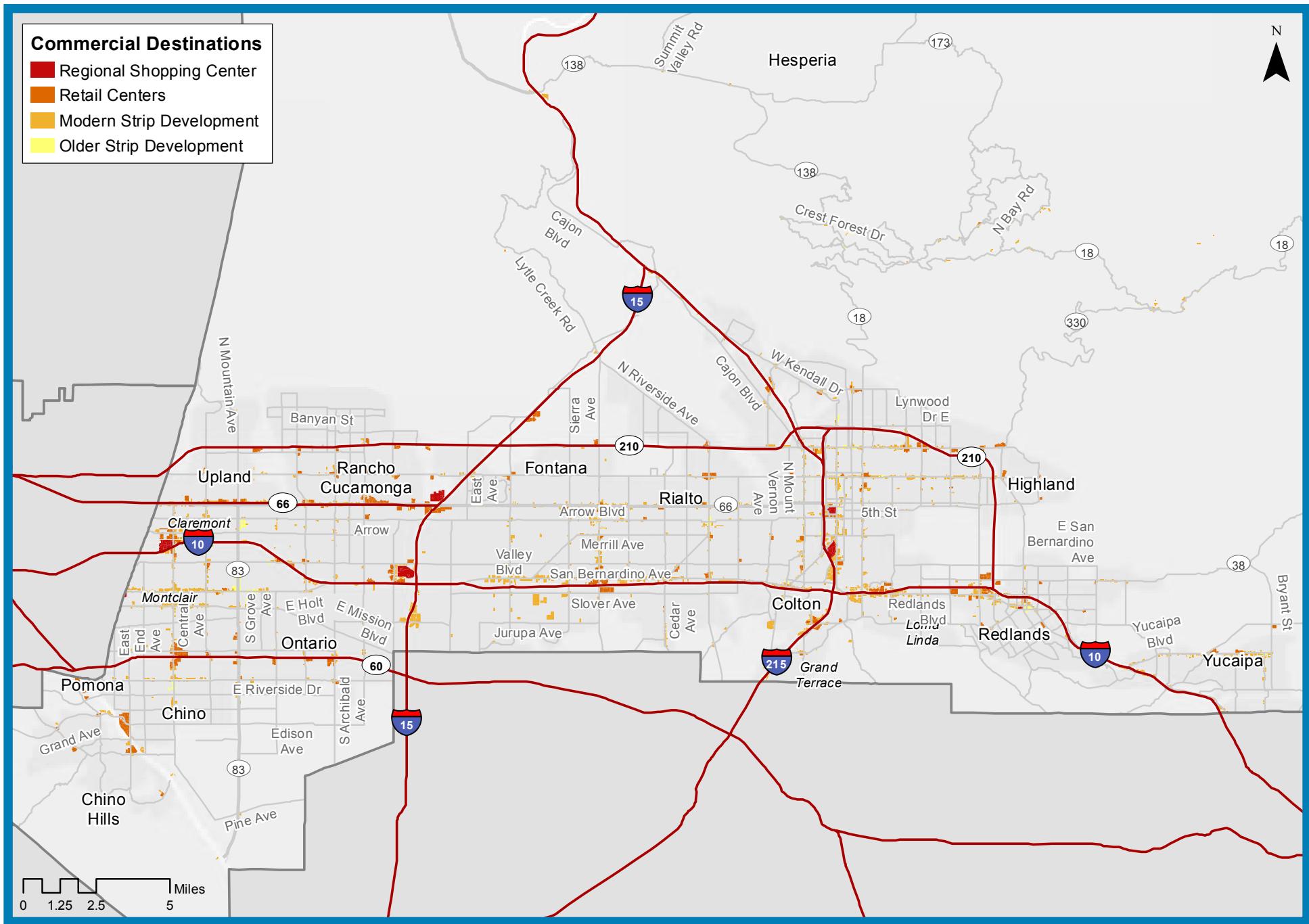
Multi-Unit Residential



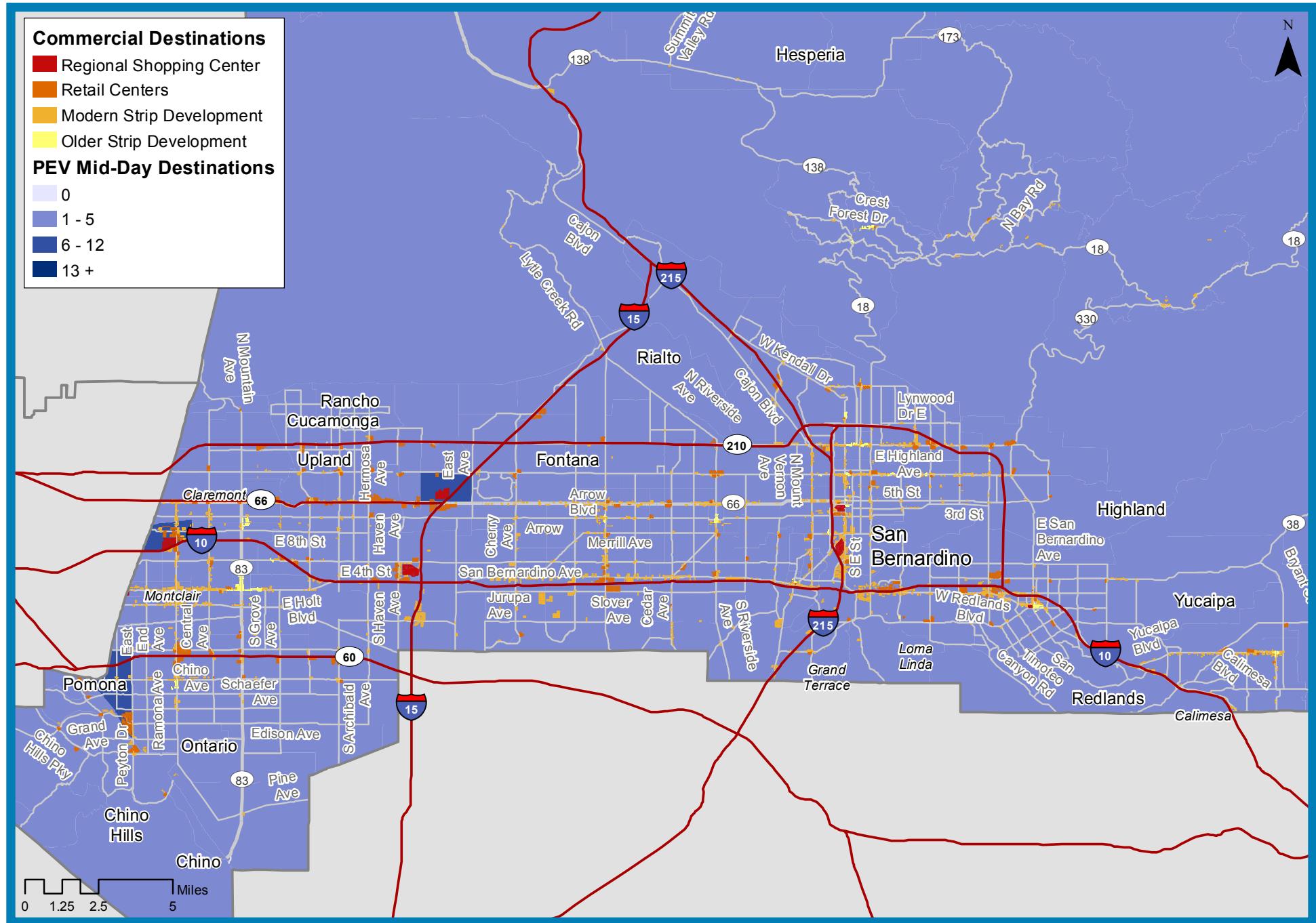
Commercial (Retail) Destinations

89

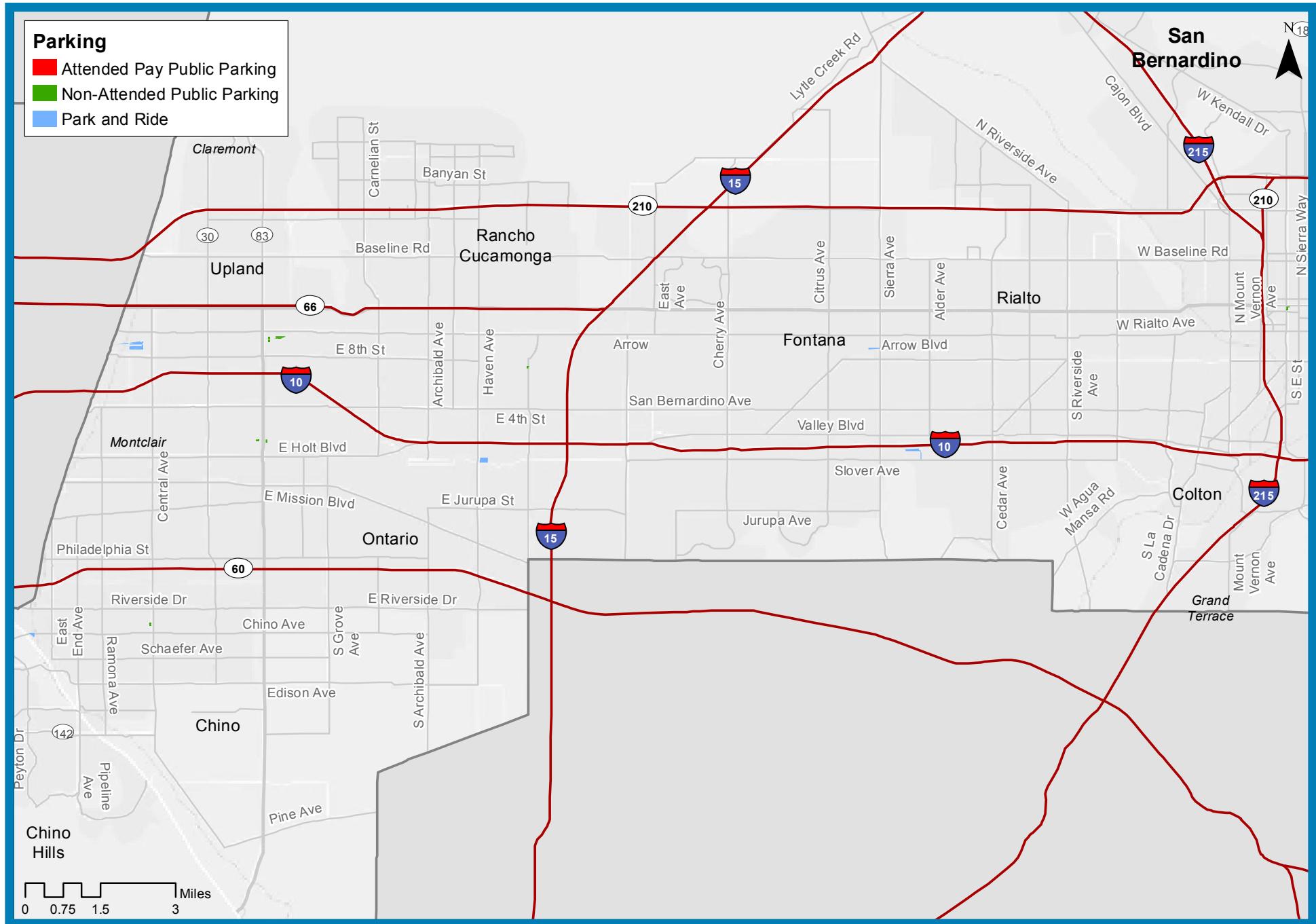
| San Bernardino Associated Governments



PEV Mid-Day Destinations and Commercial (Retail) Locations



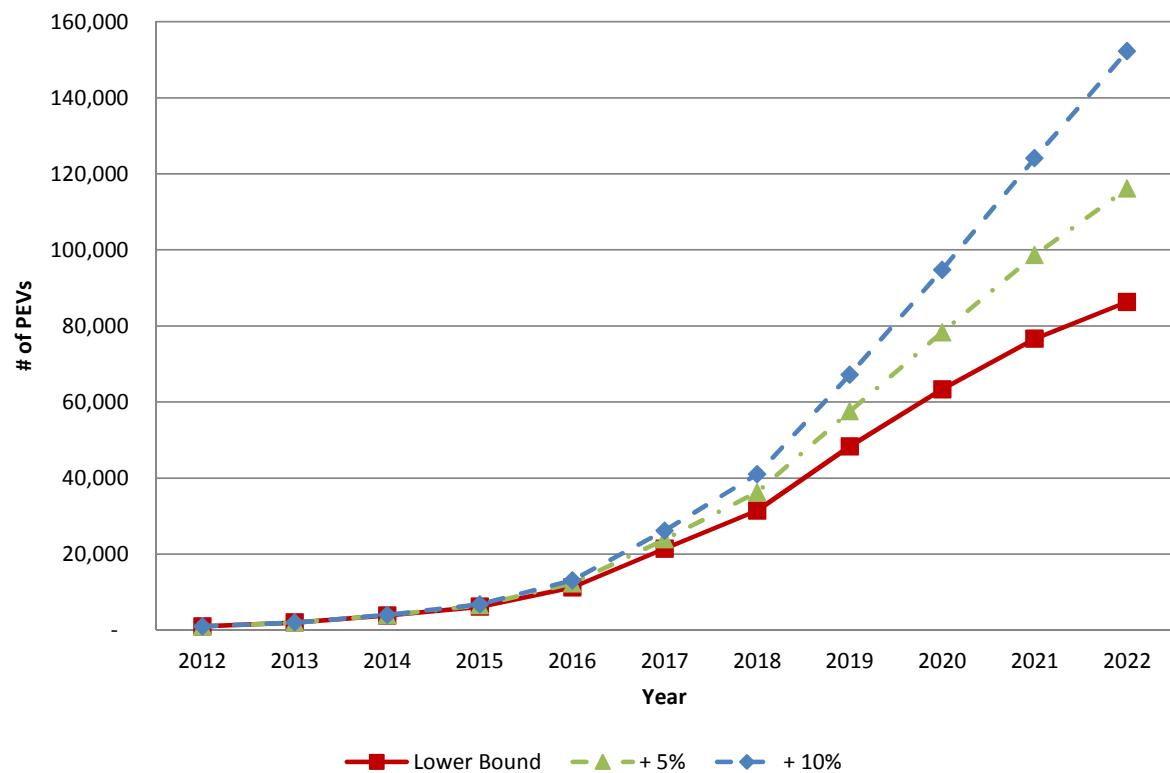
Stand-Alone Parking Facilities



SAN FERNANDO VALLEY COUNCIL OF GOVERNMENTS

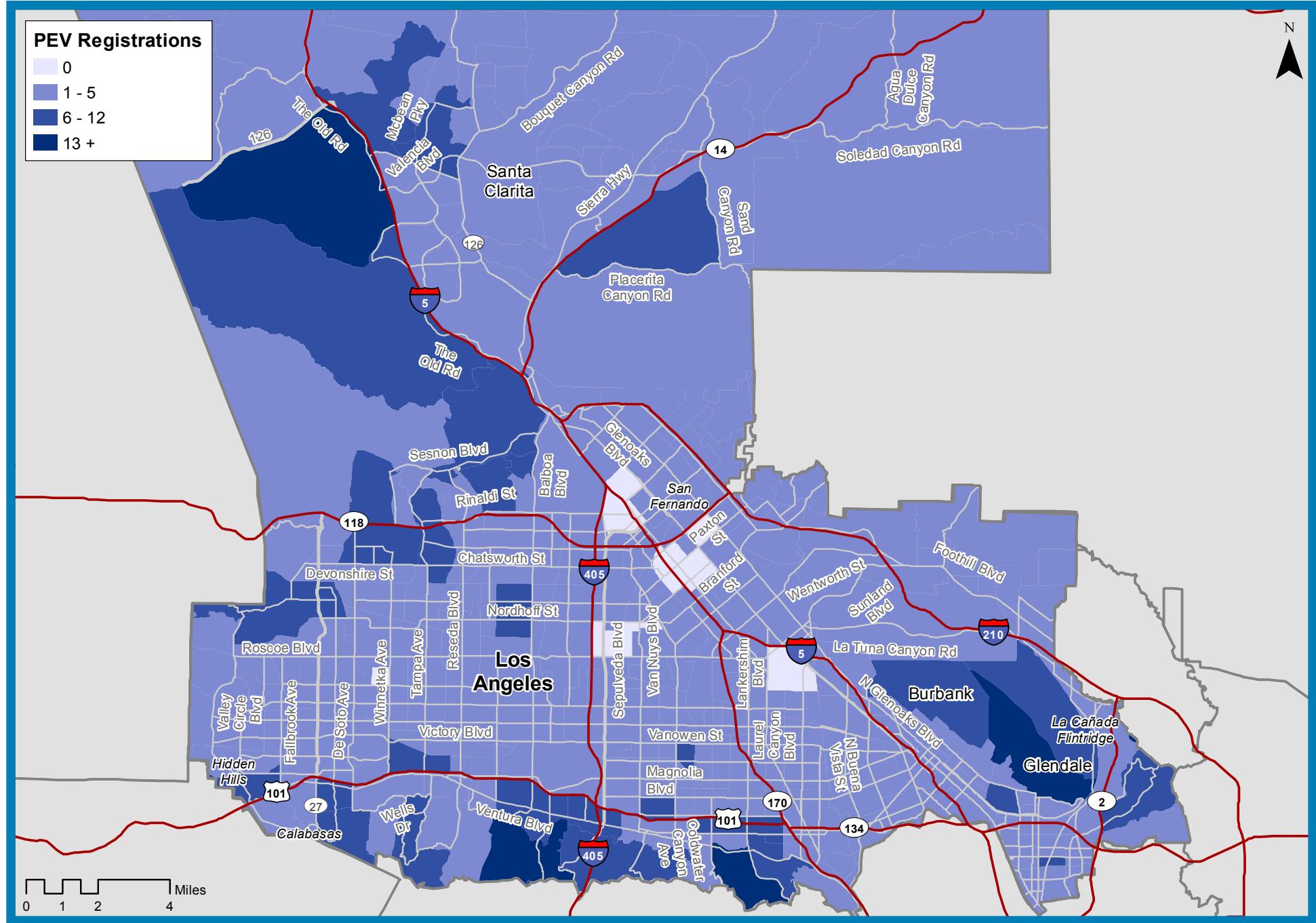
PEV Growth

Year	Cumulative PEV registrations*		
	Lower Bound	+ 5%	+ 10%
2012	1,002	1,002	1,002
2013	2,004	2,004	2,004
2014	3,870	3,970	4,008
2015	6,159	6,517	6,779
2016	11,298	12,280	13,113
2017	21,401	23,876	26,151
2018	31,421	36,248	41,011
2019	48,317	57,553	67,165
2020	63,328	78,312	94,749
2021	76,593	98,631	124,070
2022	86,328	116,098	152,246

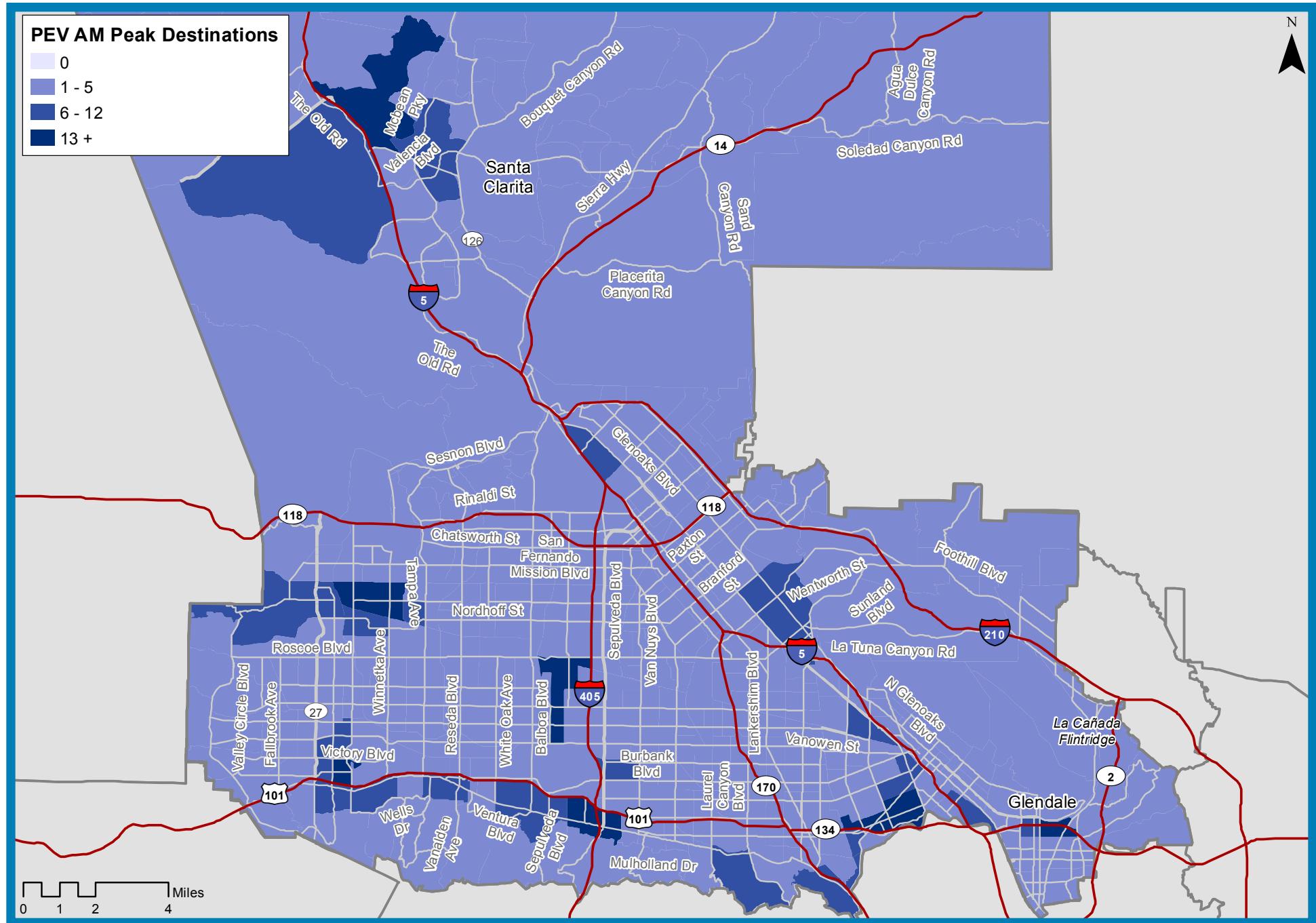


* The +5% and +10% projections begin in 2014, when uncertainty becomes greater.

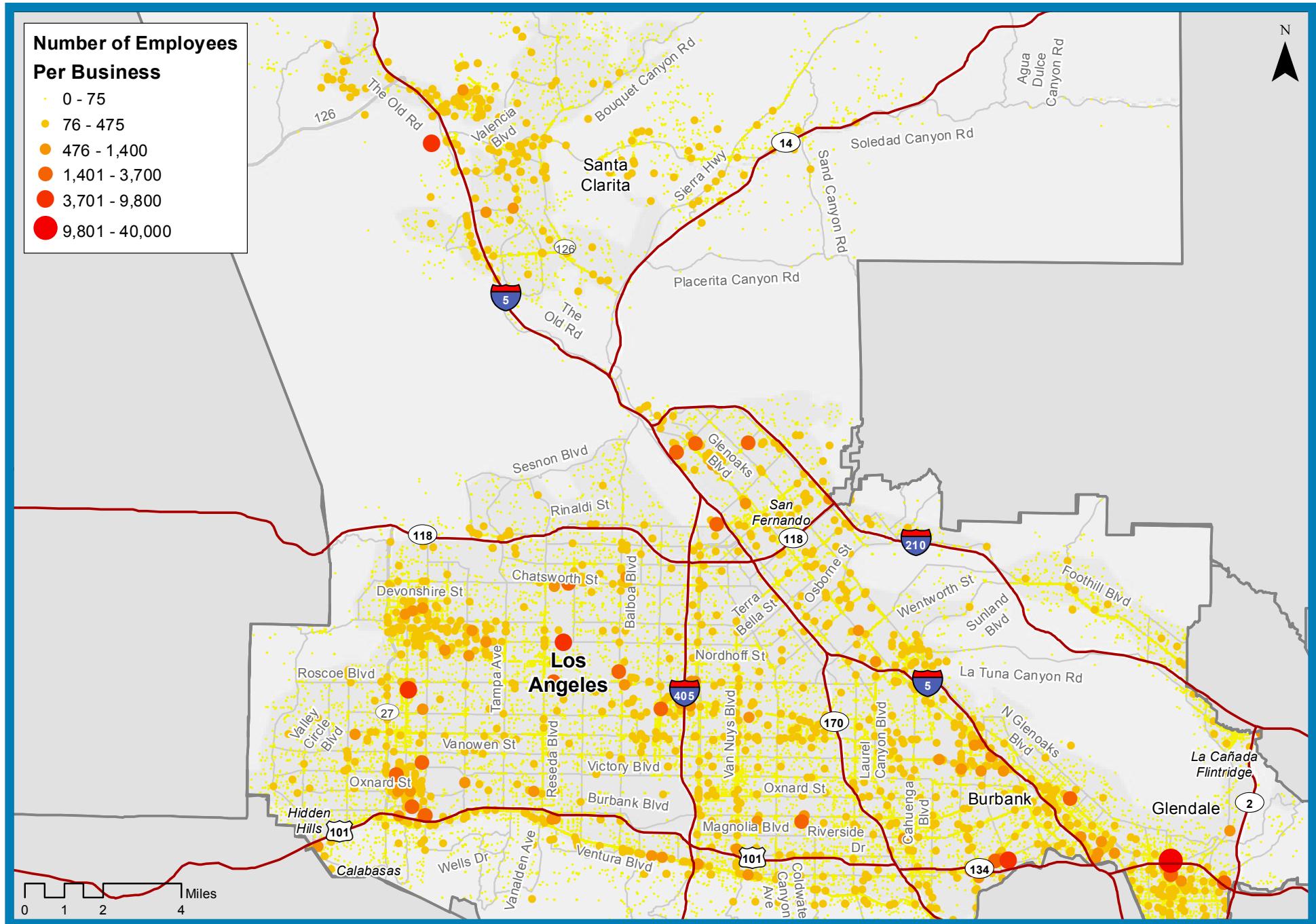
Plug-in Electric Vehicle Registrations



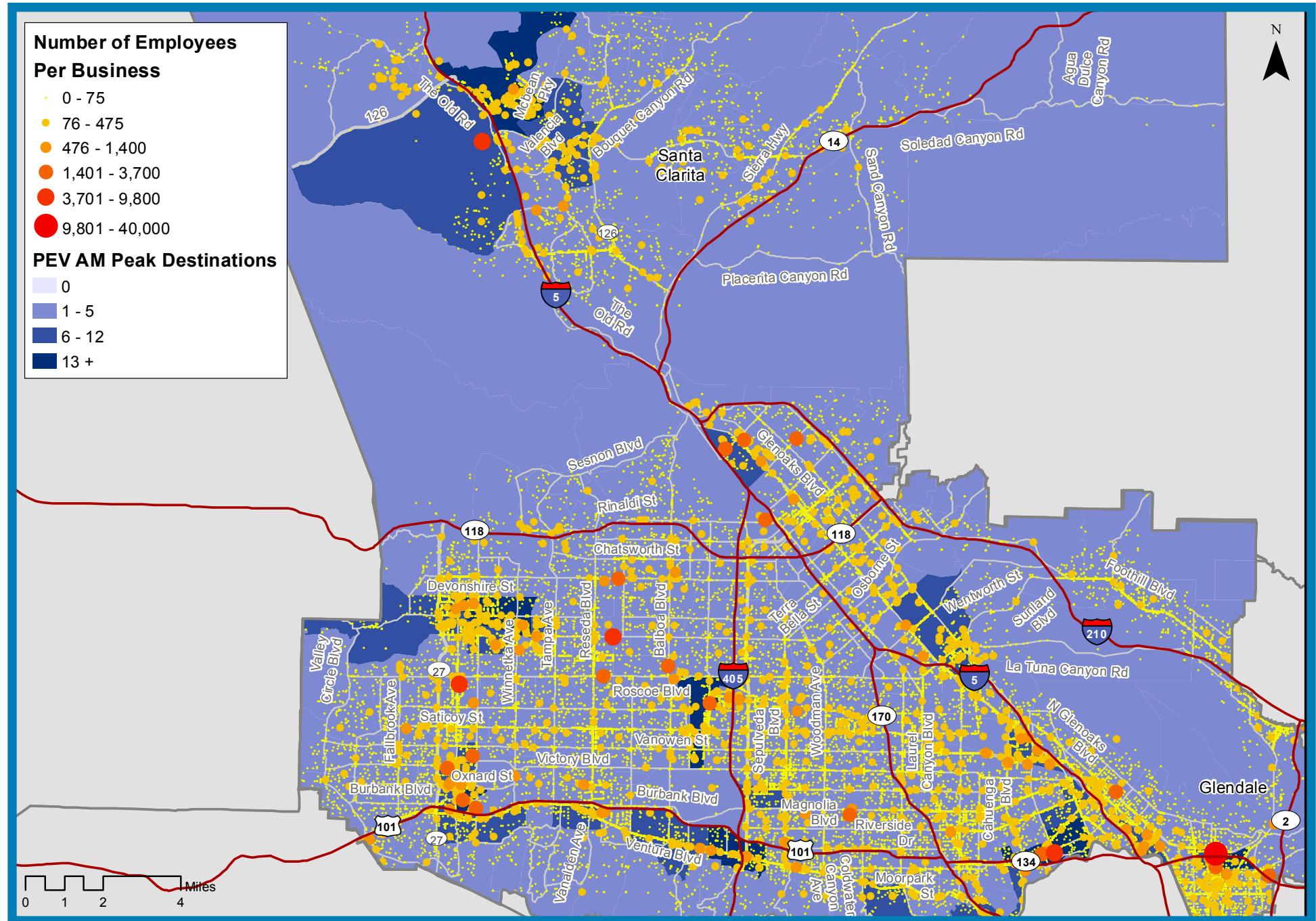
Plug-in Electric Vehicle Morning Peak Destinations



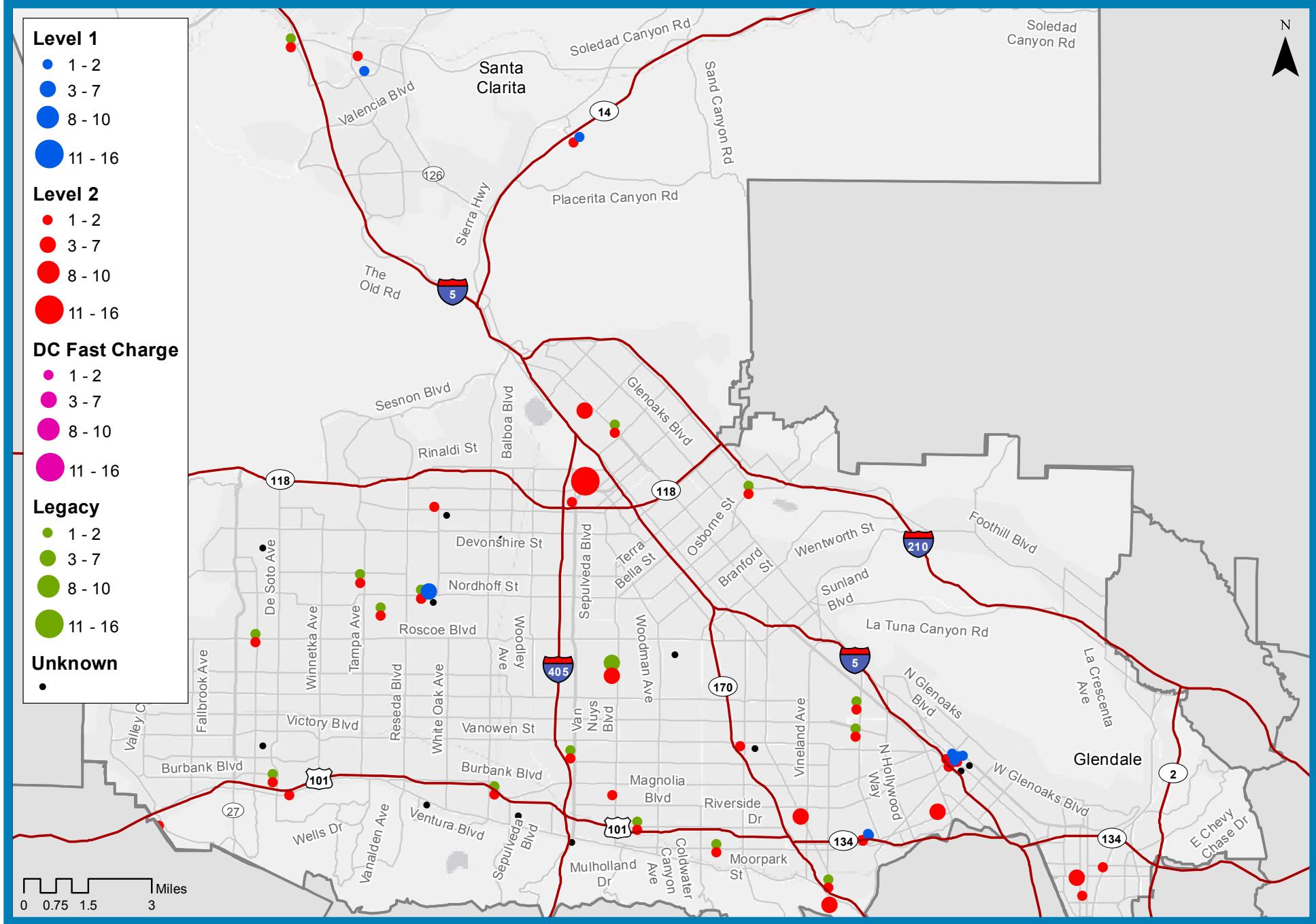
Workplaces by Number of Employees



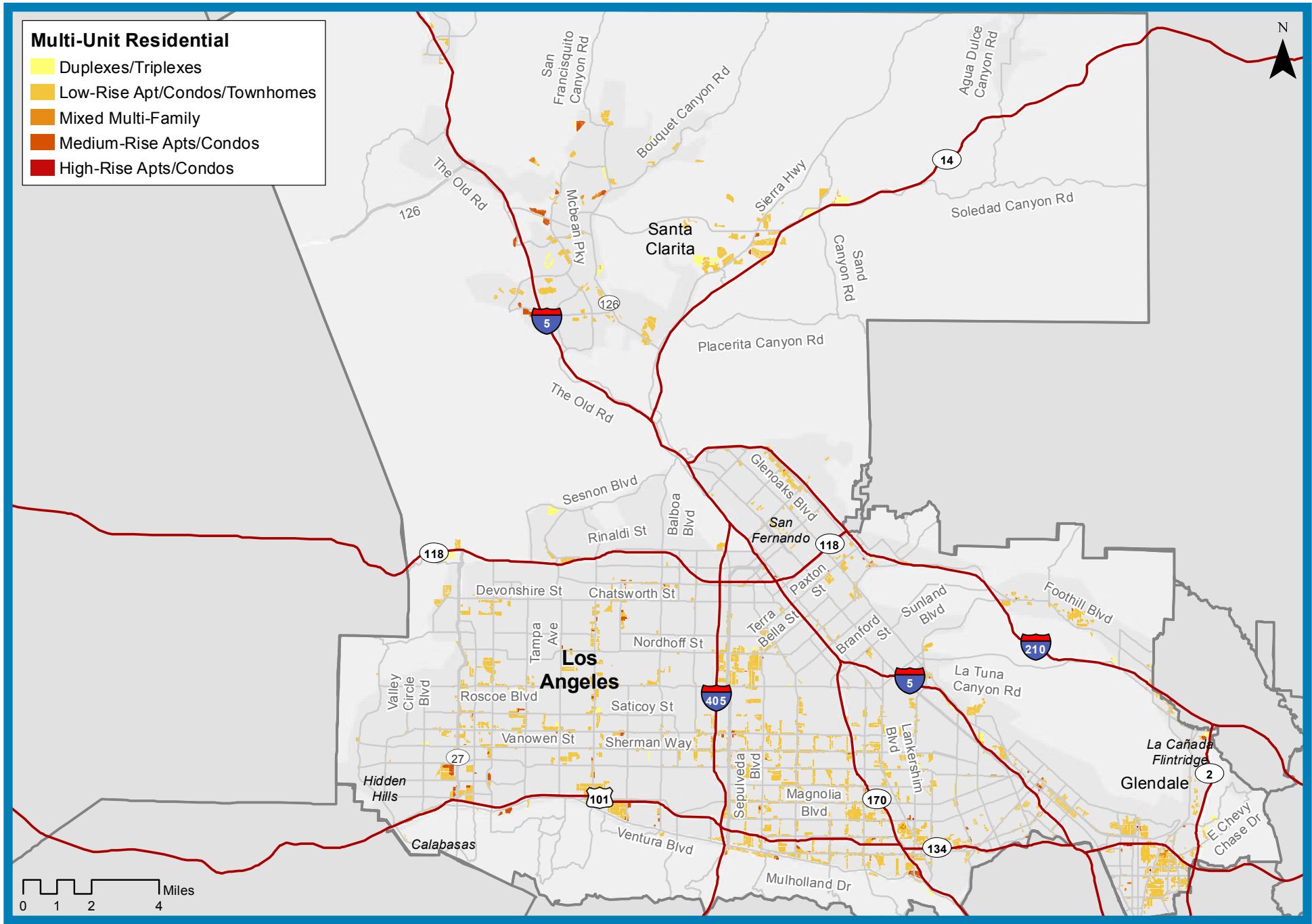
PEV Morning Peak Destinations and Workplaces



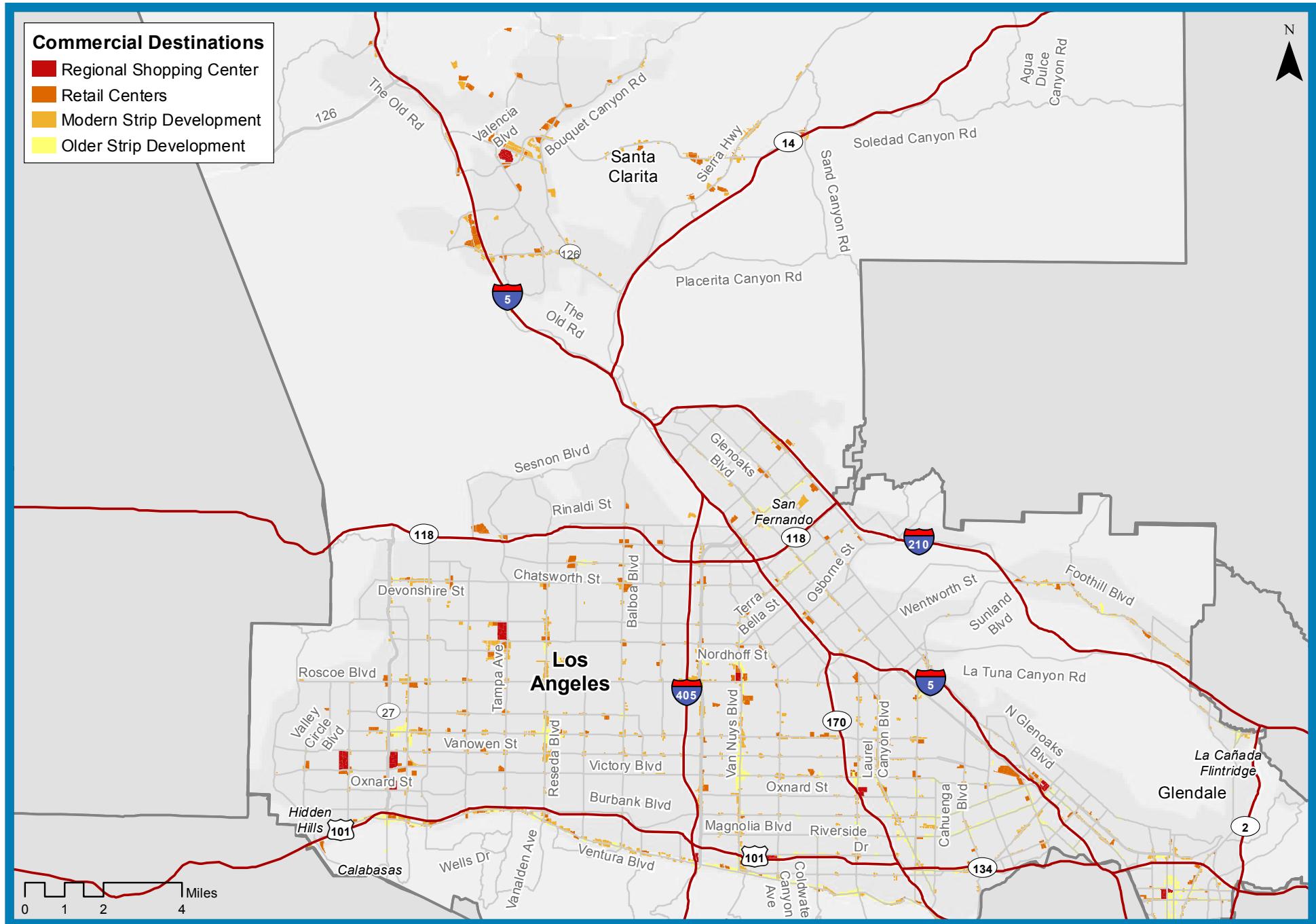
Publicly-Accessible Charging Stations (Summer/Fall 2012)



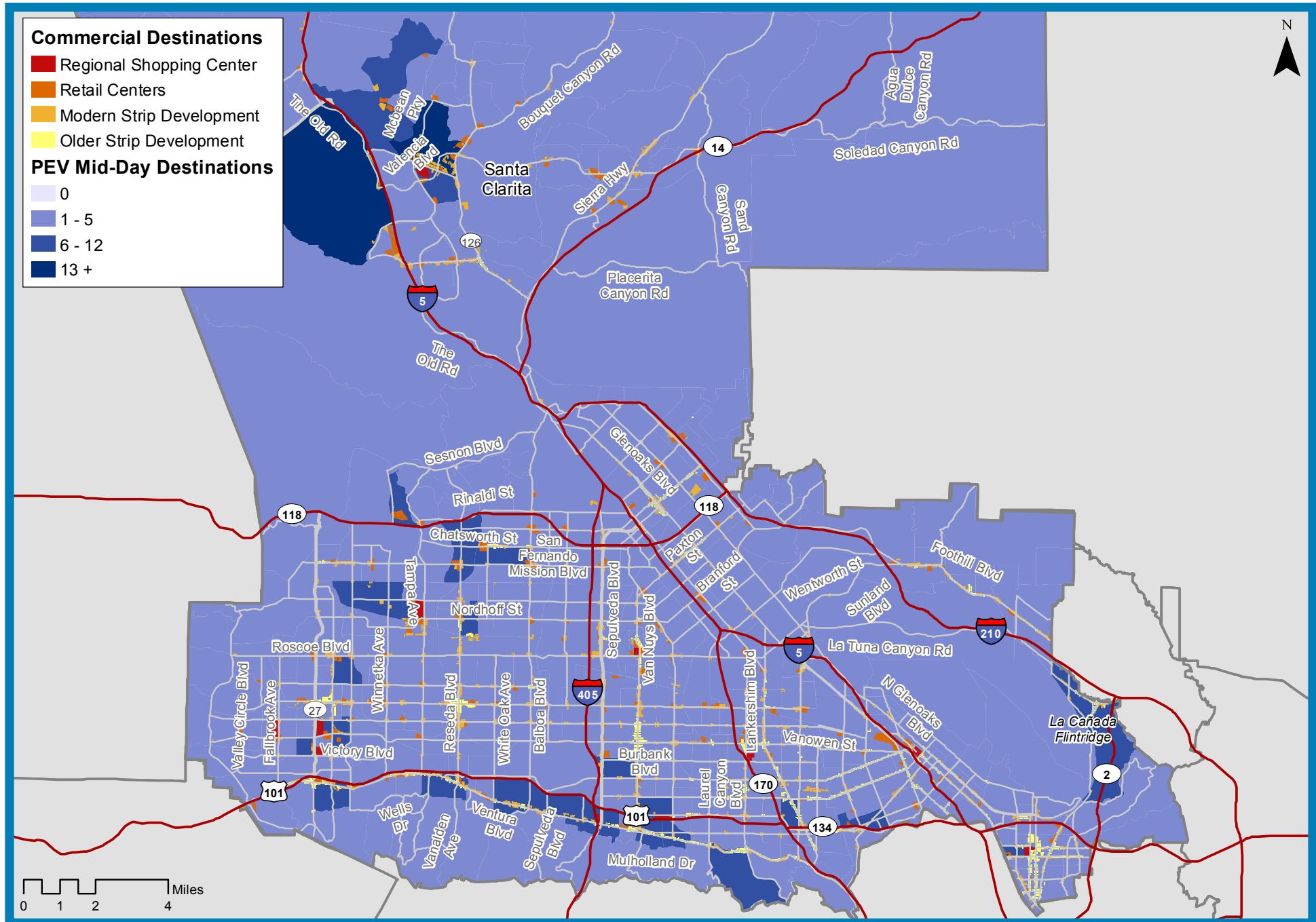
Multi-Unit Residential



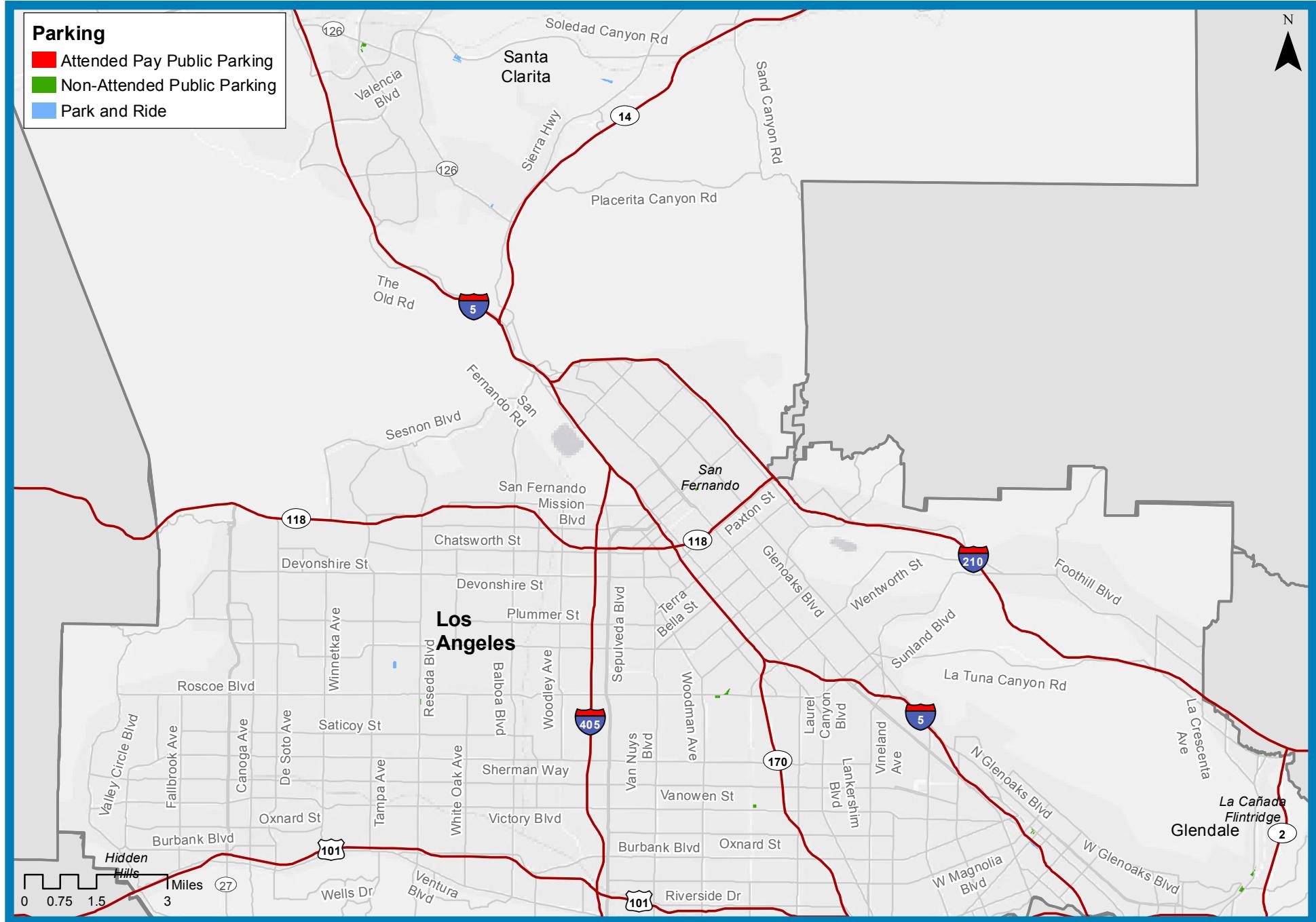
Commercial (Retail) Destinations



PEV Mid-Day Destinations and Commercial (Retail) Locations



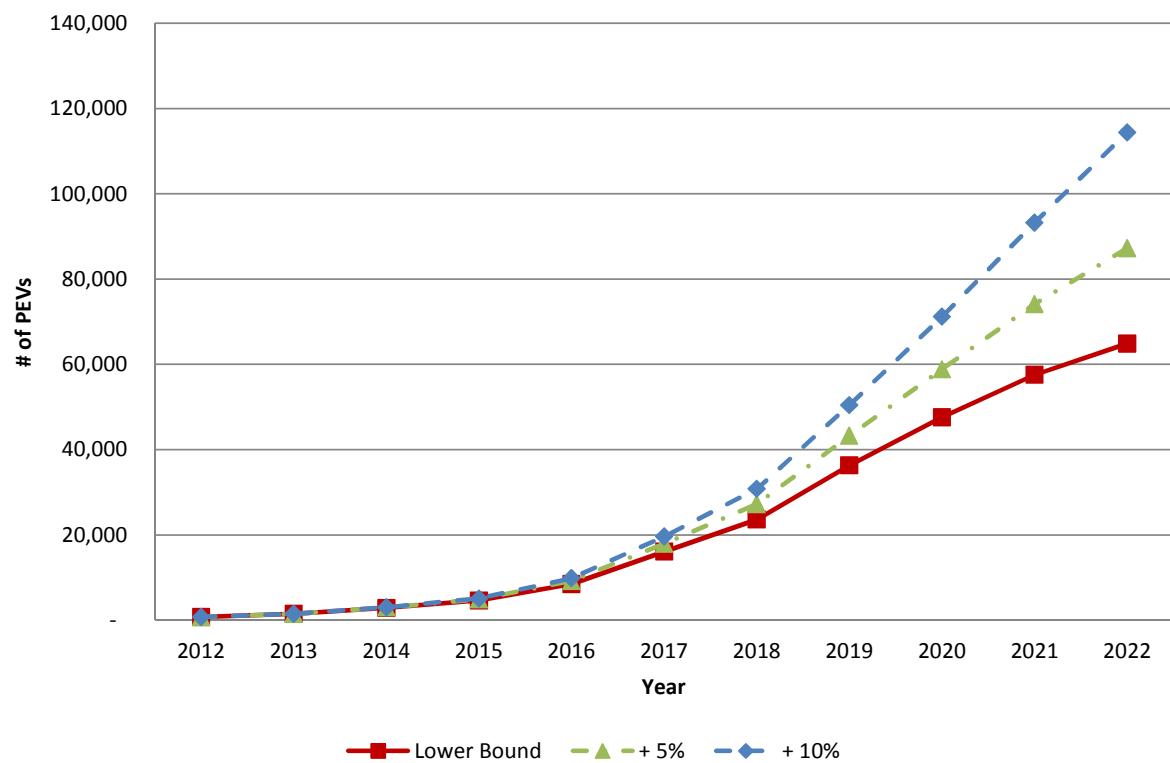
Stand-alone Parking Facilities



SAN GABRIEL VALLEY COUNCIL OF GOVERNMENTS

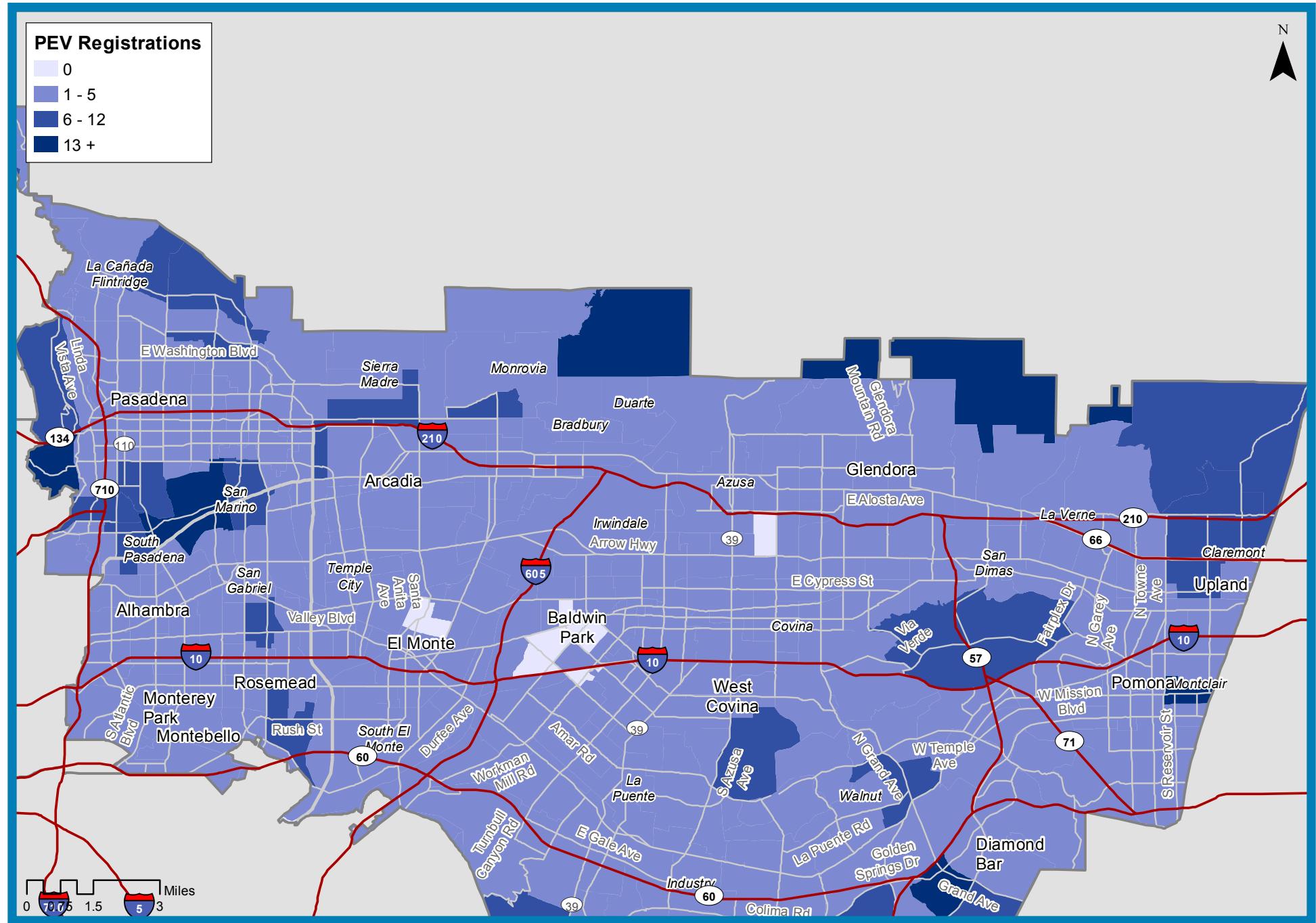
PEV Growth

Year	Cumulative PEV registrations*		
	Lower Bound	+ 5%	+ 10%
2012	753	753	753
2013	1,506	1,506	1,506
2014	2,908	2,984	3,012
2015	4,629	4,898	5,095
2016	8,490	9,229	9,855
2017	16,082	17,942	19,652
2018	23,612	27,240	30,819
2019	36,310	43,251	50,474
2020	47,591	58,851	71,203
2021	57,560	74,121	93,238
2022	64,875	87,248	114,413

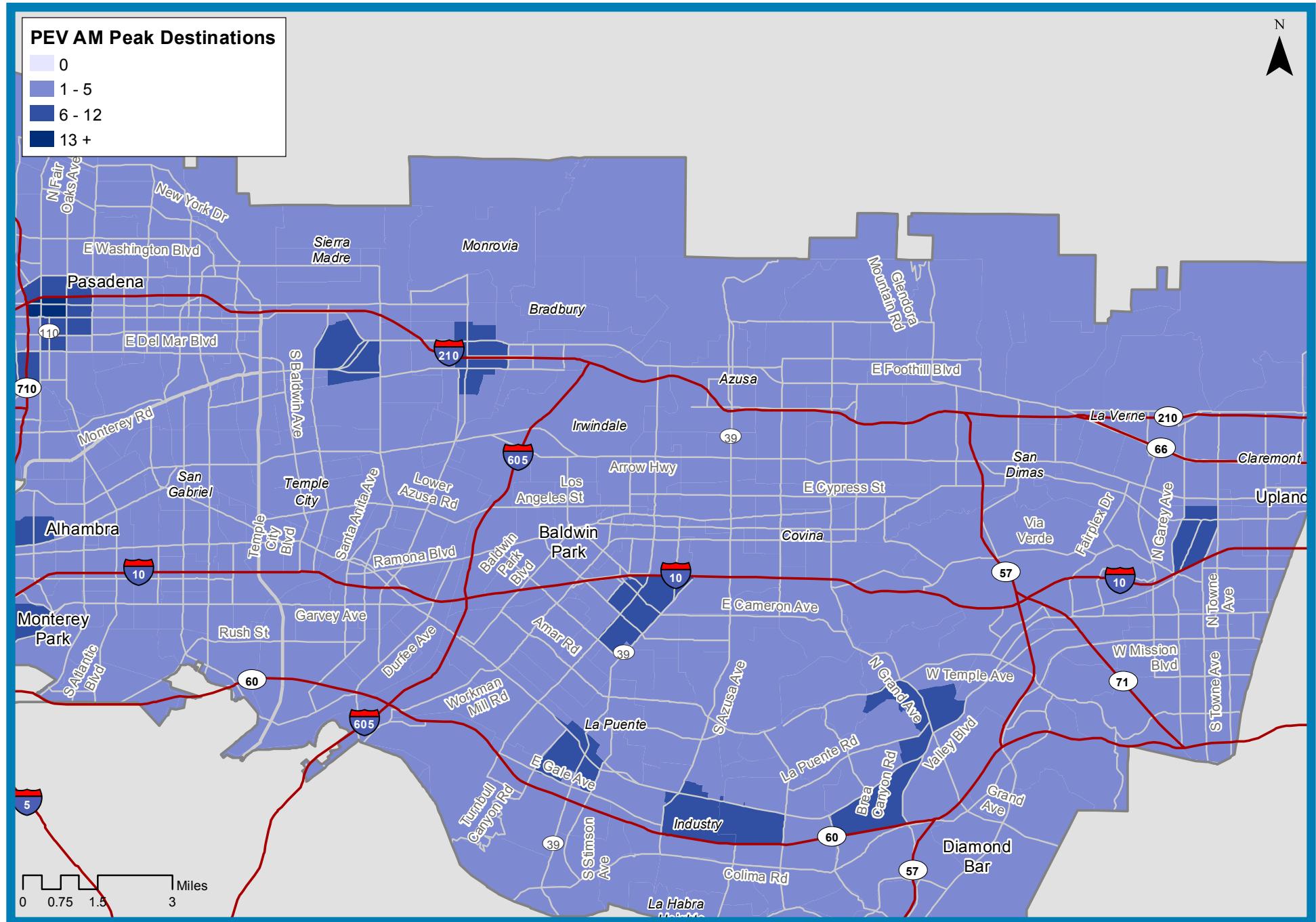


* The +5% and +10% projections begin in 2014, when uncertainty becomes greater.

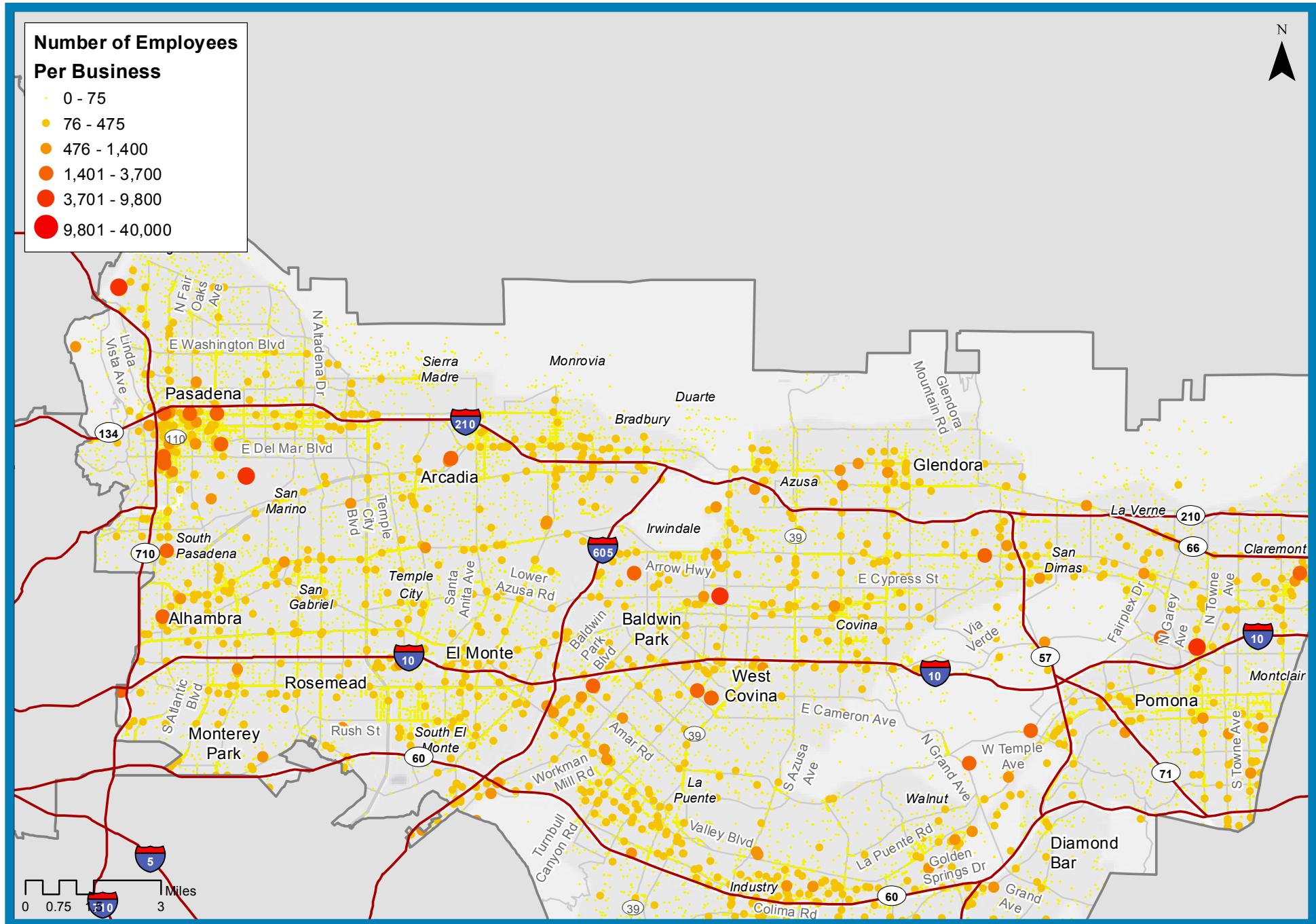
Plug-in Electric Vehicle Registrations



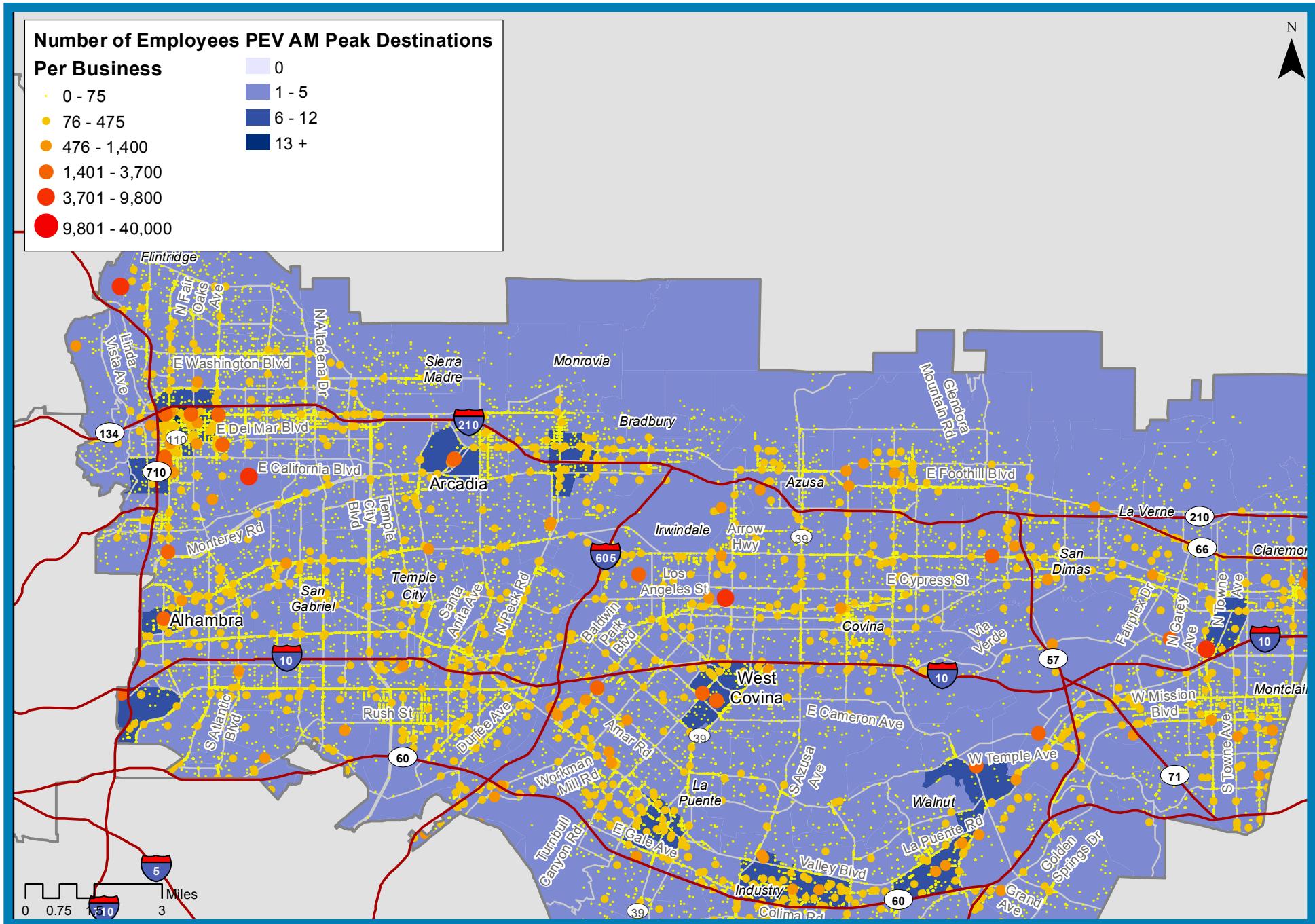
Plug-in Electric Vehicle Morning Peak Destinations



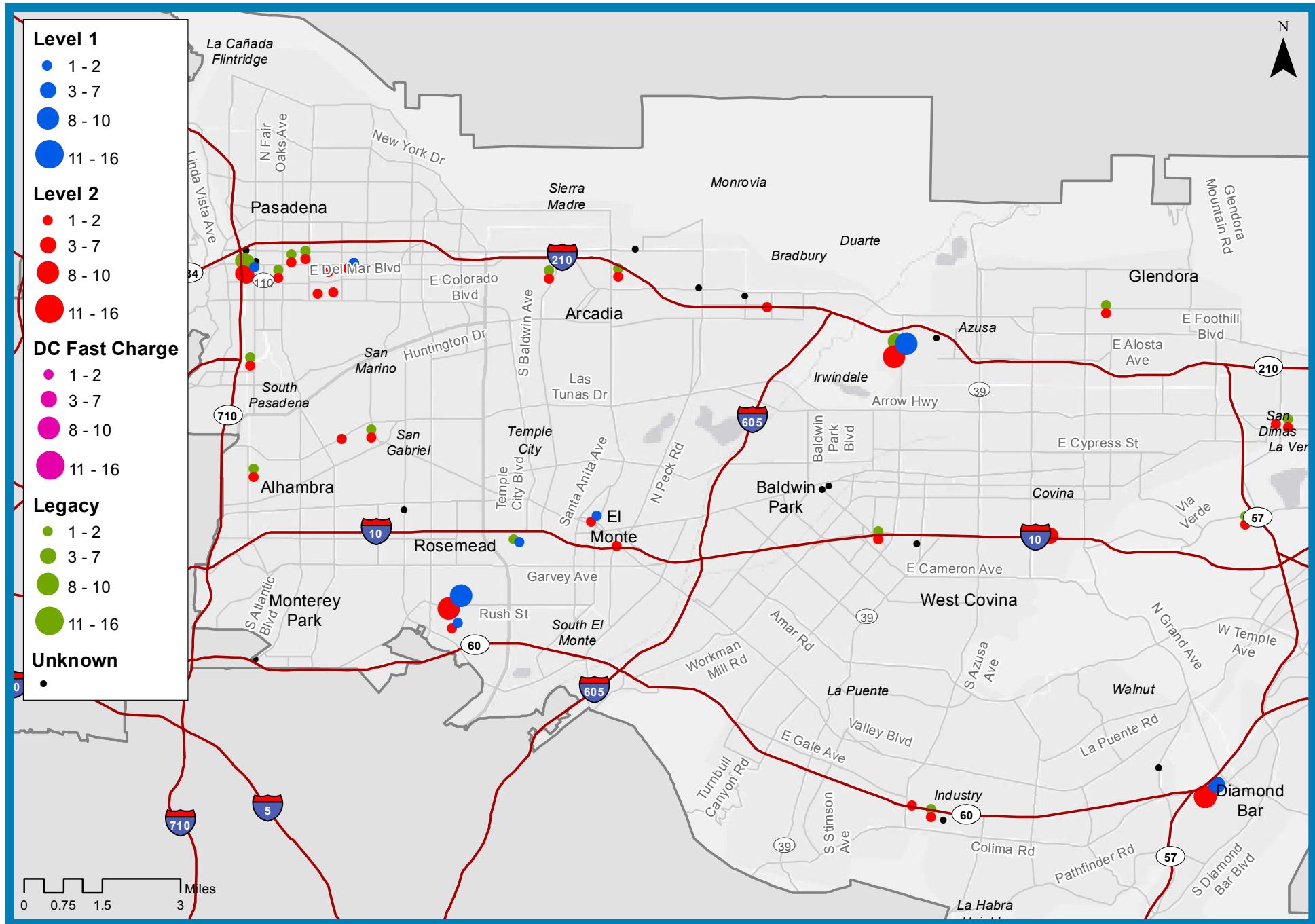
Workplaces by Number of Employees



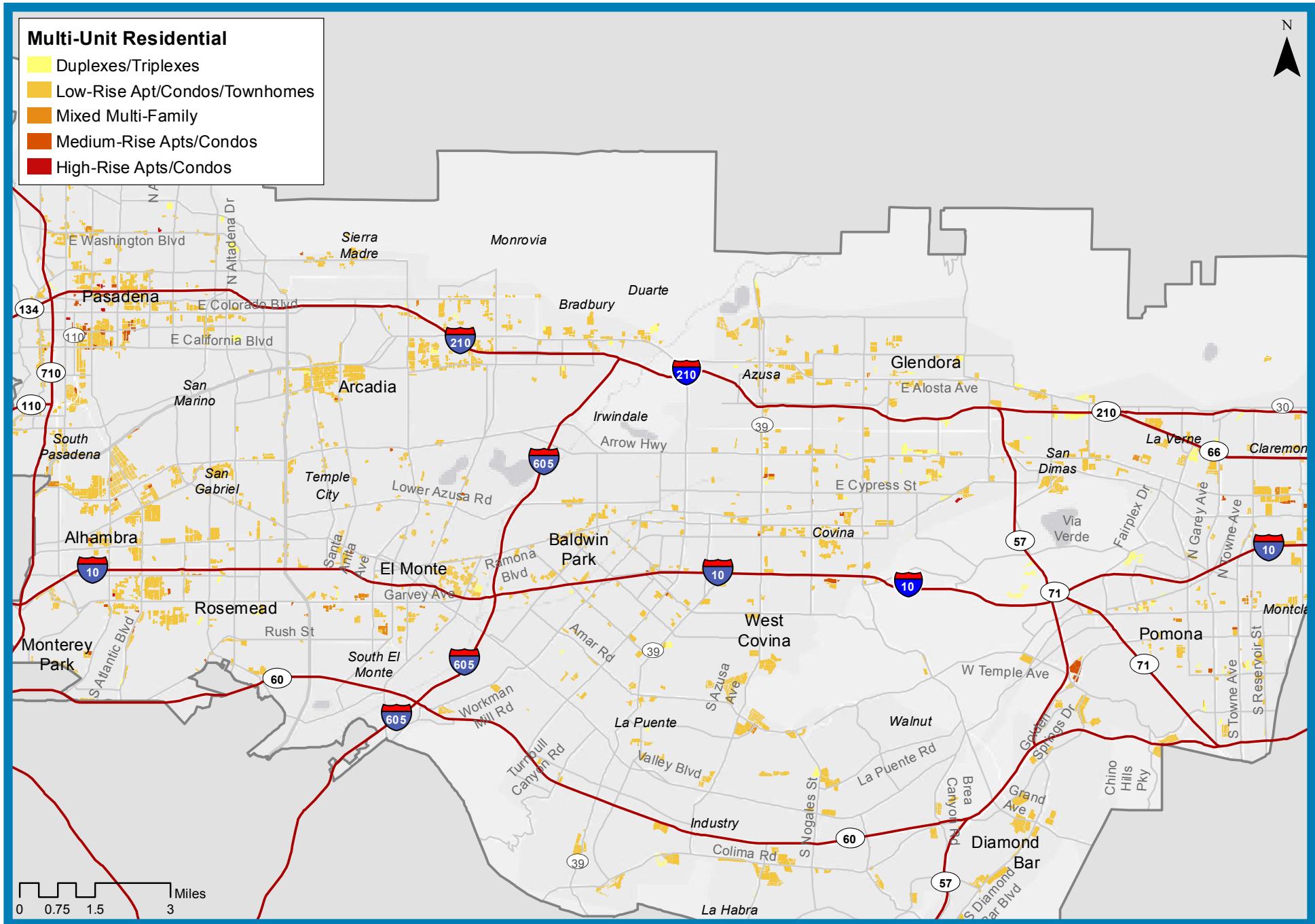
PEV Morning Peak Destinations and Workplaces



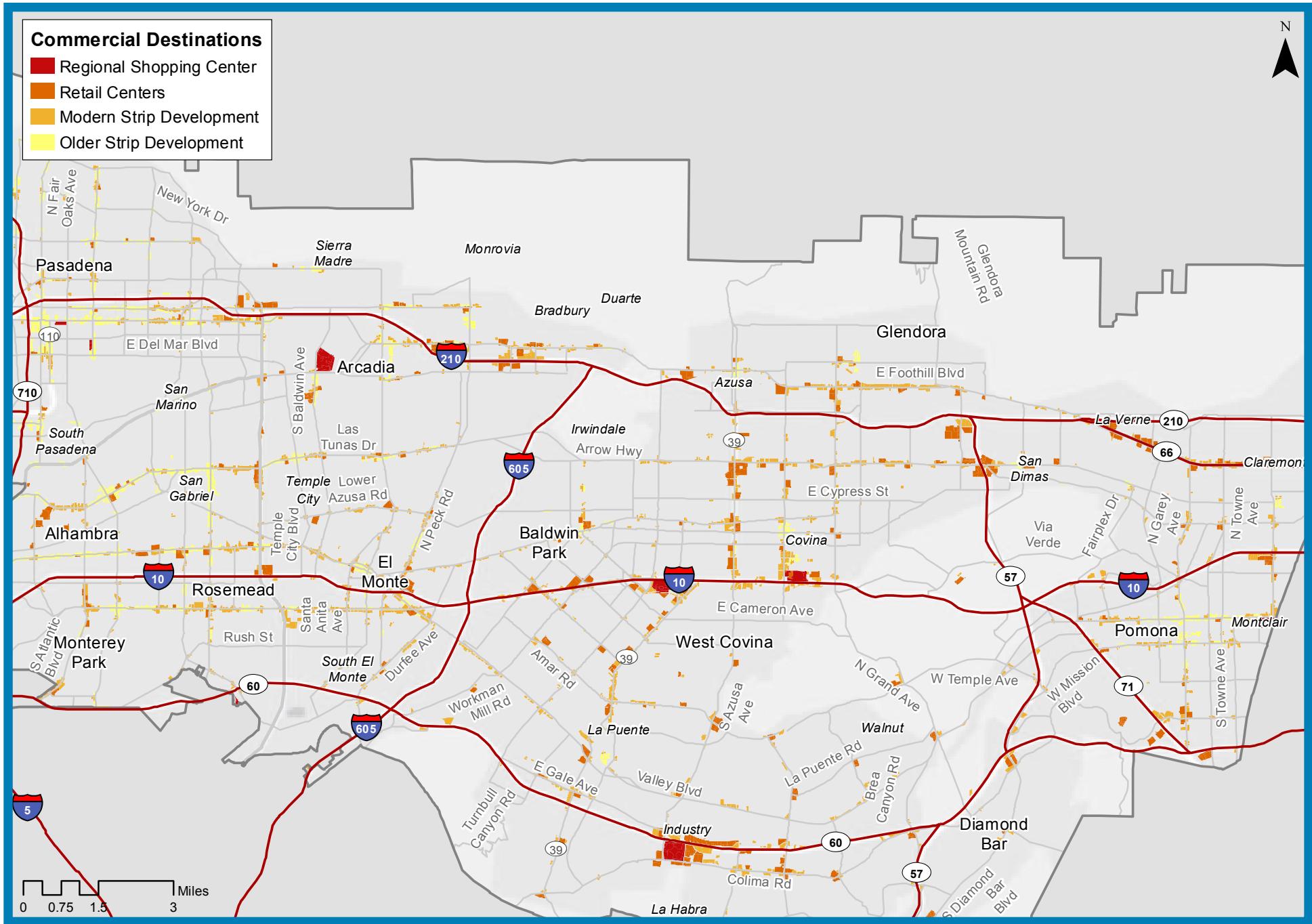
Publicly-Accessible Charging Stations (Summer/Fall 2012)



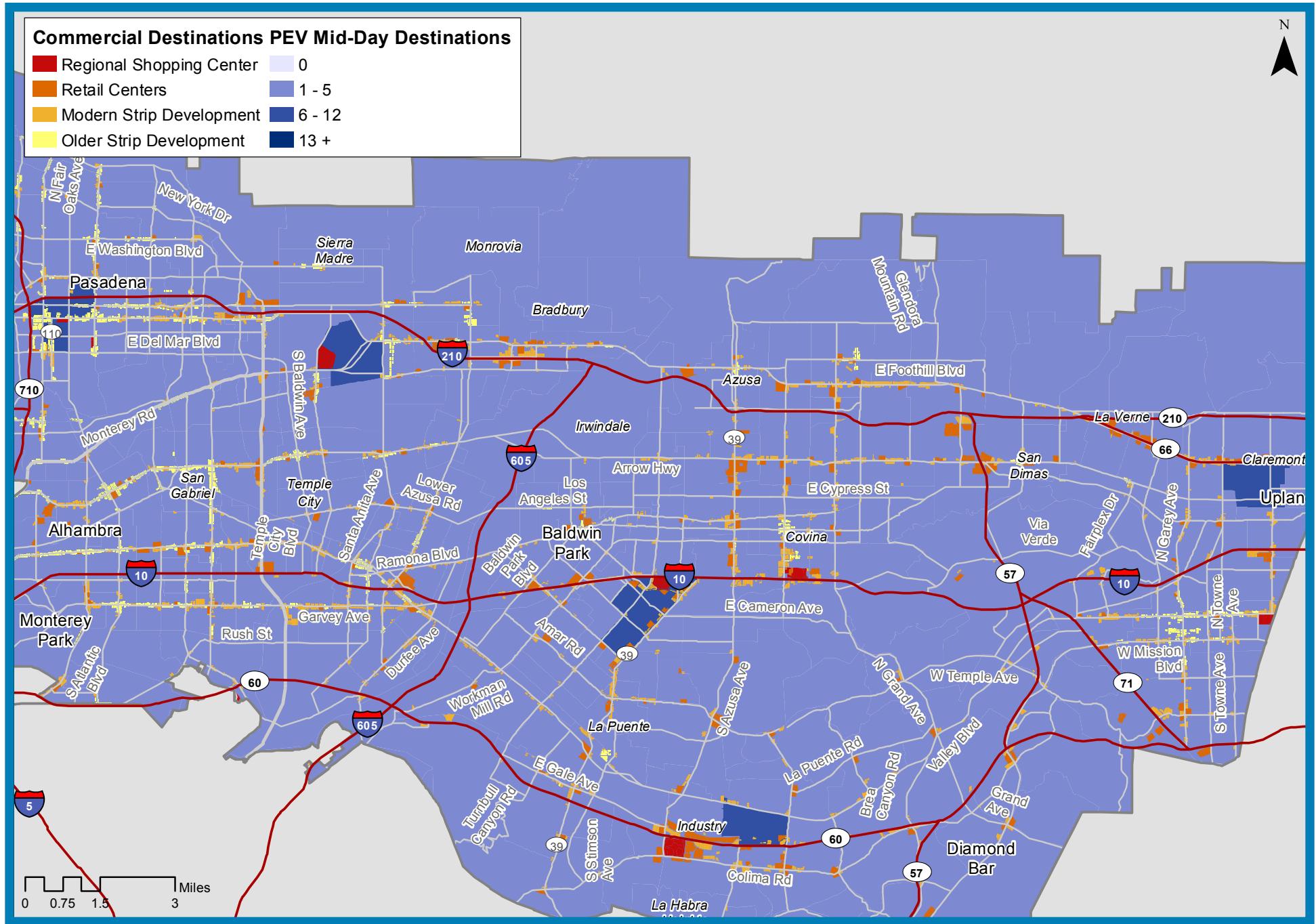
Multi-Unit Residential



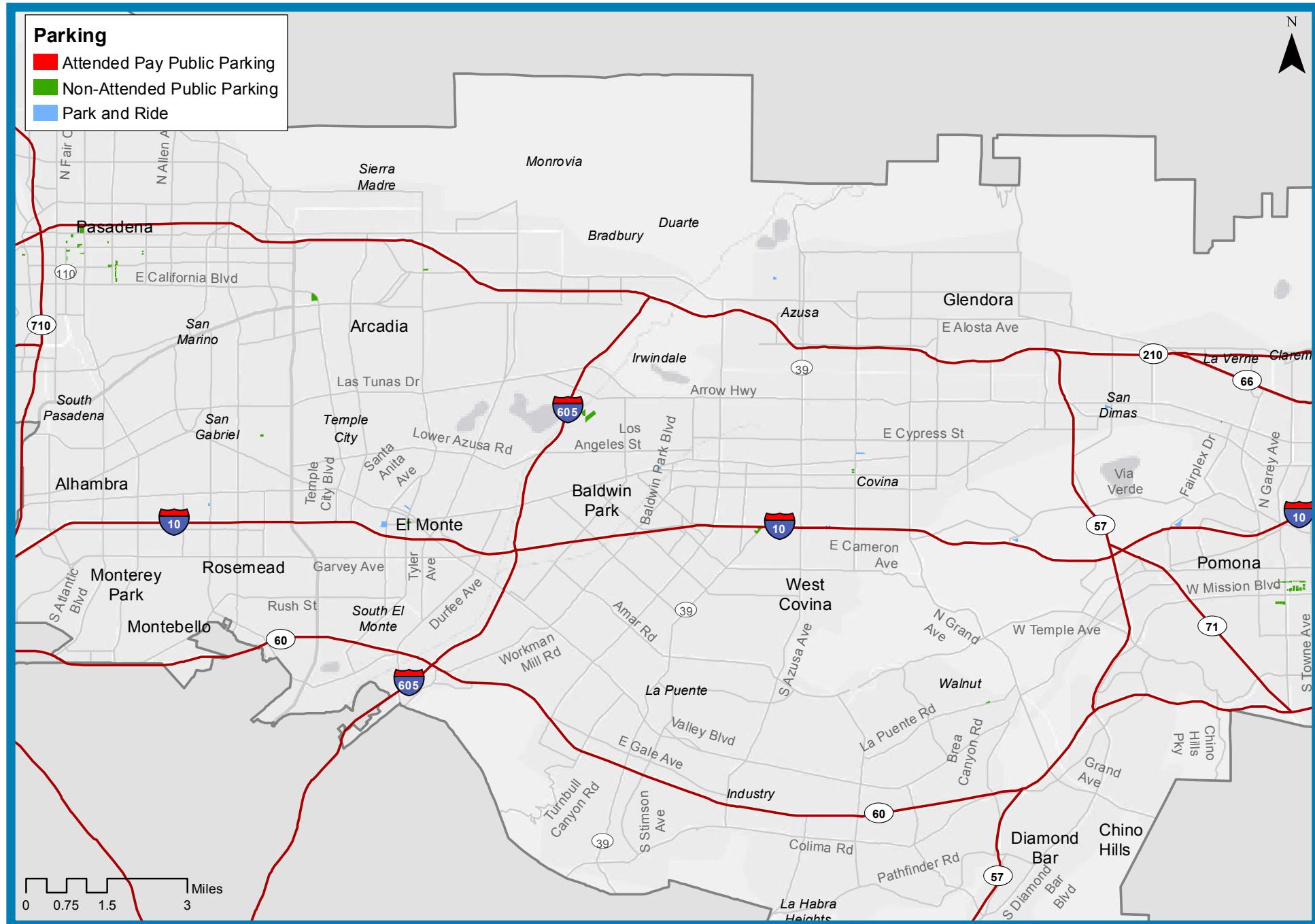
Commercial (Retail) Destinations



PEV Mid-Day Destinations and Commercial (Retail) Locations



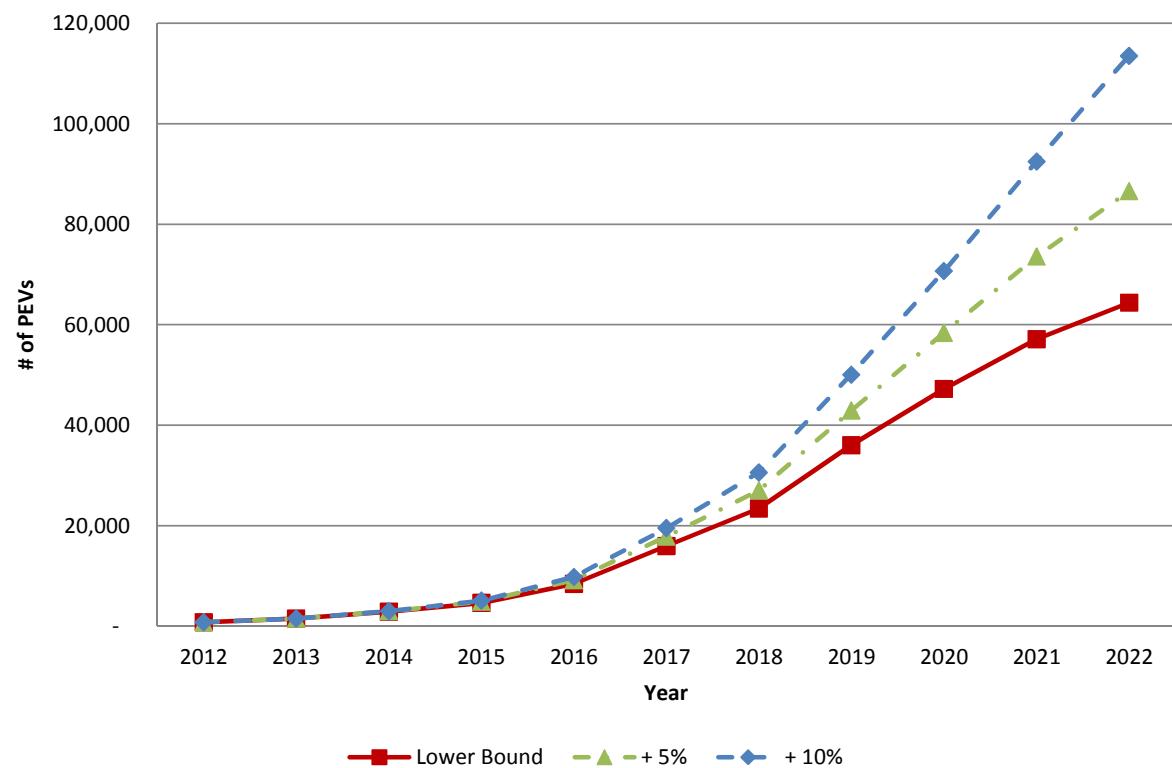
Stand-alone Parking Facilities



SOUTH BAY CITIES COUNCIL OF GOVERNMENTS

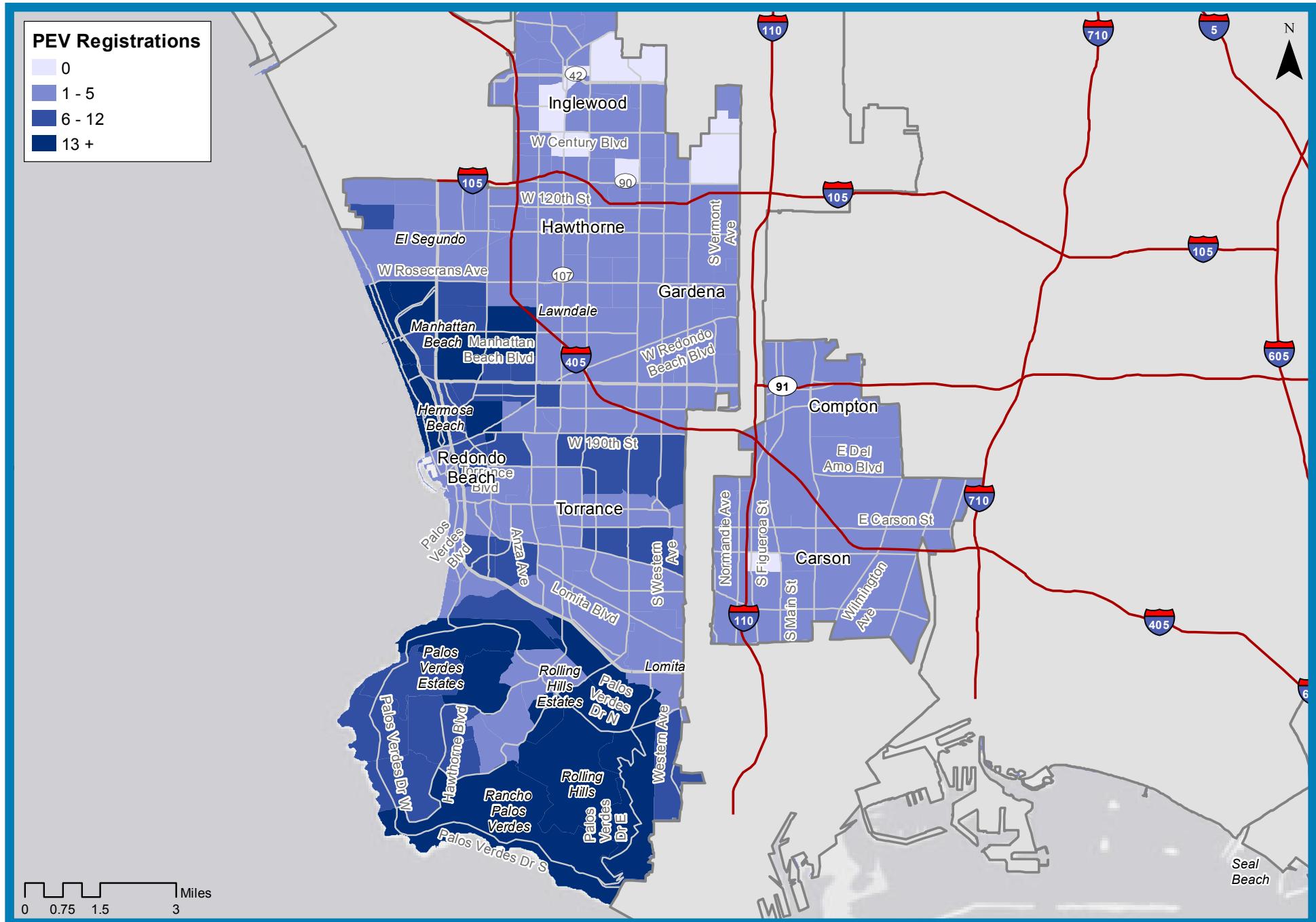
PEV Growth

Year	Cumulative PEV registrations*		
	Lower Bound	+ 5%	+ 10%
2012	747	747	747
2013	1,494	1,494	1,494
2014	2,885	2,960	2,988
2015	4,592	4,859	5,054
2016	8,423	9,155	9,776
2017	15,954	17,799	19,496
2018	23,424	27,023	30,574
2019	36,020	42,906	50,072
2020	47,212	58,382	70,636
2021	57,101	73,530	92,495
2022	64,359	86,552	113,501

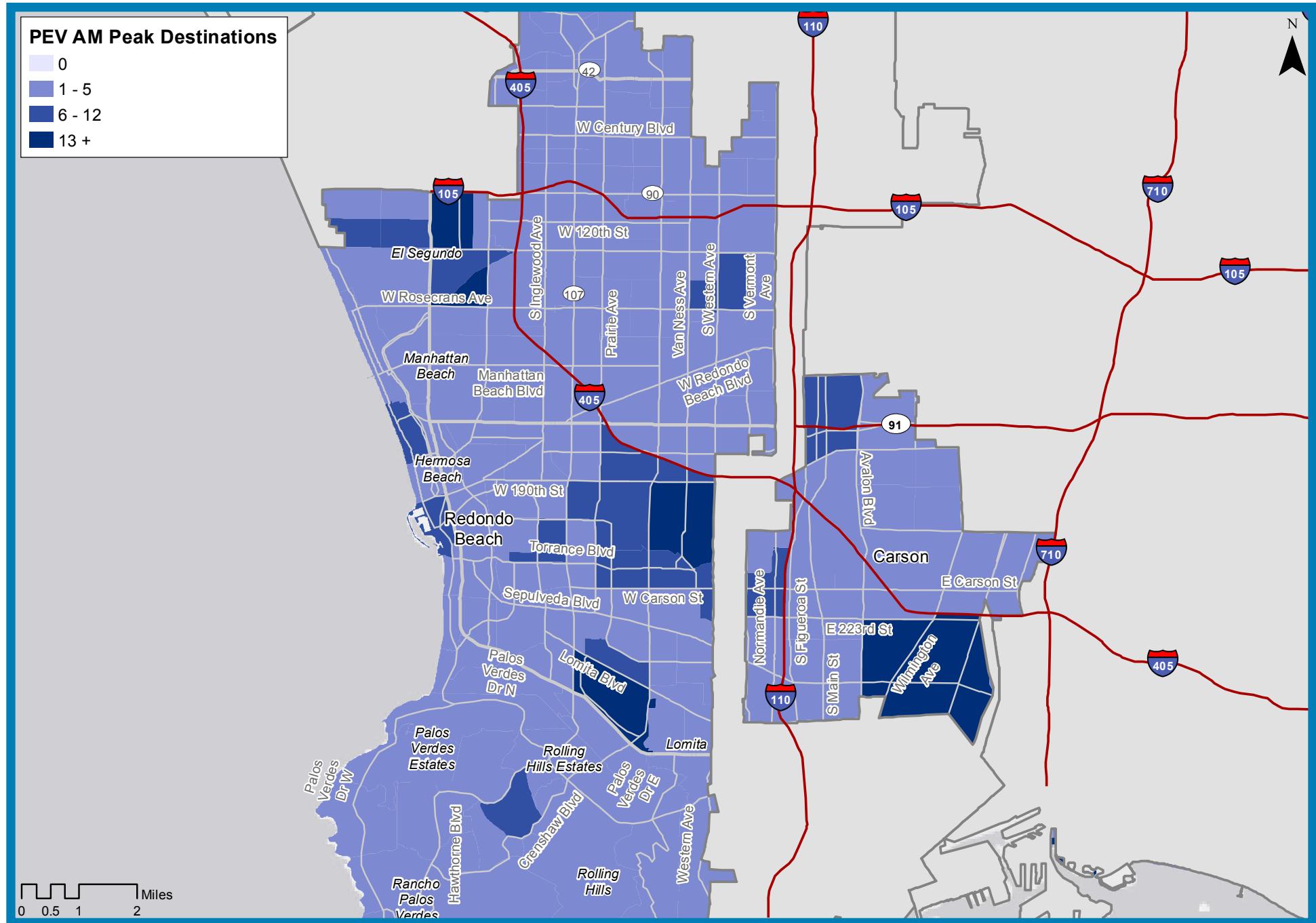


* The +5% and +10% projections begin in 2014, when uncertainty becomes greater.

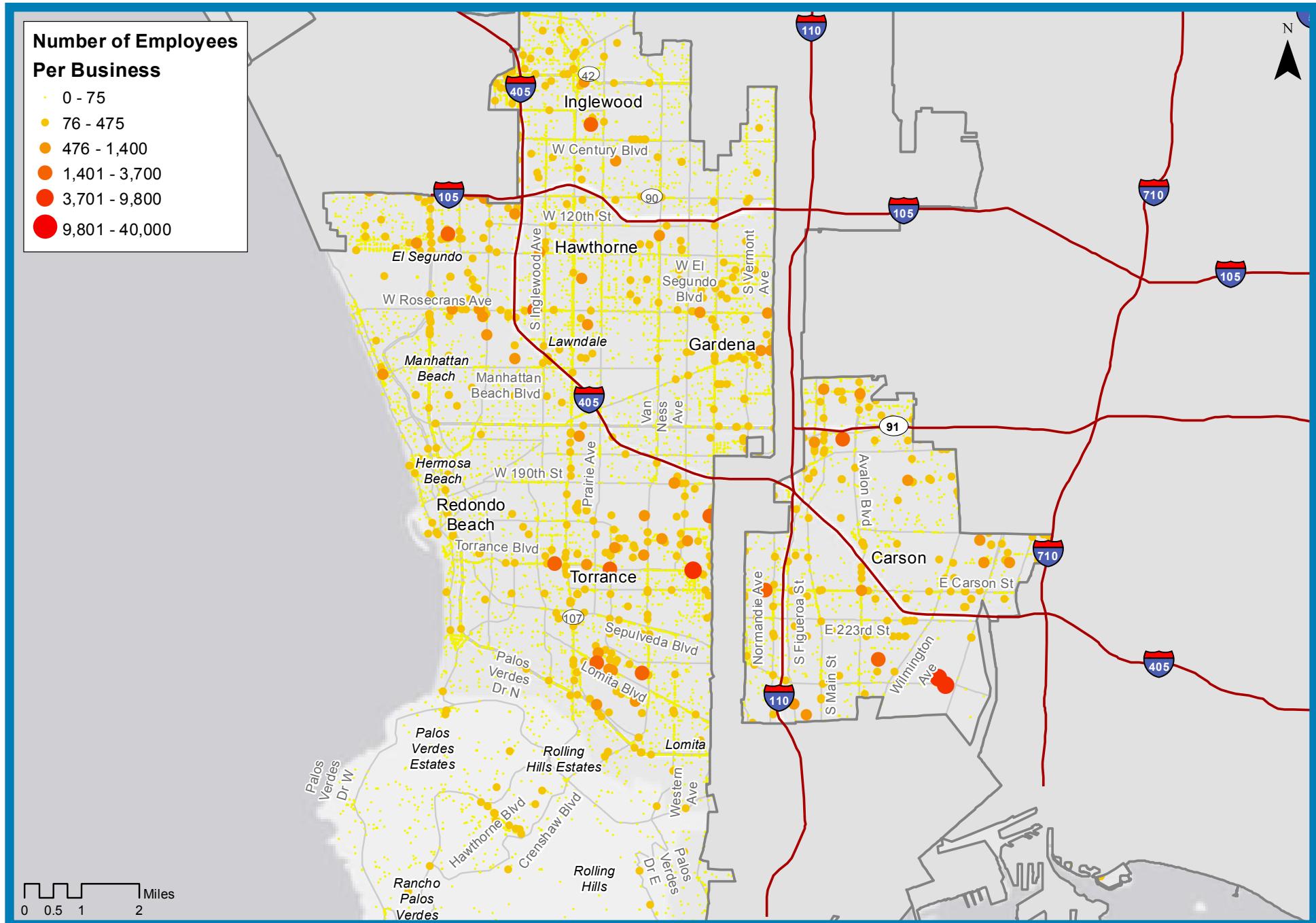
Plug-in Electric Vehicle Registrations



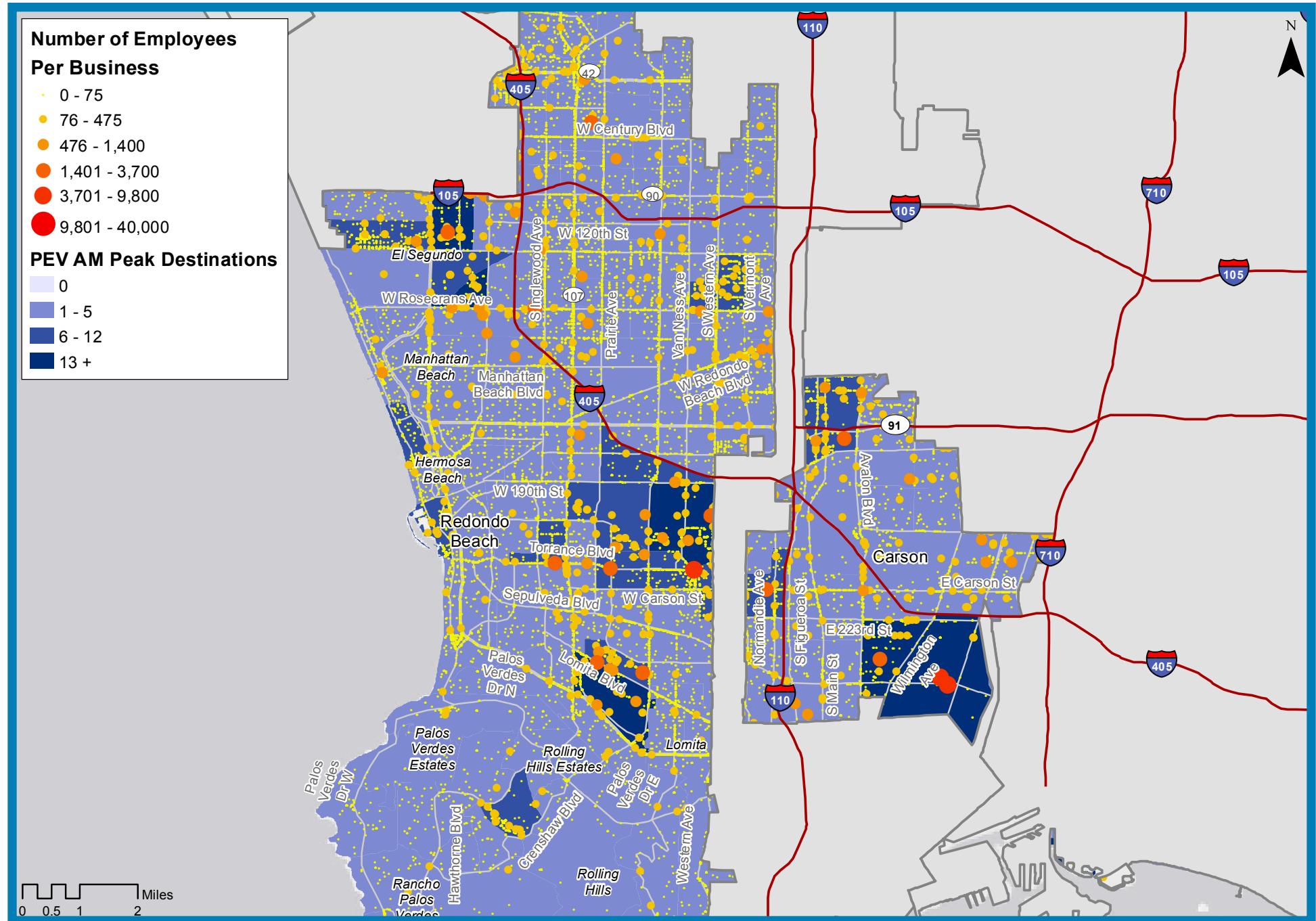
Plug-in Electric Vehicle Morning Peak Destinations



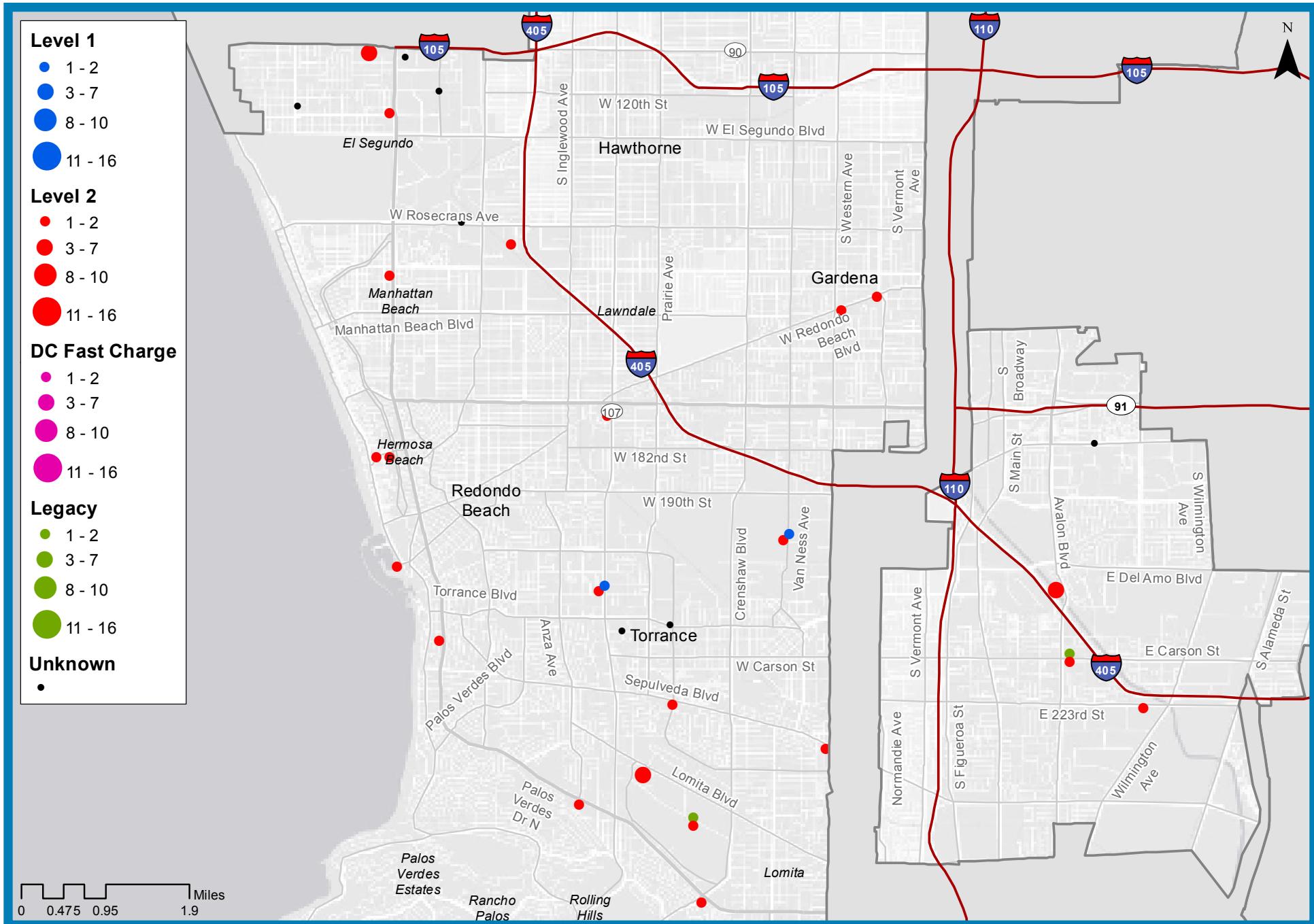
Workplaces by Number of Employees



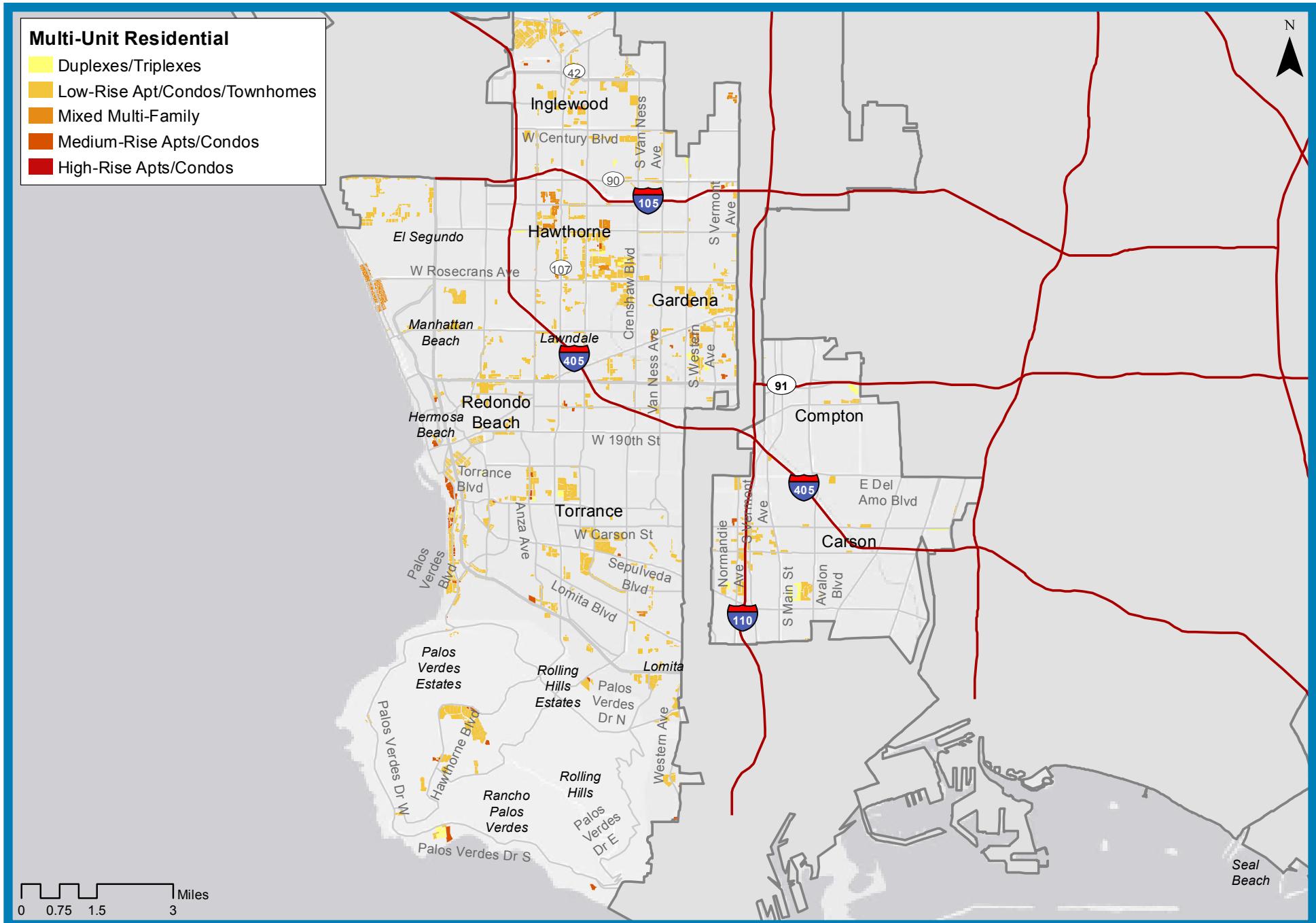
PEV Morning Peak Destinations and Workplaces



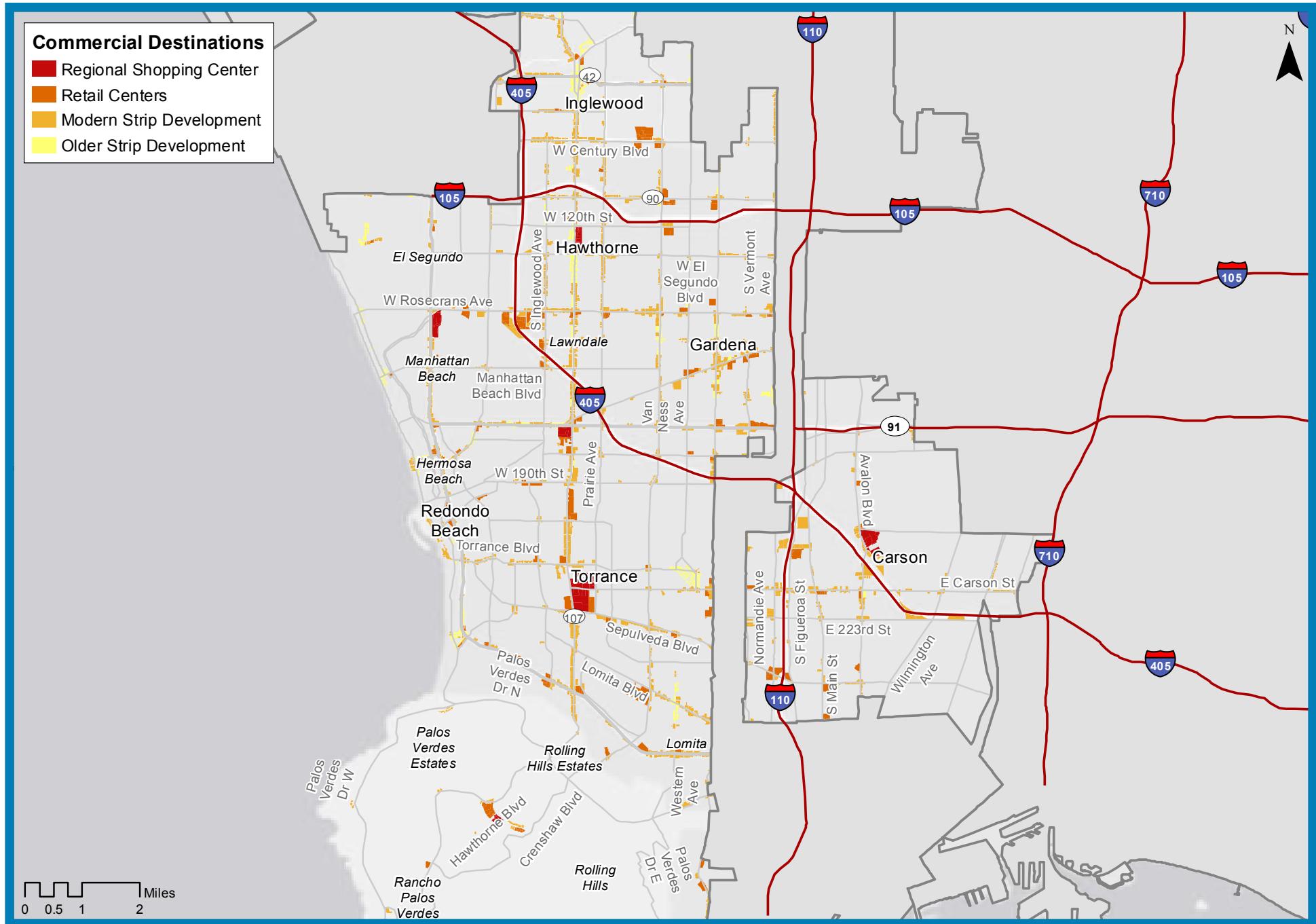
Publicly-Accessible Charging Stations (Summer/Fall 2012)



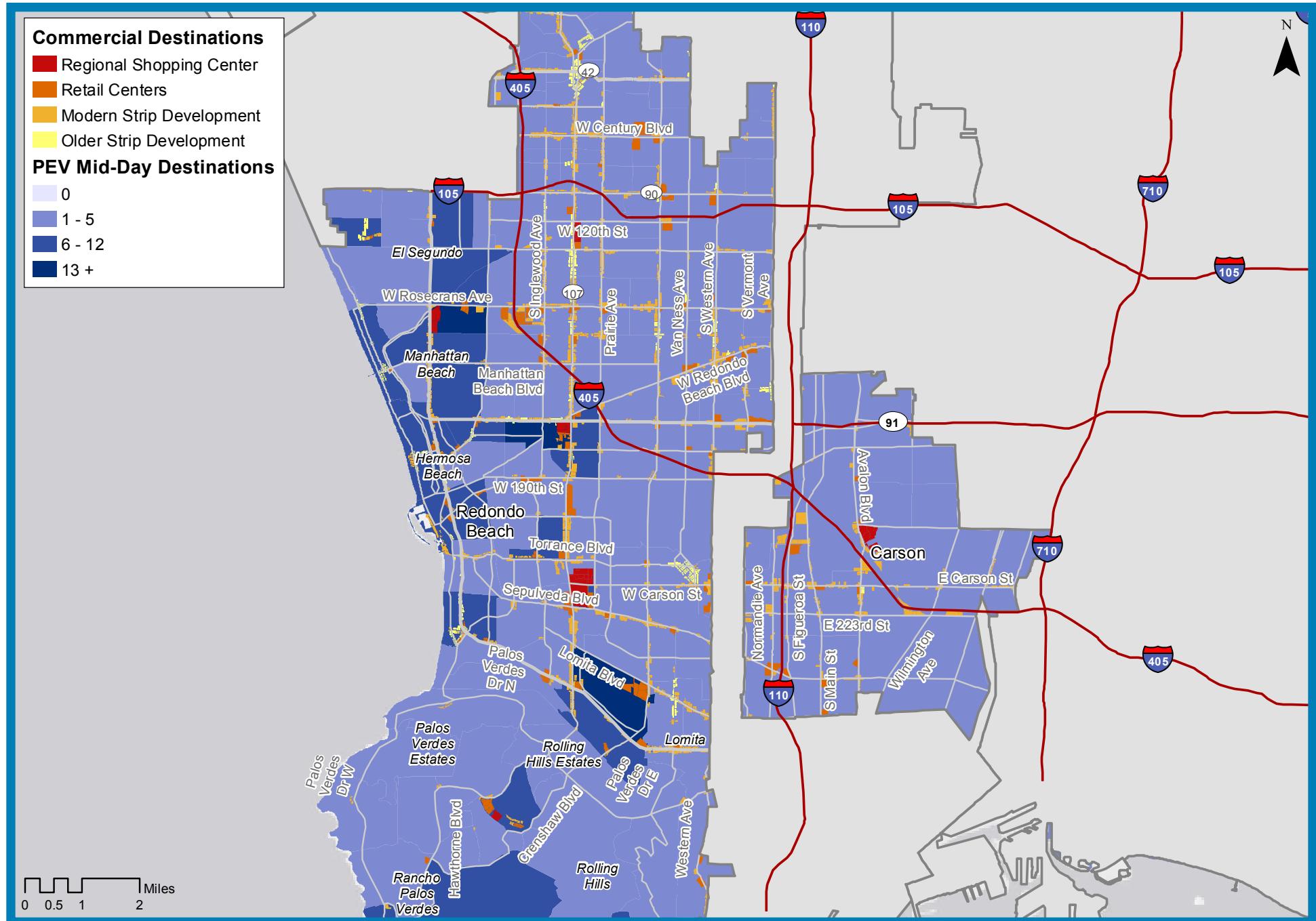
Multi-Unit Residential



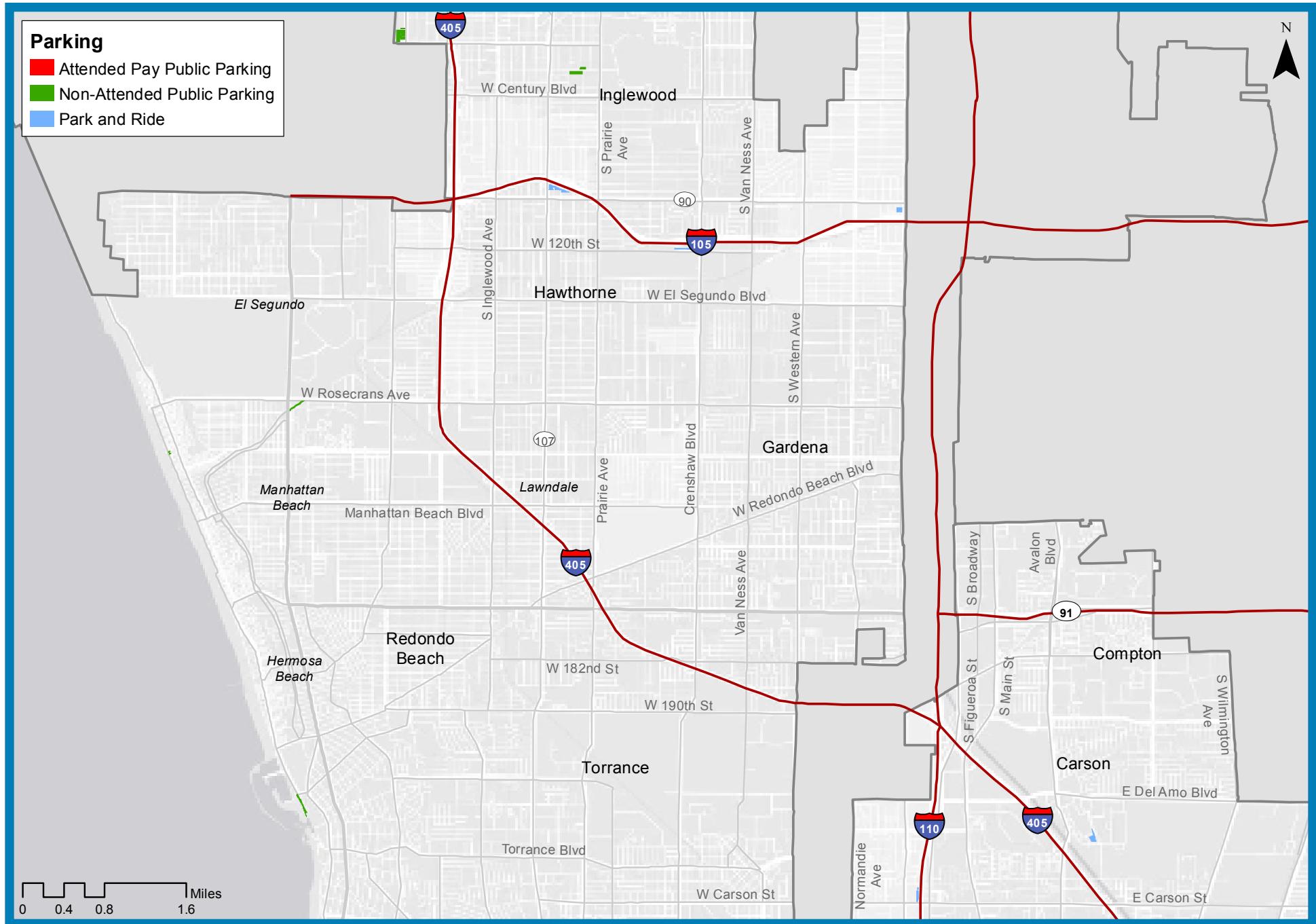
Commercial (Retail) Destinations



PEV Mid-Day Destinations and Commercial (Retail) Locations



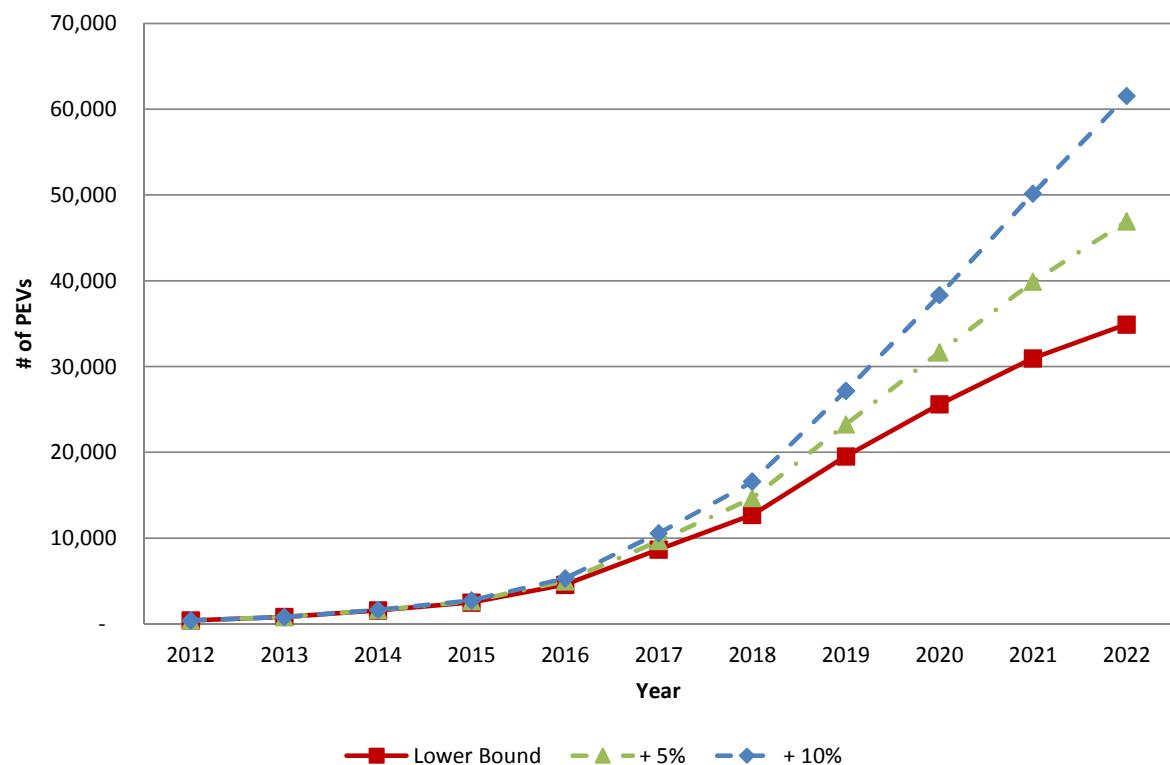
Stand-alone Parking Facilities



VENTURA COUNCIL OF GOVERNMENTS

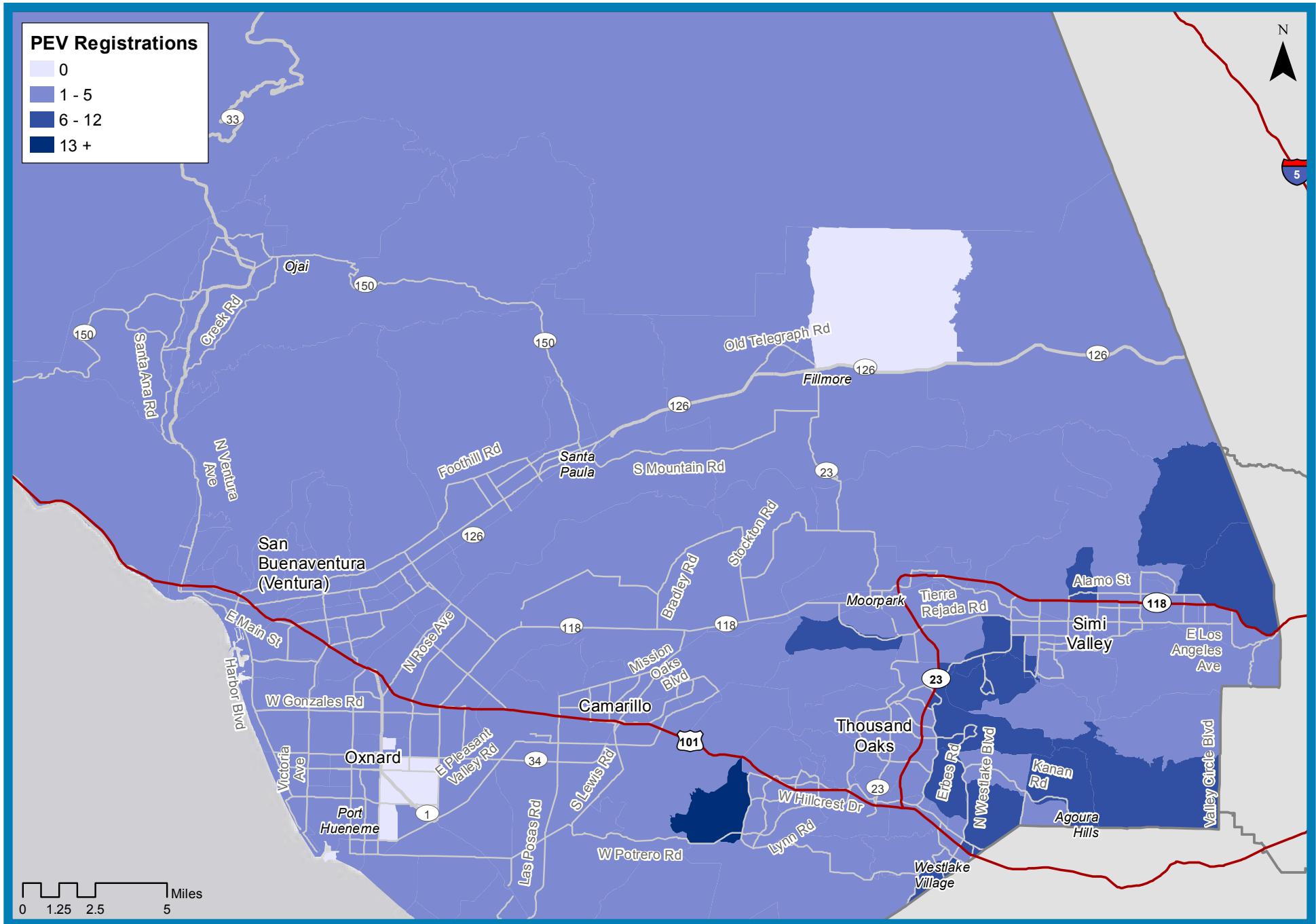
PEV Growth

Year	Cumulative PEV registrations*		
	Lower Bound	+ 5%	+ 10%
2012	405	405	405
2013	810	810	810
2014	1,564	1,605	1,620
2015	2,489	2,634	2,740
2016	4,566	4,964	5,300
2017	8,650	9,650	10,570
2018	12,700	14,651	16,576
2019	19,529	23,262	27,147
2020	25,597	31,653	38,297
2021	30,958	39,866	50,148
2022	34,893	46,926	61,537

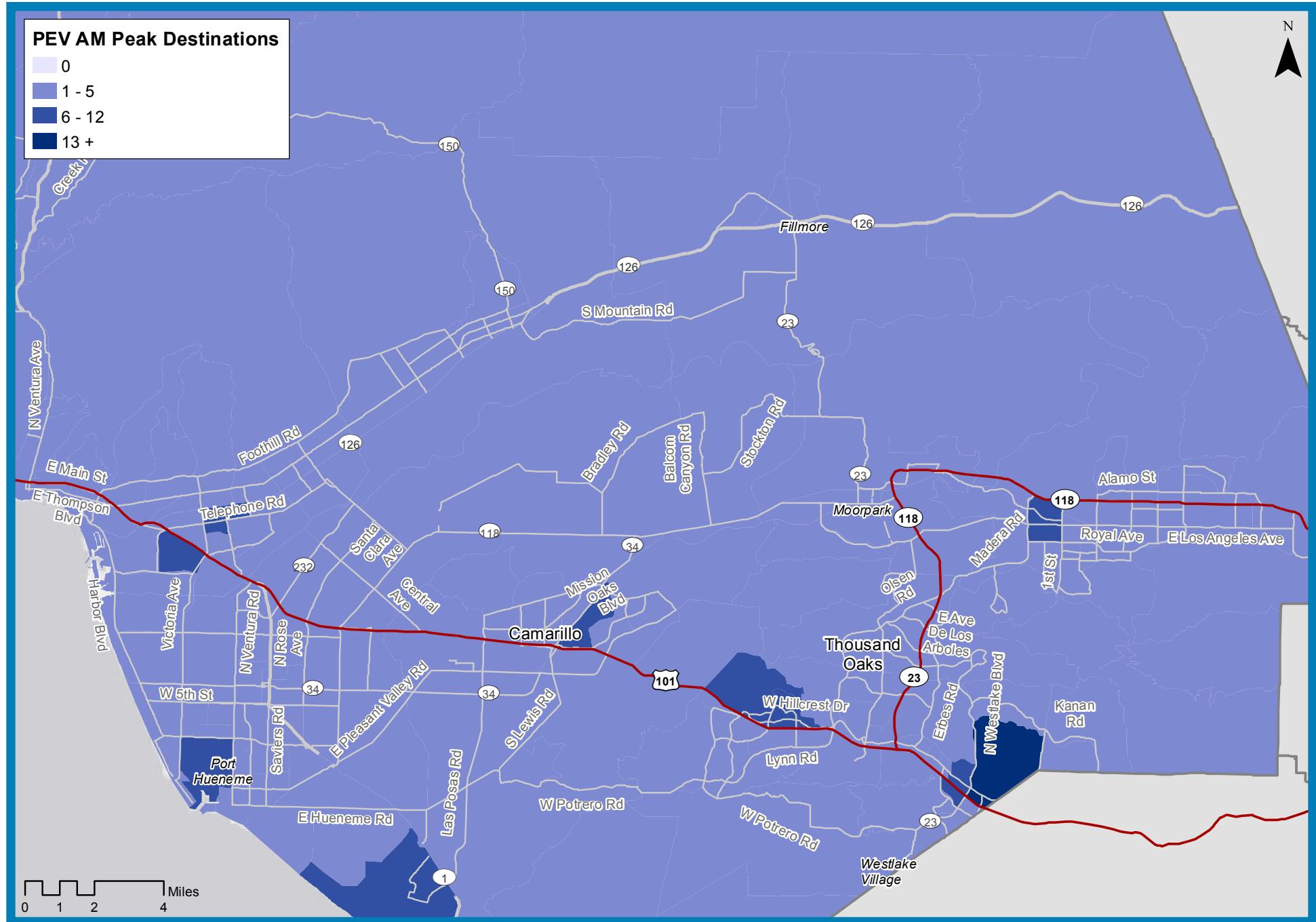


* The +5% and +10% projections begin in 2014, when uncertainty becomes greater.

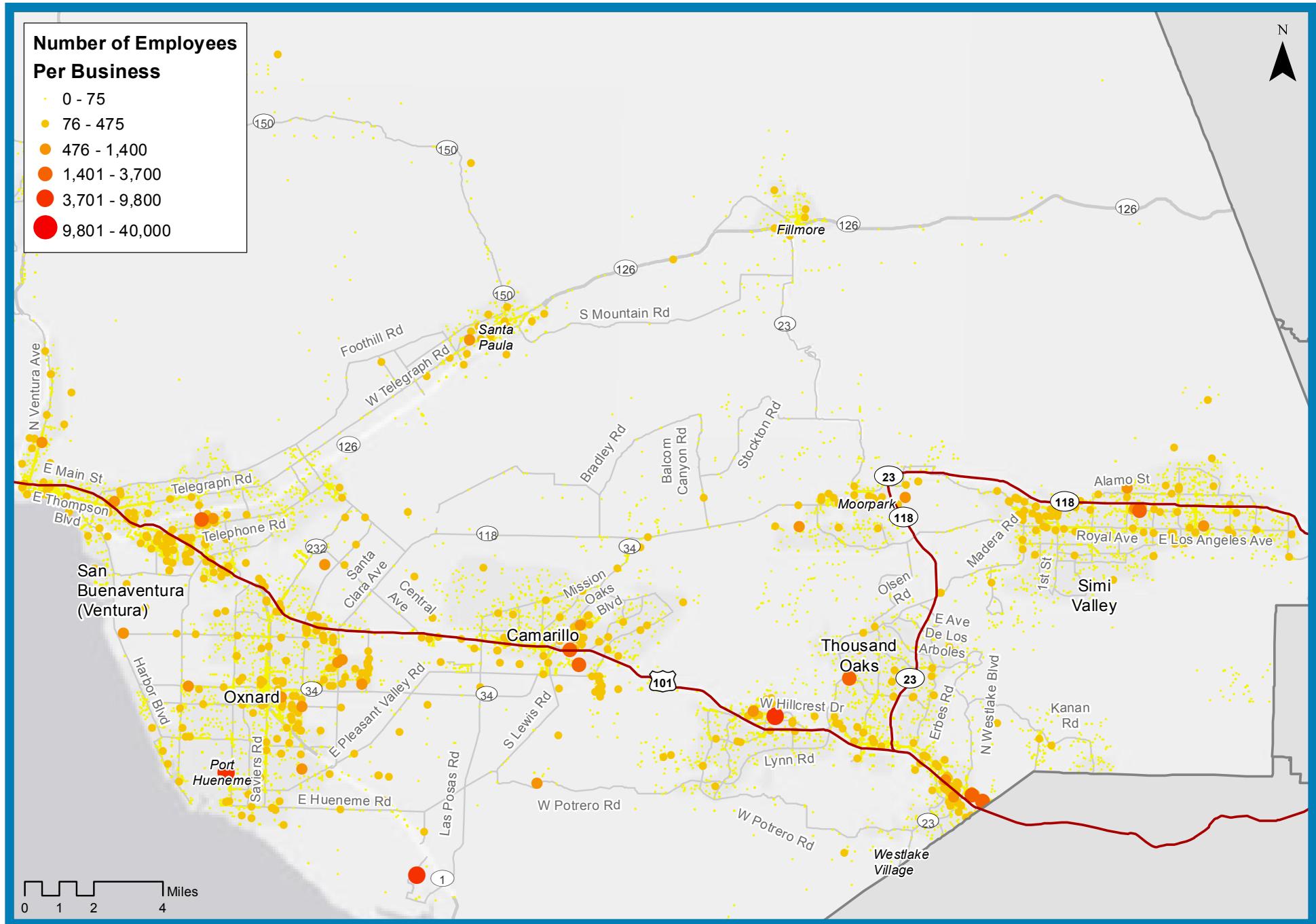
Plug-in Electric Vehicle Registrations



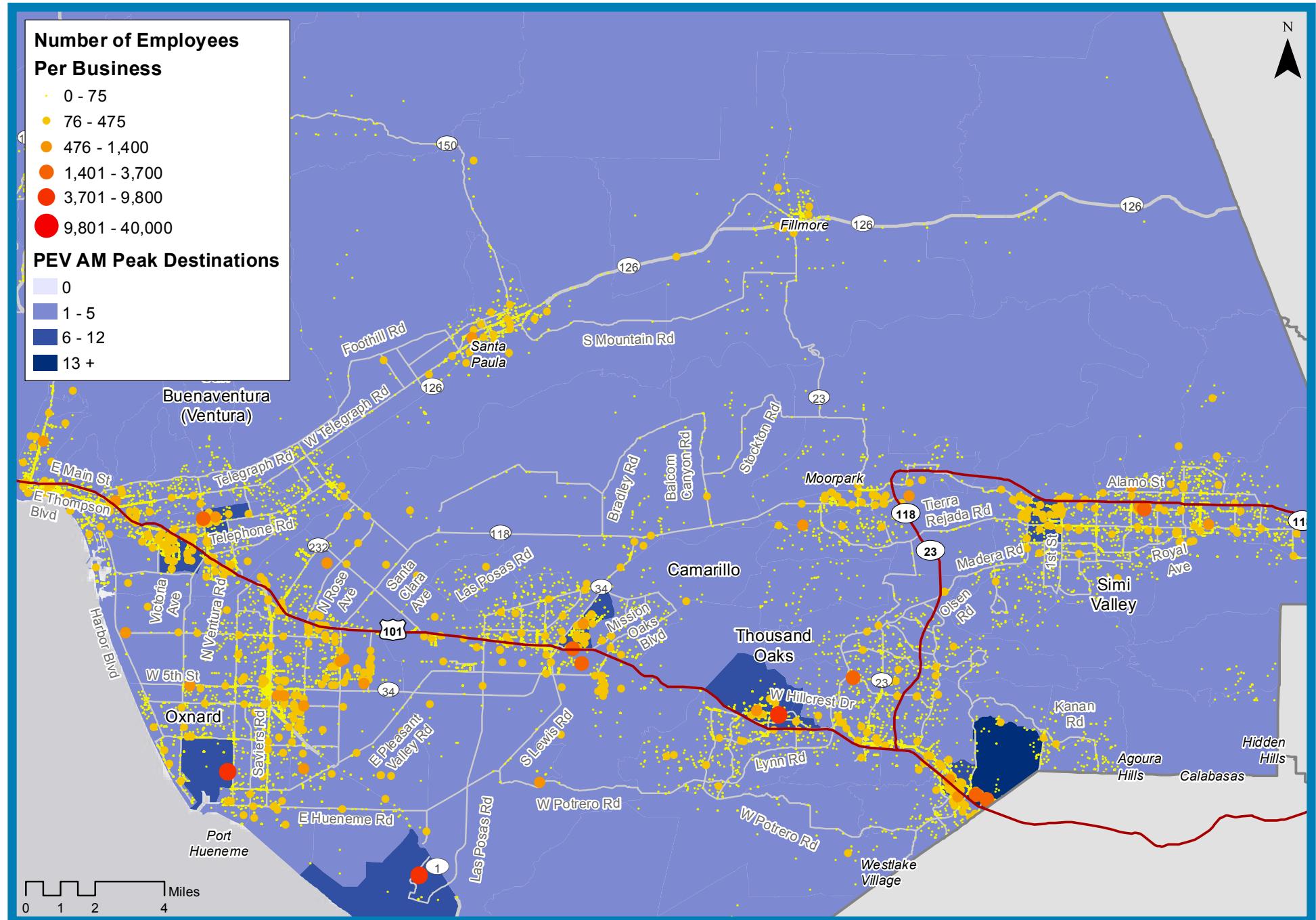
Plug-in Electric Vehicle Morning Peak Destinations



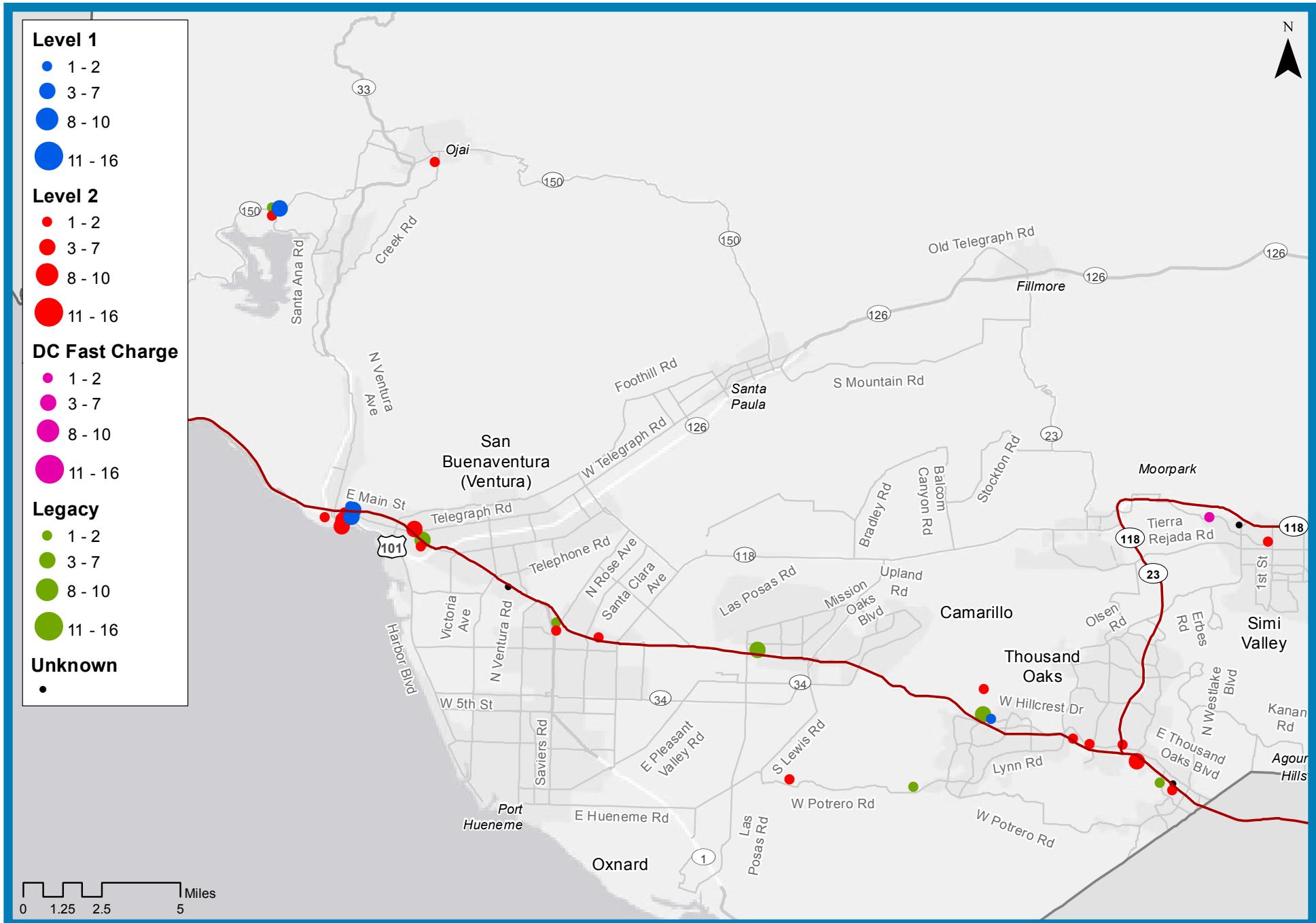
Workplaces by Number of Employees



PEV Morning Peak Destinations and Workplaces



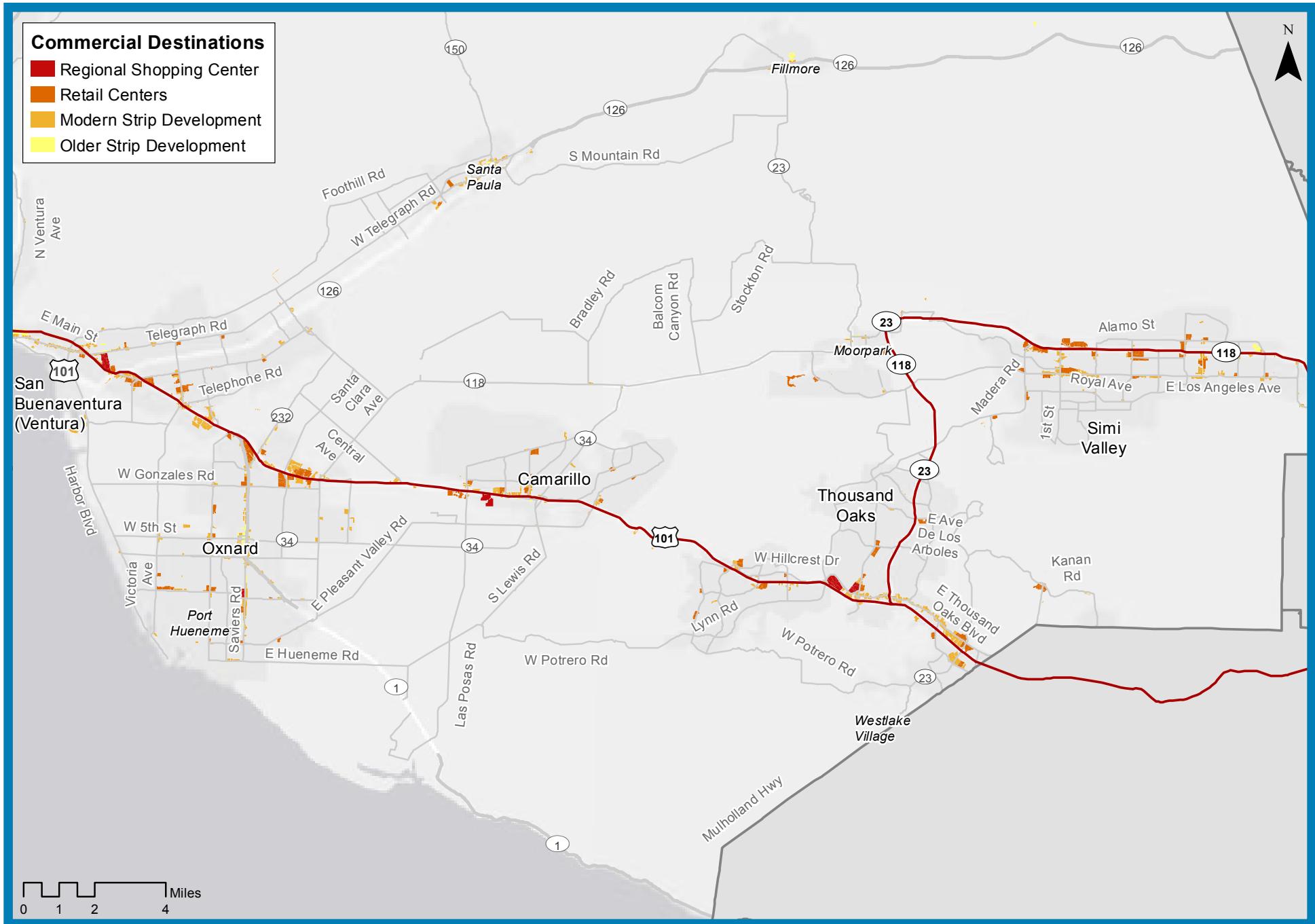
Publicly-Accessible Charging Stations (Summer/Fall 2012)



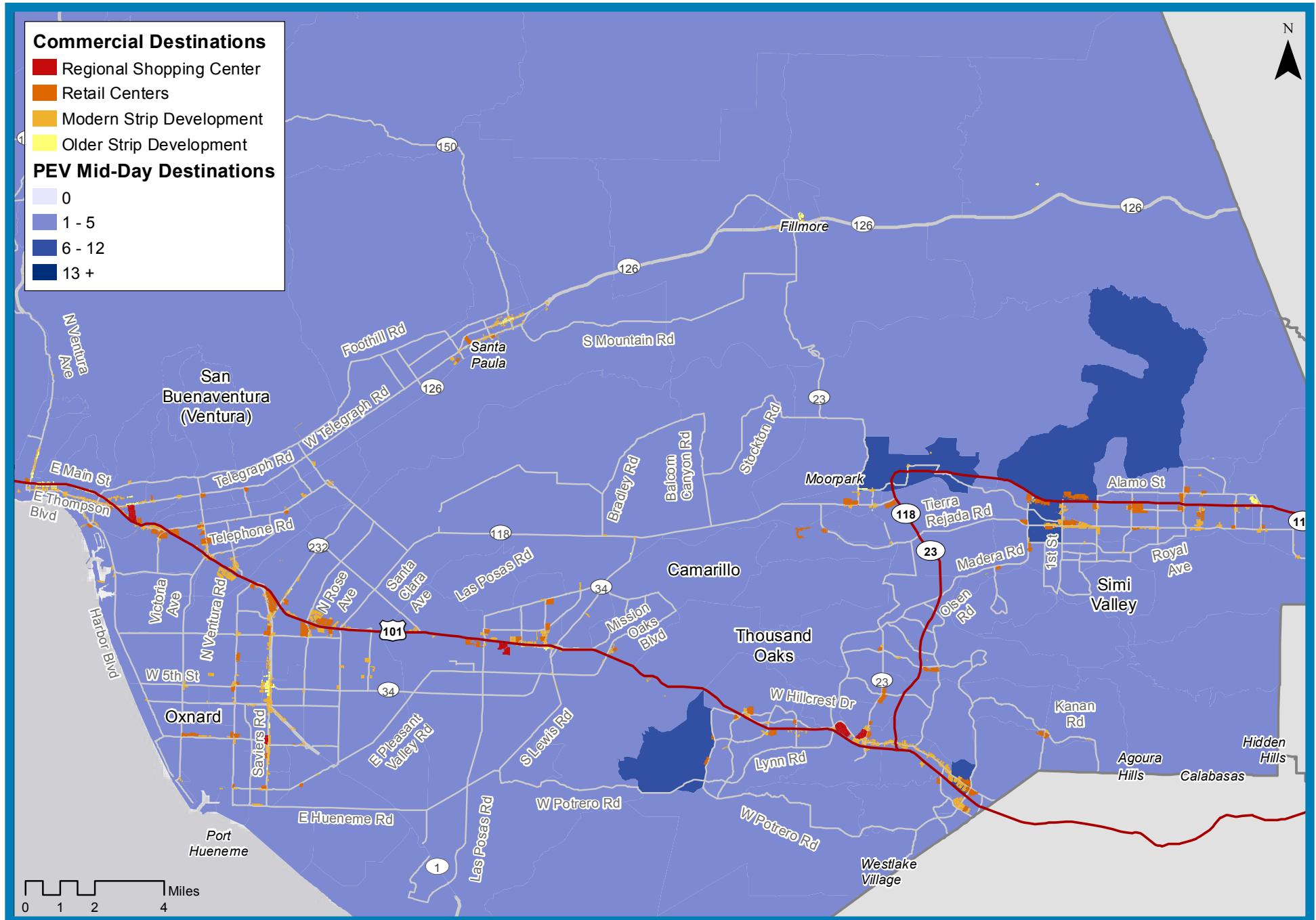
Multi-Unit Residential



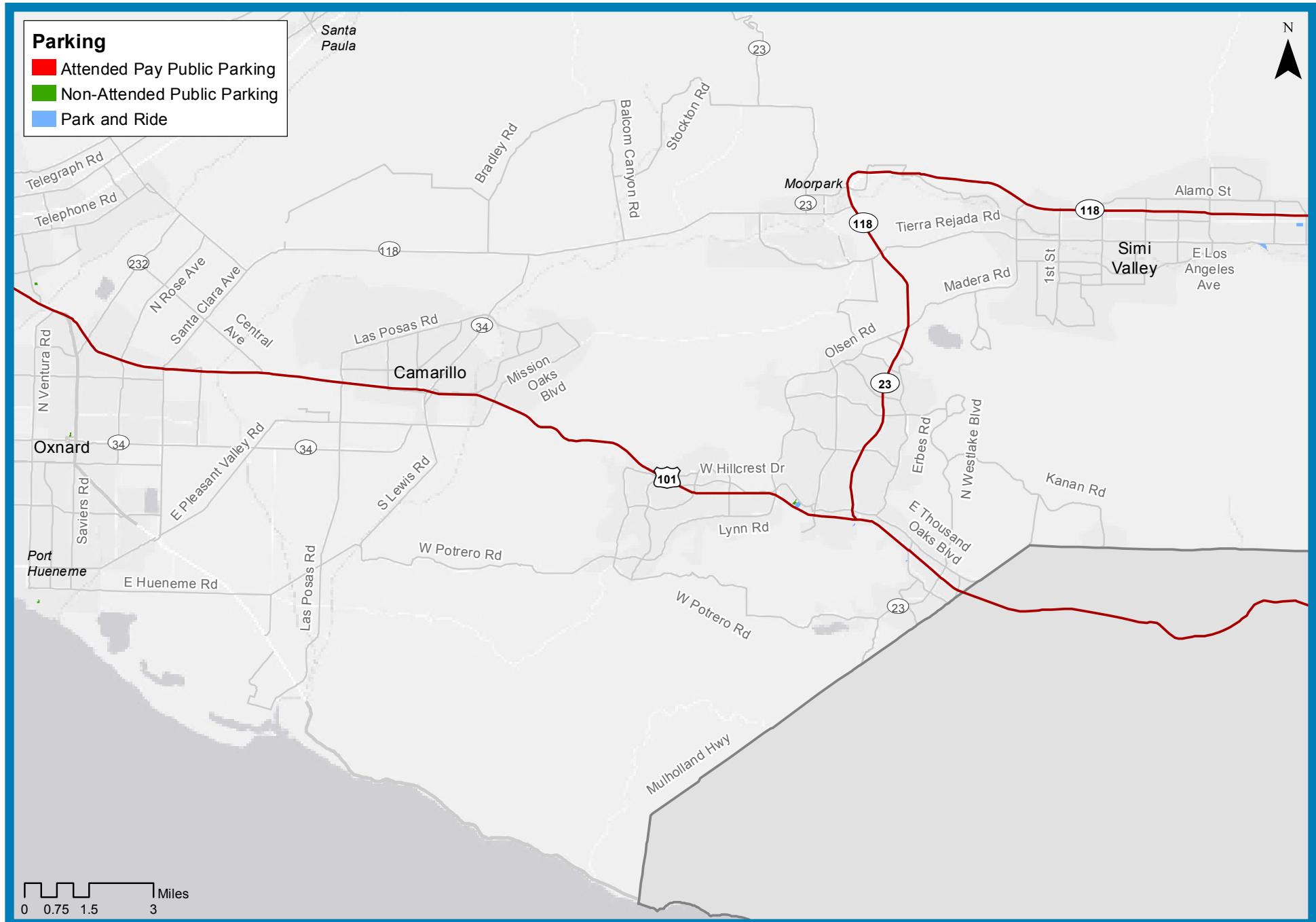
Commercial (Retail) Destinations



PEV Mid-Day Destinations and Commercial (Retail) Locations



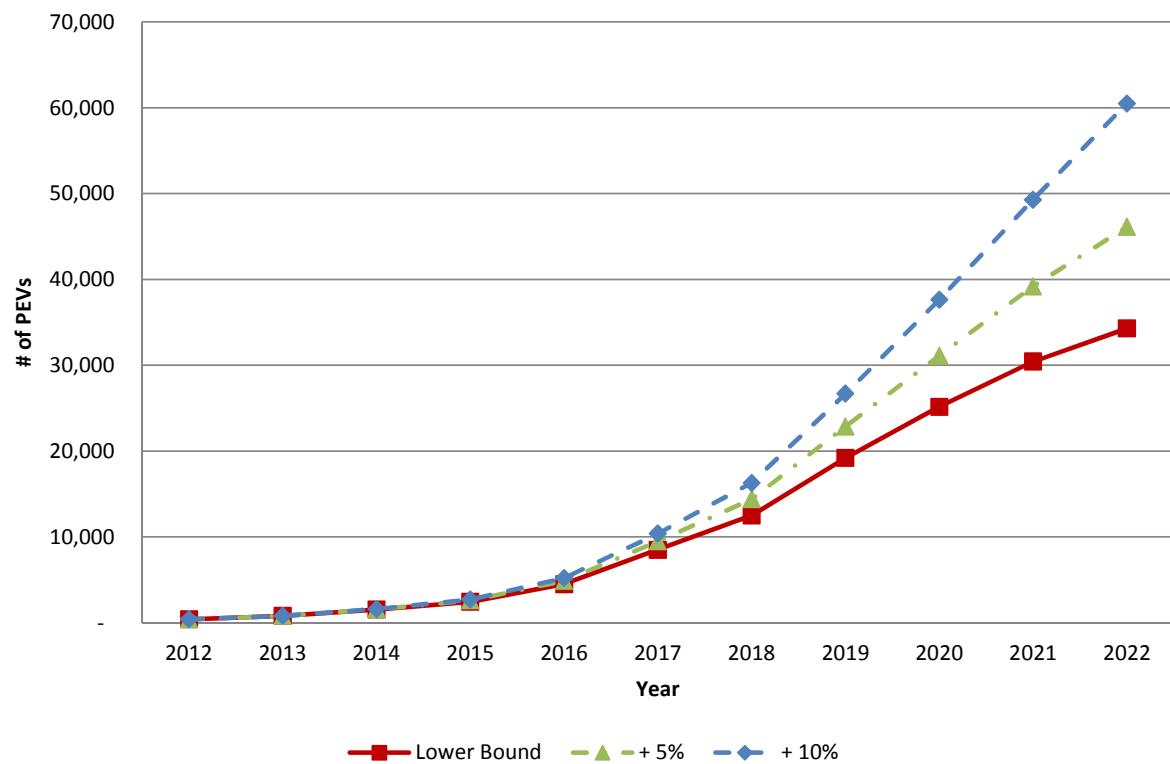
Stand-alone Parking Facilities



WESTERN RIVERSIDE COUNCIL OF GOVERNMENTS

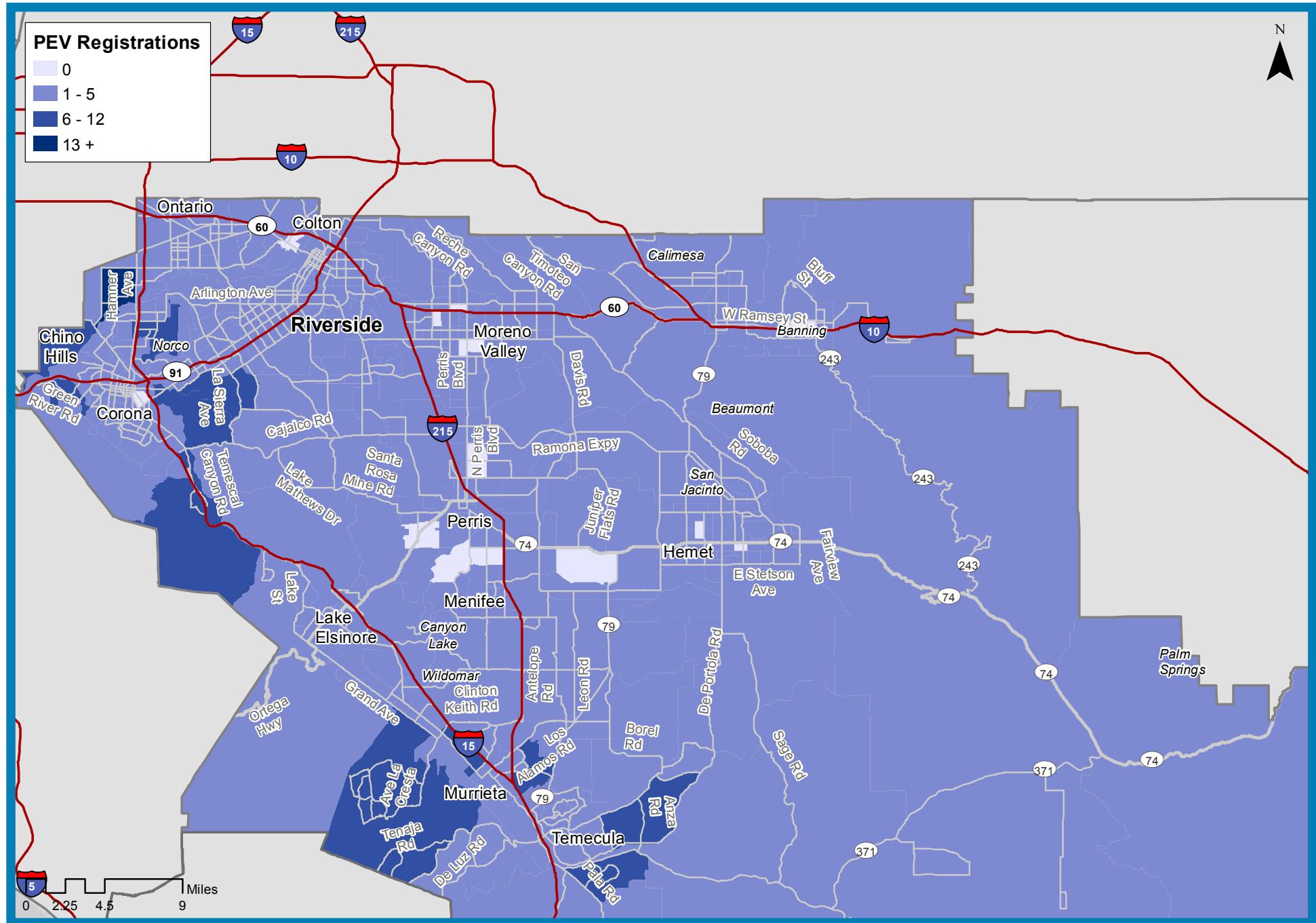
PEV Growth

Year	Cumulative PEV registrations*		
	Lower Bound	+ 5%	+ 10%
2012	398	398	398
2013	796	796	796
2014	1,537	1,577	1,592
2015	2,446	2,589	2,693
2016	4,488	4,878	5,209
2017	8,500	9,484	10,387
2018	12,480	14,398	16,290
2019	19,192	22,860	26,678
2020	25,154	31,106	37,635
2021	30,423	39,177	49,281
2022	34,290	46,115	60,473

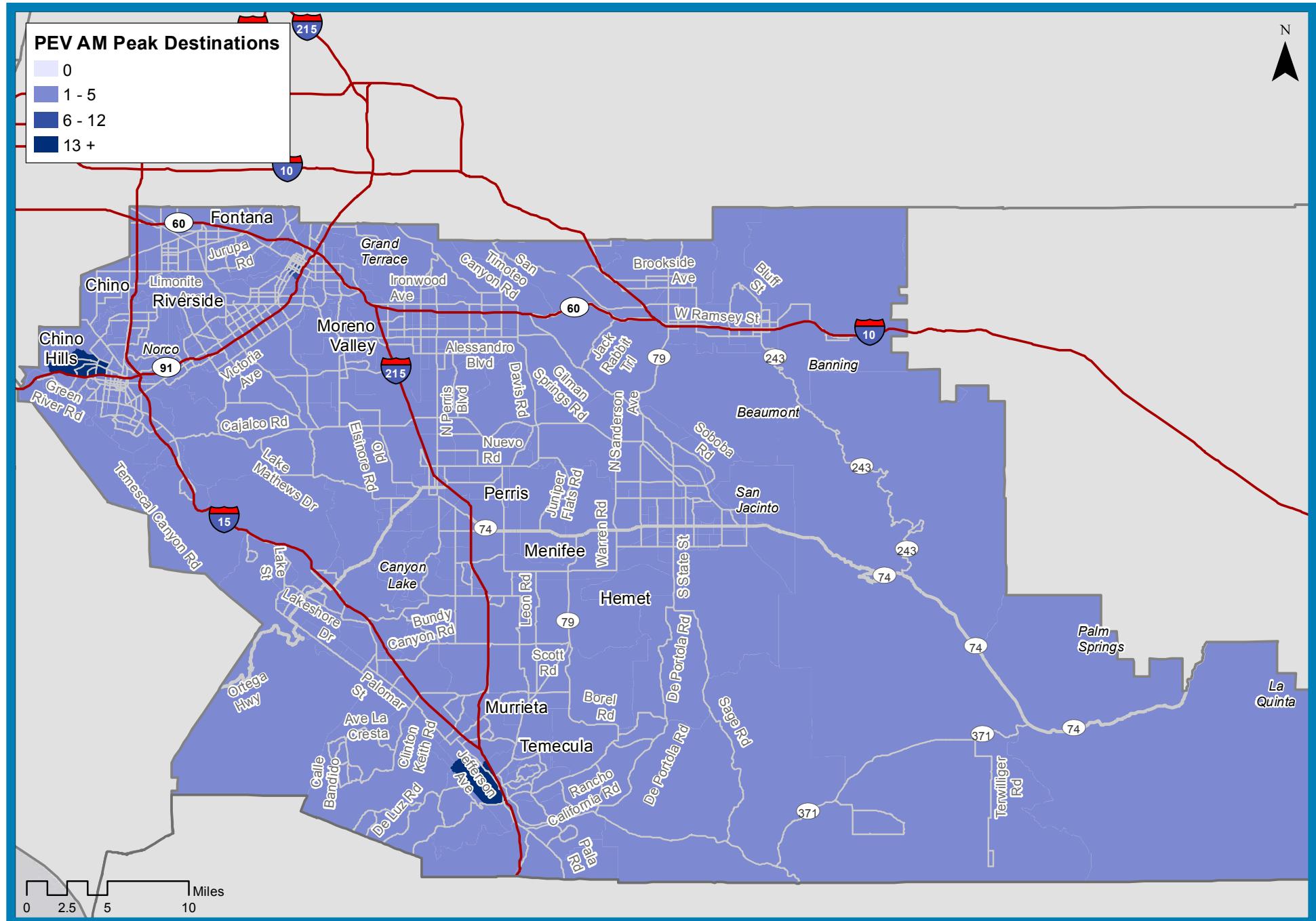


* The +5% and +10% projections begin in 2014, when uncertainty becomes greater.

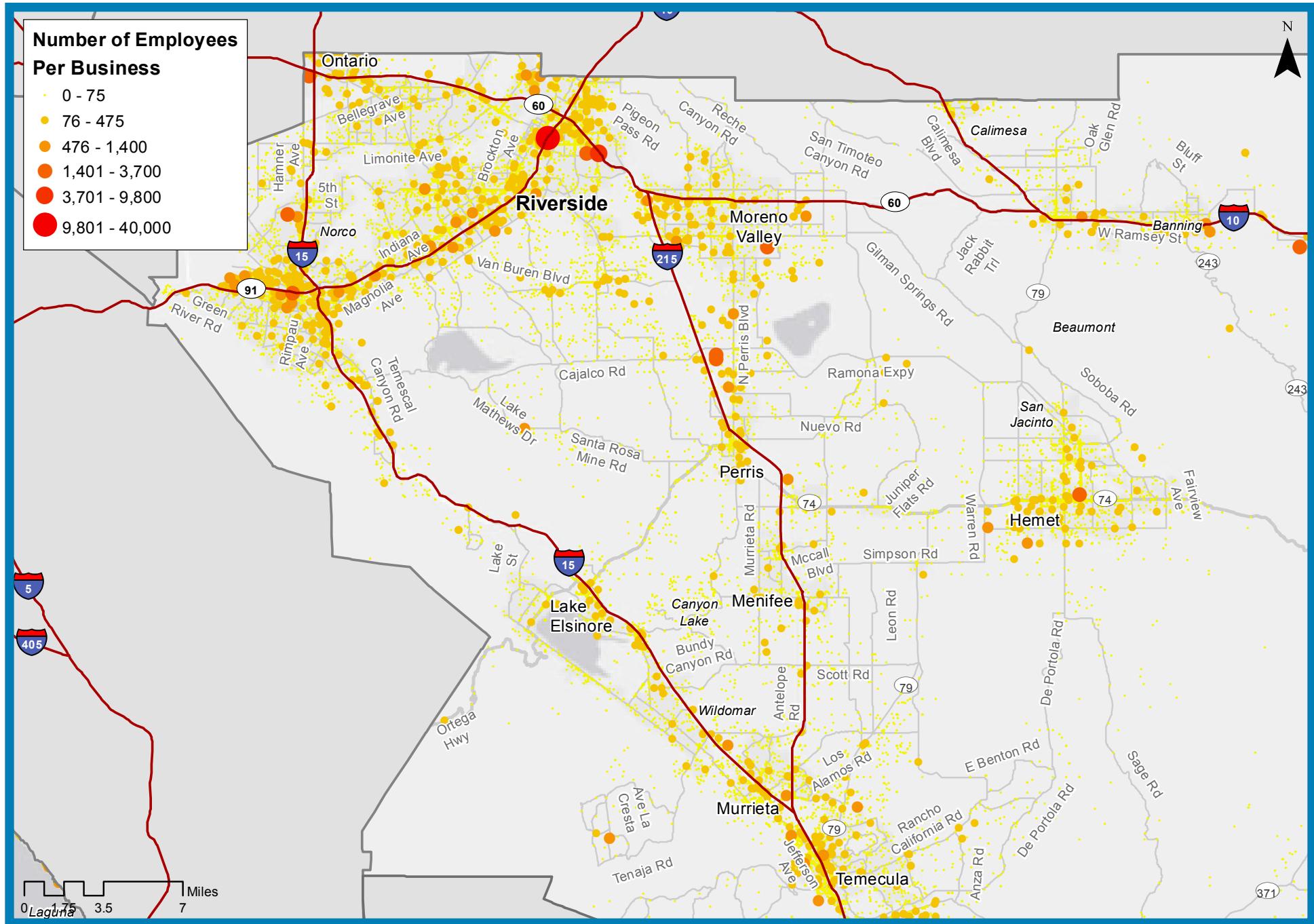
Plug-in Electric Vehicle Registrations



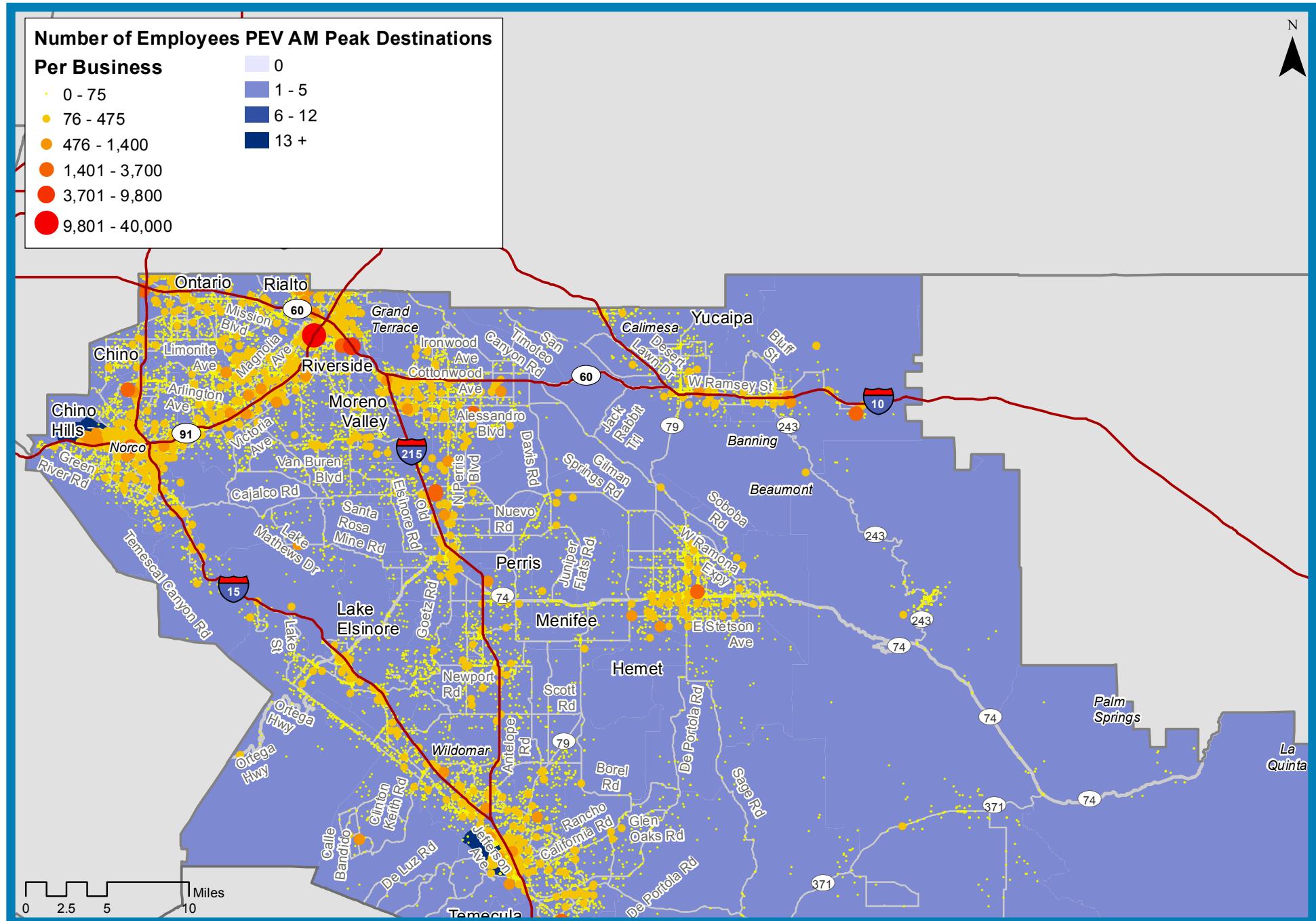
Plug-in Electric Vehicle Morning Peak Destinations



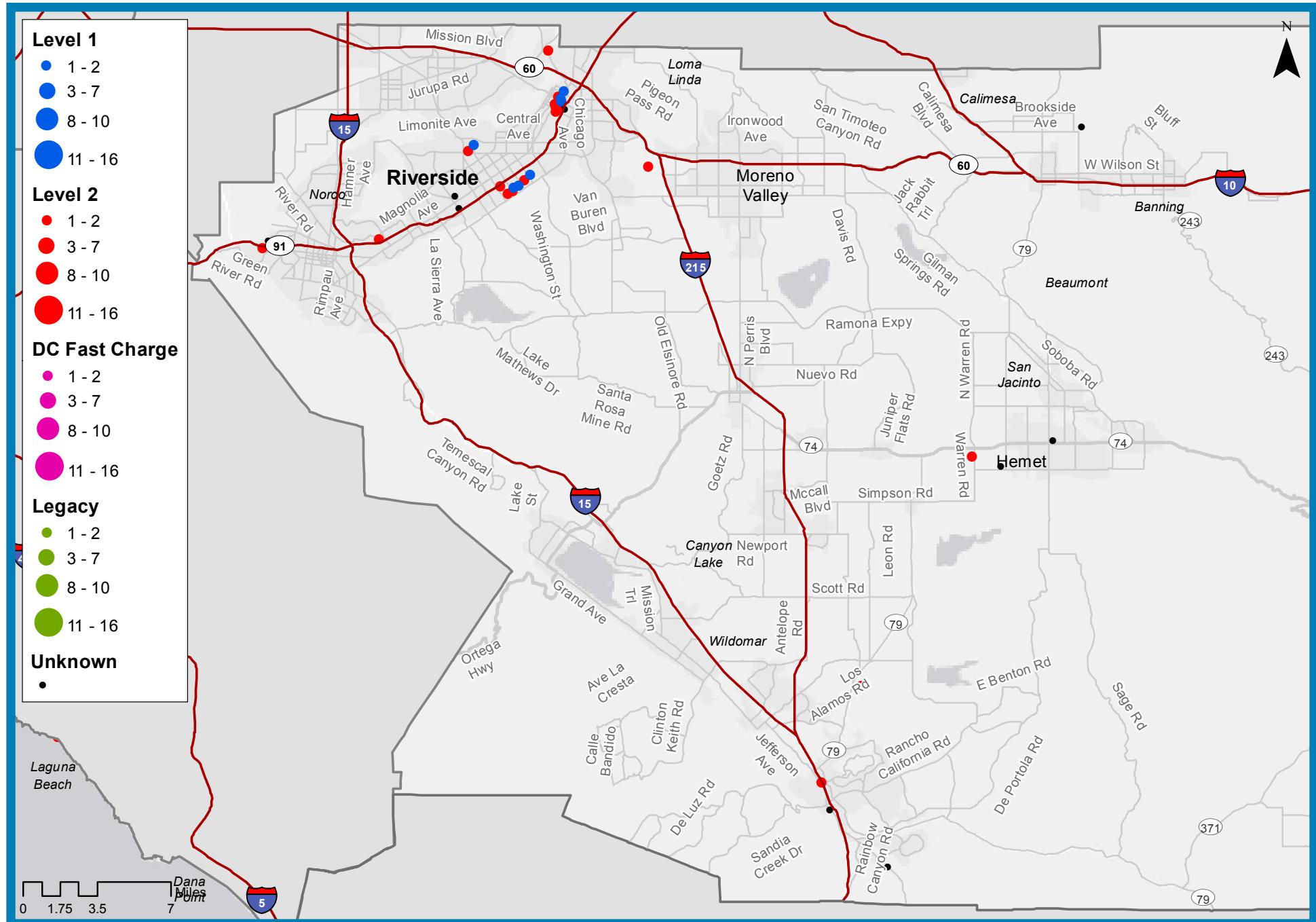
Workplaces by Number of Employees



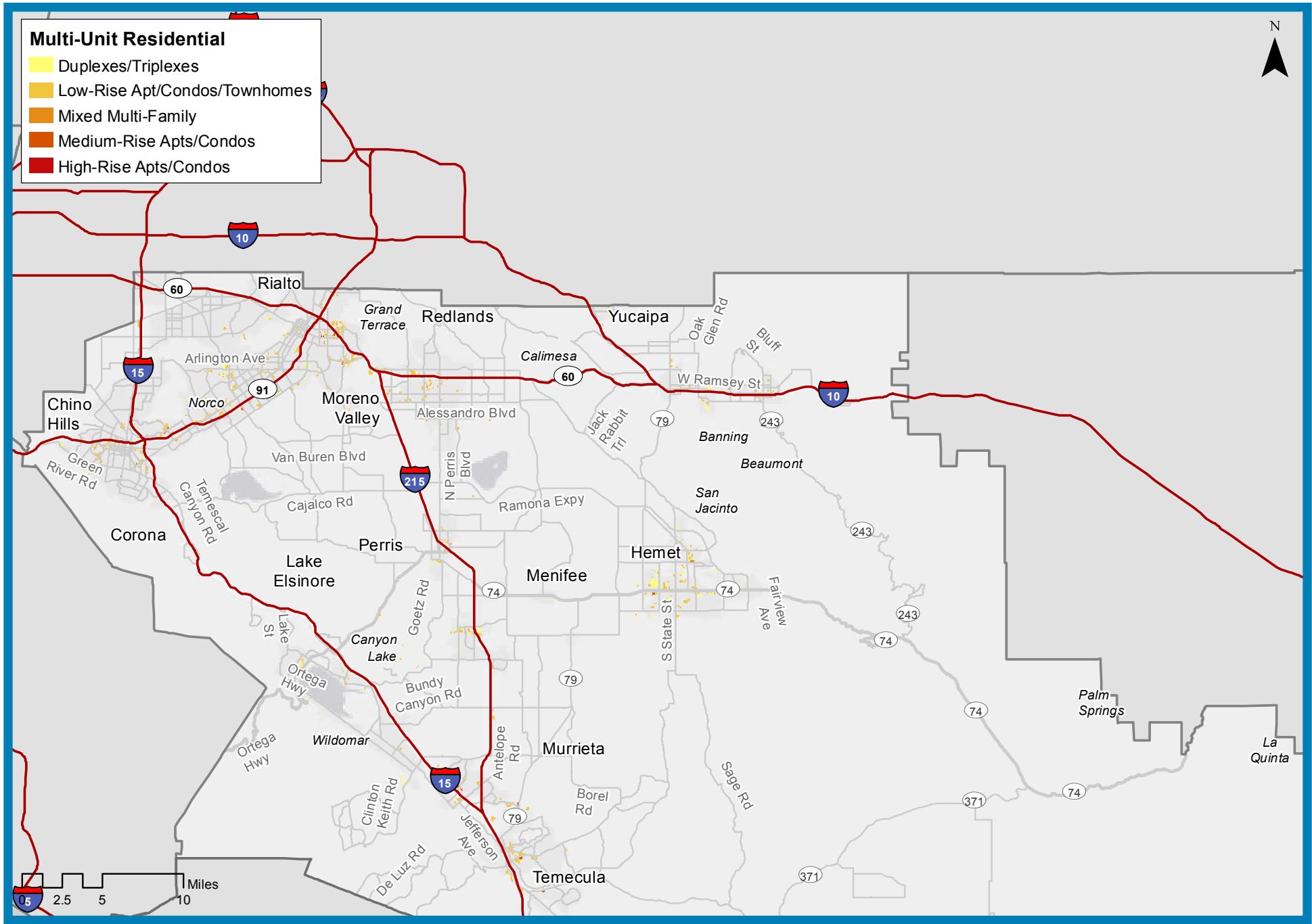
PEV Morning Peak Destinations and Workplaces



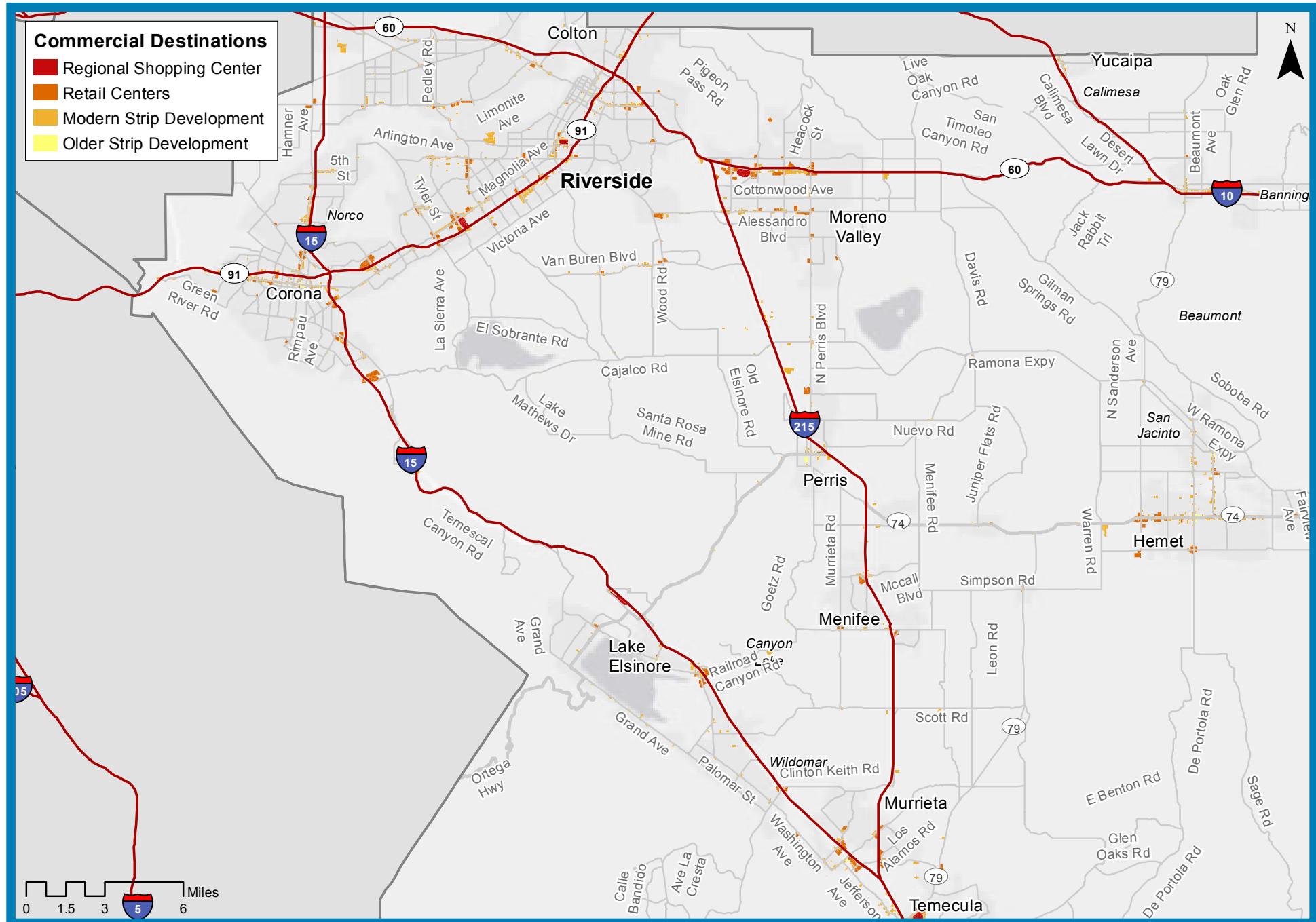
Publicly-Accessible Charging Stations (Summer/Fall 2012)



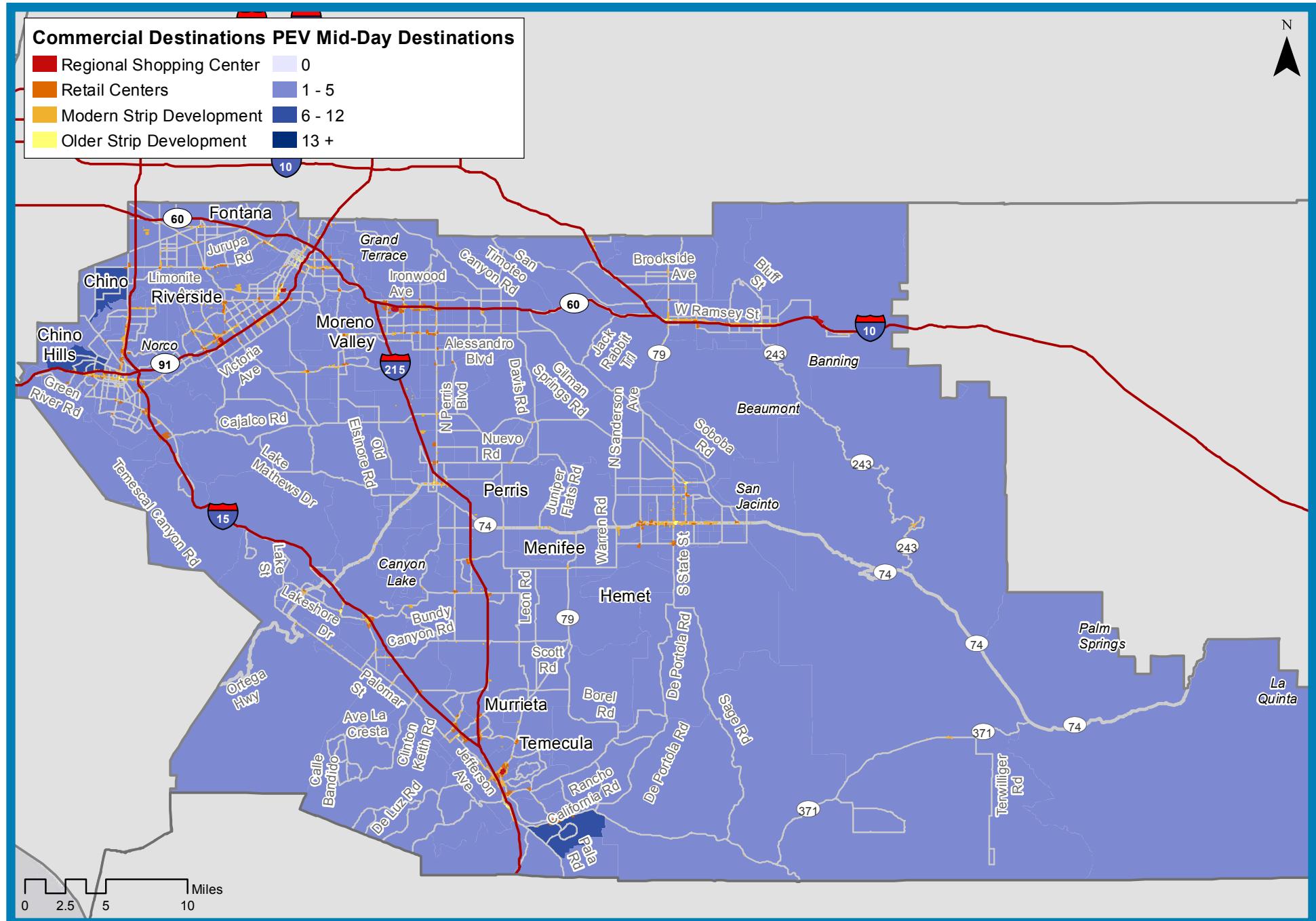
Multi-Unit Residential



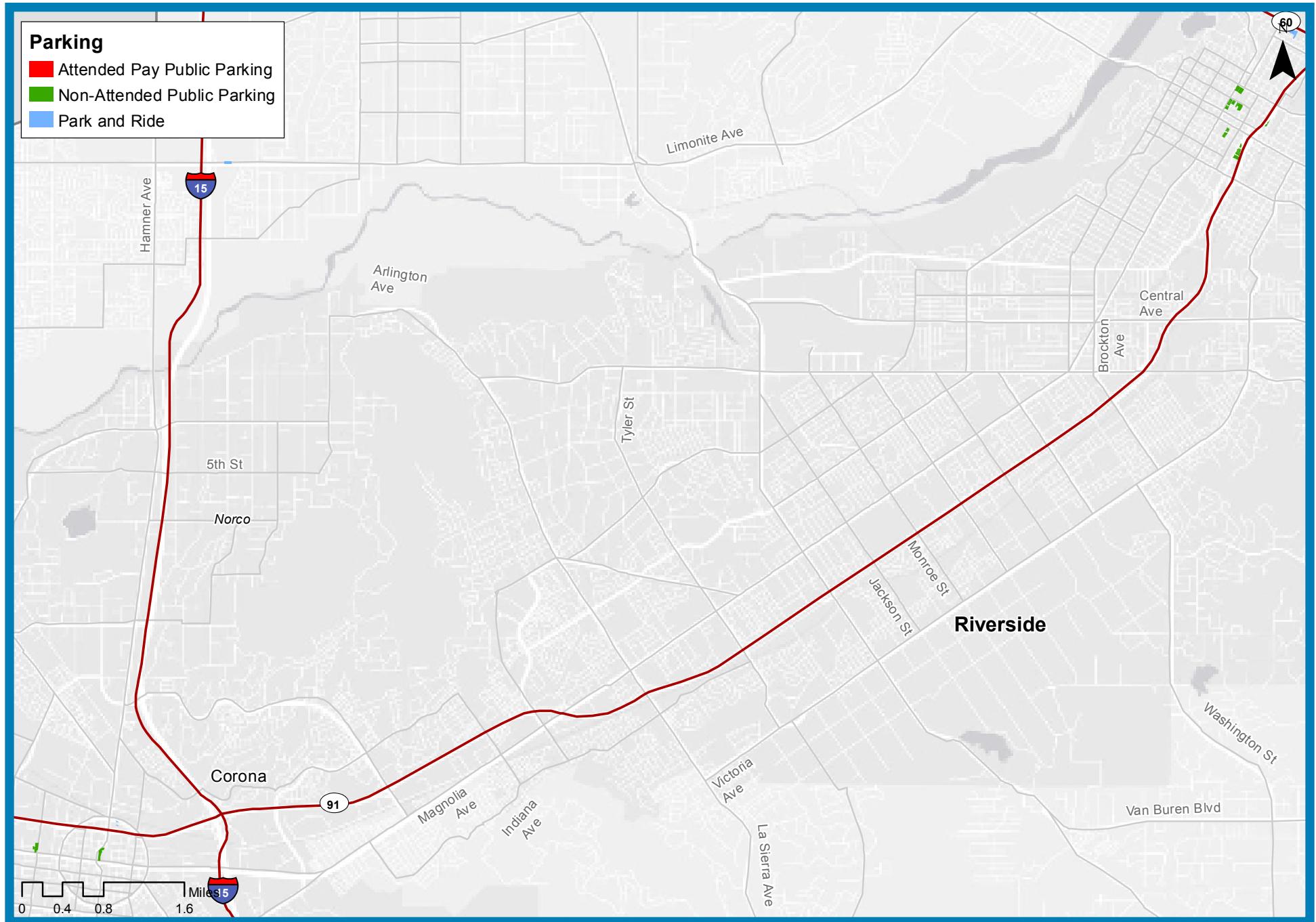
Commercial (Retail) Destinations



PEV Mid-Day Destinations and Commercial (Retail) Locations



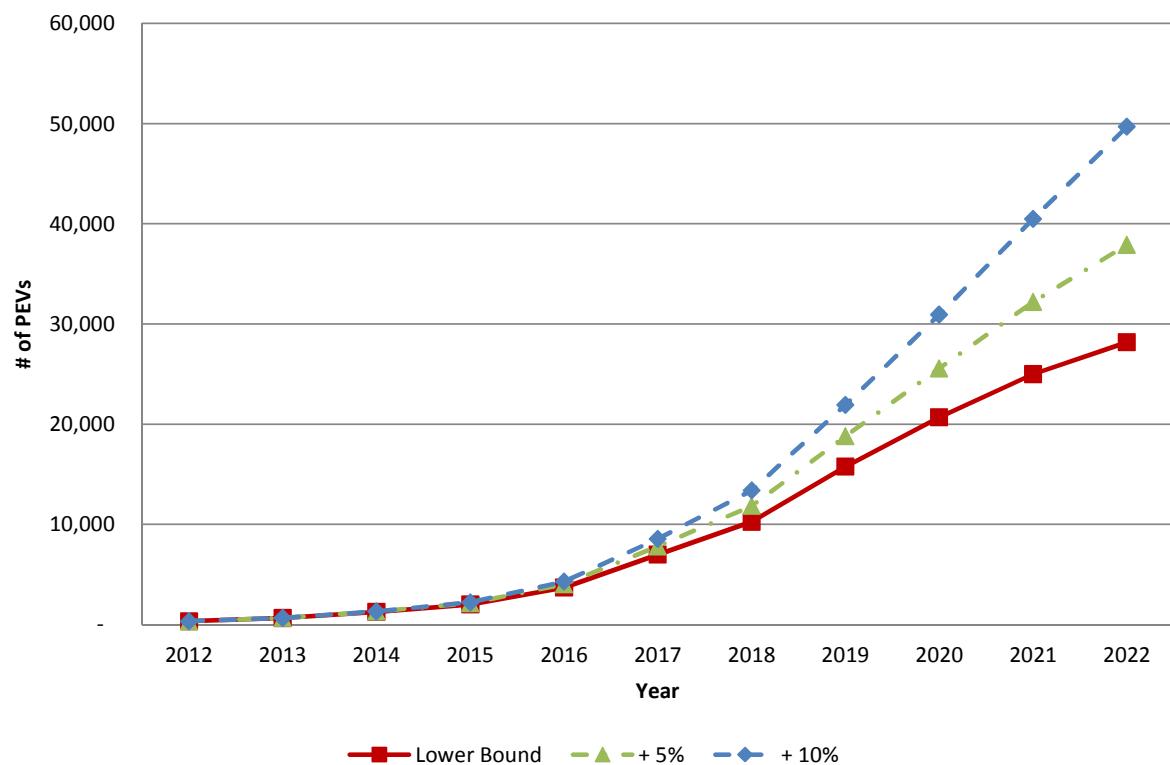
Stand-alone Parking Facilities



WESTSIDE CITIES COUNCIL OF GOVERNMENTS

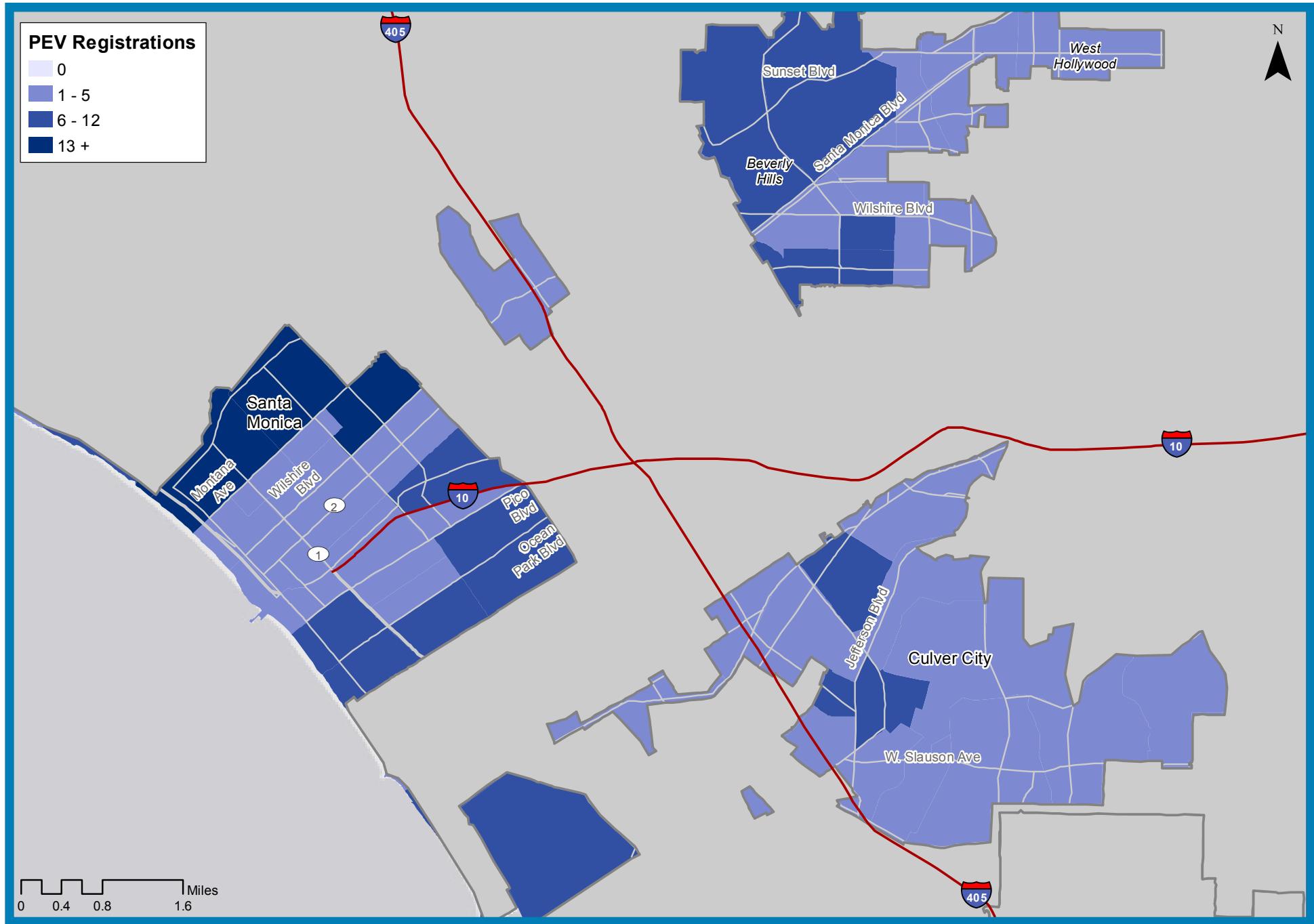
PEV Growth

Year	Cumulative PEV registrations*		
	Lower Bound	+ 5%	+ 10%
2012	327	327	327
2013	654	654	654
2014	1,263	1,296	1,308
2015	2,010	2,127	2,212
2016	3,687	4,008	4,280
2017	6,984	7,792	8,534
2018	10,254	11,830	13,384
2019	15,768	18,782	21,919
2020	20,667	25,557	30,921
2021	24,996	32,188	40,490
2022	28,173	37,888	49,685

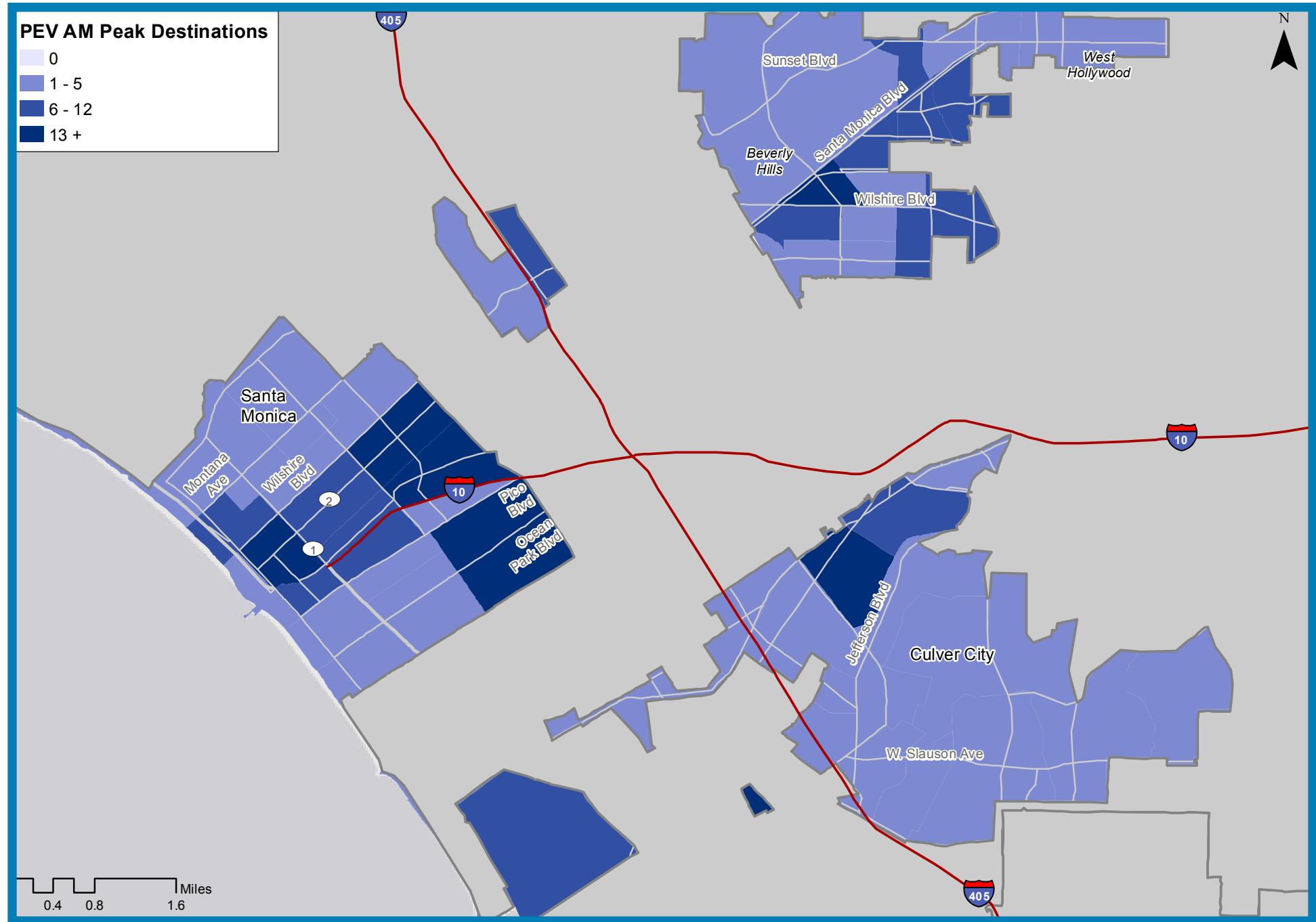


* The +5% and +10% projections begin in 2014, when uncertainty becomes greater.

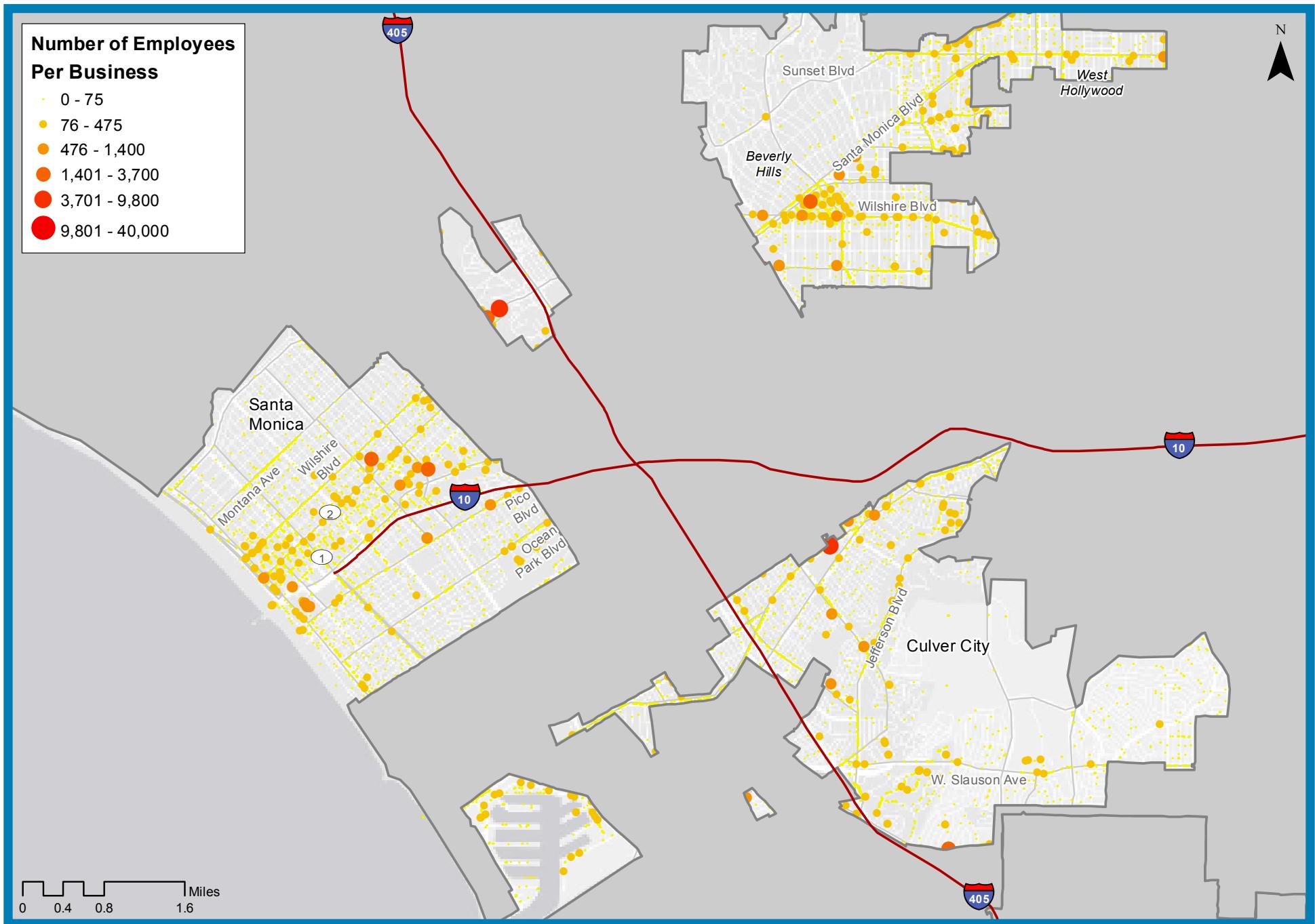
Plug-in Electric Vehicle Registrations



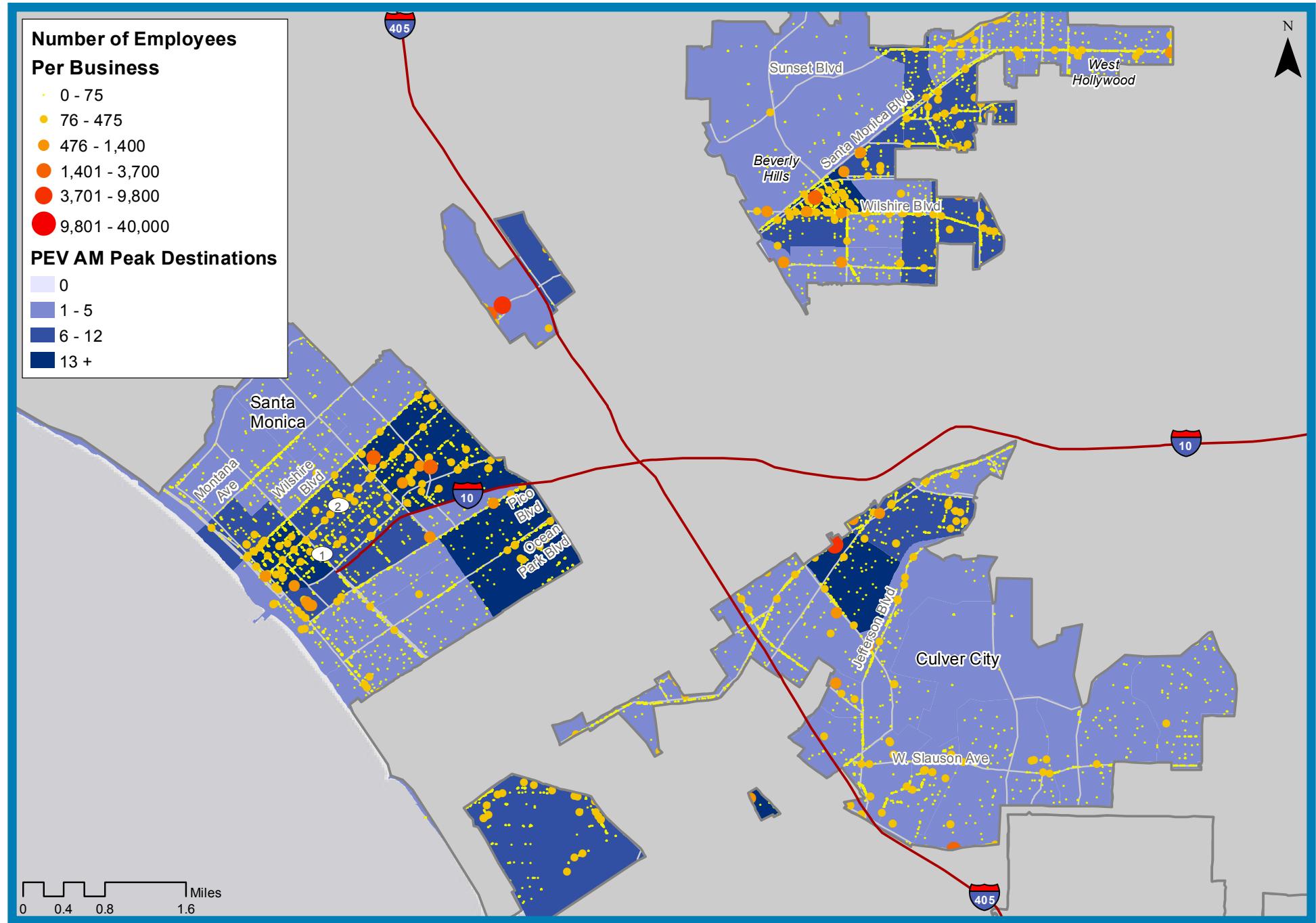
Plug-in Electric Vehicle Morning Peak Destinations



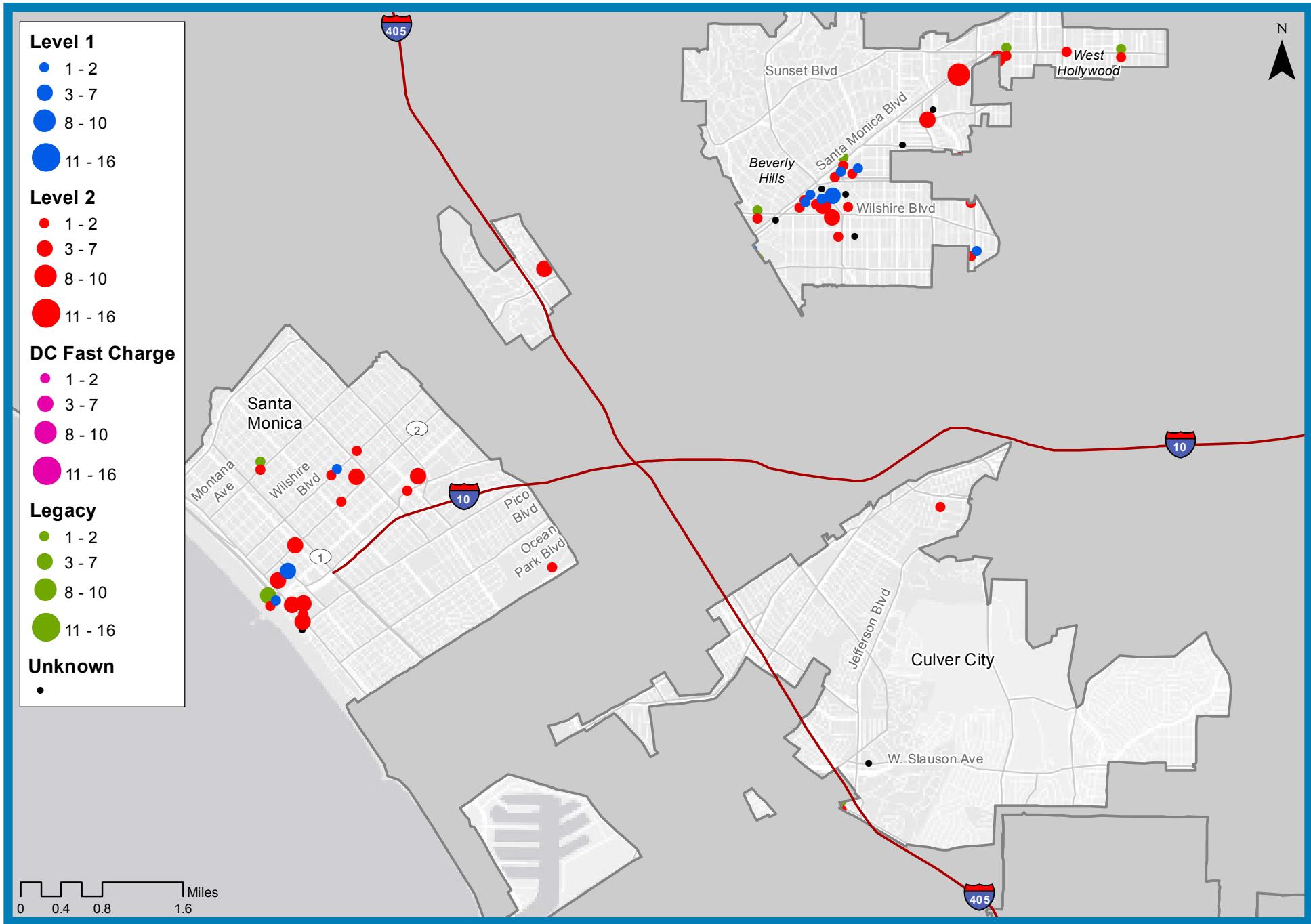
Workplaces by Number of Employees



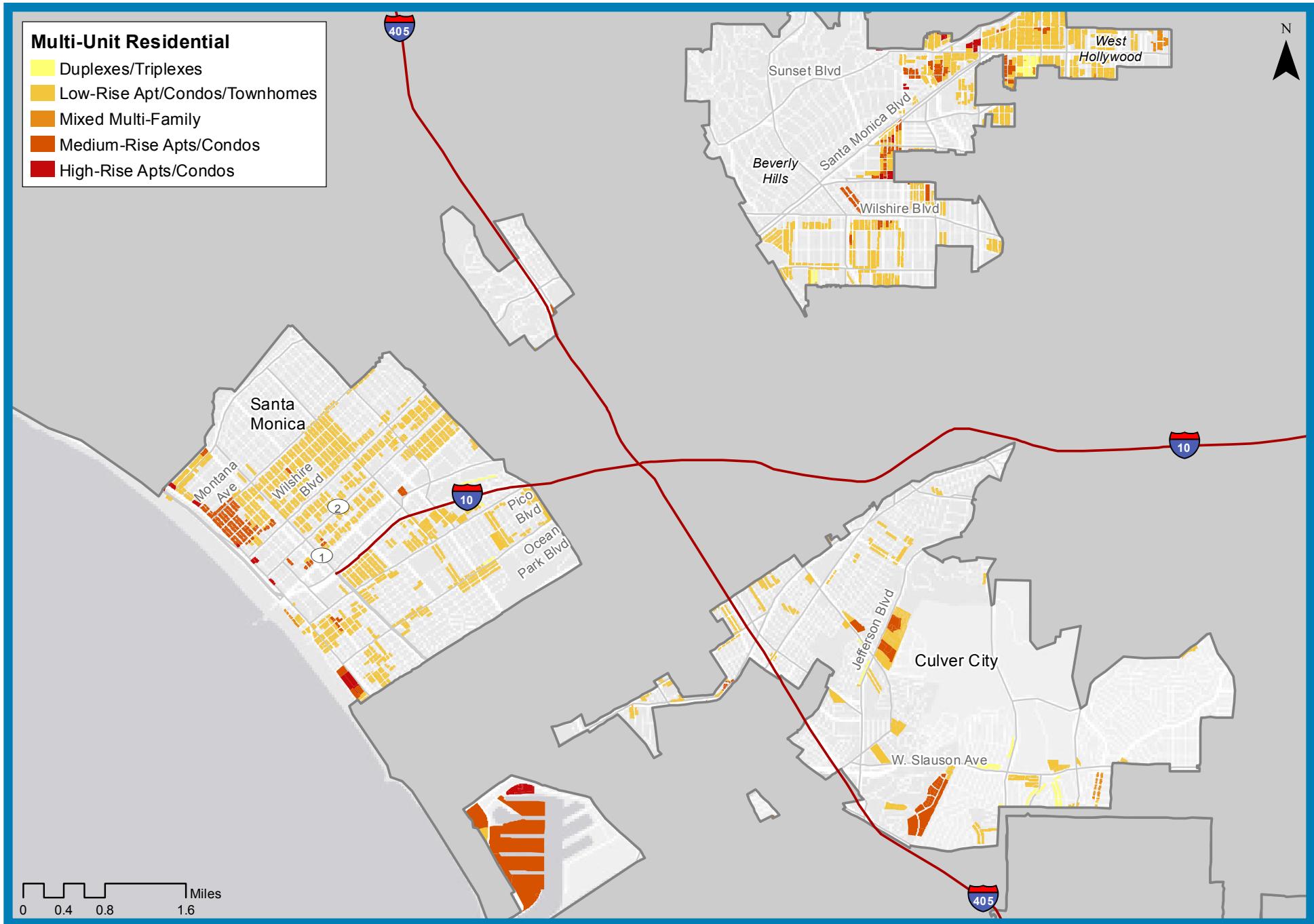
PEV Morning Peak Destinations and Workplaces



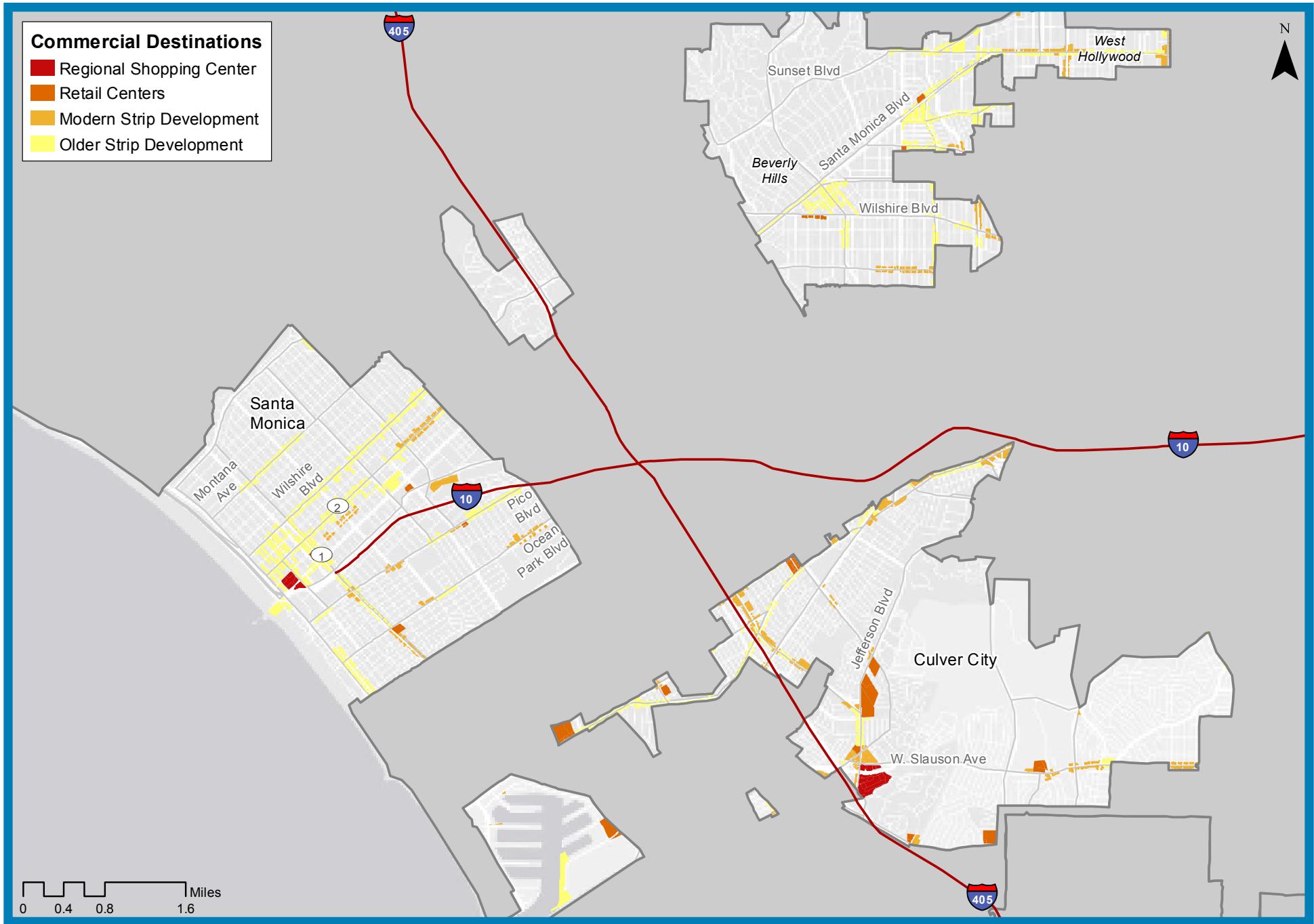
Publicly-Accessible Charging Stations (Summer/Fall 2012)



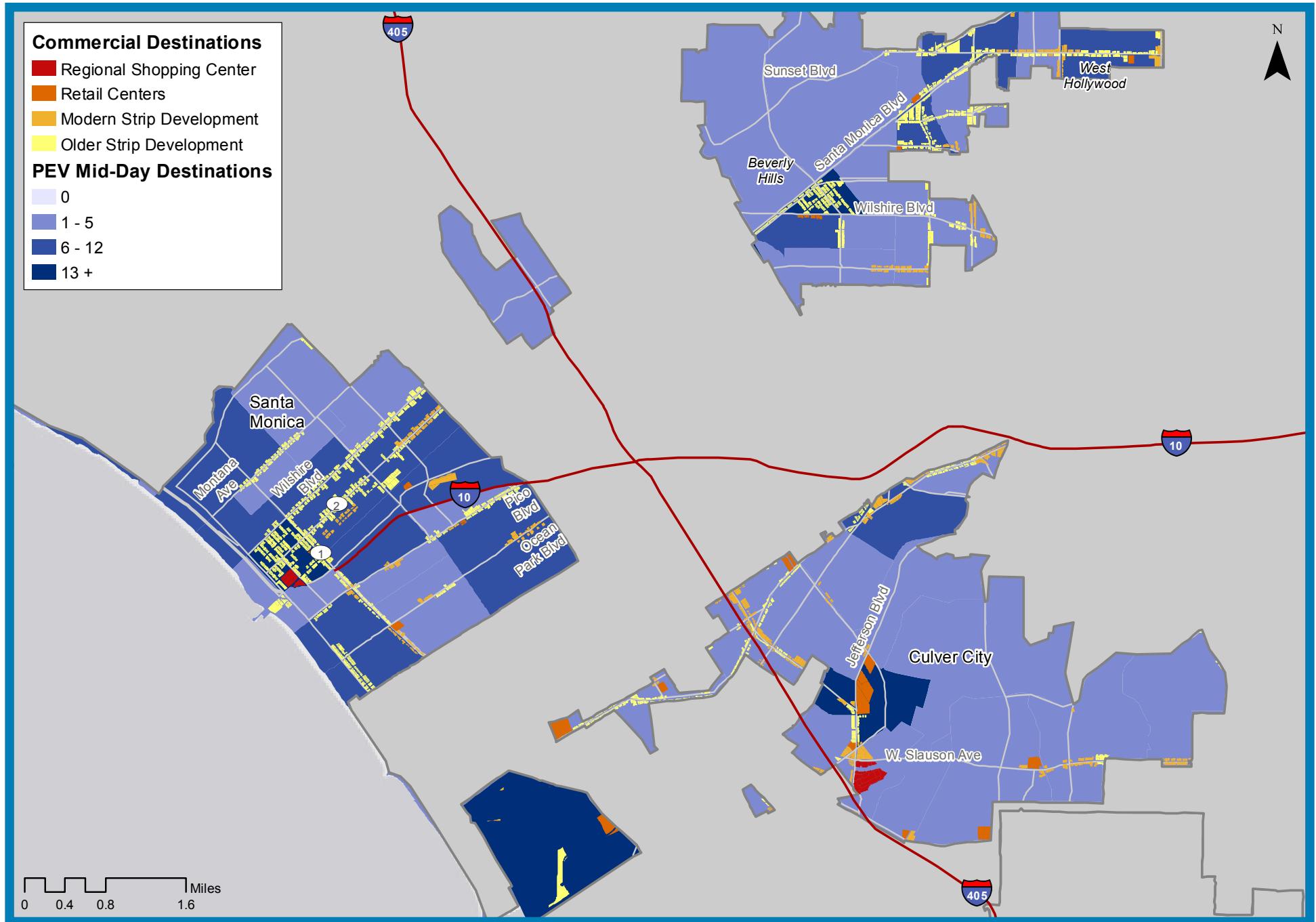
Multi-Unit Residential



Commercial (Retail) Destinations



PEV Mid-Day Destinations and Commercial (Retail) Destinations



Stand-alone Parking Facilities



UTILITIES COMBINED PROJECTION¹

Utility	Number of PEVs in utility territory	% share	2017			2022		
			Lower Bound	+ 5%	+ 10%	Lower Bound	+ 5%	+ 10%
Azusa Light and Water	8	<1%	171	191	209	689	927	1,216
Burbank Water and Power	59	1%	1,260	1,406	1,540	5,083	6,836	8,965
Cerritos Electric Utility	53	1%	1,132	1,263	1,383	4,566	6,141	8,053
City of Colton Public Utilities	1	<1%	21	24	26	86	116	152
Glendale Water and Power	103	1%	2,200	2,454	2,688	8,874	11,934	15,650
Pasadena Water and Power	119	1%	2,542	2,836	3,106	10,253	13,788	18,081
Vernon Light and Power	1	<1%	21	24	26	86	116	152
Anaheim Public Utilities Department	99	1%	2,114	2,359	2,584	8,529	11,471	15,042
City of Banning Electric Utility	1	<1%	21	24	26	86	116	152
Imperial Irrigation District	59	1%	1,260	1,406	1,540	5,083	6,836	8,965
Los Angeles Department of Water and Power	1,809	22%	38,636	43,105	47,213	155,856	209,603	274,864
Riverside Public Utilities	65	1%	1,388	1,549	1,696	5,600	7,531	9,876
Southern California Edison	5,650	68%	120,672	134,628	147,459	486,781	654,647	858,475
Anza Electric Cooperative	2	<1%	43	48	52	172	232	304
Moreno Valley Electric Utility	5	<1%	107	119	130	431	579	760
Rancho Cucamonga Municipal Utility	9	<1%	192	214	235	775	1,043	1,367
San Diego Gas and Electric ²	278	3%	5,937	6,624	7,256	23,951	32,211	42,240
TOTAL	8,321	100%	177,717	198,274	217,169	716,901	964,127	1,264,314

¹ Utilities not represented by the Southern California Public Power Authority and that have less than 2 PEVs attributable to their service territories have been excluded from this analysis. They are Bear Valley Electrical Service, Corona Water and Power, City of Needles, and Victorville Municipal Utility Services.

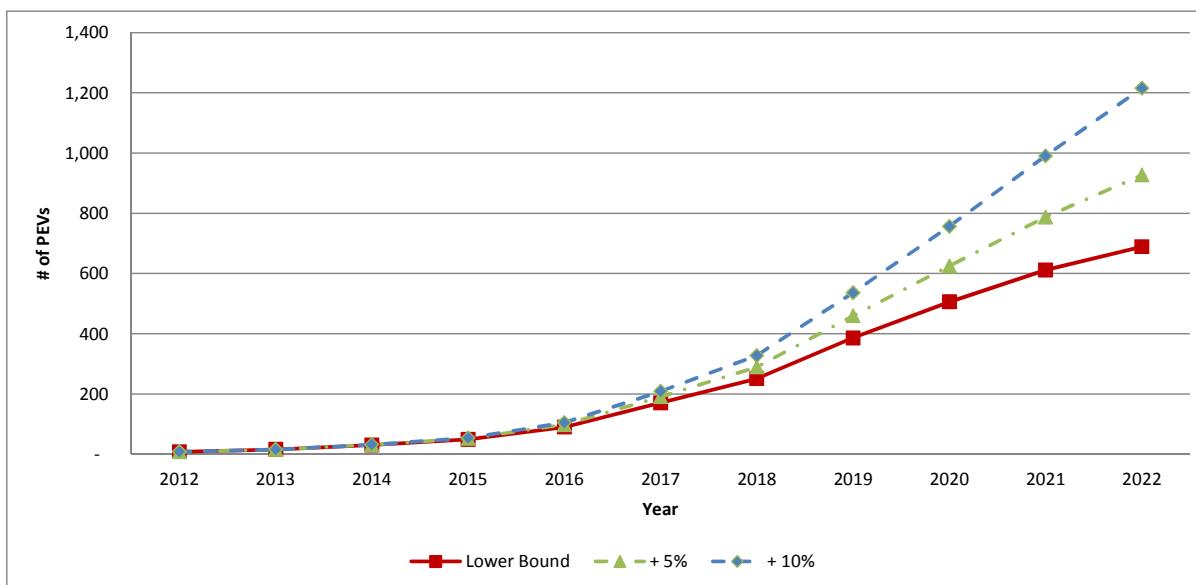
² Portion within SCAG

AZUSA LIGHT AND WATER

Predicted Cumulative Sales

Year	Number of PEVs*			Total Number of Electric Miles		
	Lower Bound	+ 5%	+ 10%	Lower Bound	+ 5%	+ 10%
2012	8	8	8	58,400	58,400	58,400
2013	16	16	16	116,800	116,800	116,800
2014	31	32	32	225,563	231,403	233,600
2015	49	52	54	358,972	379,837	395,122
2016	90	98	105	658,473	715,737	764,297
2017	171	191	209	1,247,295	1,391,552	1,524,178
2018	251	289	327	1,831,295	2,112,673	2,390,236
2019	386	460	536	2,816,059	3,354,378	3,914,588
2020	506	625	756	3,690,987	4,564,278	5,522,280
2021	612	787	991	4,464,117	5,748,545	7,231,228
2022	689	927	1,216	5,031,508	6,766,614	8,873,443

* The +5% and +10% projections begin in 2014, when uncertainty becomes greater.

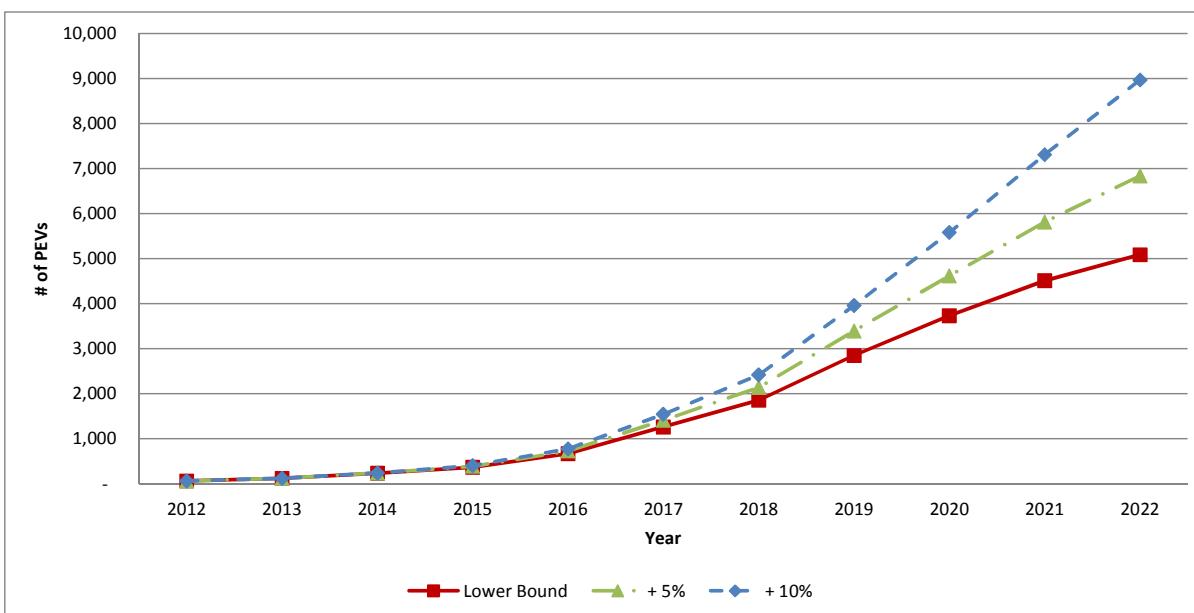


BURBANK WATER AND POWER

Predicted Cumulative Sales

Year	Number of PEVs*			Total Number of Electric Miles		
	Lower Bound	+ 5%	+ 10%	Lower Bound	+ 5%	+ 10%
2012	59	59	59	430,700	430,700	430,700
2013	118	118	118	861,400	861,400	861,400
2014	228	234	236	1,663,529	1,706,599	1,722,800
2015	363	384	399	2,647,422	2,801,296	2,914,028
2016	665	723	772	4,856,241	5,278,561	5,636,687
2017	1,260	1,406	1,540	9,198,804	10,262,699	11,240,811
2018	1,850	2,134	2,415	13,505,804	15,580,964	17,627,987
2019	2,845	3,389	3,955	20,768,433	24,738,541	28,870,084
2020	3,729	4,611	5,579	27,221,030	33,661,548	40,726,812
2021	4,510	5,808	7,306	32,922,866	42,395,521	53,330,309
2022	5,083	6,836	8,965	37,107,373	49,903,782	65,441,640

* The +5% and +10% projections begin in 2014, when uncertainty becomes greater.

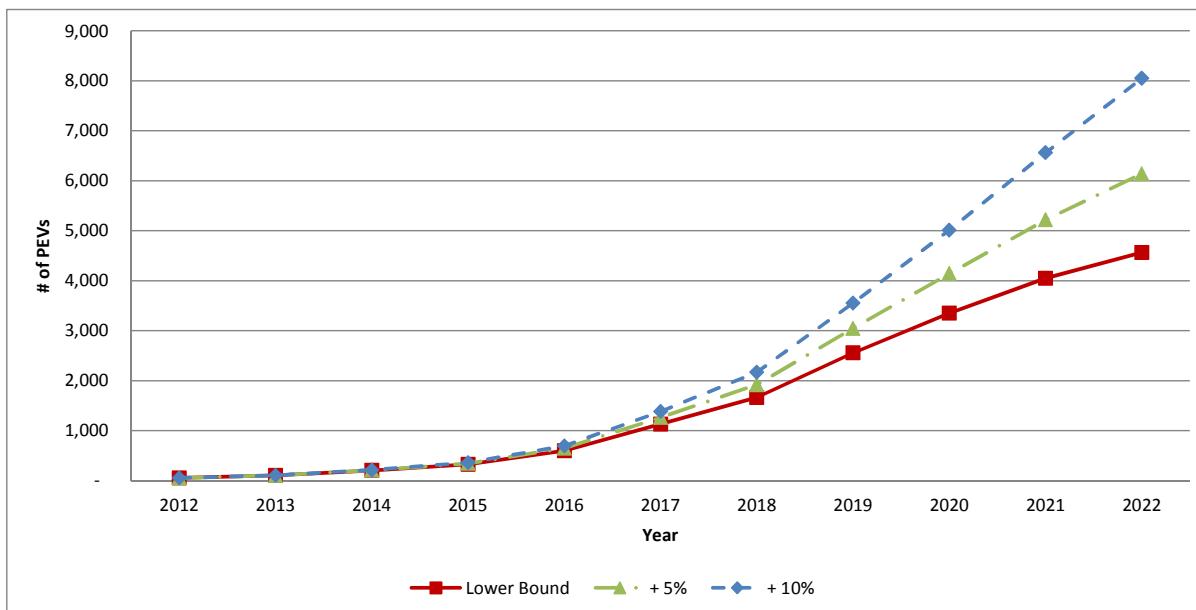


CERRITOS ELECTRIC UTILITY

Predicted Cumulative Sales

Year	Number of PEVs*			Total Number of Electric Miles		
	Lower Bound	+ 5%	+ 10%	Lower Bound	+ 5%	+ 10%
2012	53	53	53	386,900	386,900	386,900
2013	106	106	106	773,800	773,800	773,800
2014	205	210	212	1,494,357	1,533,047	1,547,600
2015	326	345	359	2,378,193	2,516,418	2,617,686
2016	598	650	694	4,362,386	4,741,758	5,063,465
2017	1,132	1,263	1,383	8,263,332	9,219,035	10,097,678
2018	1,662	1,917	2,169	12,132,332	13,996,459	15,835,311
2019	2,556	3,044	3,553	18,656,389	22,222,757	25,934,143
2020	3,350	4,142	5,012	24,452,790	30,238,340	36,585,102
2021	4,051	5,217	6,563	29,574,778	38,084,112	47,906,888
2022	4,566	6,141	8,053	33,333,742	44,828,821	58,786,558

* The +5% and +10% projections begin in 2014, when uncertainty becomes greater.

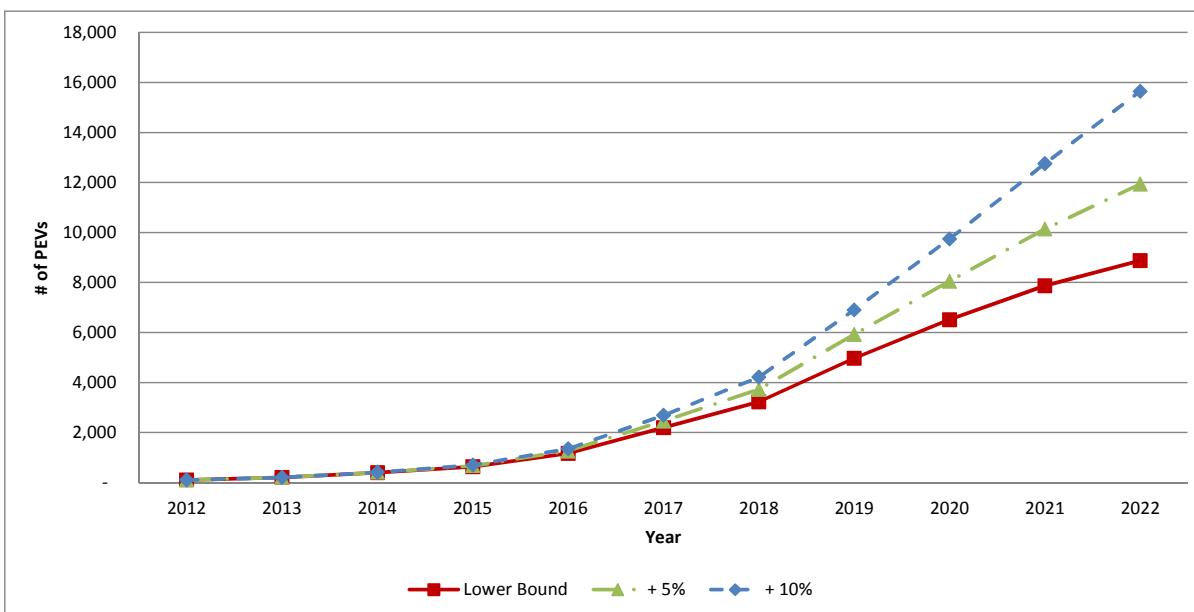


GLENDALE WATER AND POWER

Predicted Cumulative Sales

Year	Number of PEVs*			Total Number of Electric Miles		
	Lower Bound	+ 5%	+ 10%	Lower Bound	+ 5%	+ 10%
2012	103	103	103	751,900	751,900	751,900
2013	206	206	206	1,503,800	1,503,800	1,503,800
2014	398	408	412	2,904,128	2,979,318	3,007,600
2015	633	670	697	4,621,771	4,890,398	5,087,202
2016	1,161	1,262	1,348	8,477,845	9,215,115	9,840,319
2017	2,200	2,454	2,688	16,058,928	17,916,238	19,623,789
2018	3,230	3,726	4,216	23,577,928	27,200,666	30,774,283
2019	4,967	5,916	6,904	36,256,756	43,187,623	50,400,316
2020	6,510	8,050	9,740	47,521,460	58,765,076	71,099,350
2021	7,873	10,139	12,754	57,475,512	74,012,519	93,102,065
2022	8,874	11,934	15,650	64,780,669	87,120,161	114,245,575

* The +5% and +10% projections begin in 2014, when uncertainty becomes greater.

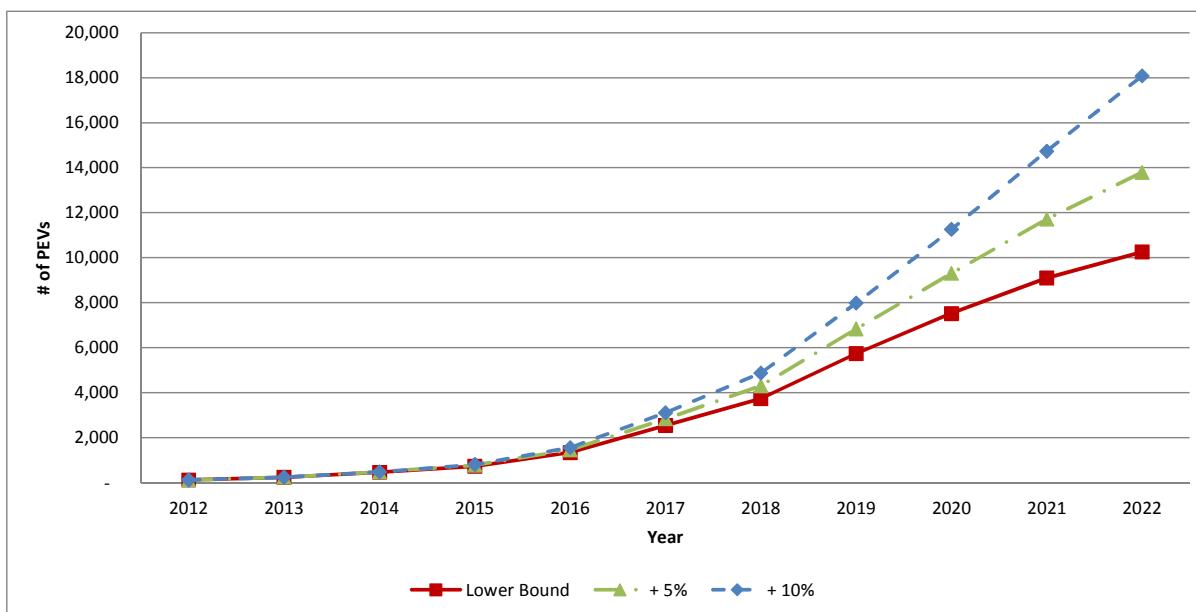


PASADENA WATER AND POWER

Predicted Cumulative Sales

Year	Number of PEVs*			Total Number of Electric Miles		
	Lower Bound	+ 5%	+ 10%	Lower Bound	+ 5%	+ 10%
2012	119	119	119	868,700	868,700	868,700
2013	238	238	238	1,737,400	1,737,400	1,737,400
2014	460	472	476	3,355,254	3,442,124	3,474,800
2015	731	774	805	5,339,716	5,650,071	5,877,447
2016	1,342	1,458	1,557	9,794,792	10,646,589	11,368,912
2017	2,542	2,836	3,106	18,553,519	20,699,343	22,672,145
2018	3,732	4,305	4,871	27,240,519	31,426,012	35,554,754
2019	5,738	6,835	7,977	41,888,873	49,896,380	58,229,491
2020	7,521	9,300	11,253	54,903,434	67,893,632	82,143,909
2021	9,096	11,714	14,735	66,403,747	85,509,609	107,564,522
2022	10,253	13,788	18,081	74,843,685	100,653,390	131,992,461

* The +5% and +10% projections begin in 2014, when uncertainty becomes greater.

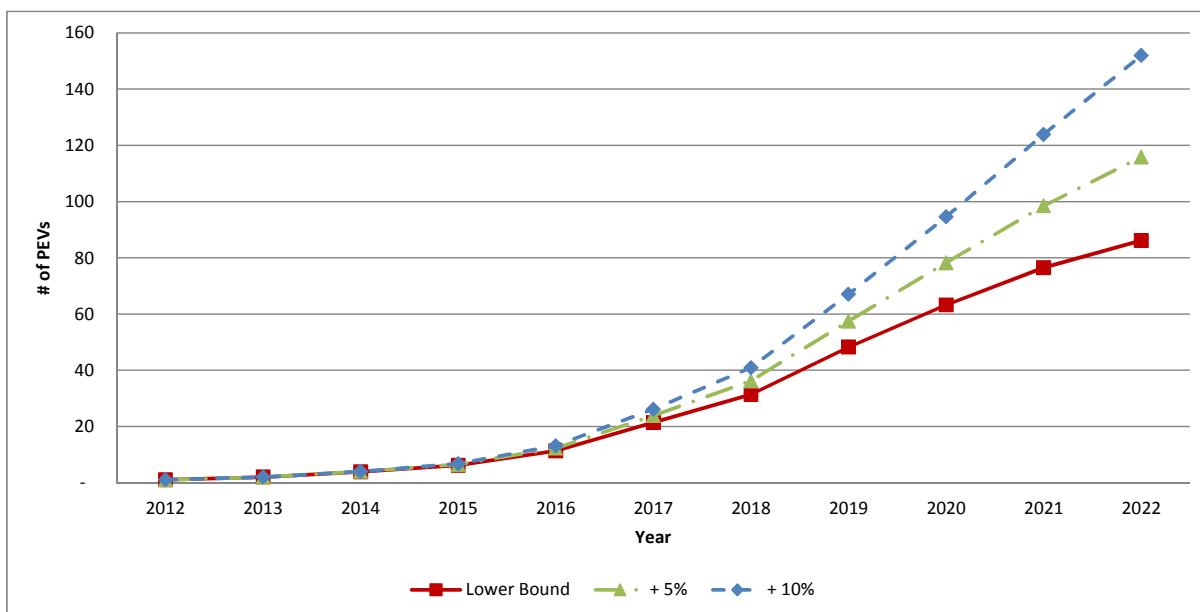


VERNON LIGHT AND POWER

Predicted Cumulative Sales

Year	Number of PEVs*			Total Number of Electric Miles		
	Lower Bound	+ 5%	+ 10%	Lower Bound	+ 5%	+ 10%
2012	1	1	1	7,300	7,300	7,300
2013	2	2	2	14,600	14,600	14,600
2014	4	4	4	28,195	28,925	29,200
2015	6	7	7	44,872	47,480	49,390
2016	11	12	13	82,309	89,467	95,537
2017	21	24	26	155,912	173,944	190,522
2018	31	36	41	228,912	264,084	298,779
2019	48	57	67	352,007	419,297	489,323
2020	63	78	95	461,373	570,535	690,285
2021	76	98	124	558,015	718,568	903,904
2022	86	116	152	628,939	845,827	1,109,180

* The +5% and +10% projections begin in 2014, when uncertainty becomes greater.

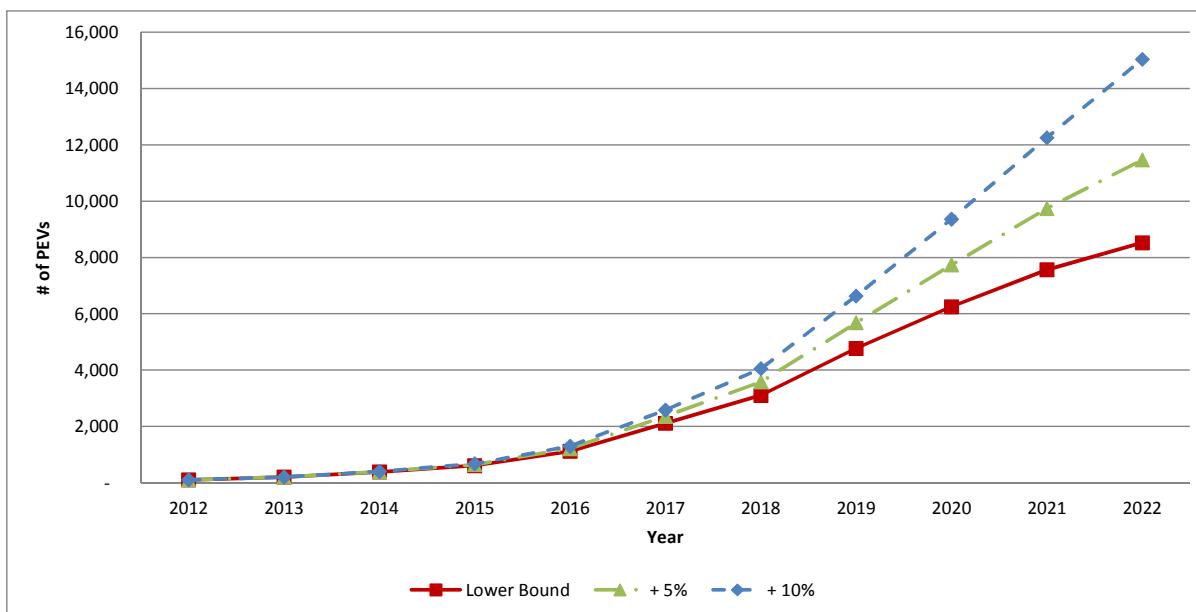


ANAHEIM PUBLIC UTILITIES DEPARTMENT

Predicted Cumulative Sales

Year	Number of PEVs*			Total Number of Electric Miles		
	Lower Bound	+ 5%	+ 10%	Lower Bound	+ 5%	+ 10%
2012	99	99	99	722,700	722,700	722,700
2013	198	198	198	1,445,400	1,445,400	1,445,400
2014	382	392	396	2,791,346	2,863,616	2,890,800
2015	609	644	670	4,442,284	4,700,479	4,889,641
2016	1,116	1,213	1,296	8,148,608	8,857,246	9,458,170
2017	2,114	2,359	2,584	15,435,281	17,220,461	18,861,700
2018	3,104	3,581	4,052	22,662,281	26,144,329	29,579,165
2019	4,774	5,686	6,636	34,848,727	41,510,433	48,443,022
2020	6,257	7,737	9,361	45,675,966	56,482,937	68,338,210
2021	7,568	9,745	12,258	55,243,453	71,138,246	89,486,451
2022	8,529	11,471	15,042	62,264,915	83,736,854	109,808,854

* The +5% and +10% projections begin in 2014, when uncertainty becomes greater.

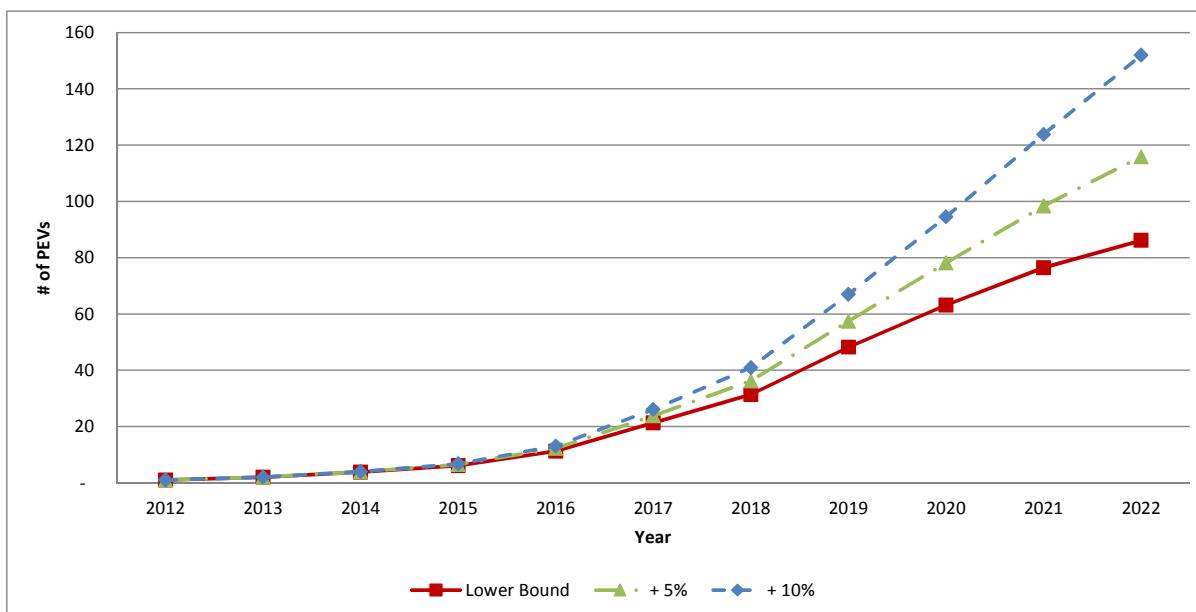


CITY OF BANNING ELECTRIC UTILITY

Predicted Cumulative Sales

Year	Number of PEVs*			Total Number of Electric Miles		
	Lower Bound	+ 5%	+ 10%	Lower Bound	+ 5%	+ 10%
2012	1	1	1	7,300	7,300	7,300
2013	2	2	2	14,600	14,600	14,600
2014	4	4	4	28,195	28,925	29,200
2015	6	7	7	44,872	47,480	49,390
2016	11	12	13	82,309	89,467	95,537
2017	21	24	26	155,912	173,944	190,522
2018	31	36	41	228,912	264,084	298,779
2019	48	57	67	352,007	419,297	489,323
2020	63	78	95	461,373	570,535	690,285
2021	76	98	124	558,015	718,568	903,904
2022	86	116	152	628,939	845,827	1,109,180

* The +5% and +10% projections begin in 2014, when uncertainty becomes greater.

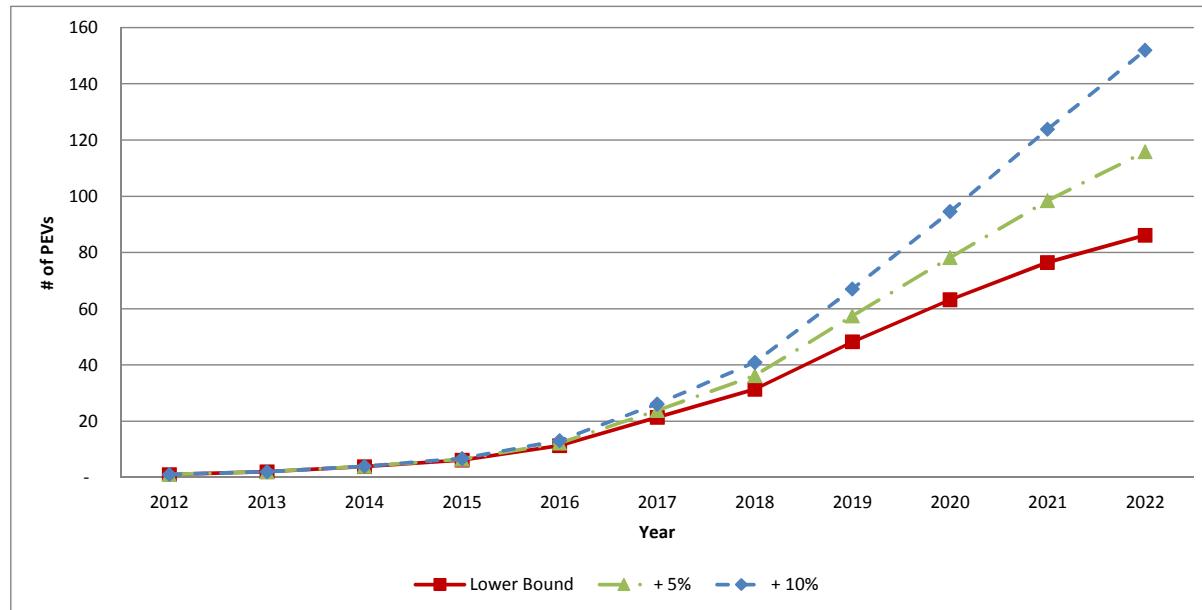


CITY OF COLTON UTILITIES SERVICES

Predicted Cumulative Sales

Year	Number of PEVs*			Total Number of Electric Miles		
	Lower Bound	+ 5%	+ 10%	Lower Bound	+ 5%	+ 10%
2012	1	1	1	7,300	7,300	7,300
2013	2	2	2	14,600	14,600	14,600
2014	4	4	4	28,195	28,925	29,200
2015	6	7	7	44,872	47,480	49,390
2016	11	12	13	82,309	89,467	95,537
2017	21	24	26	155,912	173,944	190,522
2018	31	36	41	228,912	264,084	298,779
2019	48	57	67	352,007	419,297	489,323
2020	63	78	95	461,373	570,535	690,285
2021	76	98	124	558,015	718,568	903,904
2022	86	116	152	628,939	845,827	1,109,180

* The +5% and +10% projections begin in 2014, when uncertainty becomes greater.

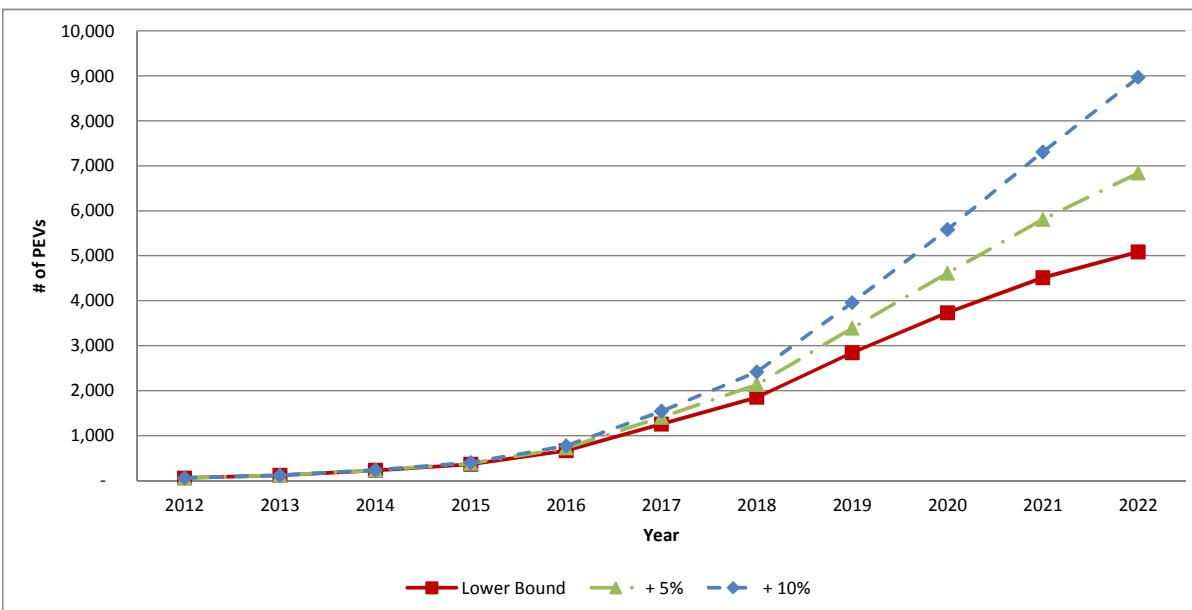


IMPERIAL IRRIGATION DISTRICT

Predicted Cumulative Sales

Year	Number of PEVs*			Total Number of Electric Miles		
	Lower Bound	+ 5%	+ 10%	Lower Bound	+ 5%	+ 10%
2012	59	59	59	430,700	430,700	430,700
2013	118	118	118	861,400	861,400	861,400
2014	228	234	236	1,663,529	1,706,599	1,722,800
2015	363	384	399	2,647,422	2,801,296	2,914,028
2016	665	723	772	4,856,241	5,278,561	5,636,687
2017	1,260	1,406	1,540	9,198,804	10,262,699	11,240,811
2018	1,850	2,134	2,415	13,505,804	15,580,964	17,627,987
2019	2,845	3,389	3,955	20,768,433	24,738,541	28,870,084
2020	3,729	4,611	5,579	27,221,030	33,661,548	40,726,812
2021	4,510	5,808	7,306	32,922,866	42,395,521	53,330,309
2022	5,083	6,836	8,965	37,107,373	49,903,782	65,441,640

* The +5% and +10% projections begin in 2014, when uncertainty becomes greater.

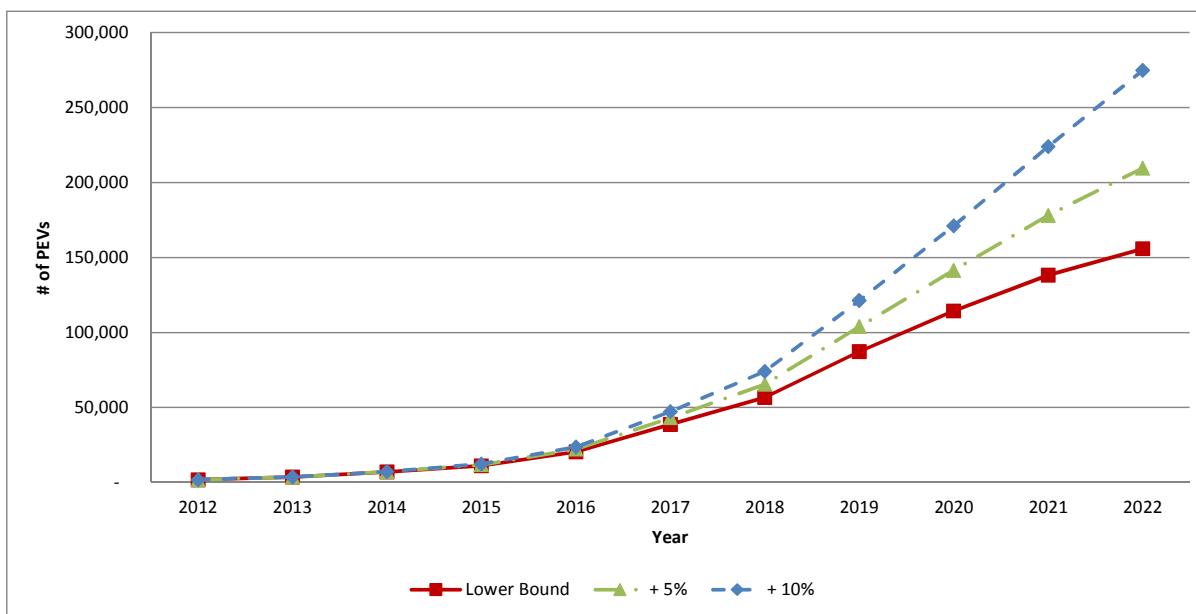


LOS ANGELES DEPARTMENT OF WATER AND POWER

Predicted Cumulative Sales

Year	Number of PEVs*			Total Number of Electric Miles		
	Lower Bound	+ 5%	+ 10%	Lower Bound	+ 5%	+ 10%
2012	1,809	1,809	1,809	13,205,700	13,205,700	13,205,700
2013	3,618	3,618	3,618	26,411,400	26,411,400	26,411,400
2014	6,987	7,168	7,236	51,005,502	52,326,072	52,822,800
2015	11,120	11,766	12,239	81,172,651	85,890,575	89,347,069
2016	20,397	22,171	23,675	148,897,296	161,846,046	172,826,569
2017	38,636	43,105	47,213	282,044,675	314,664,795	344,654,709
2018	56,726	65,442	74,040	414,101,675	477,728,201	540,492,015
2019	87,230	103,905	121,258	636,781,277	758,508,829	885,186,132
2020	114,332	141,383	171,058	834,624,471	1,032,097,306	1,248,725,475
2021	138,281	178,067	223,995	1,009,448,554	1,299,889,777	1,635,161,509
2022	155,856	209,603	274,864	1,137,749,805	1,530,100,693	2,006,507,237

* The +5% and +10% projections begin in 2014, when uncertainty becomes greater.

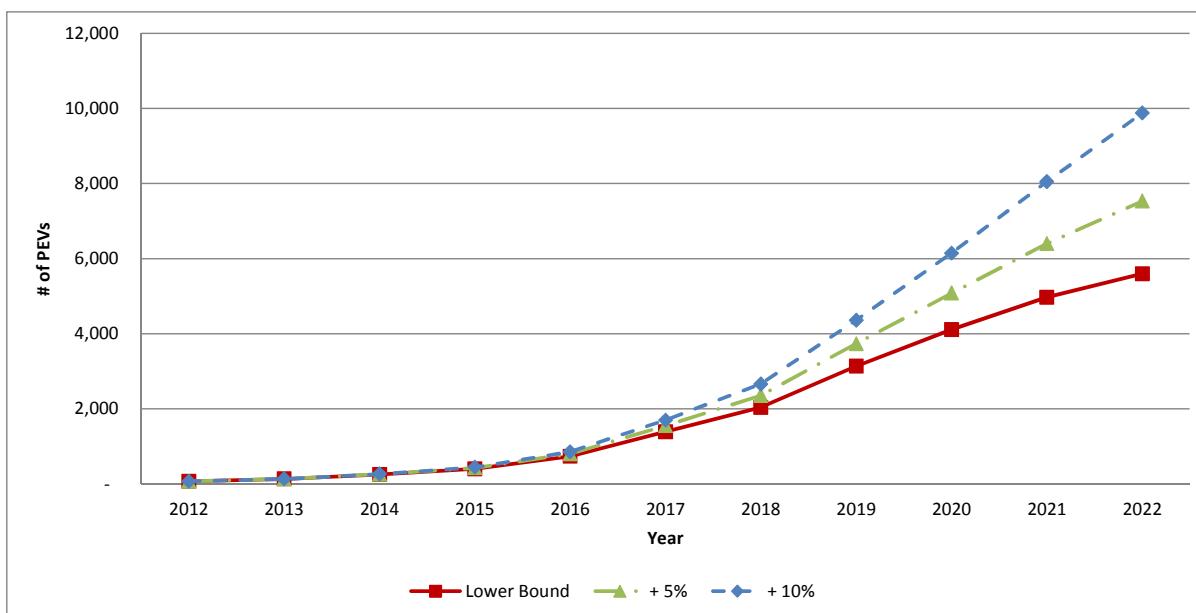


RIVERSIDE PUBLIC UTILITIES

Predicted Cumulative Sales

Year	Number of PEVs*			Total Number of Electric Miles		
	Lower Bound	+ 5%	+ 10%	Lower Bound	+ 5%	+ 10%
2012	65	65	65	474,500	474,500	474,500
2013	130	130	130	949,000	949,000	949,000
2014	251	258	260	1,832,702	1,880,152	1,898,000
2015	400	423	440	2,916,651	3,086,173	3,210,370
2016	733	797	851	5,350,096	5,815,364	6,209,910
2017	1,388	1,549	1,696	10,134,275	11,306,364	12,383,945
2018	2,038	2,351	2,660	14,879,275	17,165,469	19,420,664
2019	3,134	3,733	4,357	22,880,477	27,254,325	31,806,025
2020	4,108	5,080	6,146	29,989,271	37,084,757	44,868,522
2021	4,969	6,398	8,048	36,270,954	46,706,930	58,753,730
2022	5,600	7,531	9,876	40,881,005	54,978,742	72,096,722

* The +5% and +10% projections begin in 2014, when uncertainty becomes greater.

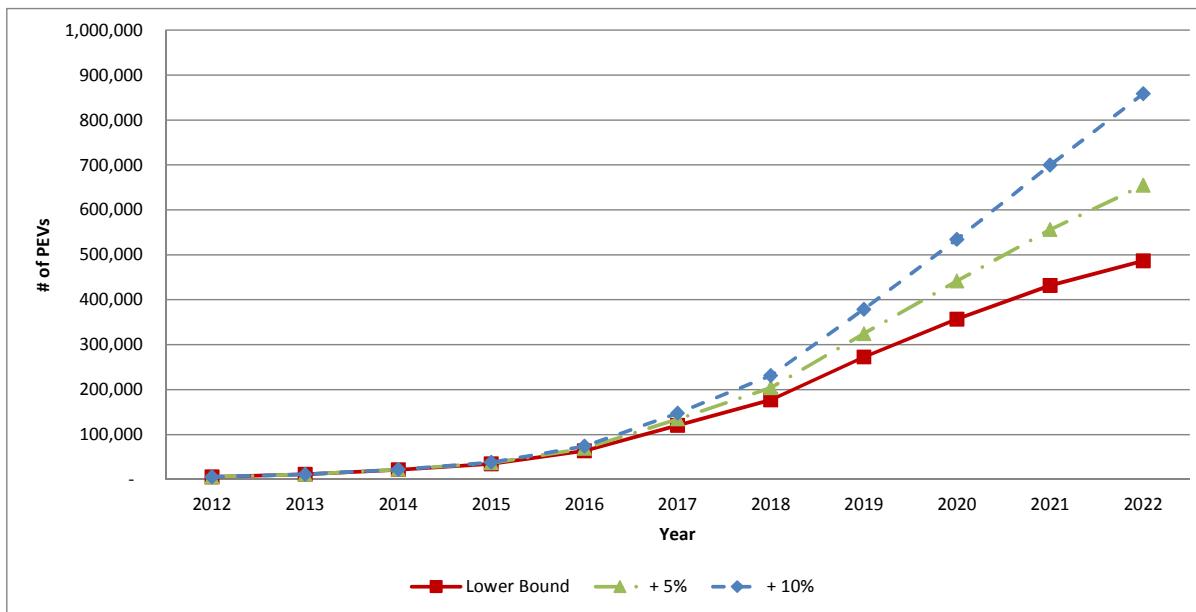


SOUTHERN CALIFORNIA EDISON

Predicted Cumulative Sales

Year	Number of PEVs*			Total Number of Electric Miles		
	Lower Bound	+ 5%	+ 10%	Lower Bound	+ 5%	+ 10%
2012	5,650	5,650	5,650	41,245,000	41,245,000	41,245,000
2013	11,300	11,300	11,300	82,490,000	82,490,000	82,490,000
2014	21,822	22,387	22,600	159,304,083	163,428,583	164,980,000
2015	34,729	36,748	38,227	253,524,312	268,259,672	279,055,245
2016	63,705	69,245	73,943	465,046,835	505,489,308	539,784,473
2017	120,672	134,628	147,459	880,902,385	982,783,911	1,076,450,582
2018	177,172	204,394	231,247	1,293,352,385	1,492,075,367	1,688,103,860
2019	272,444	324,525	378,723	1,988,841,468	2,369,029,786	2,764,677,527
2020	357,090	441,578	534,262	2,606,759,679	3,223,521,161	3,900,109,967
2021	431,888	556,152	699,597	3,152,782,936	4,059,910,027	5,107,055,016
2022	486,781	654,647	858,475	3,553,502,706	4,778,921,457	6,266,868,926

* The +5% and +10% projections begin in 2014, when uncertainty becomes greater.

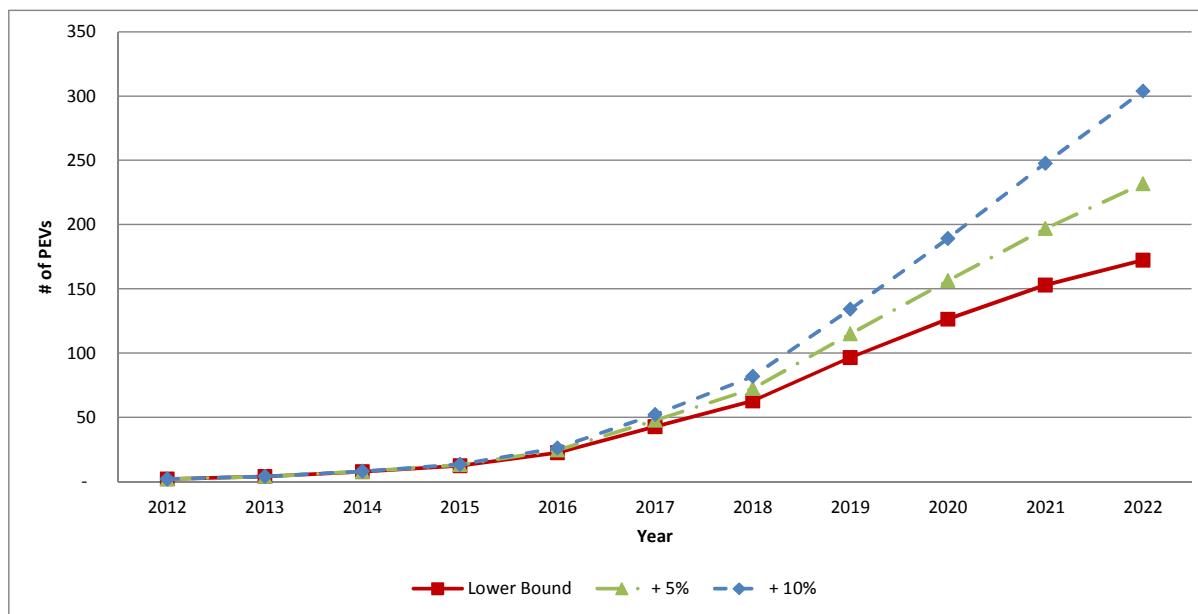


ANZA ELECTRIC COOPERATIVE

Predicted Cumulative Sales

Year	Number of PEVs*			Total Number of Electric Miles		
	Lower Bound	+ 5%	+ 10%	Lower Bound	+ 5%	+ 10%
2012	2	2	2	14,600	14,600	14,600
2013	4	4	4	29,200	29,200	29,200
2014	8	8	8	56,391	57,851	58,400
2015	12	13	14	89,743	94,959	98,781
2016	23	25	26	164,618	178,934	191,074
2017	43	48	52	311,824	347,888	381,044
2018	63	72	82	457,824	528,168	597,559
2019	96	115	134	704,015	838,595	978,647
2020	126	156	189	922,747	1,141,069	1,380,570
2021	153	197	248	1,116,029	1,437,136	1,807,807
2022	172	232	304	1,257,877	1,691,654	2,218,361

* The +5% and +10% projections begin in 2014, when uncertainty becomes greater.

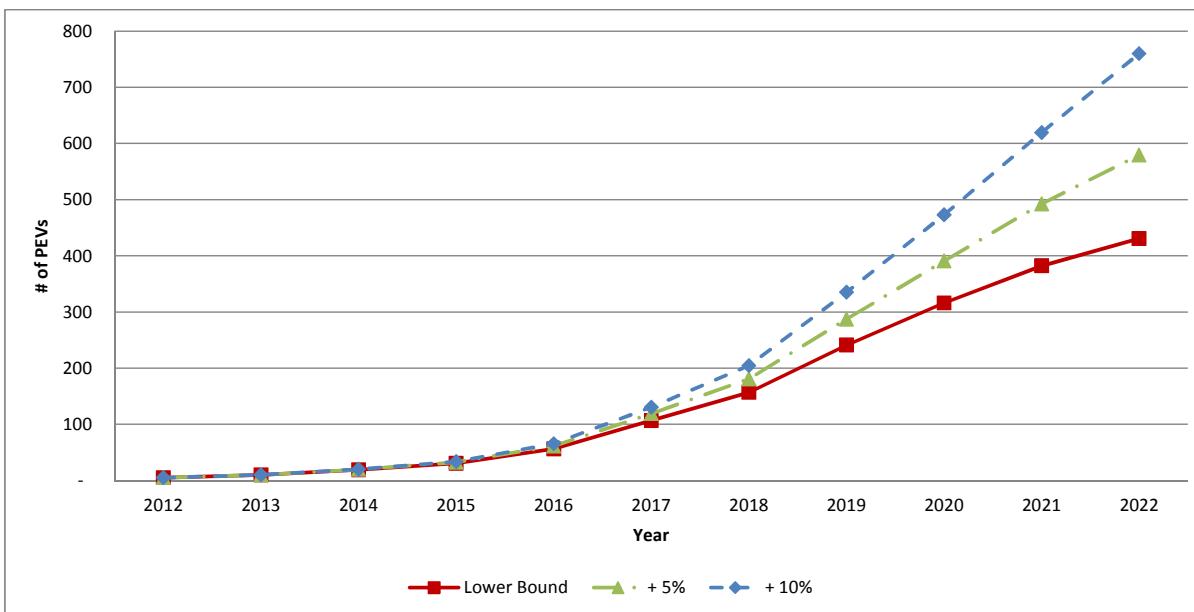


MORENO VALLEY ELECTRIC UTILITY

Predicted Cumulative Sales

Year	Number of PEVs*			Total Number of Electric Miles		
	Lower Bound	+ 5%	+ 10%	Lower Bound	+ 5%	+ 10%
2012	5	5	5	36,500	36,500	36,500
2013	10	10	10	73,000	73,000	73,000
2014	19	20	20	140,977	144,627	146,000
2015	31	33	34	224,358	237,398	246,952
2016	56	61	65	411,546	447,336	477,685
2017	107	119	130	779,560	869,720	952,611
2018	157	181	205	1,144,560	1,320,421	1,493,897
2019	241	287	335	1,760,037	2,096,487	2,446,617
2020	316	391	473	2,306,867	2,852,674	3,451,425
2021	382	492	619	2,790,073	3,592,841	4,519,518
2022	431	579	760	3,144,693	4,229,134	5,545,902

* The +5% and +10% projections begin in 2014, when uncertainty becomes greater.

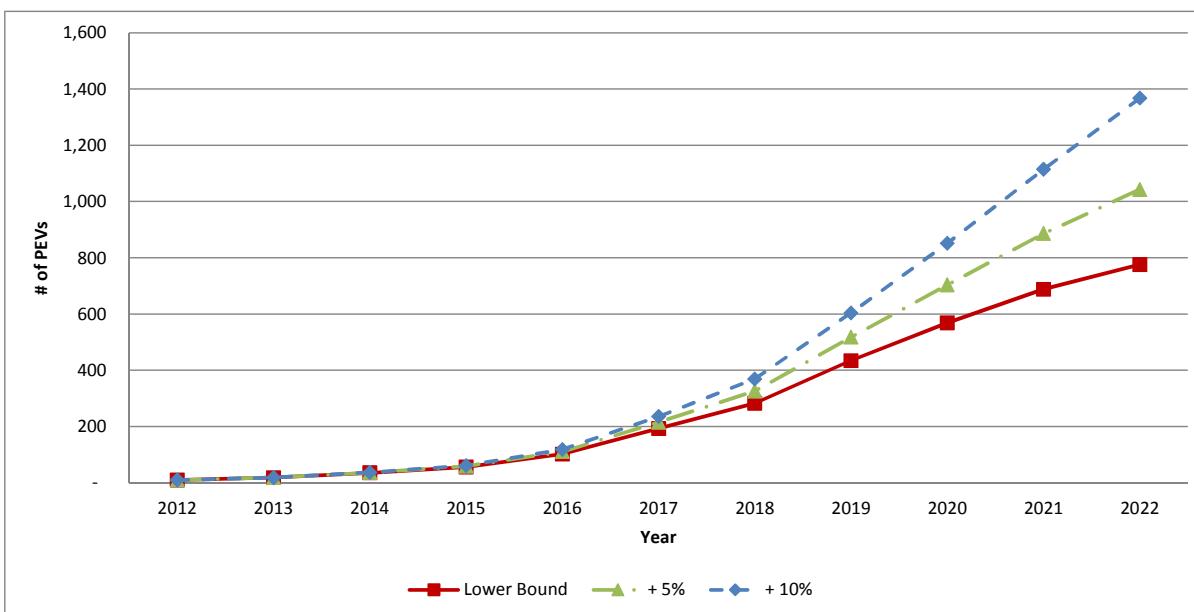


RANCHO CUCAMONGA MUNICIPAL UTILITY

Predicted Cumulative Sales

Year	Number of PEVs*			Total Number of Electric Miles		
	Lower Bound	+ 5%	+ 10%	Lower Bound	+ 5%	+ 10%
2012	9	9	9	65,700	65,700	65,700
2013	18	18	18	131,400	131,400	131,400
2014	35	36	36	253,759	260,329	262,800
2015	55	59	61	403,844	427,316	444,513
2016	101	110	118	740,783	805,204	859,834
2017	192	214	235	1,403,207	1,565,496	1,714,700
2018	282	326	368	2,060,207	2,376,757	2,689,015
2019	434	517	603	3,168,066	3,773,676	4,403,911
2020	569	703	851	4,152,361	5,134,812	6,212,565
2021	688	886	1,114	5,022,132	6,467,113	8,135,132
2022	775	1,043	1,367	5,660,447	7,612,441	9,982,623

* The +5% and +10% projections begin in 2014, when uncertainty becomes greater.

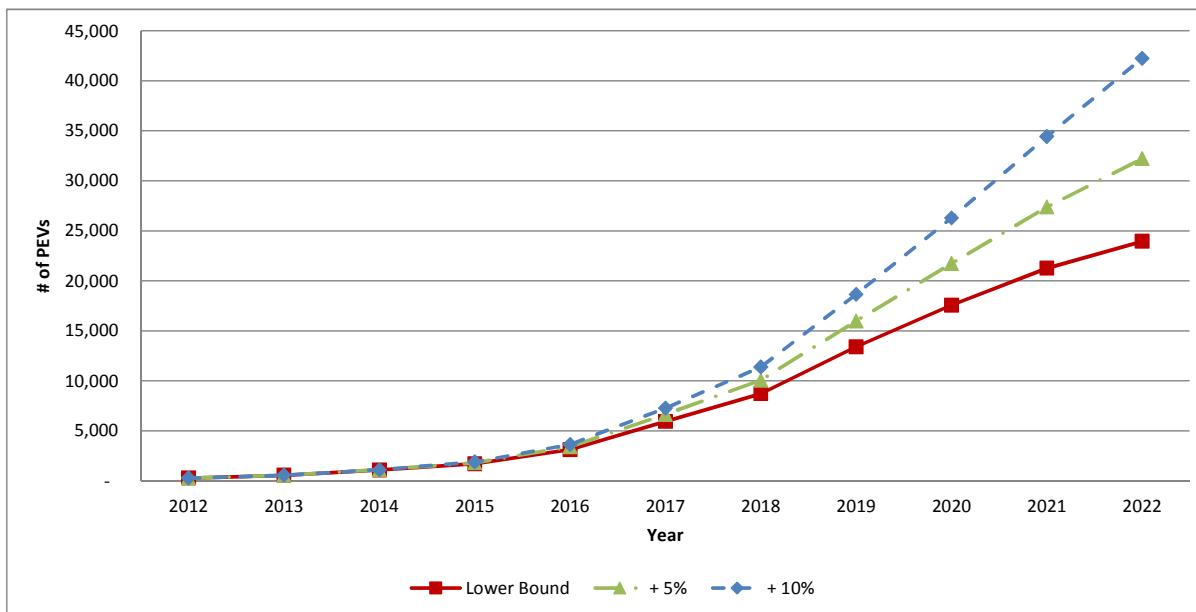


SAN DIEGO GAS & ELECTRIC¹

Predicted Cumulative Sales

Year	Number of PEVs*			Total Number of Electric Miles		
	Lower Bound	+ 5%	+ 10%	Lower Bound	+ 5%	+ 10%
2012	278	278	278	2,029,400	2,029,400	2,029,400
2013	556	556	556	4,058,800	4,058,800	4,058,800
2014	1,074	1,102	1,112	7,838,325	8,041,265	8,117,600
2015	1,709	1,808	1,881	12,474,294	13,199,325	13,730,506
2016	3,135	3,407	3,638	22,881,950	24,871,863	26,559,307
2017	5,937	6,624	7,256	43,343,516	48,356,447	52,965,179
2018	8,717	10,057	11,378	63,637,516	73,415,390	83,060,685
2019	13,405	15,968	18,635	97,858,040	116,564,651	136,031,921
2020	17,570	21,727	26,288	128,261,804	158,608,652	191,899,216
2021	21,250	27,365	34,423	155,128,081	199,761,945	251,285,185
2022	23,951	32,211	42,240	174,844,912	235,139,852	308,352,135

* The +5% and +10% projections begin in 2014, when uncertainty becomes greater.



TECHNICAL APPENDIX

This appendix describes the methods, assumptions and data sources used to create the maps and projections in this Atlas. They are presented in the same order in which the maps and projections appear.

Council of government-level maps

PEV growth

The Southern California Plug-in Electric Vehicle (PEV) Readiness Plan and Atlas define a PEV as any fully electric vehicle (including low-speed neighborhood electric vehicles and electrified trucks) or a plug-in hybrid electric vehicle (PHEV). The PHEV models counted in this analysis are the Chevrolet Volt, Toyota Plug-in Prius and Fisker Karma. The scope only includes PEVs registered as new in the SCAG region between December 2010 and September 2012 inclusive. PEV registrations are presented for each subregion or council of government (COG) as aggregated from data supplied at the 2010 Census tract level by R.L. Polk & Co.

As of September 2012, there were 8,321 PEVs in the SCAG region. It is important to note that the San Fernando Valley Council of Governments (SFVCOG) is an overlay of portions of the City of Los Angeles, the Arroyo Verdugo Subregion, and North Los Angeles County. There is no unique area within SFVCOG that is not included in another COG.

Once the 2012 PEV counts were obtained, a reasonable growth rate was needed to predict how PEVs would grow to the year 2022. We used the annual percentage increases in standard Toyota Prius hybrid sales from 2000 to 2010 to compute the lower bound of the estimates² beginning in 2013. The projection is a PEV count for each COG for each year between 2012 and 2022. A moderate bound was projected by scaling up each annual percentage growth rate by 5% (without exceeding 100%) in each year and repeating the same calculation on each year's lower-bound estimate. The high bound was calculated identically to the moderate bound but with a 10% scaling factor over the low bound.

The Southern California PEV Atlas also provides COG-specific cumulative PEV count projections for each year between 2012 and 2022. A potential limiting factor on the actual growth of PEVs is the high percentage of Southern California residents that live in multi-unit dwellings (MUDs). Unless steps are taken to facilitate charging in MUDs, PEV ownership may not grow as projected.

PEV registration maps

The maps provided in the Southern California PEV Atlas show the numbers of PEVs registered in the COGs by Tier 1 travel analysis zone (TAZ). TAZs closely follow 2000 Census tract boundaries and are used by the Southern California Association of Governments (SCAG) to estimate travel within and between neighborhoods. There are 4,109 Tier 1 TAZs in the SCAG region. The map colors move from lighter in areas with no or few PEVs registered to darker in areas with more PEVs registered. PEV registration data supplied at the 2010 Census tract level by R.L. Polk & Co. was harmonized with TAZ boundaries.

² Prius sales derived from Toyota press release: <http://www2.toyota.co.jp/en/news/10/10/1007.html>

PEV morning peak destinations

Using surveys of household travel behavior, SCAG's travel demand model estimates the number of trips from home to work, school, and other destinations by time of day³. By counting the number of PEVs from each *origin TAZ* that feed into each of the daytime *destination TAZs*, we were able to map the locations and densities of PEVs traveling to work on weekdays from 6:00 a.m. to 9:00 a.m. We used the outputs from SCAG's 2008 Regional Model⁴. It is important to note that these morning peak destination TAZs receive vehicles from outside the COG.

Employment density

The maps of employment density were prepared using commercially available Infogroup data from 2008 on employer size (i.e., number of employees) and location. Each circle on the map represents one workplace. The circles move from small to large and from yellow to red as the number of employees per workplace increases as described.

PEV morning peak destinations and employment density

This is an overlay of the previous two maps. The maps show both where PEVs driving to work are likely to be during the daytime hours and where there are many employers and potentially high demand for workplace charging depending upon how charging is priced.

Publicly-accessible charging stations

The Southern California PEV Atlas includes maps of publicly-accessible charging stations for each COG in the SCAG region. "Publicly-accessible" refers to stations that are owned by either the government or private businesses but that are available for use by the general public. The maps identify the number of charging units/cords available at each location along with the level of service (Level 1, Level 2, etc., or "Unknown" where there is charging available but the quantity of connectors and their level of service could not be immediately determined). The maps are based on information collected during the summer and early fall of 2012.

The information was compiled using online databases maintained by the U.S. Department of Energy (DOE) (http://www.afdc.energy.gov/fuels/electricity_locations.html) as well as Recargo (www.recargo.com), PlugShare (www.pluginshare.com), and Car Stations (www.carstations.com), which contain information posted by users of the charging stations. The precise number of connectors or charging units that are operational at any given time and location are subject to maintenance and upgrade schedules. Some stations designated as "legacy" in the Atlas may have since been upgraded to current connector standards under the Reconnect CA program.

The DOE database's station location feature allows one to search electric vehicle charging stations by state and then download the data into a spreadsheet. The California state list was filtered to include only those located within the six-county SCAG region. The DOE list contains charging stations from a variety of sources, including trade media, Clean Cities coordinators, a form on the AFDC website, and through collaboration with charging equipment providers. The data is updated twice per month and stations that are no longer in service are regularly removed. There are additional stations not captured on the DOE list that were found on the other sites listed above.

3 <http://www.scag.ca.gov/modeling/index.htm>

4 http://www.scag.ca.gov/modeling/pdf/MVS08/MVS08_Chap05.pdf

Multi-unit residences

This data is obtained from SCAG's 2005 Existing Land Use Dataset, which includes information on the concentration of all residential units other than single-family in the SCAG region. The land use data was developed by Aerial Information Systems, Inc. as a Modified Anderson Land Use Classification. The designations were determined by using aerial photography to estimate the land use at the parcel level. Each residential parcel in the dataset is assigned a code that best describes the composition of residential unit types. The factors that contribute to a parcel's residential designation are the height of the buildings, the square footage, and the concentration of multi-unit dwellings per parcel¹⁵. The densities of units per acre increase from yellow at the duplex, triplex and townhouse level all the way up to high-rise MUDs in red.

CODE	DESCRIPTION	DENSITY
1121	Mixed Multi-Family Residential	NA
1122	Duplexes, Triplexes, and 2- or 2-Unit Condominiums and Townhouses	2 units or less
1123	Low-Rise Apartments, Condominiums, and Townhouses	4+ units. 10 to 18 units per acre
1124	Medium-Rise Apartments and Condominiums	Greater than 18 units per acre
1125	High-Rise Apartments and Condominiums	Greater than 18 units per acre

Commercial (retail) destinations

This map data is obtained from SCAG's 2005 Existing Land Use Dataset, which includes information on the concentration of retail centers in the SCAG region. The land use data was developed by Aerial Information Systems, Inc. as a Modified Anderson Land Use Classification. The designations were determined by using aerial photography to estimate the land use at the parcel level.

The Southern California PEV Atlas contains maps of retail and small business destinations (such as beauty salons and small offices) within each COG in the region. They highlight four types of retail centers that are likely to attract many of the non-work related vehicular trips. These four categories are as follows:

⁵ Southern California Association of Governments. 2002. Southern California 1990 Aerial Land Use Study: Land Use Code Descriptions and Key Signatures, Level III/IV.

CODE	DESCRIPTION	KEY ATTRIBUTE
1221	Regional Shopping Center	Department store with surrounding parking
1222	Retail Centers (Non-Strip With Contiguous Interconnected Off-Street Parking)	Magnet store with in-front parking
1223	Modern Strip Development	Small businesses with parking on-street and on one side
1224	Older Strip Development	Small businesses with on-street parking

Land use Code 1221, Regional Shopping Center, contains large retail centers with at least one major department store and a range of other smaller retail establishments. These shopping centers are generally enclosed malls with parking surrounding the one to three story building. This also includes factory outlet malls.

Land use Code 1222, Retail Centers, is comprised of at least one large magnet store, a large off-street parking lot, and additional detached commercial stores, including small retail stores, gas stations, and restaurants. All structures are generally one story tall. Retail Centers are often located conveniently off major highways or highly trafficked surface streets.

Land use Code 1223, Modern Strip Malls, designates parcels which contain retail stores, restaurants, service shops, and offices, and are often located along major traffic corridors. Parking is available on-street as well as off-street either in front, on the side, or behind the structures. Included in this category are gas stations, auto repair shops, convenience stores, liquor stores, small bank branch offices, clothing stores, restaurants, furniture stores, discount stores, novelty stores, car dealerships or auto centers, drug stores, small corner markets, auctions, and smaller malls which do not contain a large magnet store.

Finally, land use Code 1224, Older Strip Development, contains parcels of land with little or no off-street parking. This category is commonly found in older city and town business corridors. Units are small retail establishments, restaurants, and offices with storefronts without setback, adjacent to the sidewalk. Units are often attached to the neighboring unit creating an uninterrupted streetscape. Units with commercial space on the first floor and residential units on upper floors can be considered Older Strip Development.⁶

PEV mid-day destinations and commercial (retail) locations

After mapping retail destinations, the UCLA Luskin Center mapped the locations where currently-registered PEVs travel during weekdays from 9:00 a.m. to 3:00 p.m. The data on PEV registrations comes from automotive data vendor R.L. Polk & Co., which provided the number of PEVs registered as new within each 2010 Census tract from December 2010 through September 2012.

Census tracts closely follow the boundaries of travel analysis zones (TAZs), which are the geographic areas used by SCAG to model vehicle travel. SCAG's travel demand model estimates the number of trips from home to work, school, and other destinations by time of day. By counting the number of PEVs from each *origin* TAZ that feed into each of the mid-day *destination* TAZs, we are able to map the locations and densities of PEVs traveling to neighborhoods from 9:00 a.m. to 3:00 p.m. We used the outputs from SCAG's 2008 Regional

⁶ Southern California Association of Governments. 2002. Southern California 1990 Aerial Land Use Study: Land Use Code Descriptions and Key Signatures, Level III/IV.

Model⁷. It is important to note that these morning peak destination TAZs receive vehicles from outside the COG.

Stand-alone parking facilities

This map data is obtained from SCAG's 2005 Existing Land Use Dataset, which includes information on the concentration of stand-alone parking facilities in the SCAG region. The land use data was developed by Aerial Information Systems, Inc. as a Modified Anderson Land Use Classification. The designations were determined by using aerial photography to estimate the land use at the parcel level.

Parking lots and structures greater than 2.5 acres that are not attached to other land uses are mapped at the COG level in the Southern California PEV Atlas. They highlight three types of stand-alone parking classified by SCAG:⁸

Description	Key Attribute
Attended Pay Public Parking Facilities	Stand-alone public parking areas and parking structures that have an attendant-cashier present
Non-Attended Public Parking Facilities	Free or metered public parking areas where no attendant-cashier is present
Park and Ride Lots	Cal Trans park and ride lots provided for commuter ridesharing, buspooling, vanpooling, and carpooling purposes

The “Attended Pay Public Parking Facilities” classification does not distinguish between privately-owned commercial parking facilities available for public use and municipal or other parking facilities owned by the public sector that are available for public use.

7 http://www.scag.ca.gov/modeling/pdf/MVS08/MVS08_Chap05.pdf

8 Southern California Association of Governments. 2002. Southern California 1990 Aerial Land Use Study: Land Use Code Descriptions and Key Signatures, Level III/IV.

Utility projections

Current counts and growth projections of PEVs in utility service territories in the SCAG region were calculated using the same sources, methods and assumptions as the COG-level counts and projections. The PEV counts are based on 2010 Census tract-level data from R.L. Polk & Co. on PEVs newly registered from December 2010 to September 2012. Only Census tracts that fall within the SCAG region were counted.

The data was aggregated into utility service territories using municipal boundaries (for municipal utilities) as well as individual utility maps and the California Electric Utility Service Areas map published in 2011 by the California Energy Commission.⁹

Utilities not represented by the Southern California Public Power Authority and that have less than 2 PEVs attributable to their service territories have been excluded from this analysis. They are Bear Valley Electrical Service, Corona Water and Power, City of Needles, and Victorville Municipal Utility Services.

The three factors most likely to influence electric (e-)miles driven are travel distance, charging opportunities, and PEV battery range. Of these, only travel distance can be estimated with some certainty. We used Krumm (2012)¹⁰ to estimate daily average travel (regardless of vehicle type) of about 30 miles. We assumed the average number of daily *electric* miles driven per PEV to be 20 miles, although in practice this number would vary according to battery range and charging opportunities. The product of the number of PEVs in each utility territory and the estimated average number of daily electric miles driven per PEV (20 miles per PEV) resulted in the predicted daily e-miles driven.

⁹ http://www.energy.ca.gov/maps/serviceareas/Electric_Service_Areas_Detail.pdf

¹⁰ <http://research.microsoft.com/en-us/um/people/jckrumm/Publications%202012/2012-01-0489%20SAE%20published.pdf>

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