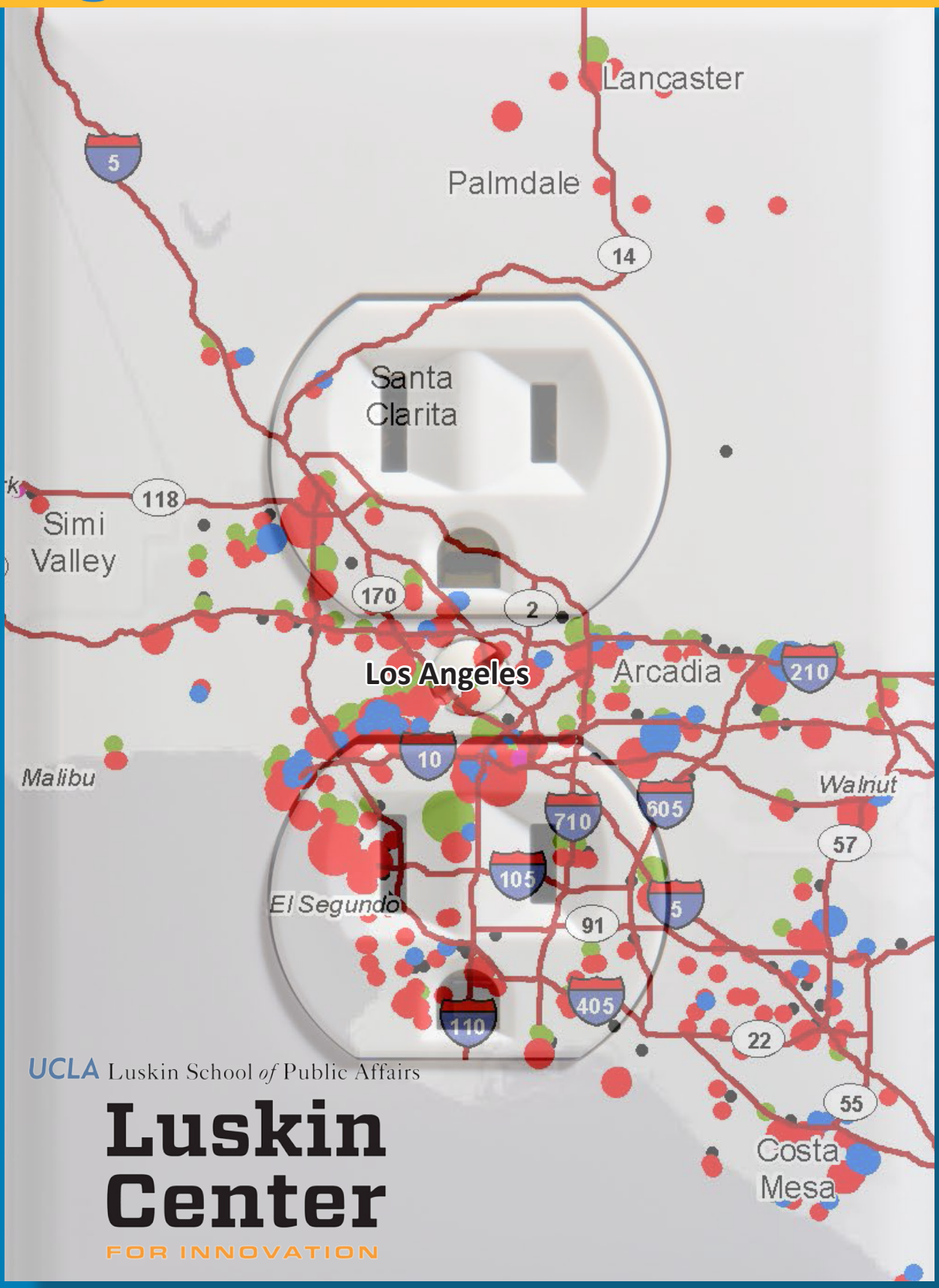
Southern California
Plug-in Electric Vehicle Atlas

SOUTHERN CALIFORNIA ASSOCIATION of GOVERNMENTS



UCLA Luskin School of Public Affairs

Luskin Center FOR INNOVATION

Southern California Plug-in Electric Vehicle Readiness Atlas

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.

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Acknowledgements

We thank the Southern California Association of Governments, the South Coast Air Quality Management District, U.S. Department of Energy, and the California Energy Commission for support of this project. In particular, we thank Marco Anderson of SCAG, Patricia Kwon of SCAQMD and the other governmental and utility members of the SoCal PEV Coordinating Council for their guidance and assistance. We also thank the University of California Office of the President Multicampus Research Programs and Initiatives for its support.

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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
- City of Los Angeles
- Coachella Valley Association of Governments
- Gateway Cities Council of Governments
- Imperial County Transportation Commission
- Las Virgenes Malibu Council of Governments
- North Los Angeles County
- Orange County Council of Governments
- San Bernardino Associated Governments
- San Fernando Valley Council of Governments
- San Gabriel Valley Council of Governments
- South Bay Cities Council of Governments
- Ventura County Council of Governments
- Western Riverside Council of Governments
- Westside Cities 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 utilities[1]:

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

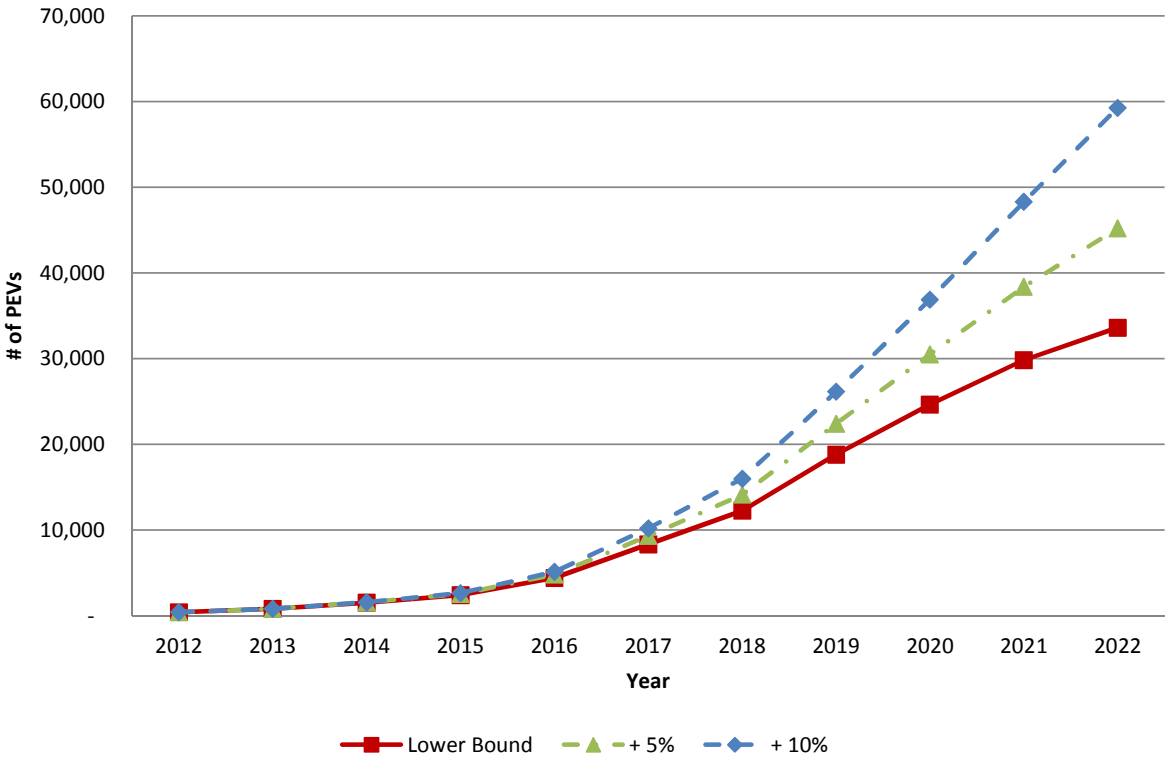
These projections are designed to help regional planners and utilities locate current and future demand for PEV charging and coordinate efforts to meet that demand.

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.

San Bernardino Associated Governments

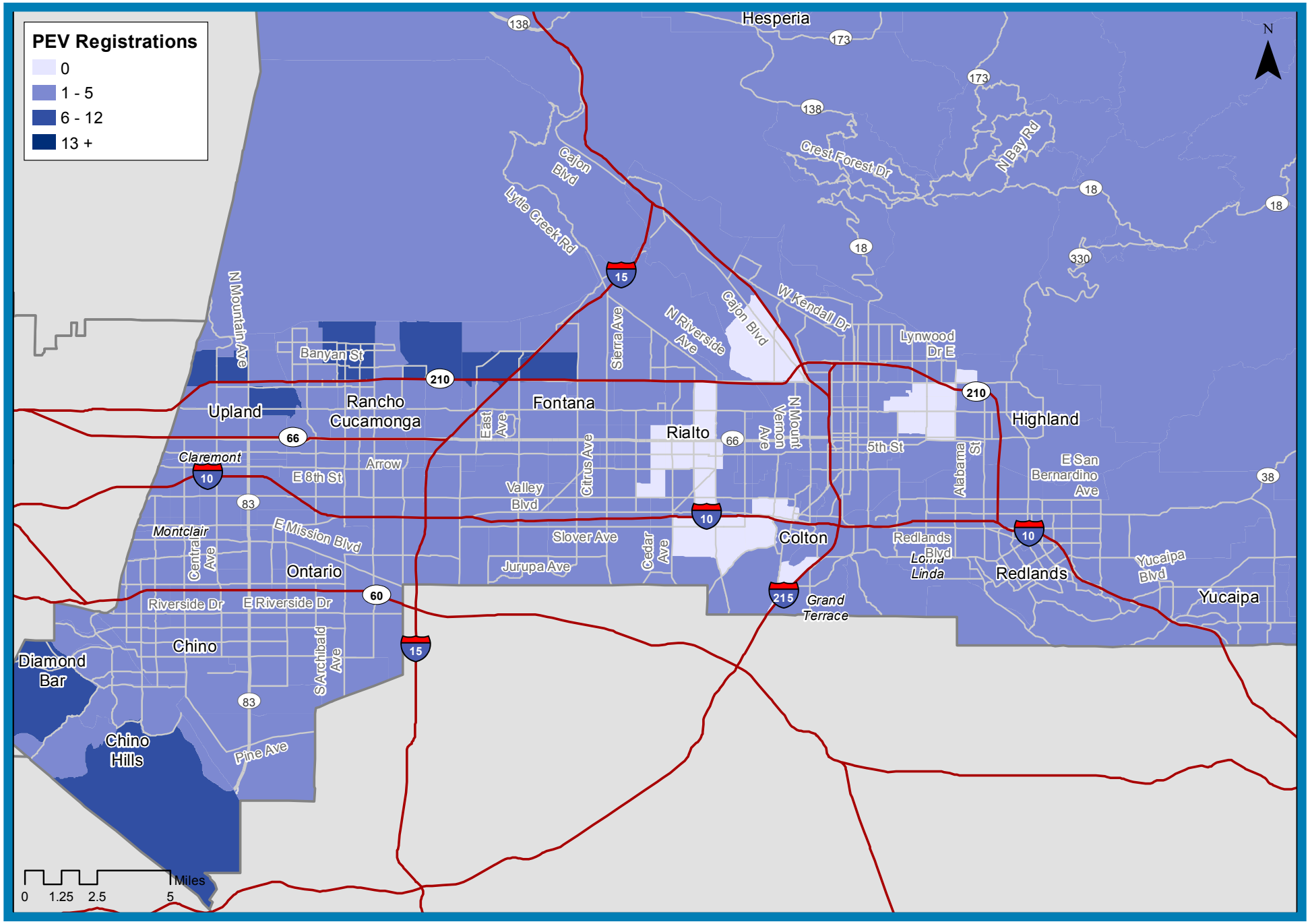
PEV Growth

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

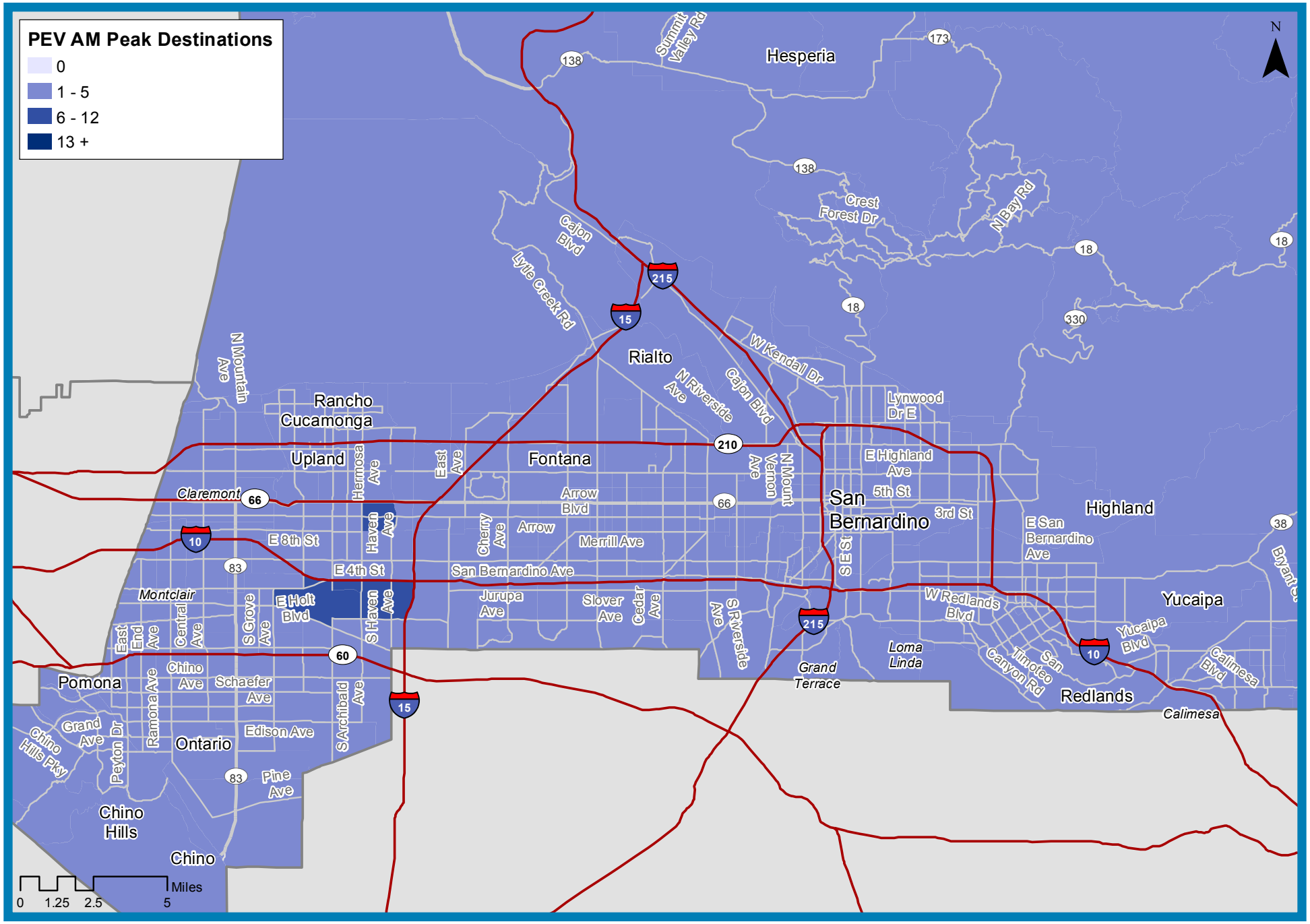


** The +5% and +10% projections begin in 2014, when uncertainty becomes greater.*

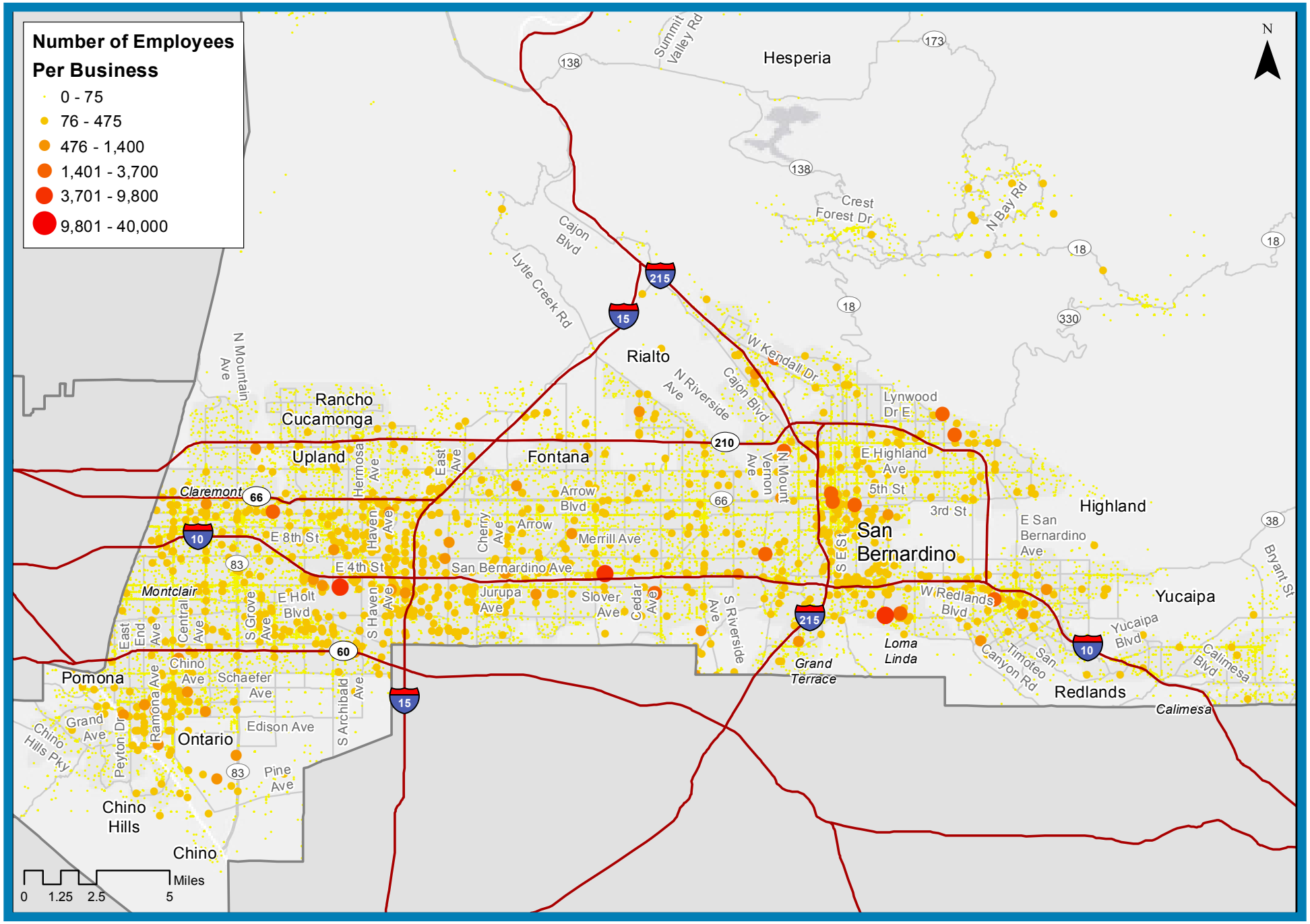
Plug-in Electric Vehicle Registrations



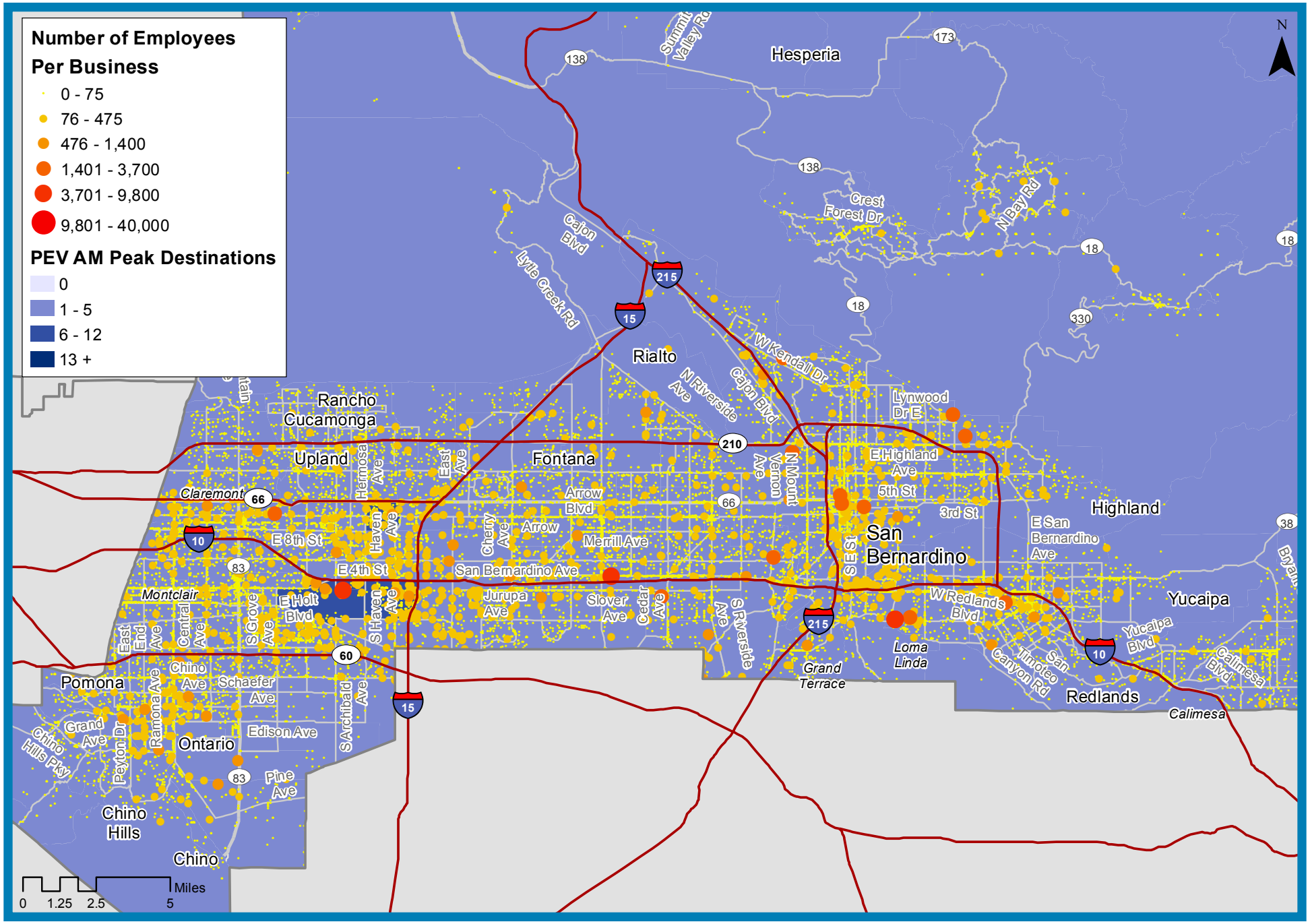
Plug-in Electric Vehicle Morning Peak Destinations



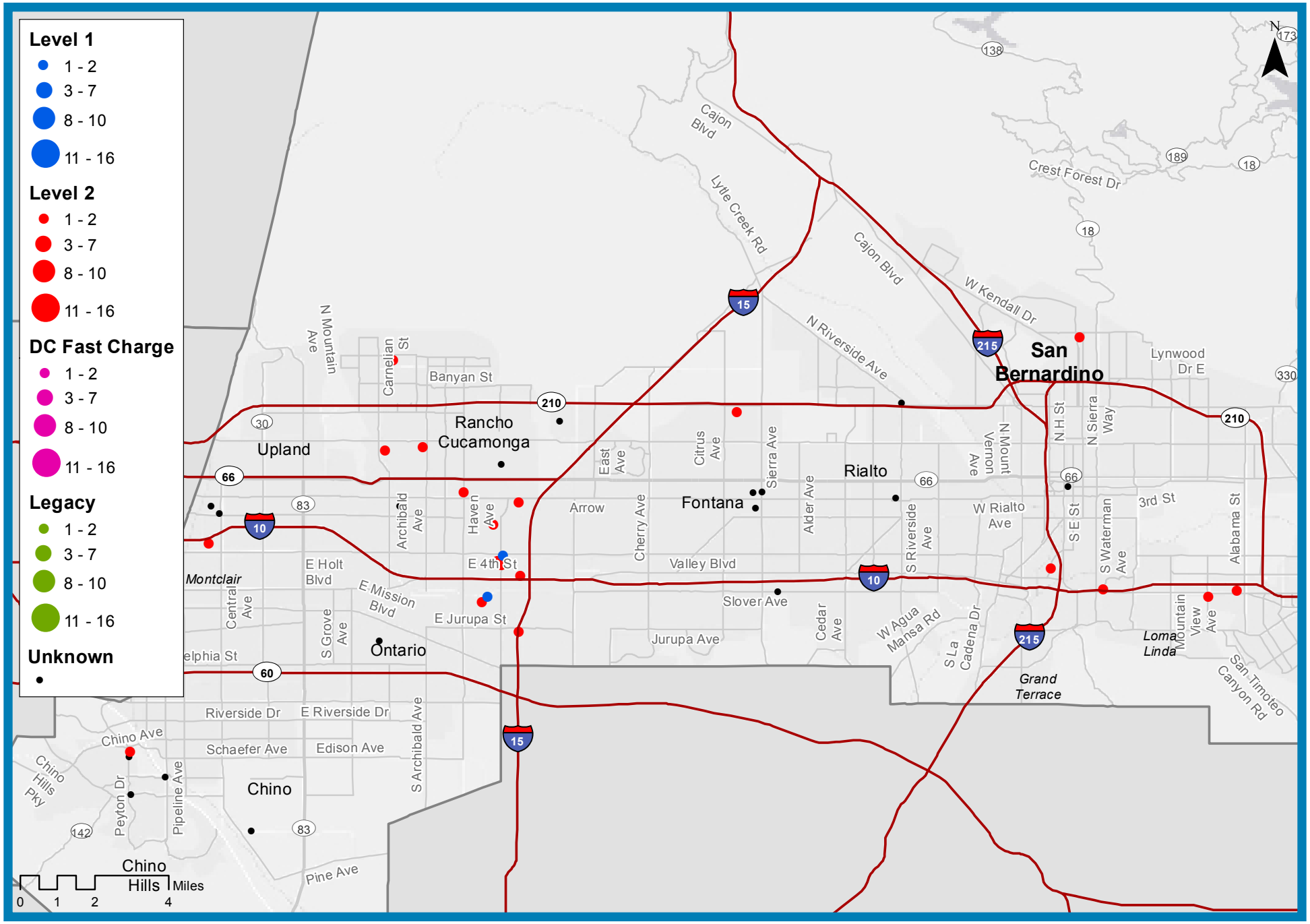
Workplaces by Number of Employees



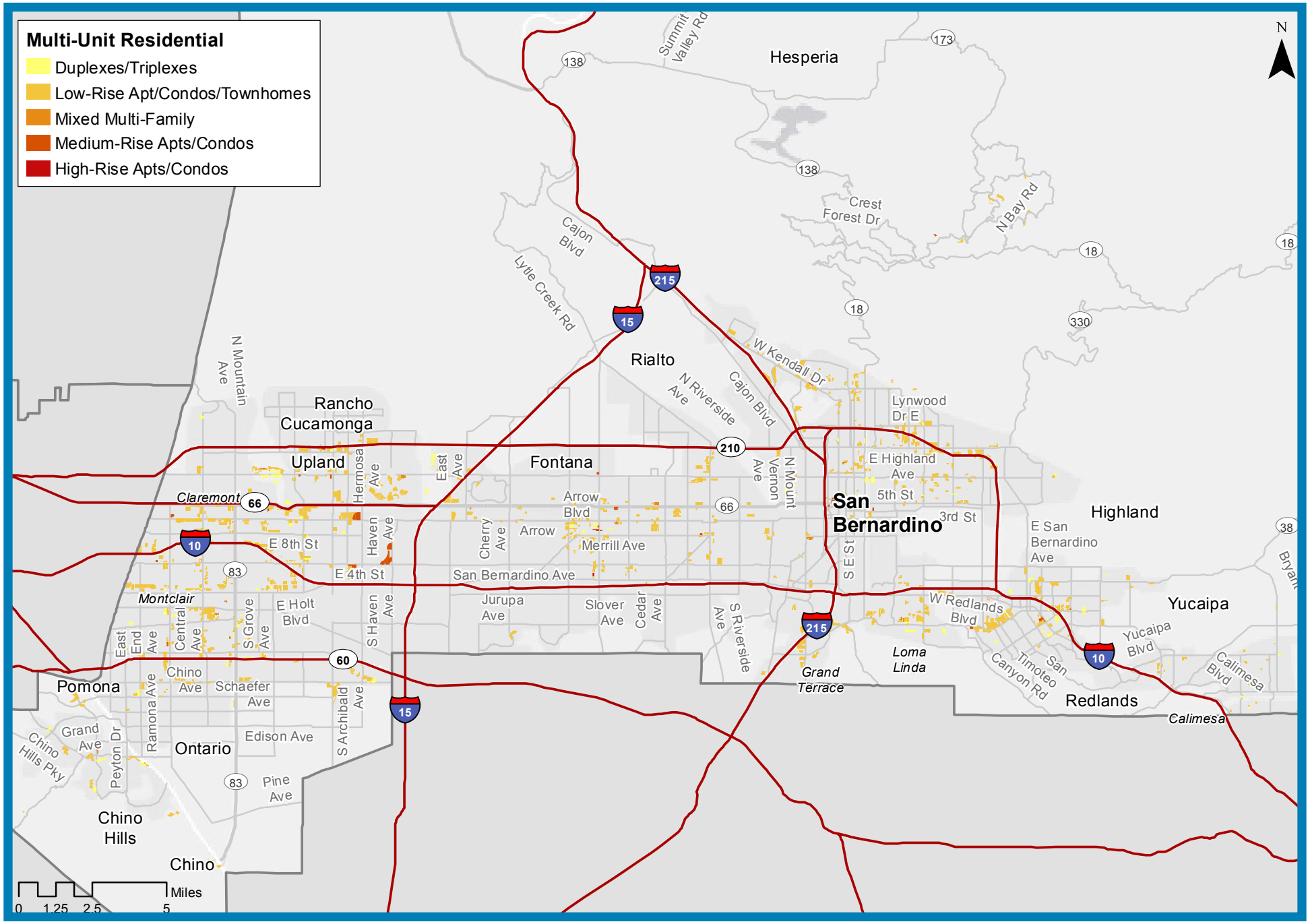
PEV Morning Peak Destinations and Workplaces



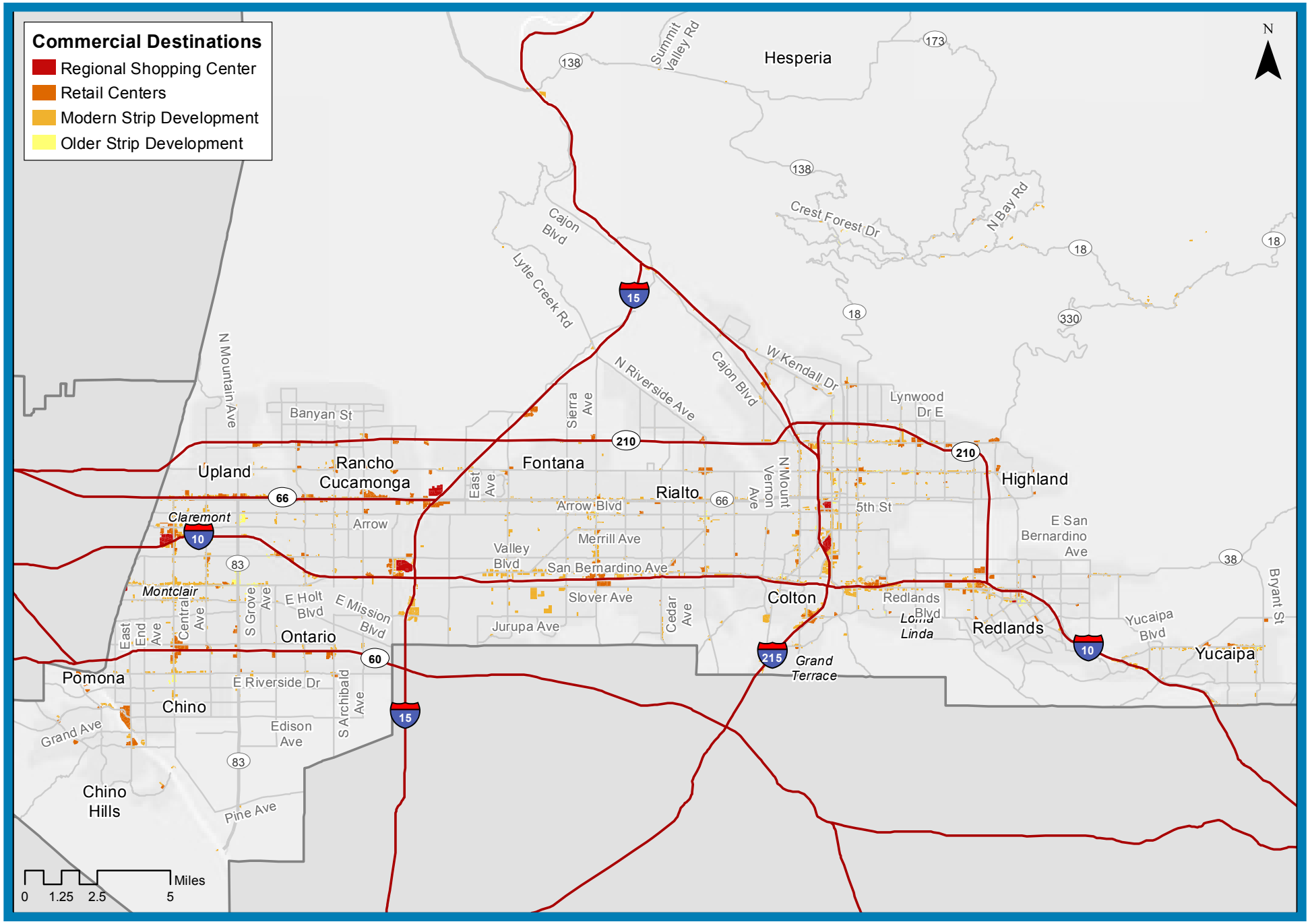
Publicly-Accessible Charging Stations (Summer/Fall 2012)



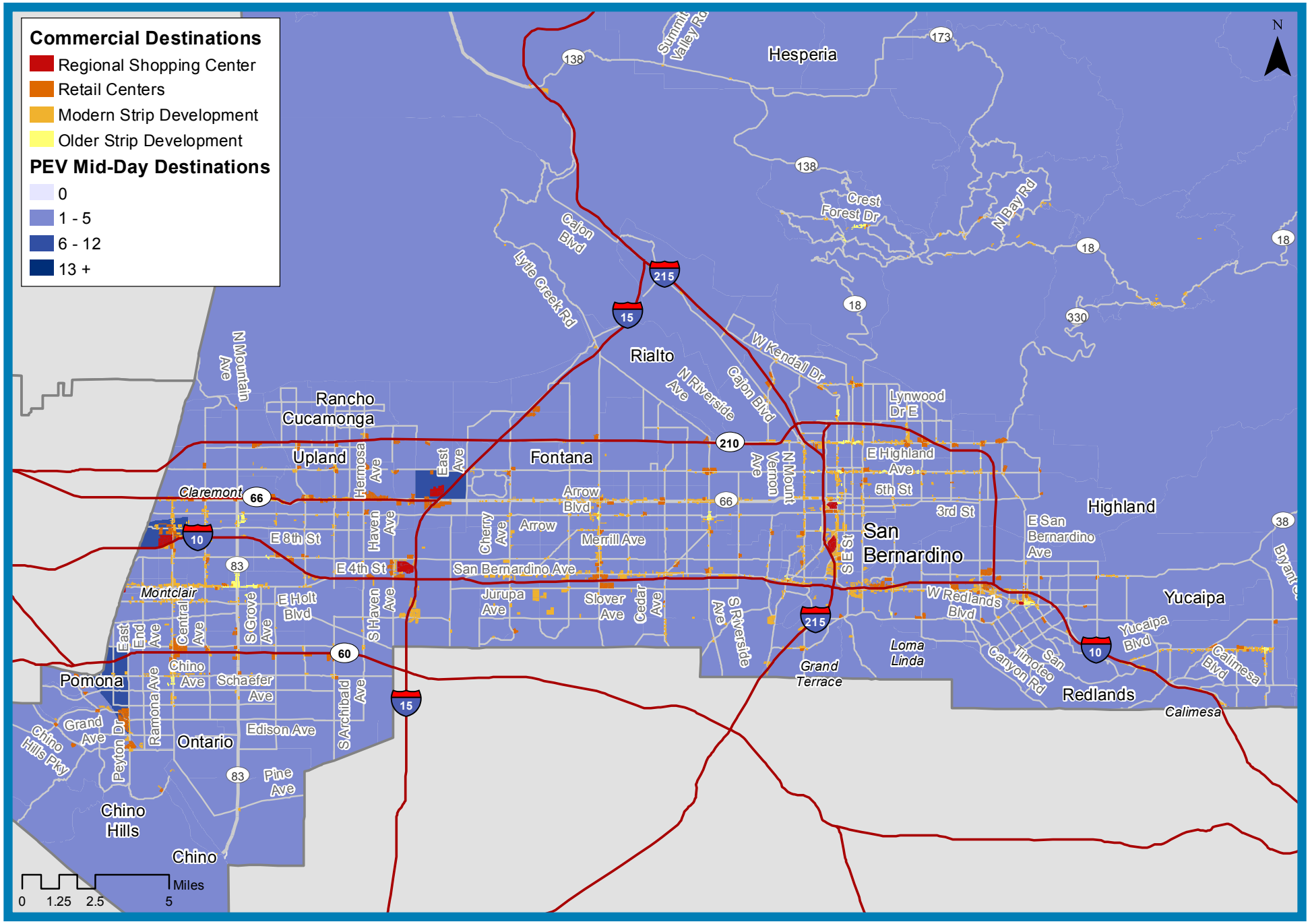
Multi-Unit Residential



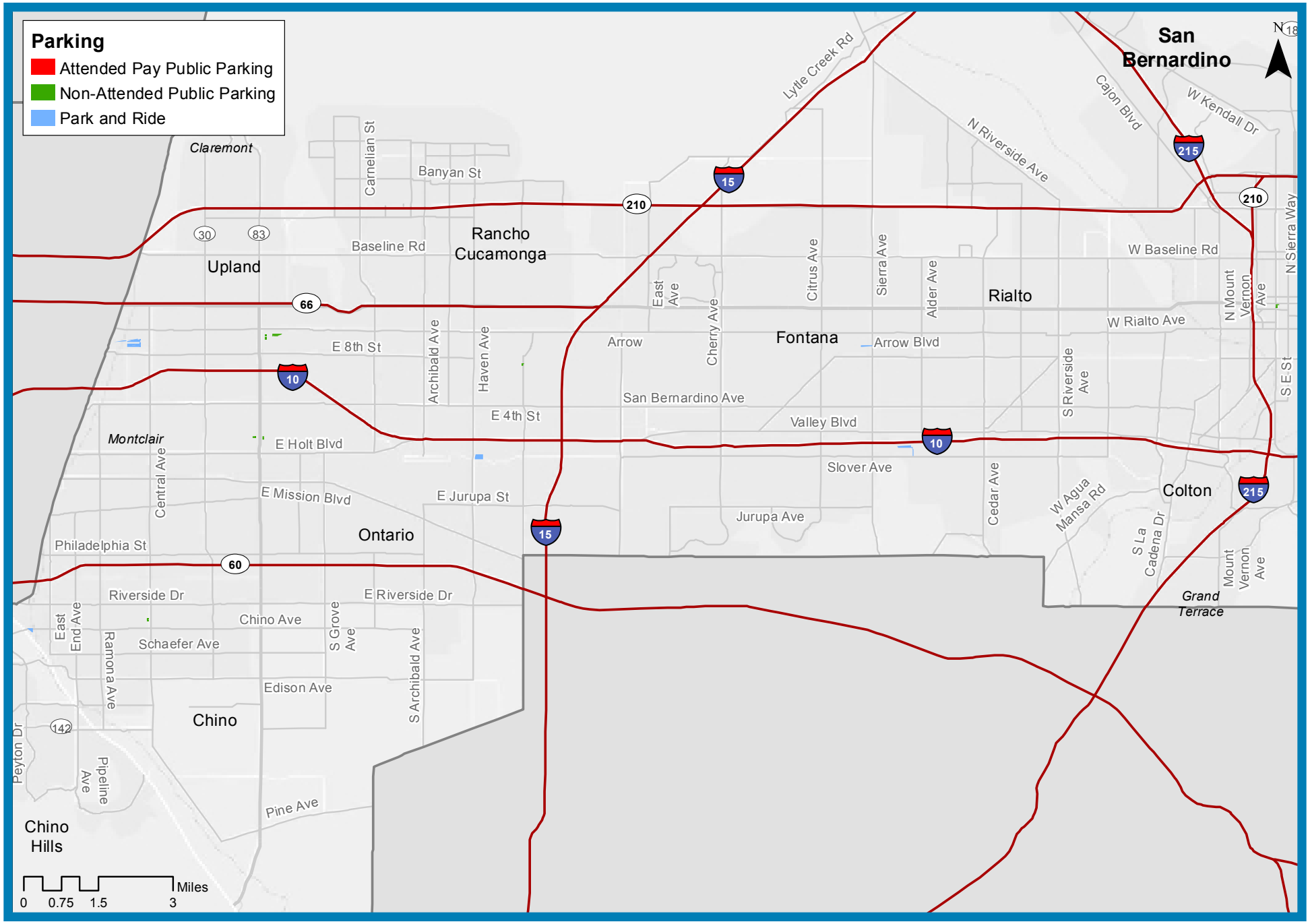
Commercial (Retail) Destinations



PEV Mid-Day Destinations and Commercial (Retail) Locations



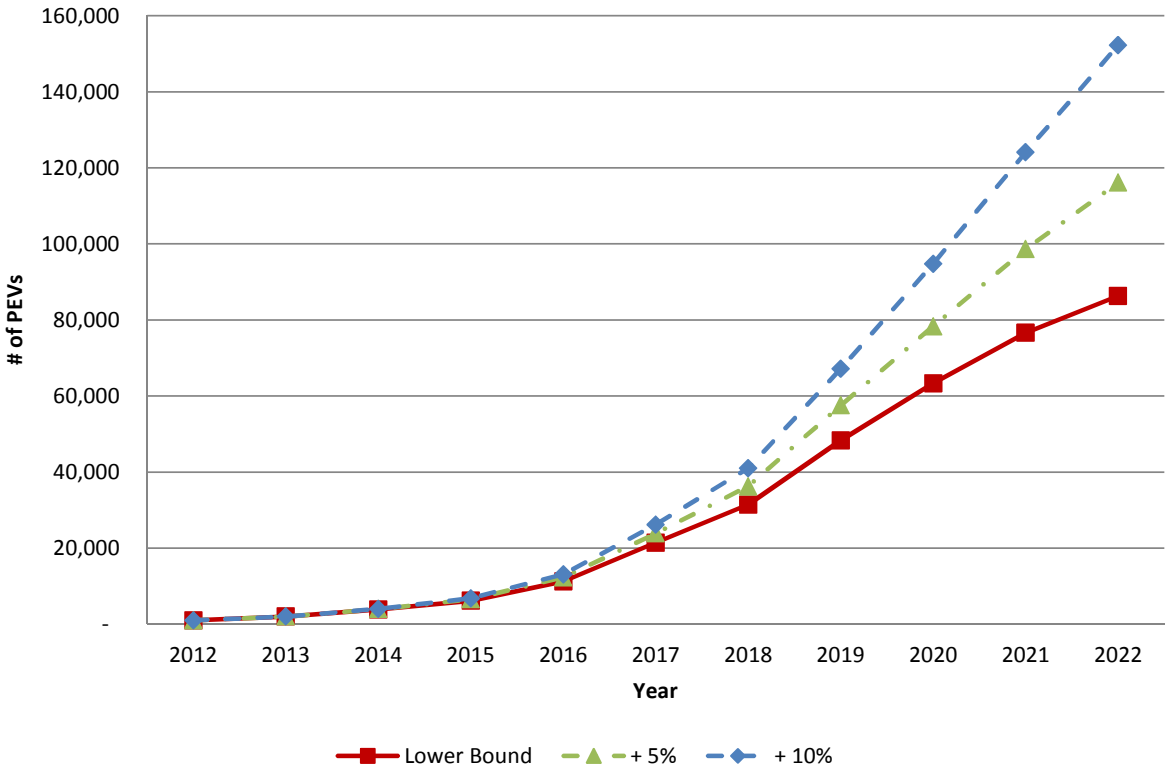
Stand-Alone Parking Facilities



San Fernando Valley Council of Governments

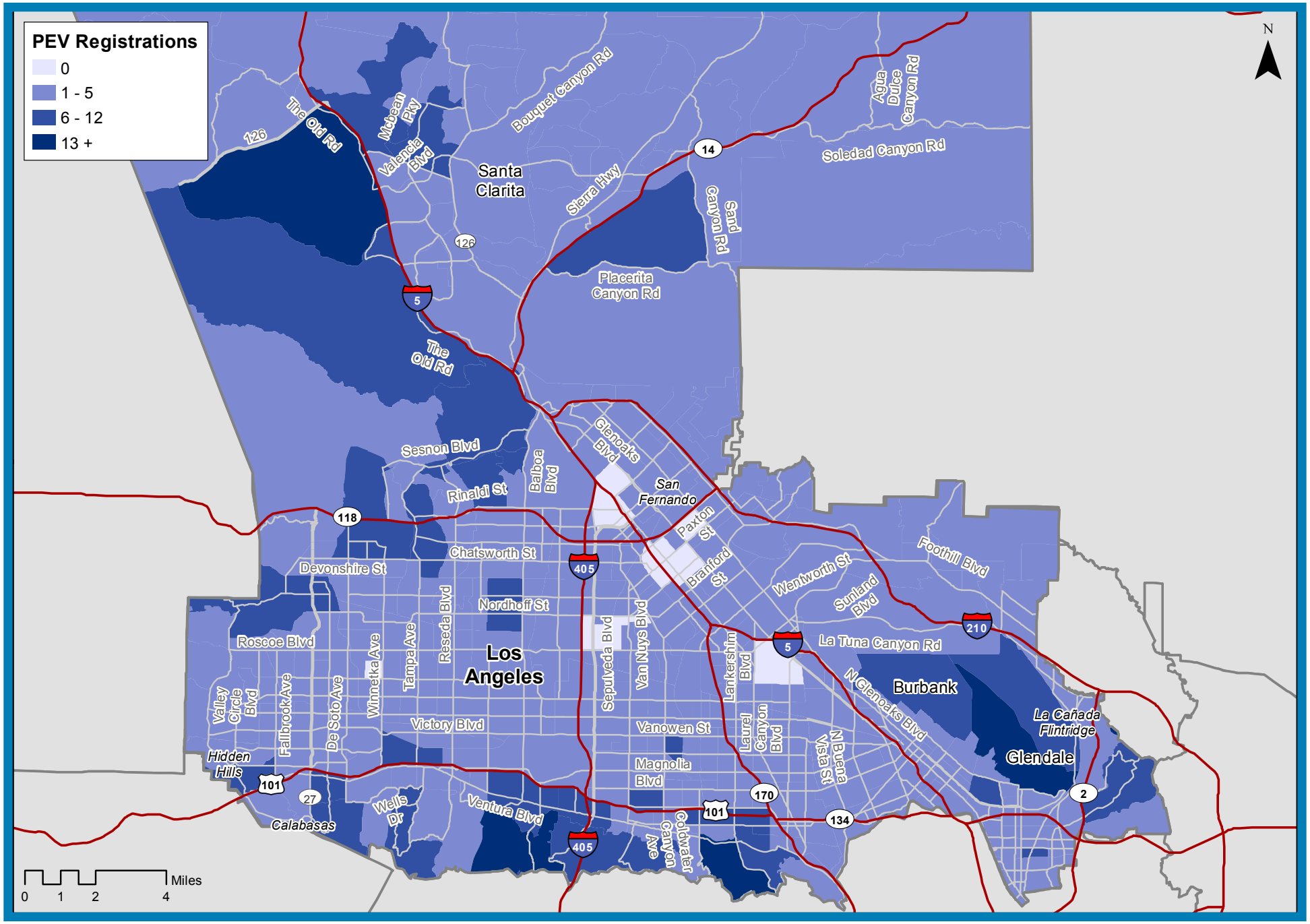
PEV Growth

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

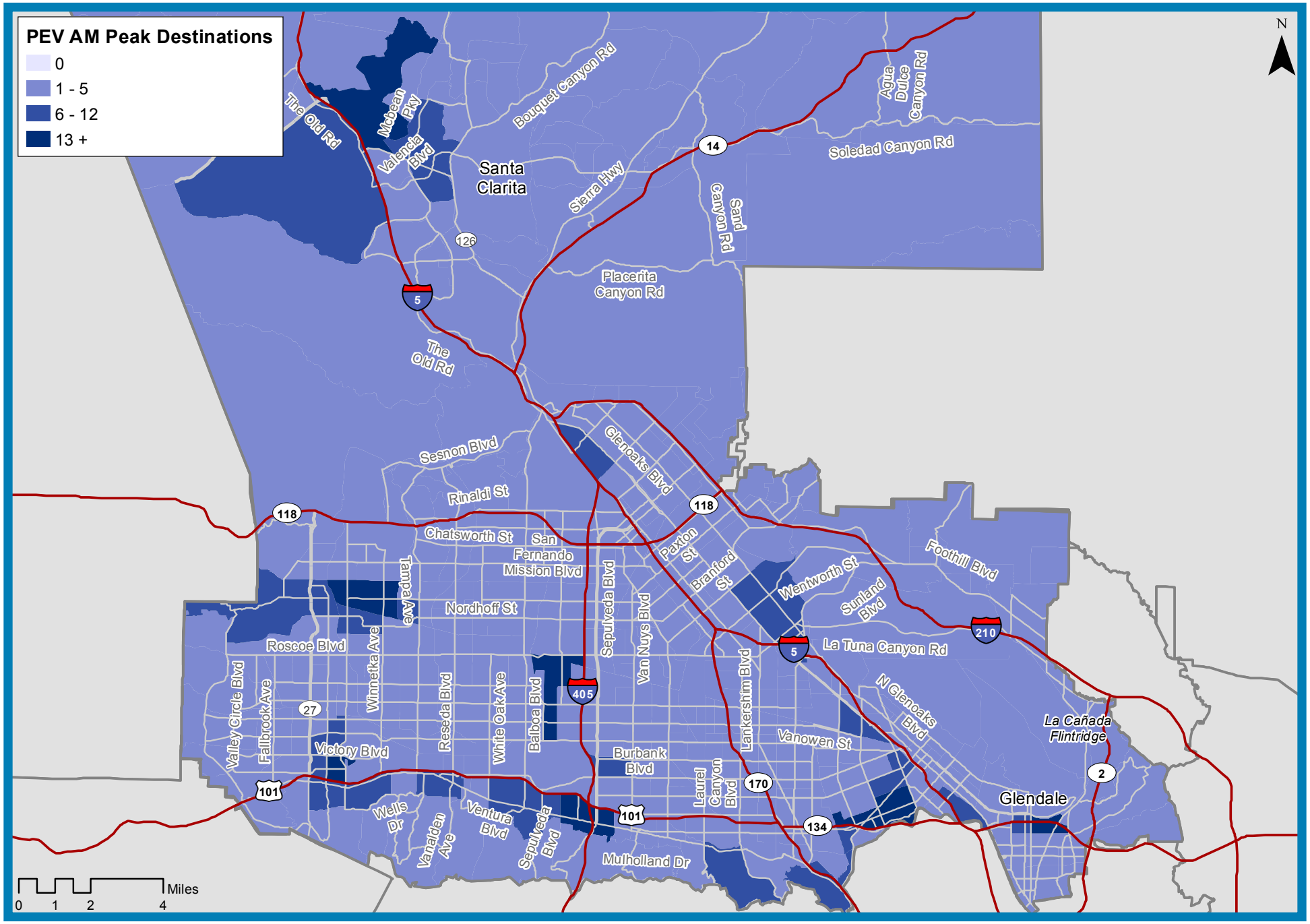


** The +5% and +10% projections begin in 2014, when uncertainty becomes greater.*

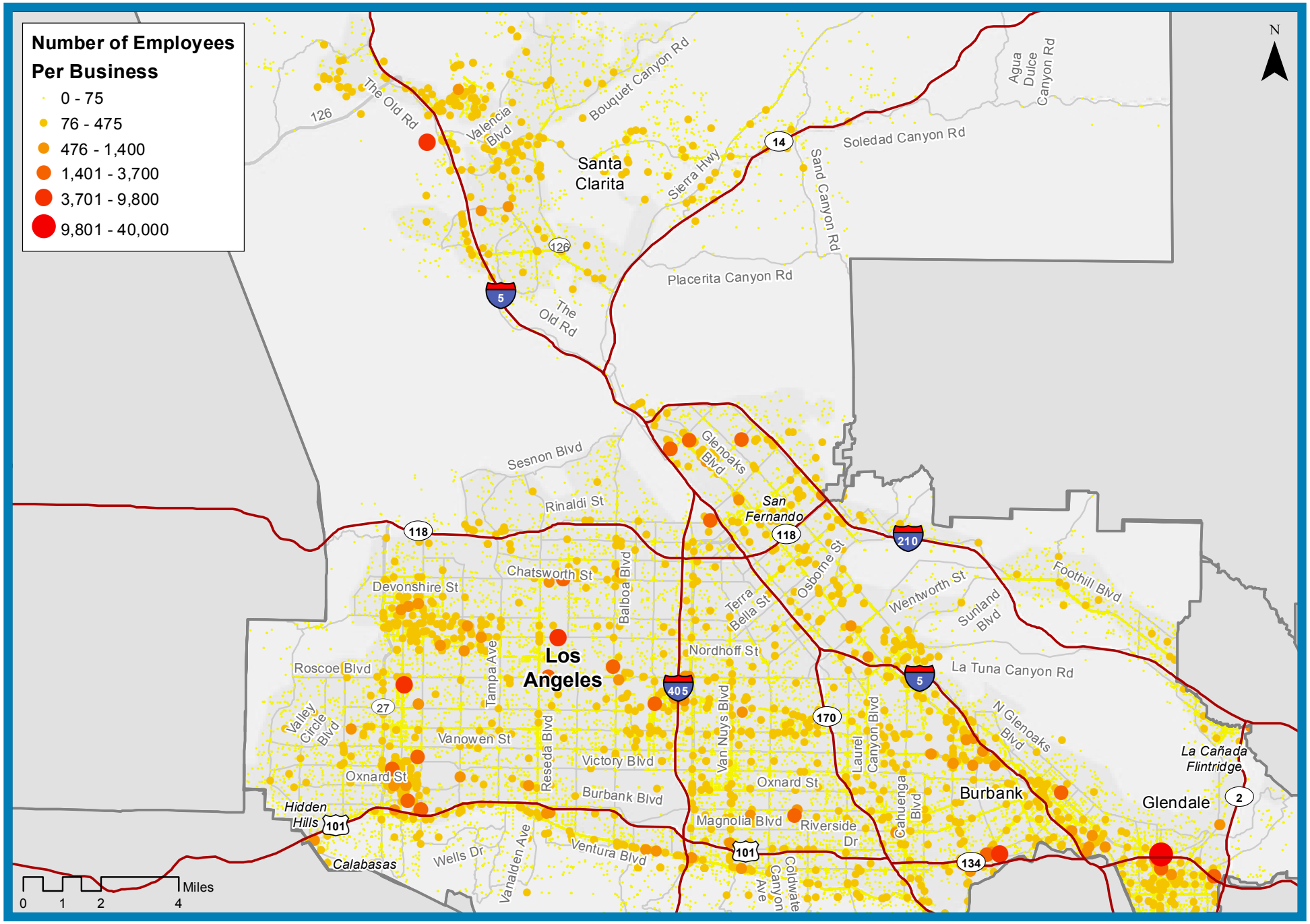
Plug-in Electric Vehicle Registrations



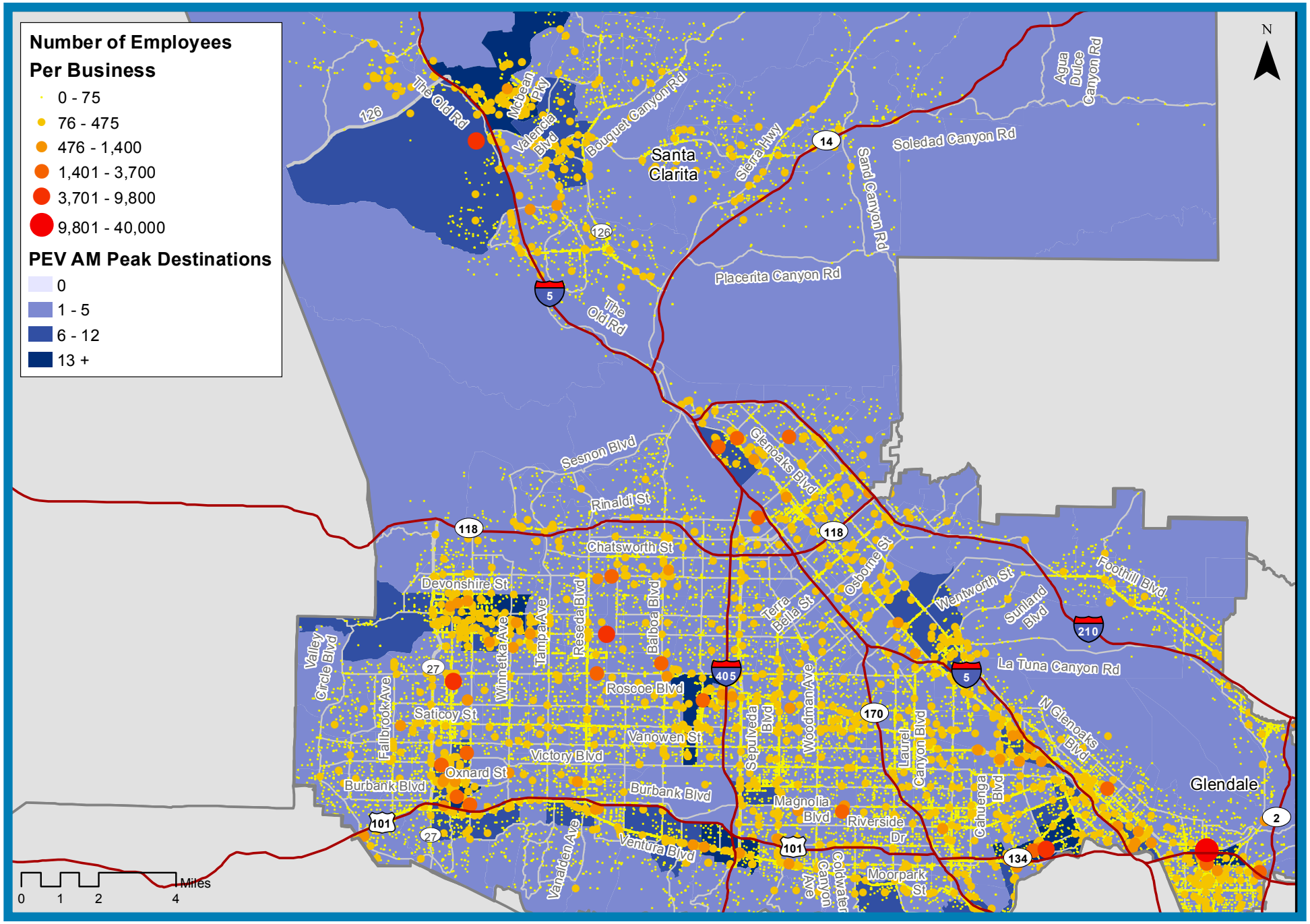
Plug-in Electric Vehicle Morning Peak Destinations



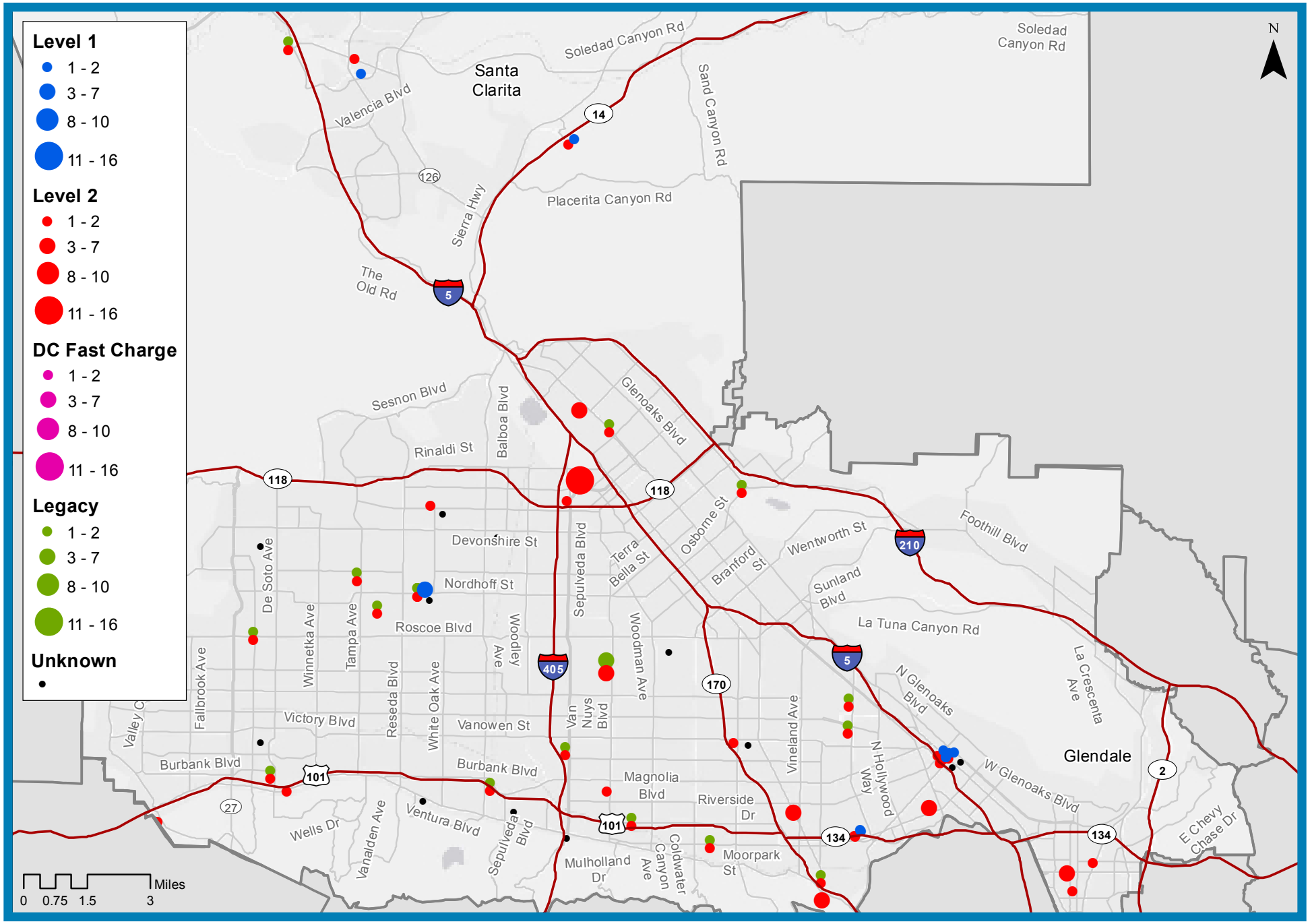
Workplaces by Number of Employees



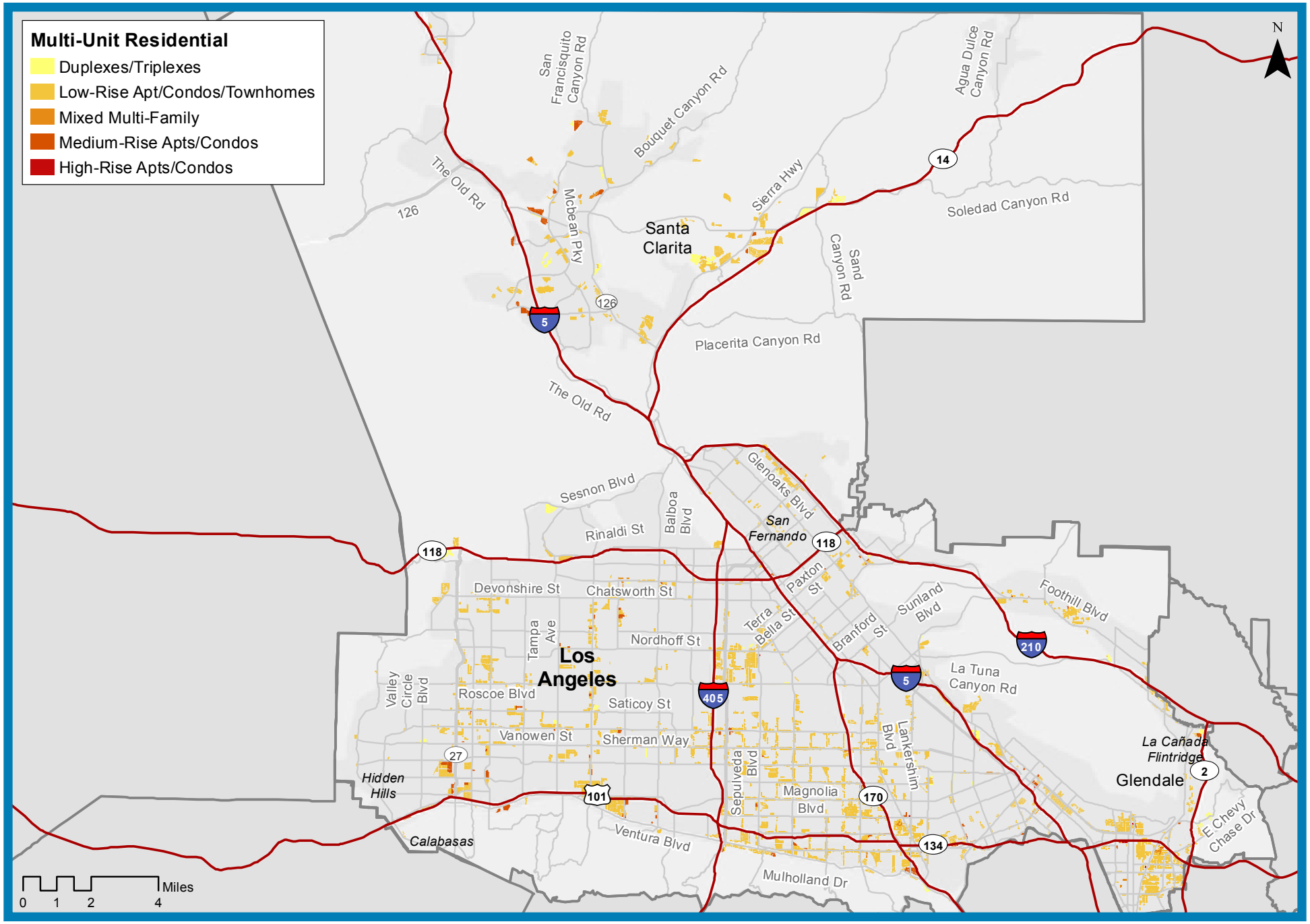
PEV Morning Peak Destinations and Workplaces



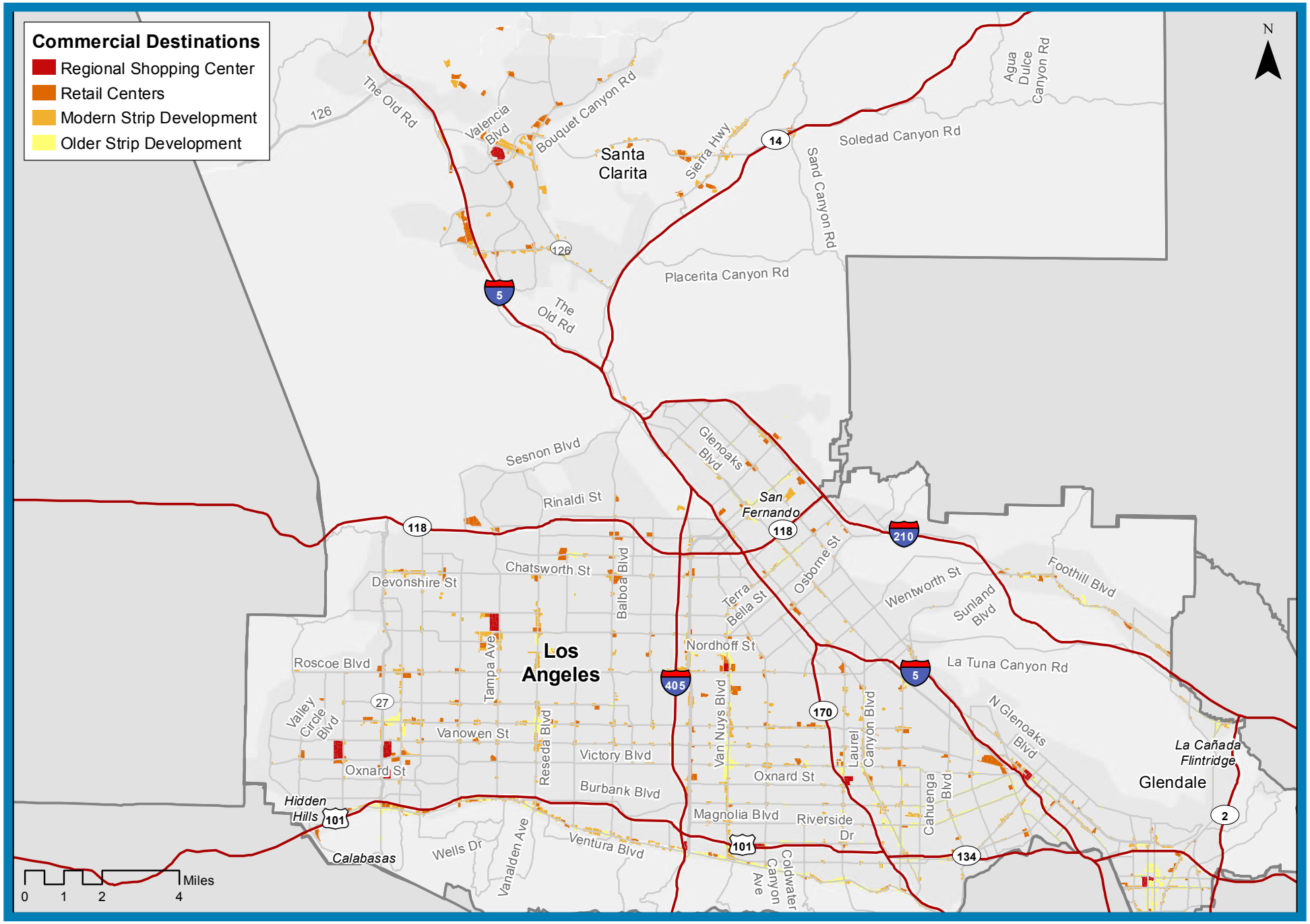
Publicly-Accessible Charging Stations (Summer/Fall 2012)



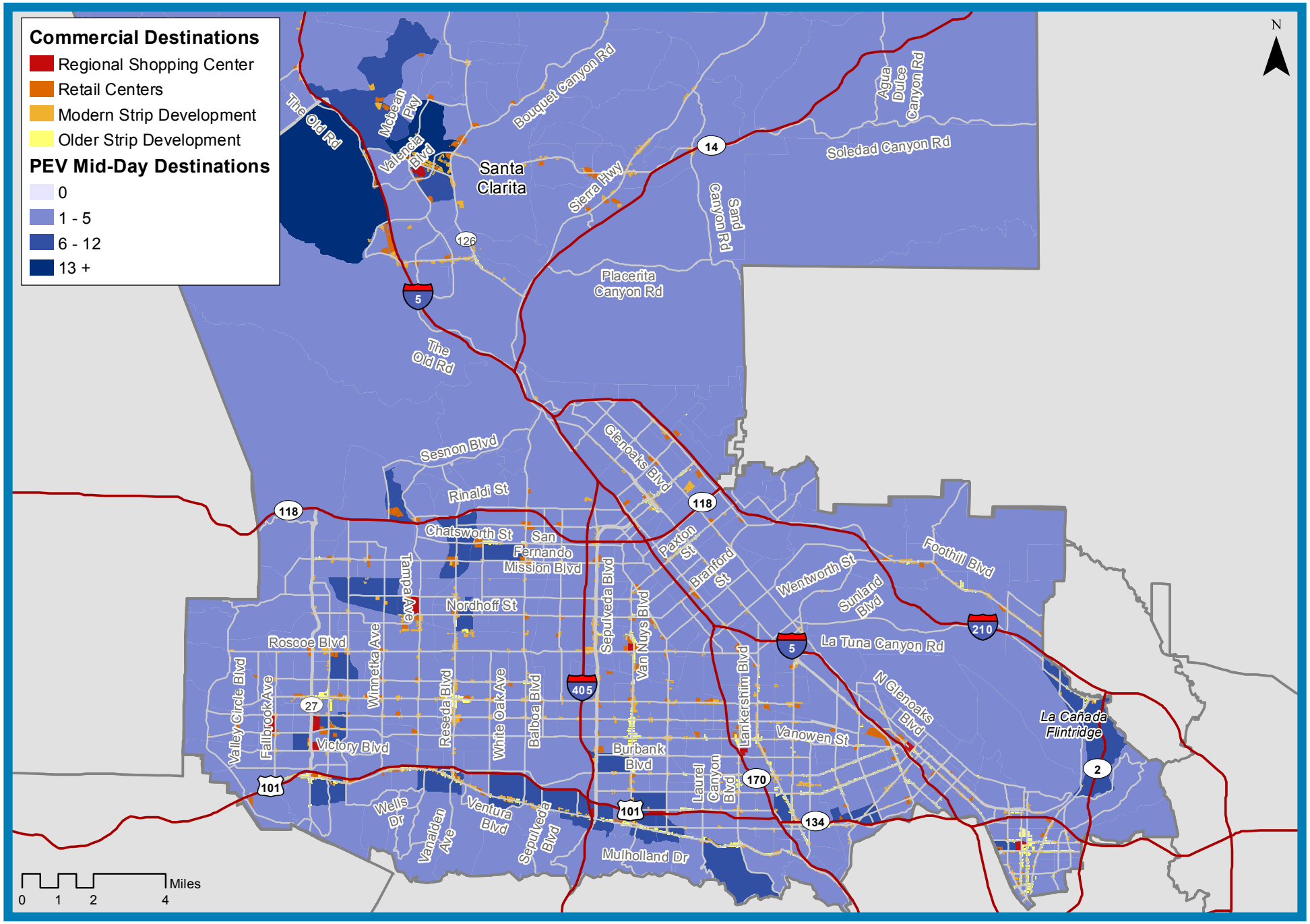
Multi-Unit Residential



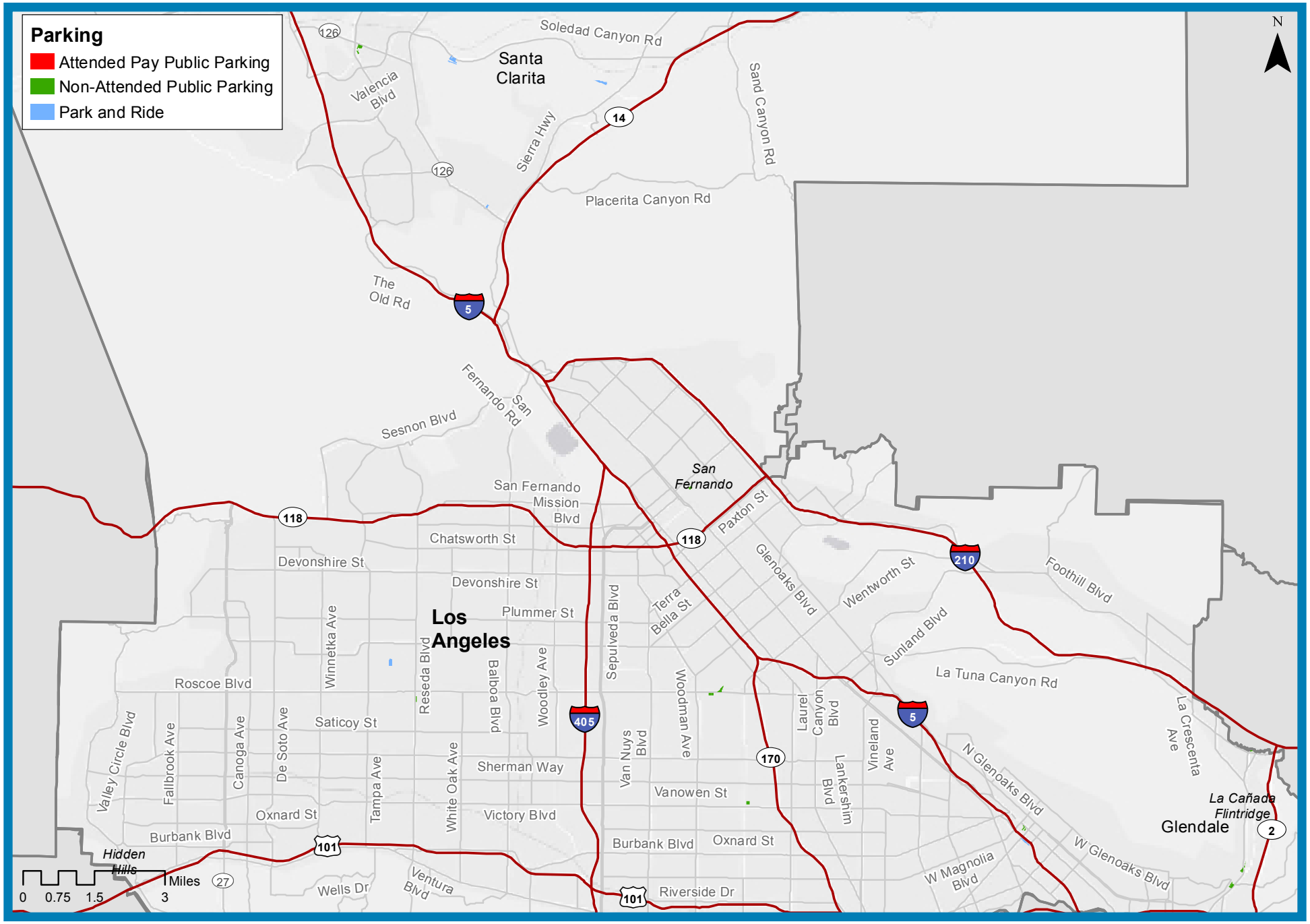
Commercial (Retail) Destinations



PEV Mid-Day Destinations and Commercial (Retail) Locations



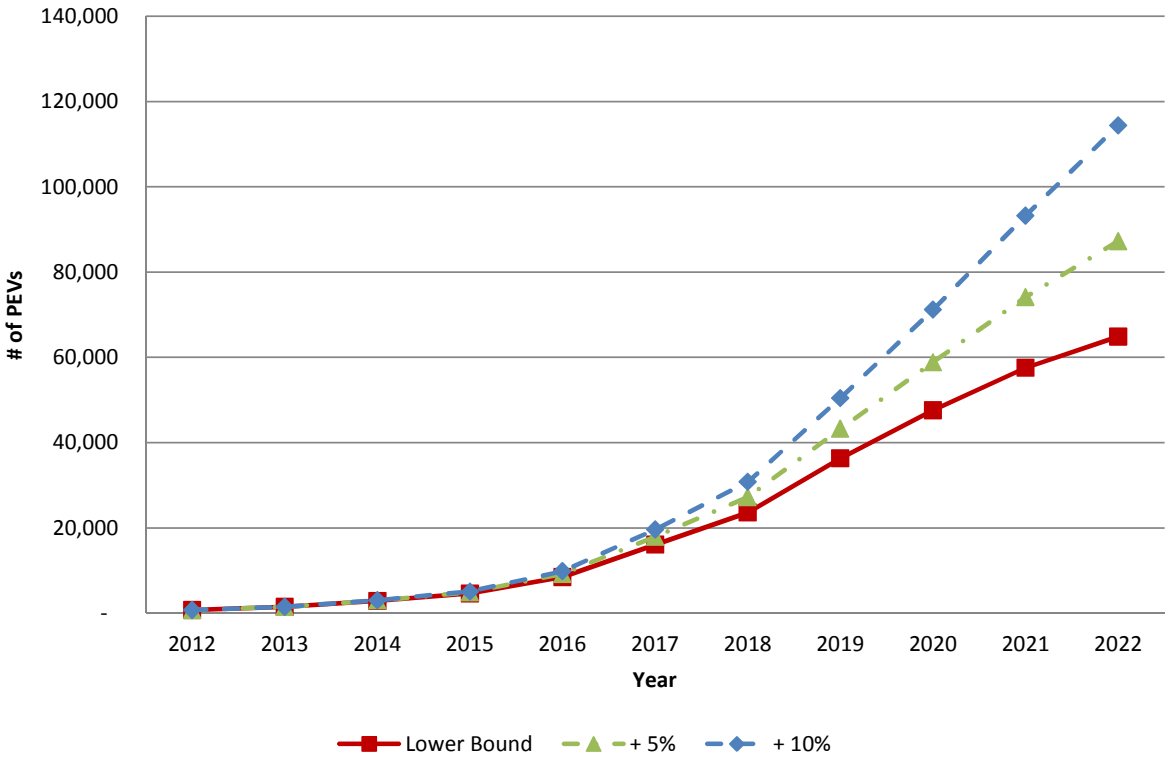
Stand-alone Parking Facilities



San Gabriel Valley Council of Governments

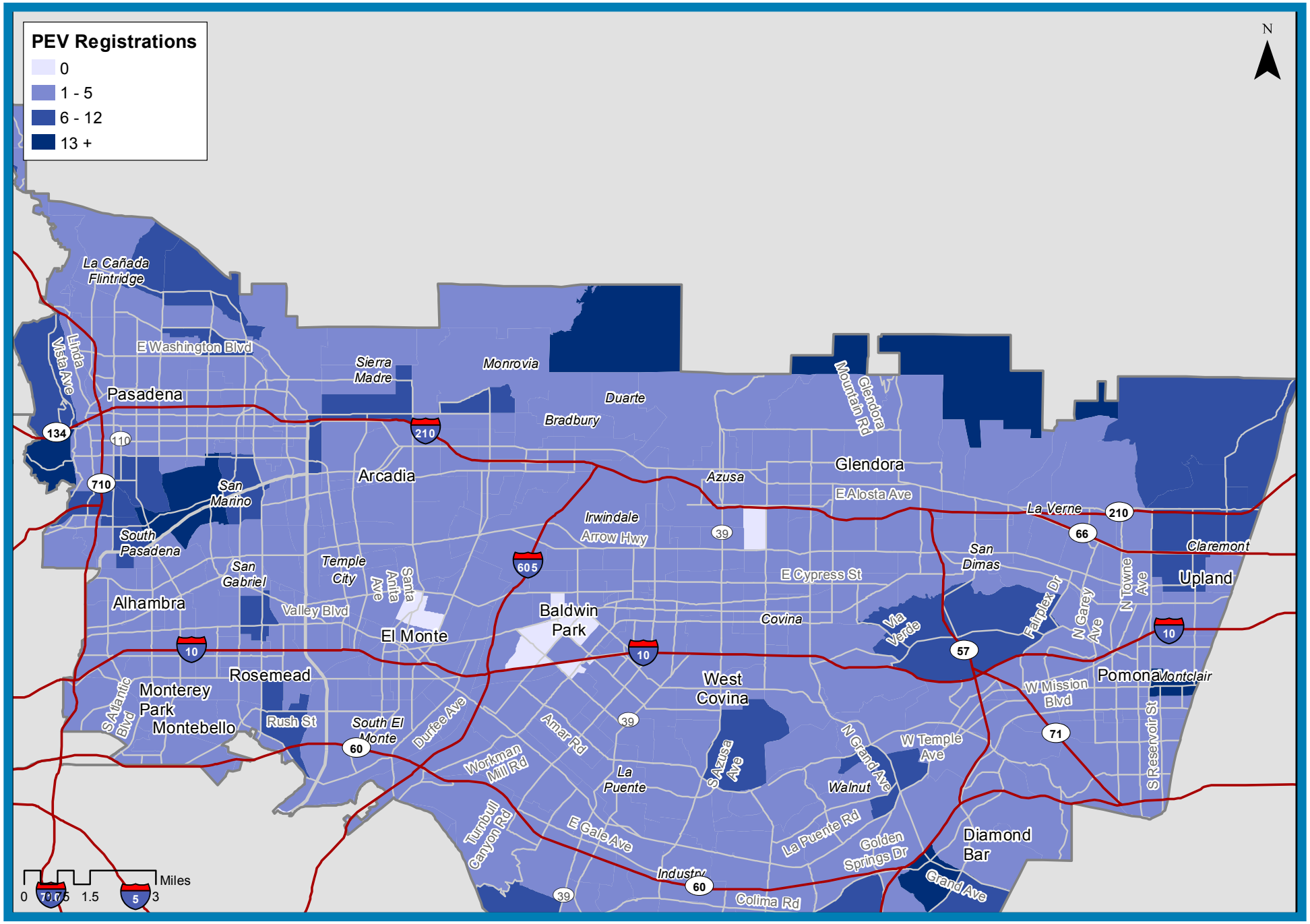
PEV Growth

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

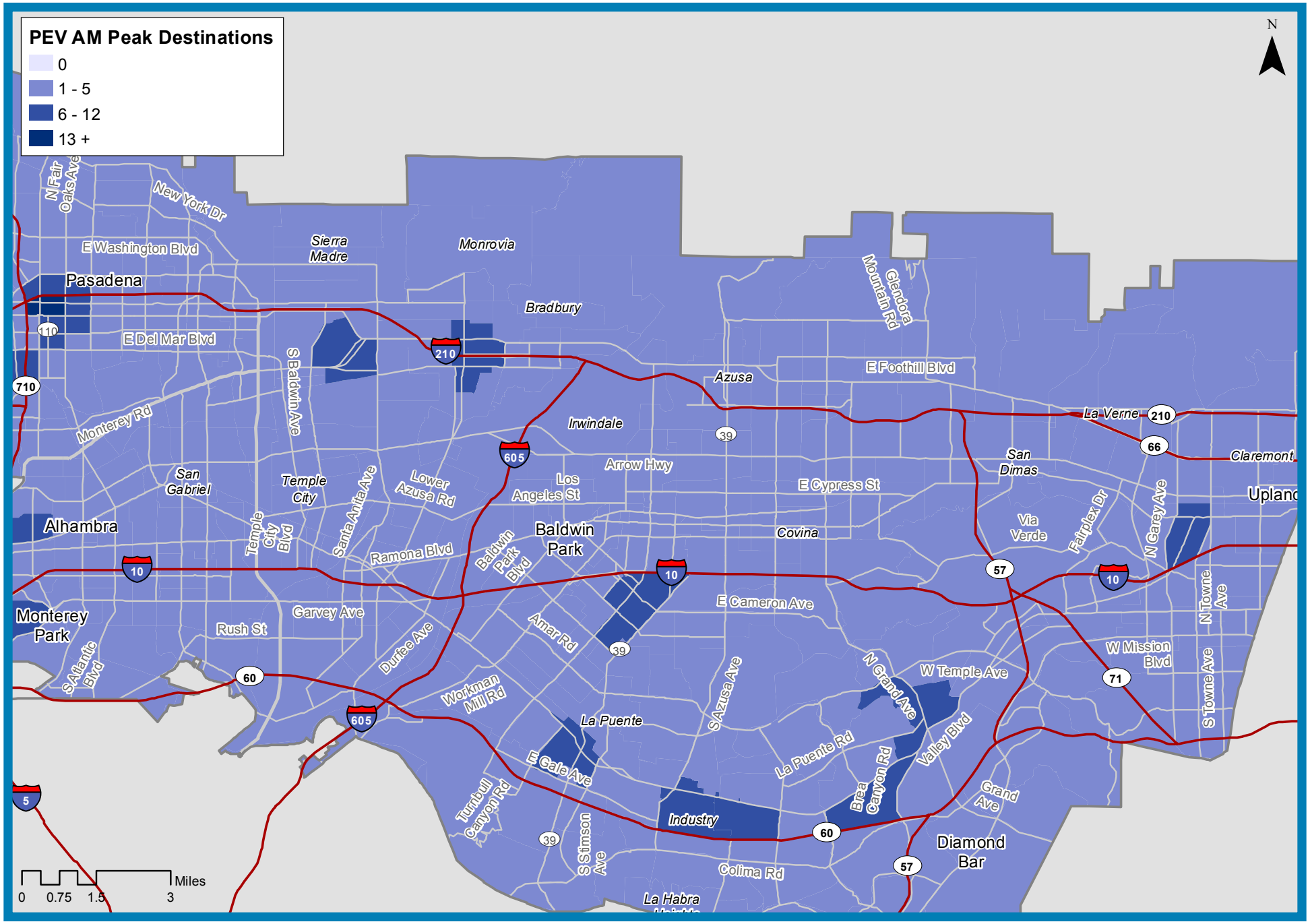


** The +5% and +10% projections begin in 2014, when uncertainty becomes greater.*

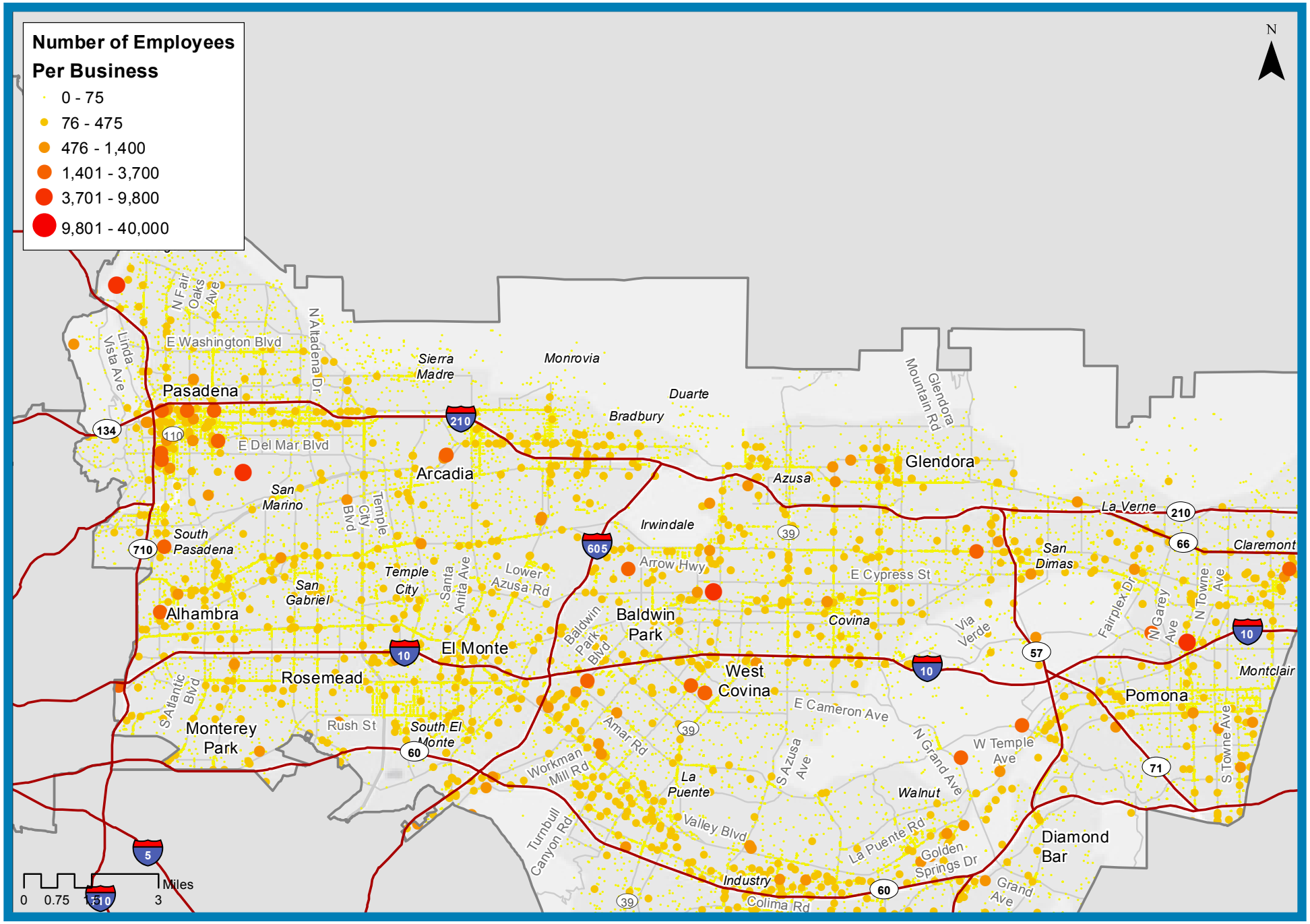
Plug-in Electric Vehicle Registrations



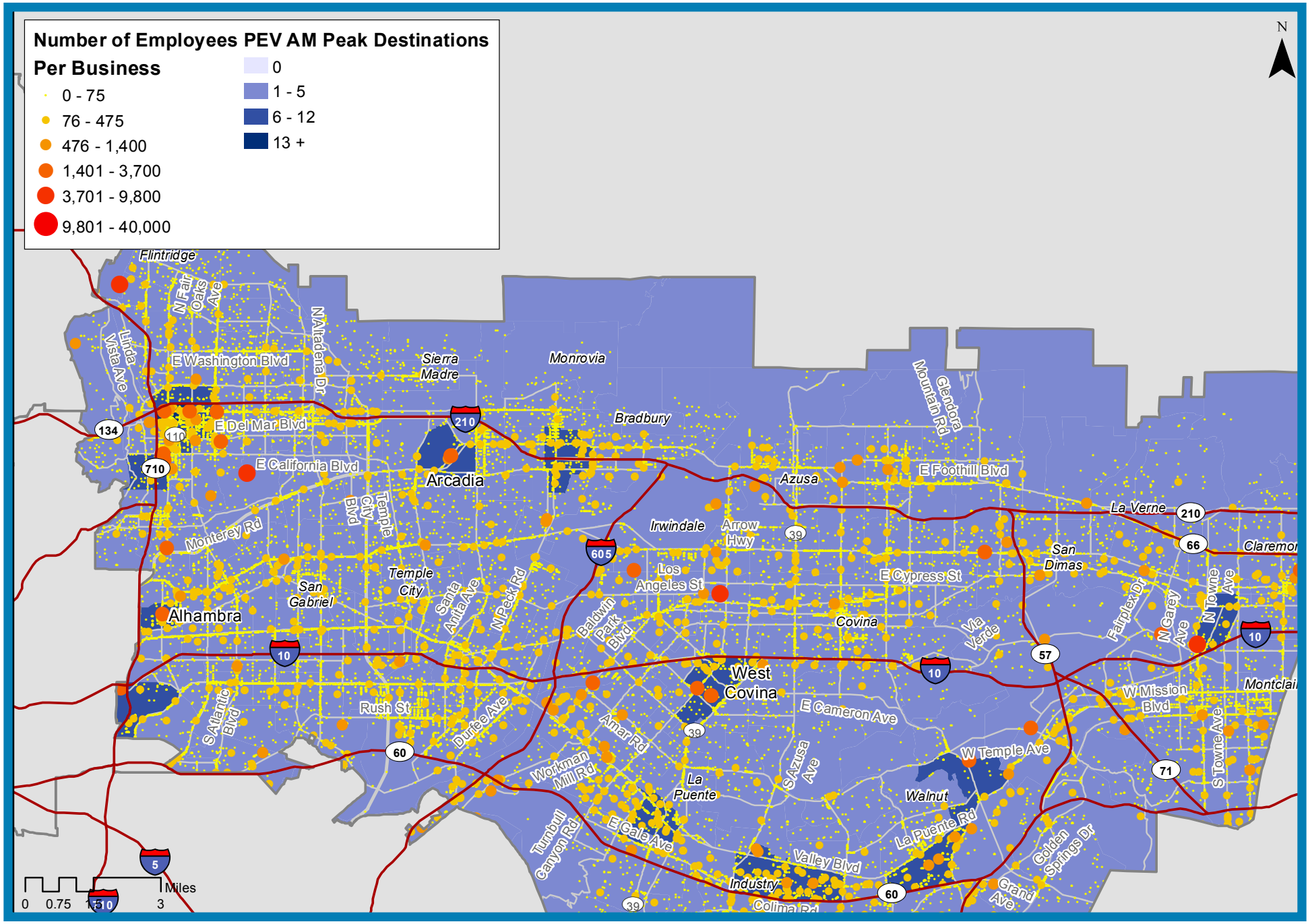
Plug-in Electric Vehicle Morning Peak Destinations



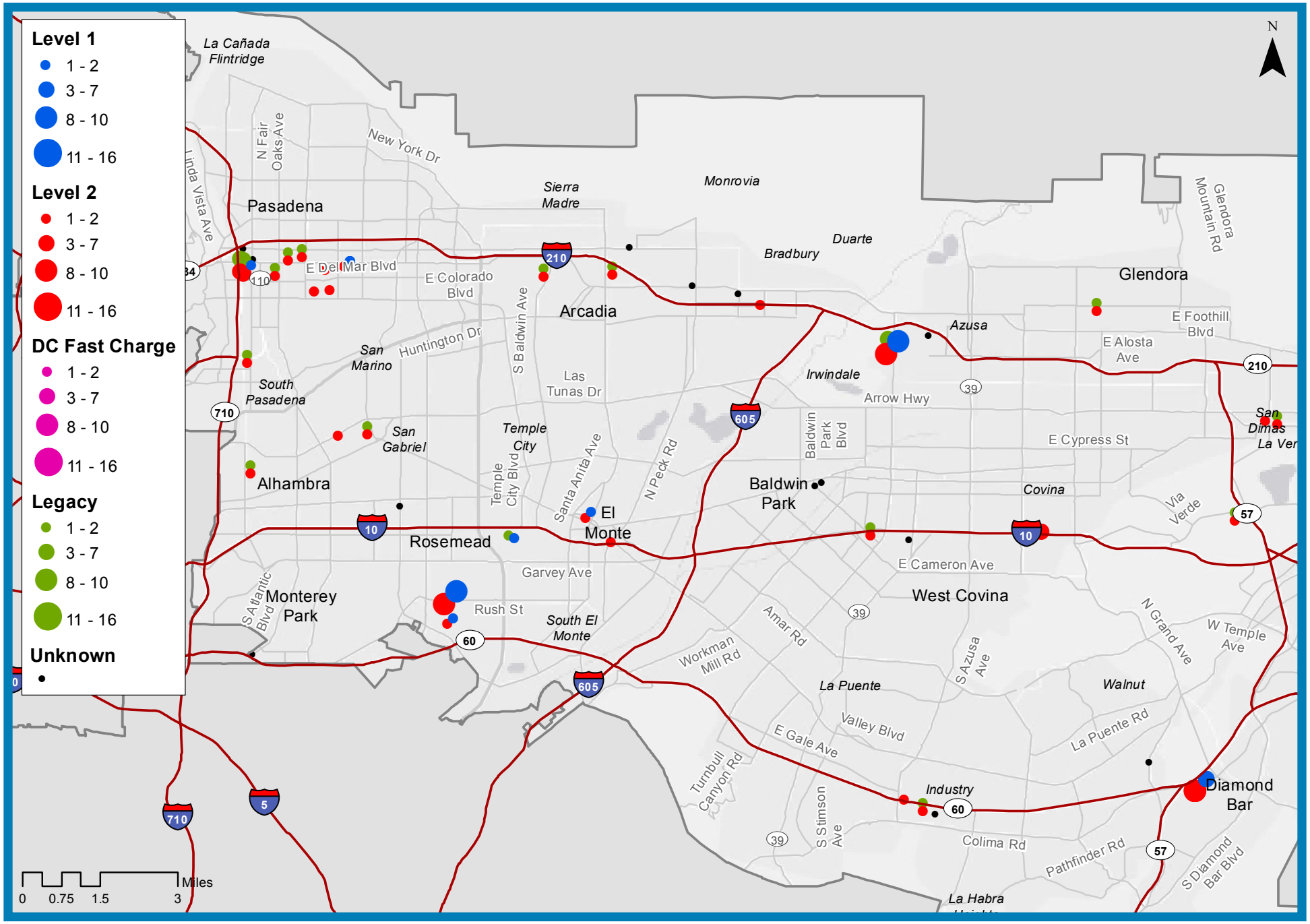
Workplaces by Number of Employees



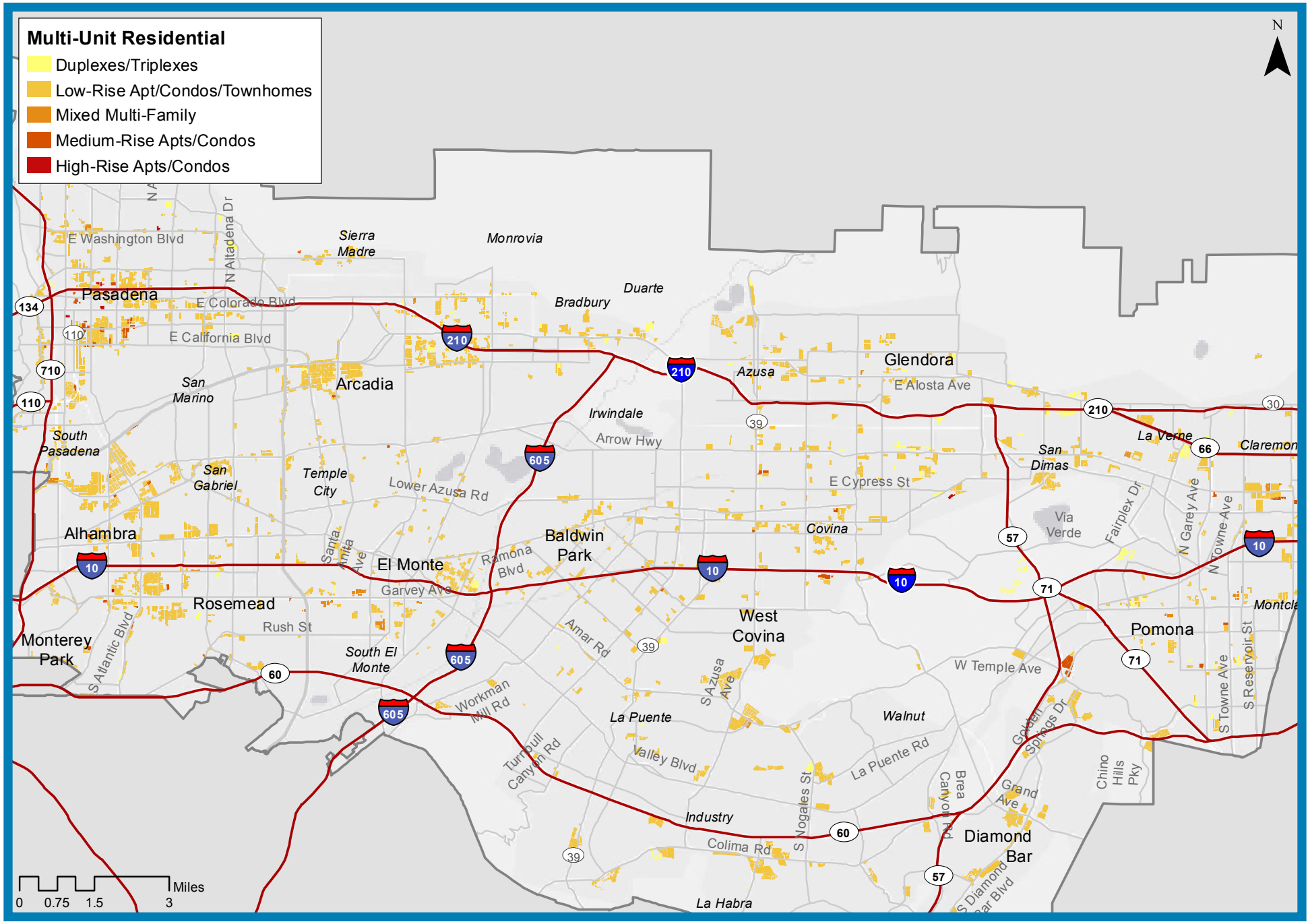
PEV Morning Peak Destinations and Workplaces



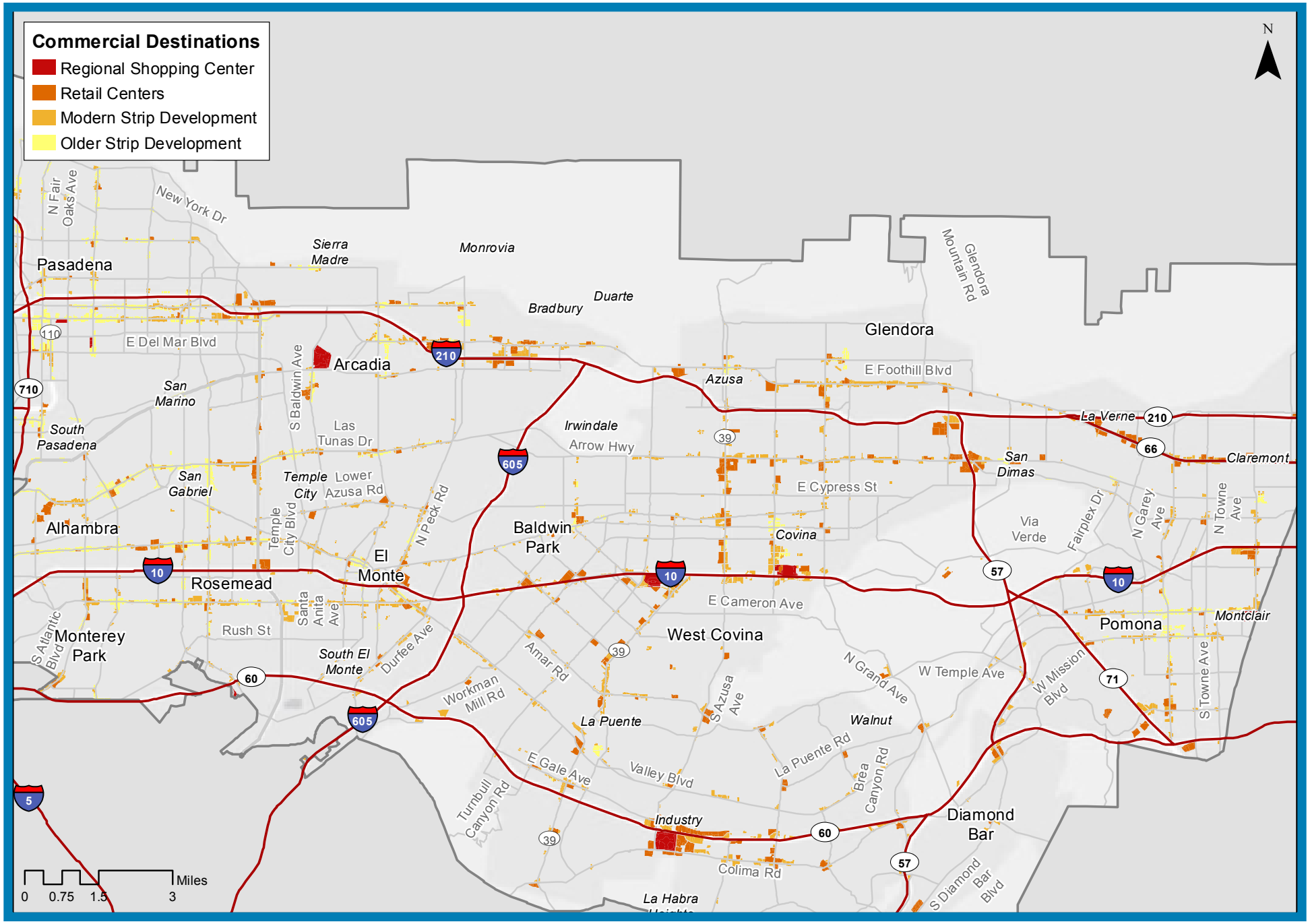
Publicly-Accessible Charging Stations (Summer/Fall 2012)



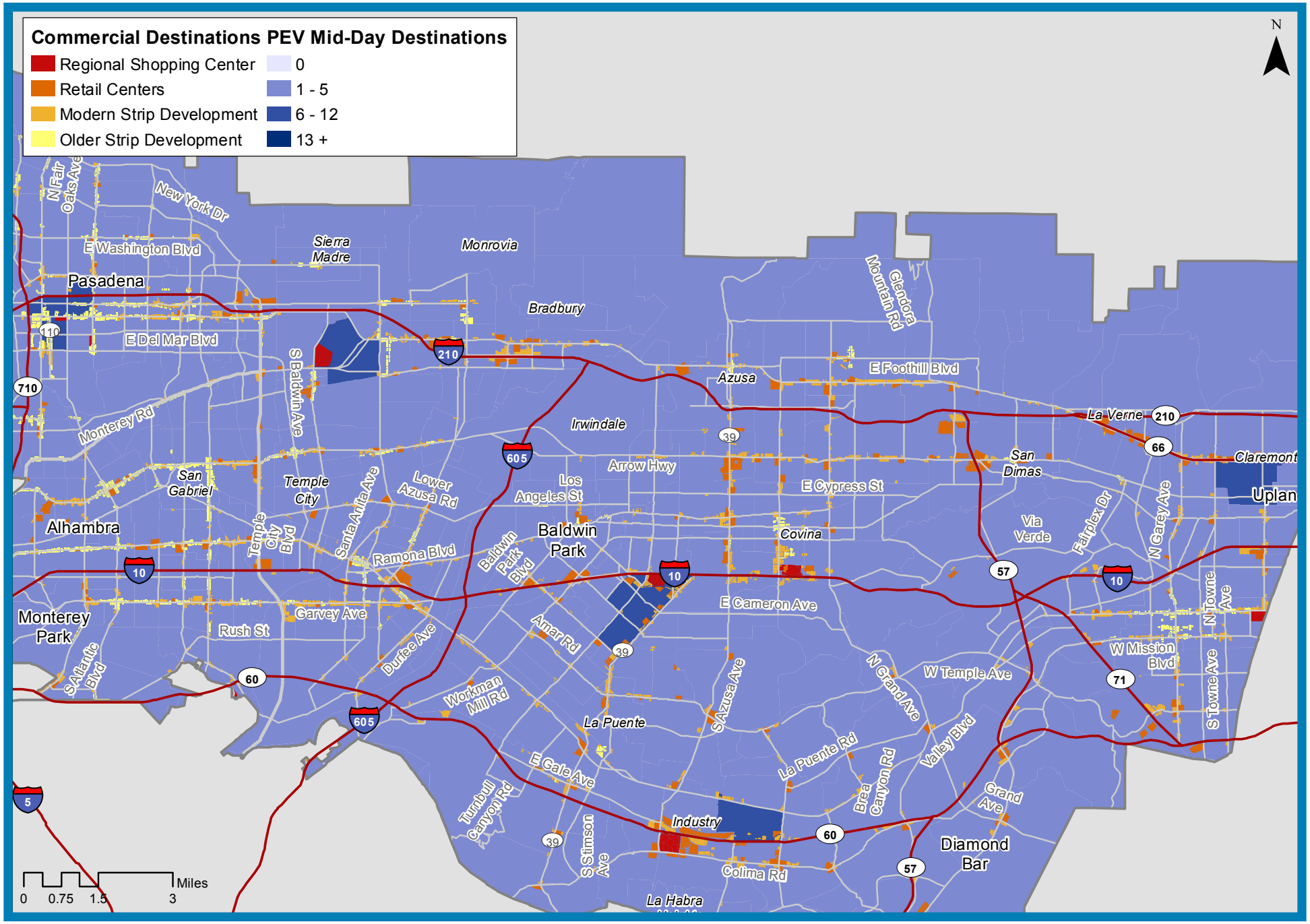
Multi-Unit Residential



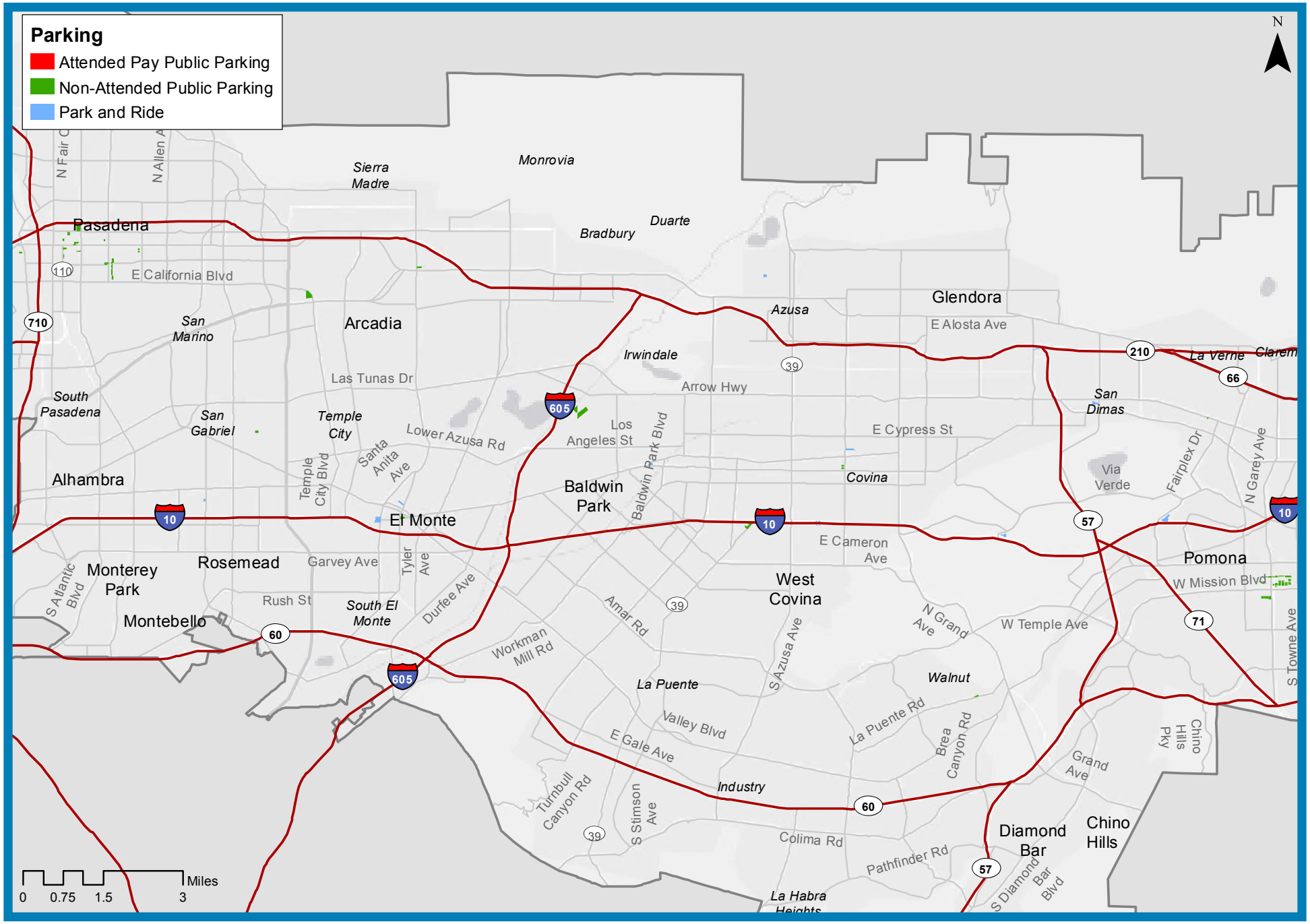
Commercial (Retail) Destinations



PEV Mid-Day Destinations and Commercial (Retail) Locations



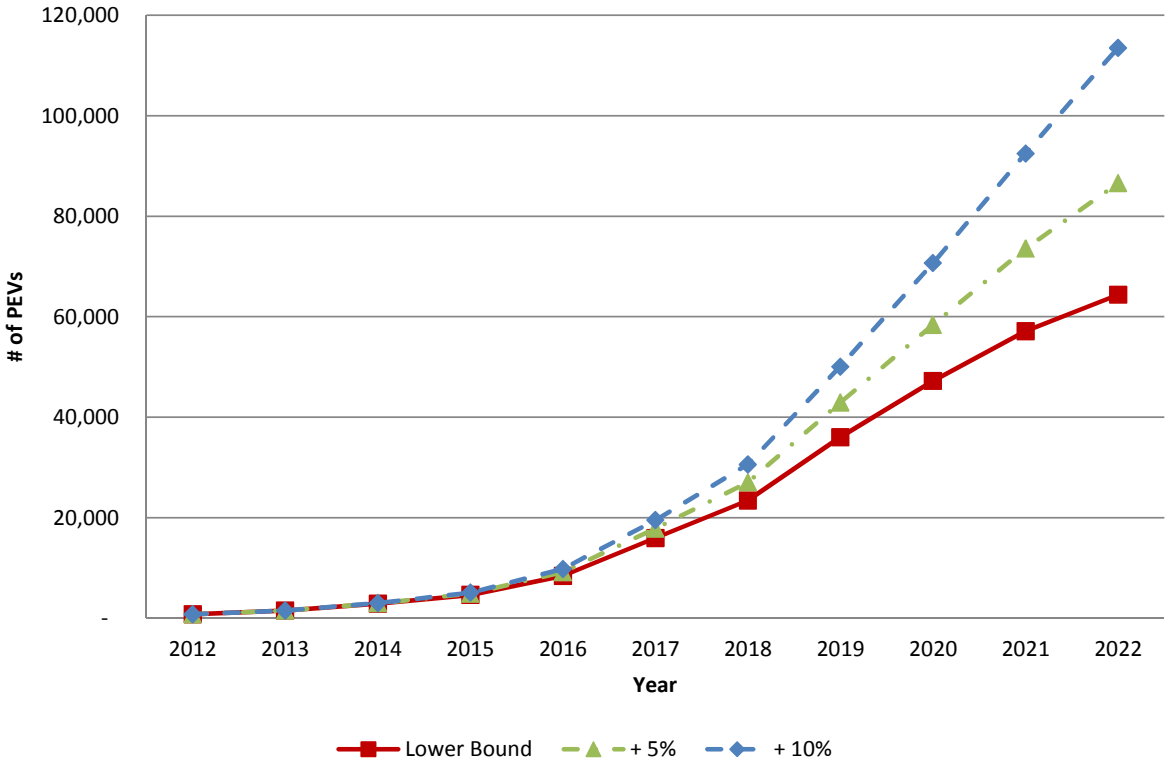
Stand-alone Parking Facilities



South Bay Cities Council of Governments

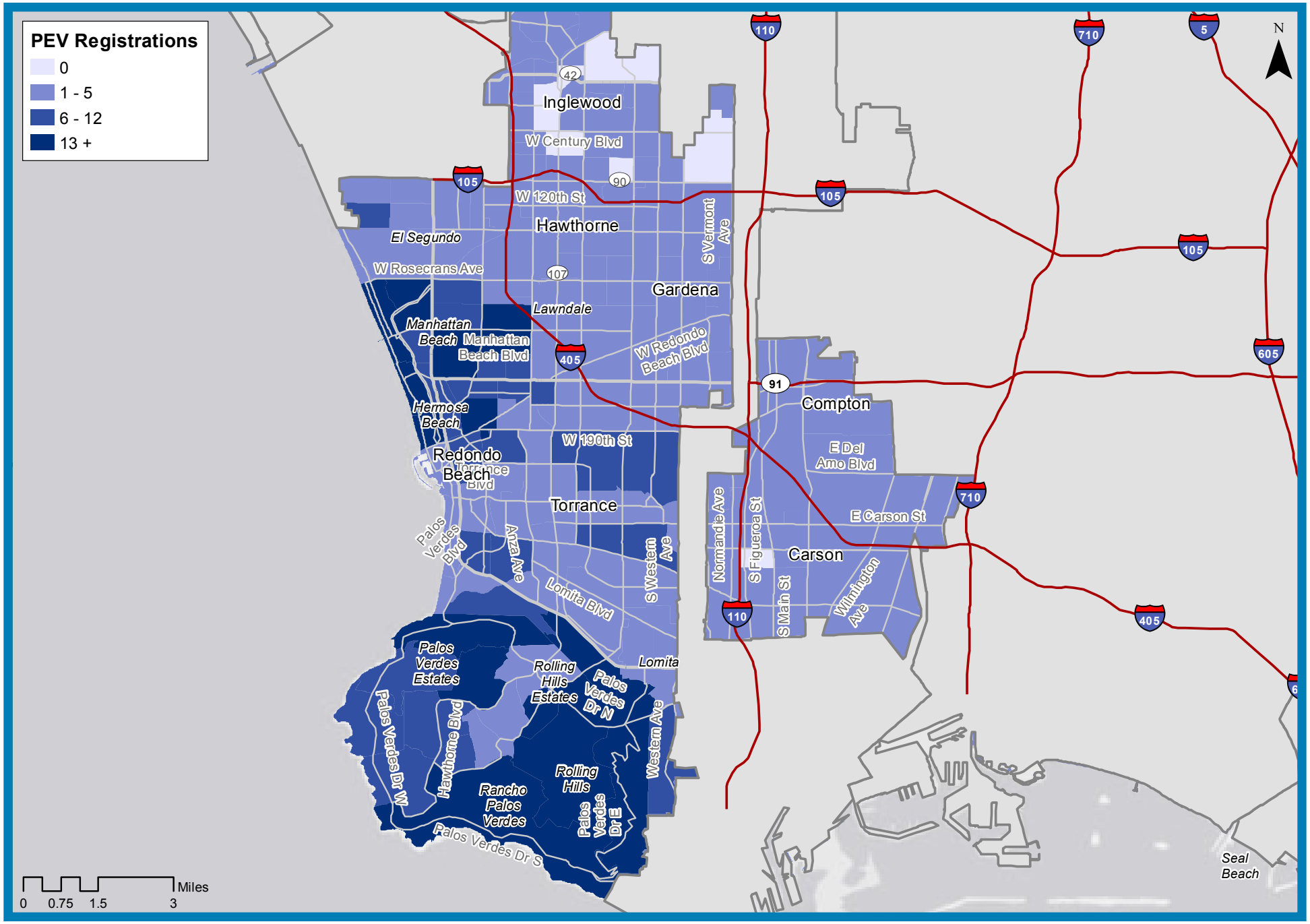
PEV Growth

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

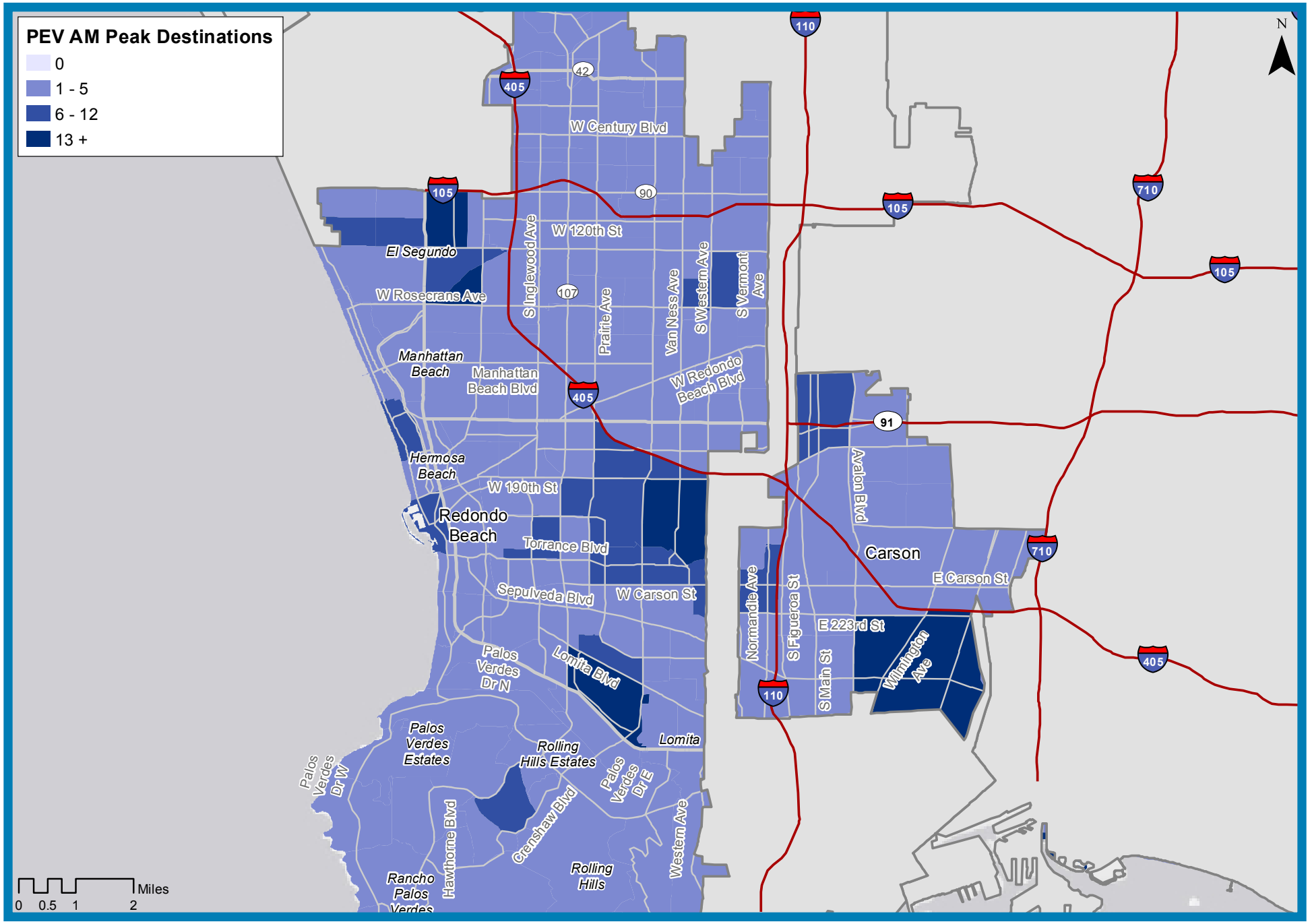


** The +5% and +10% projections begin in 2014, when uncertainty becomes greater.*

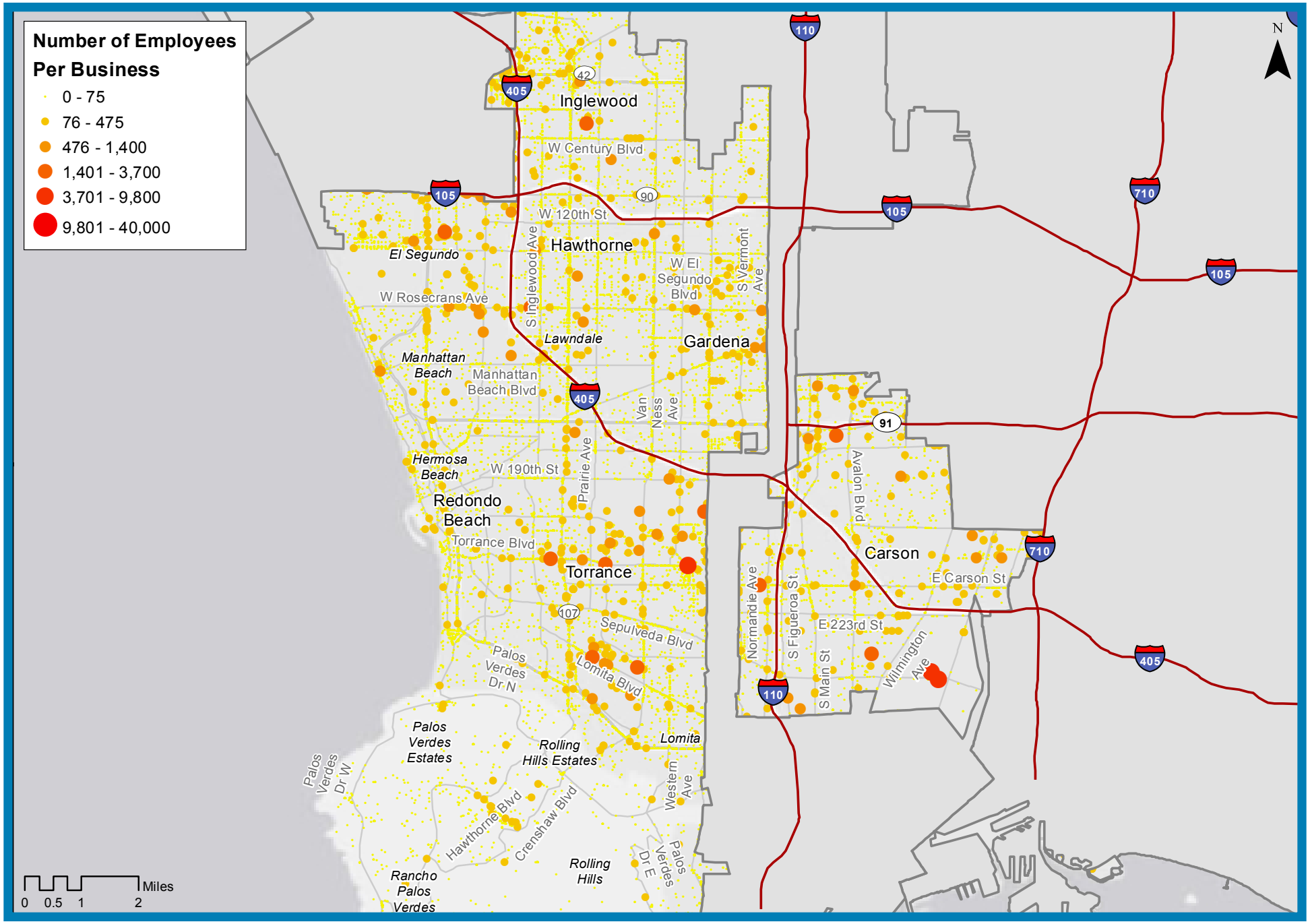
Plug-in Electric Vehicle Registrations



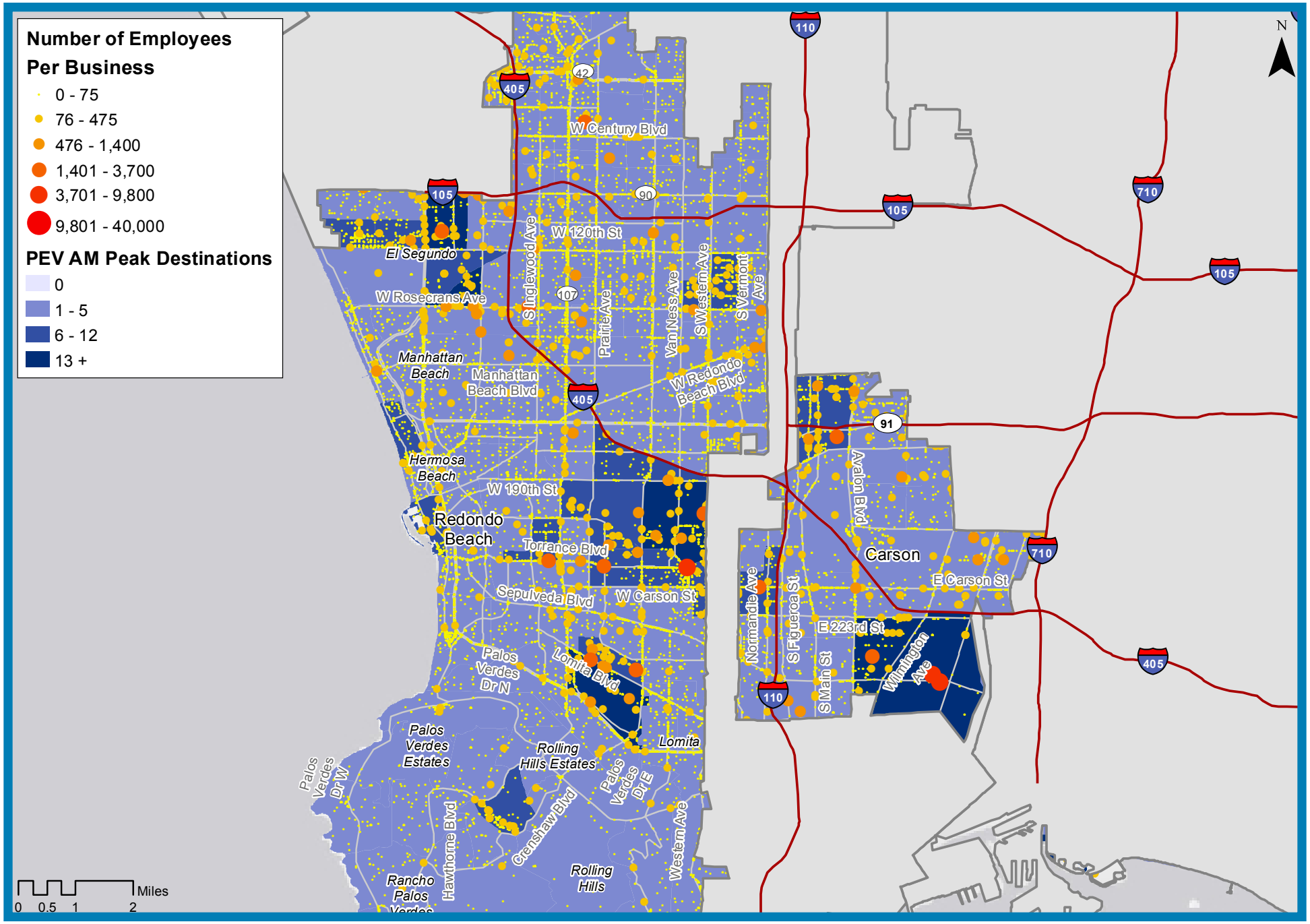
Plug-in Electric Vehicle Morning Peak Destinations



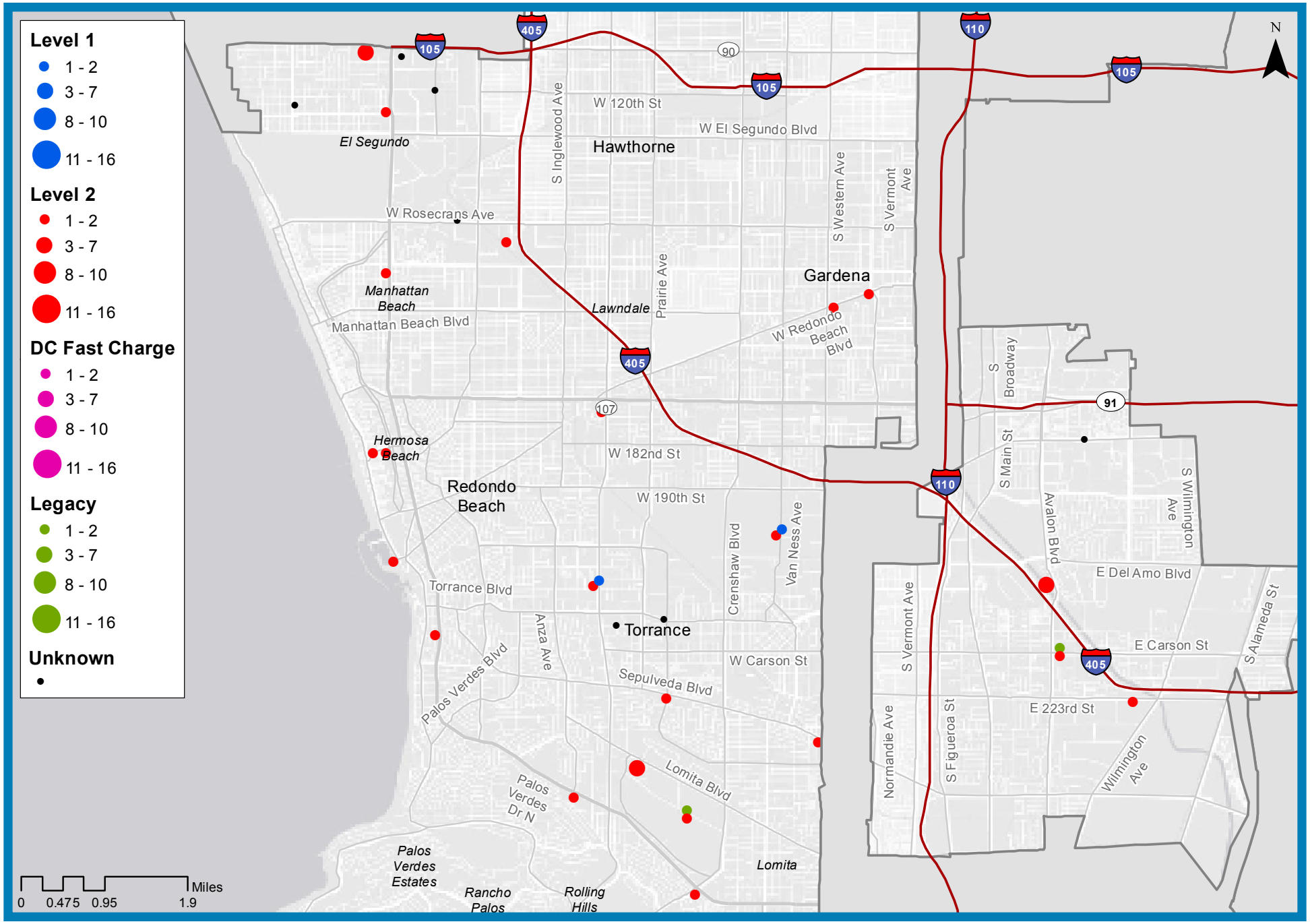
Workplaces by Number of Employees



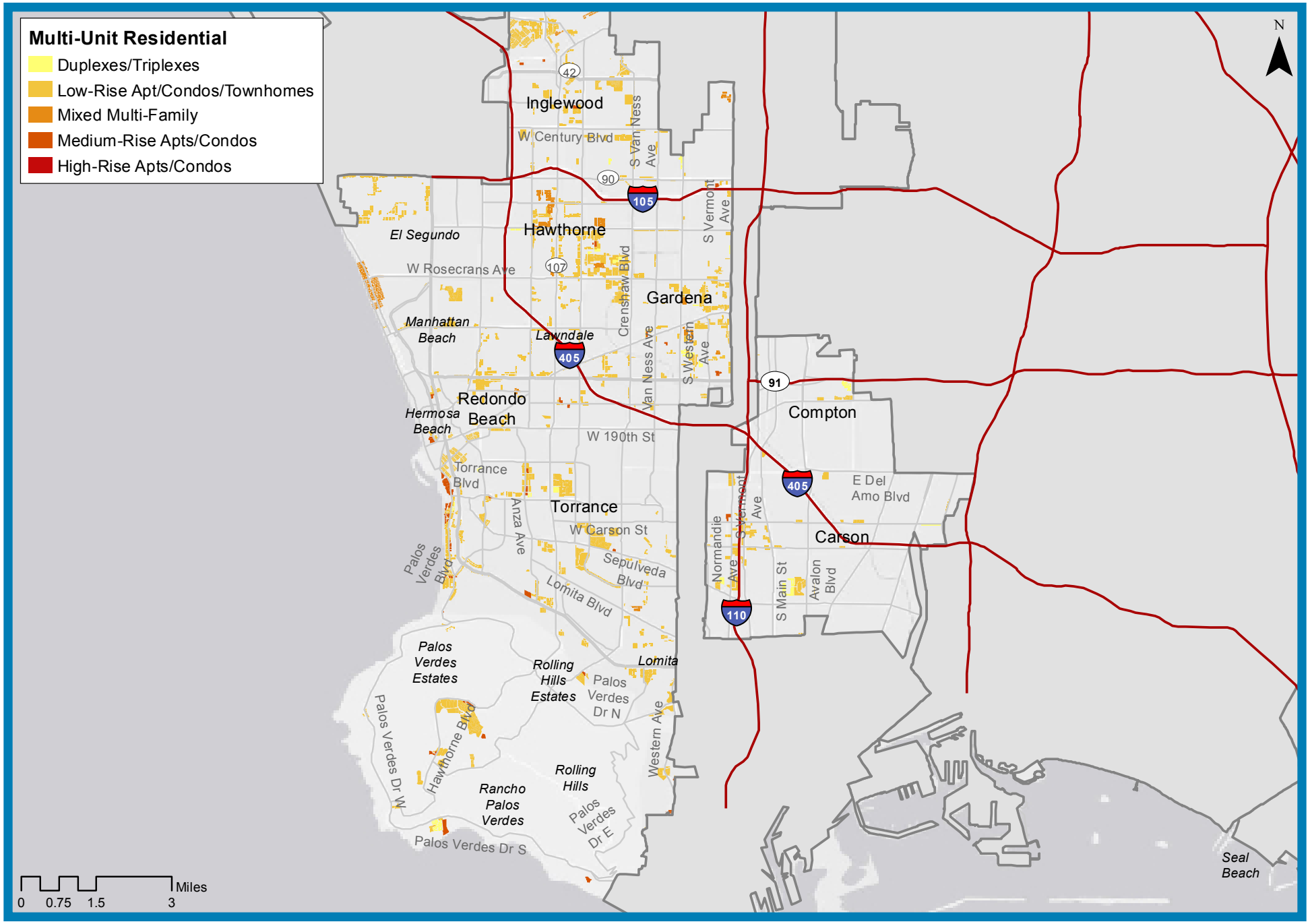
PEV Morning Peak Destinations and Workplaces



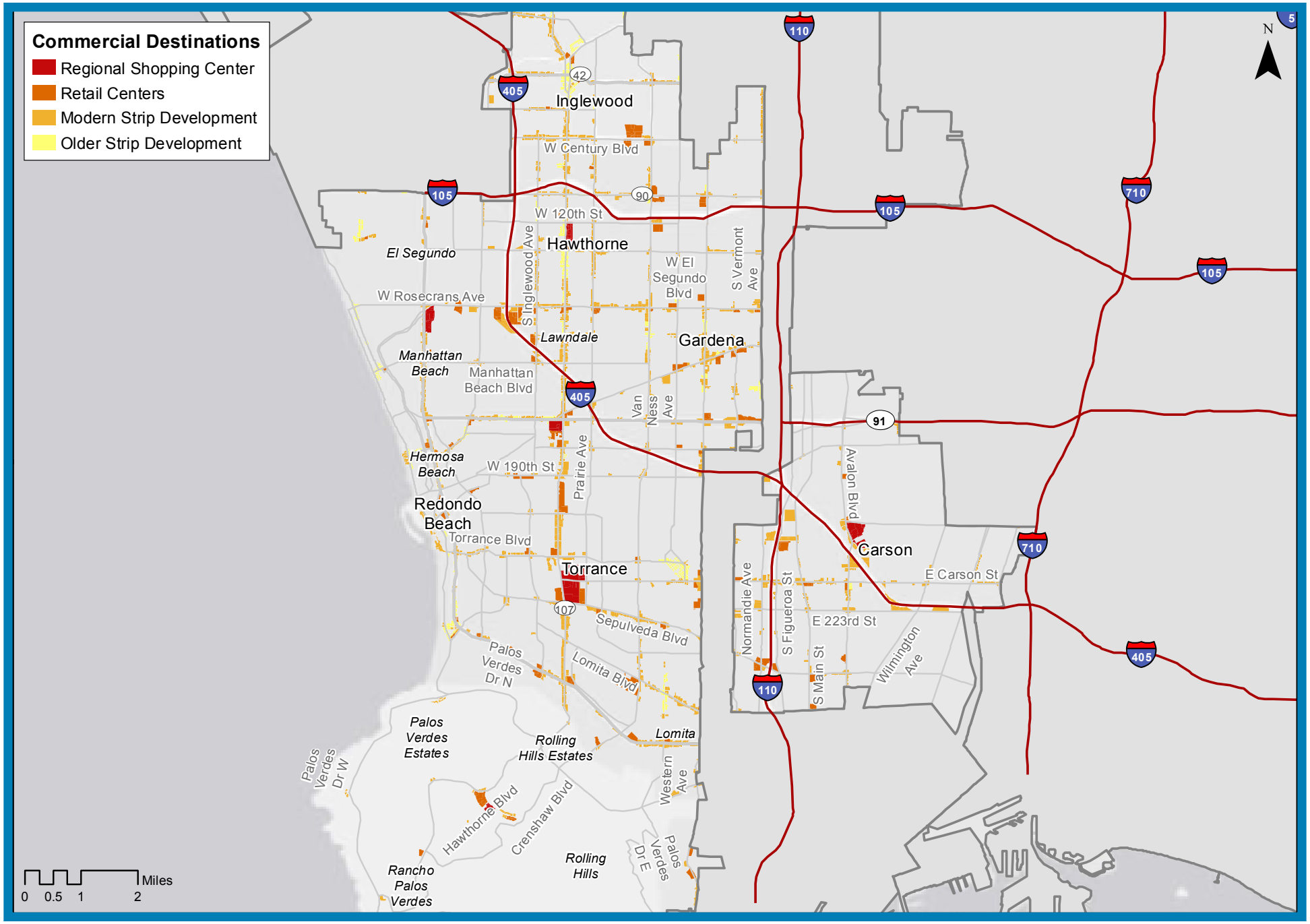
Publicly-Accessible Charging Stations (Summer/Fall 2012)



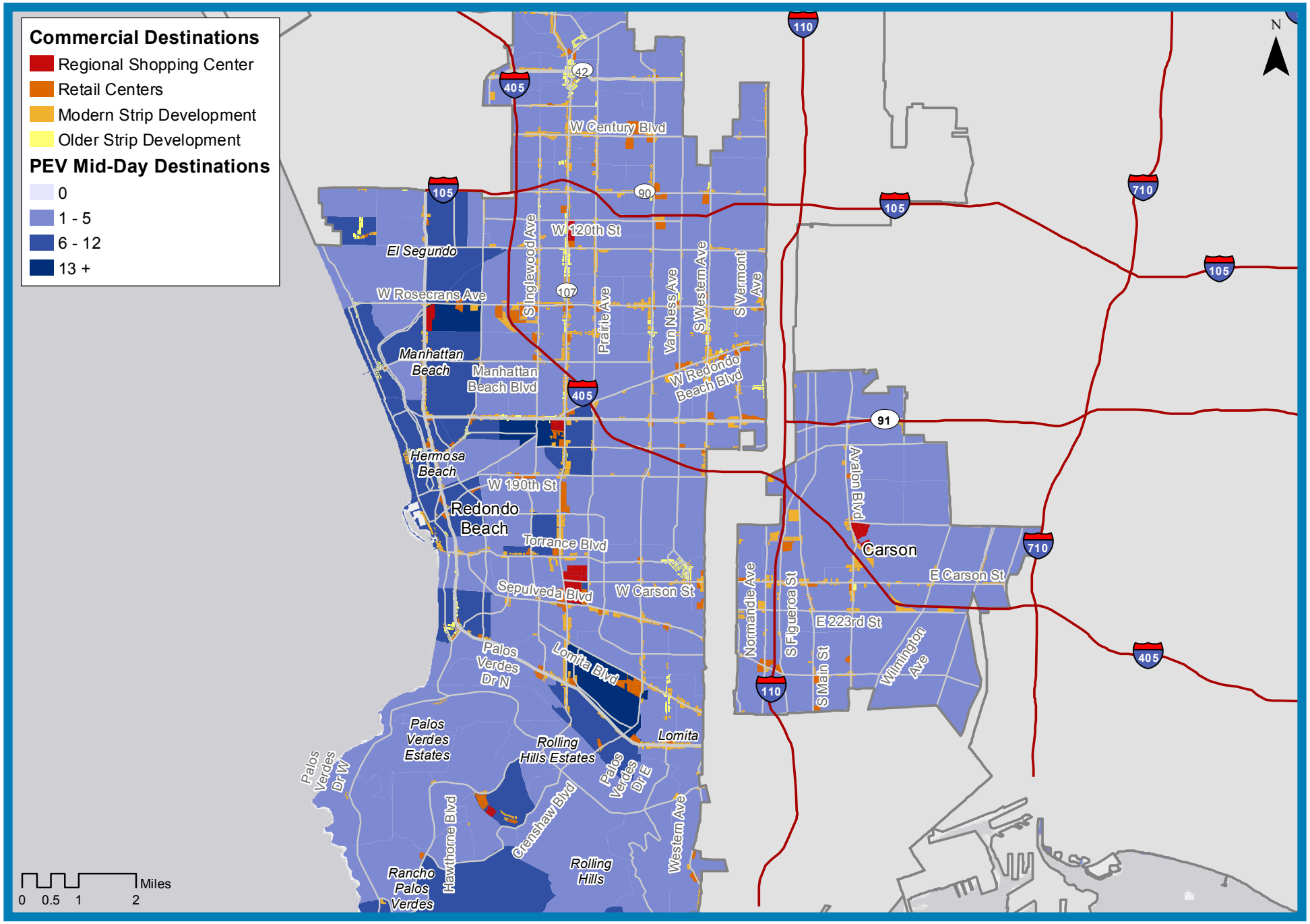
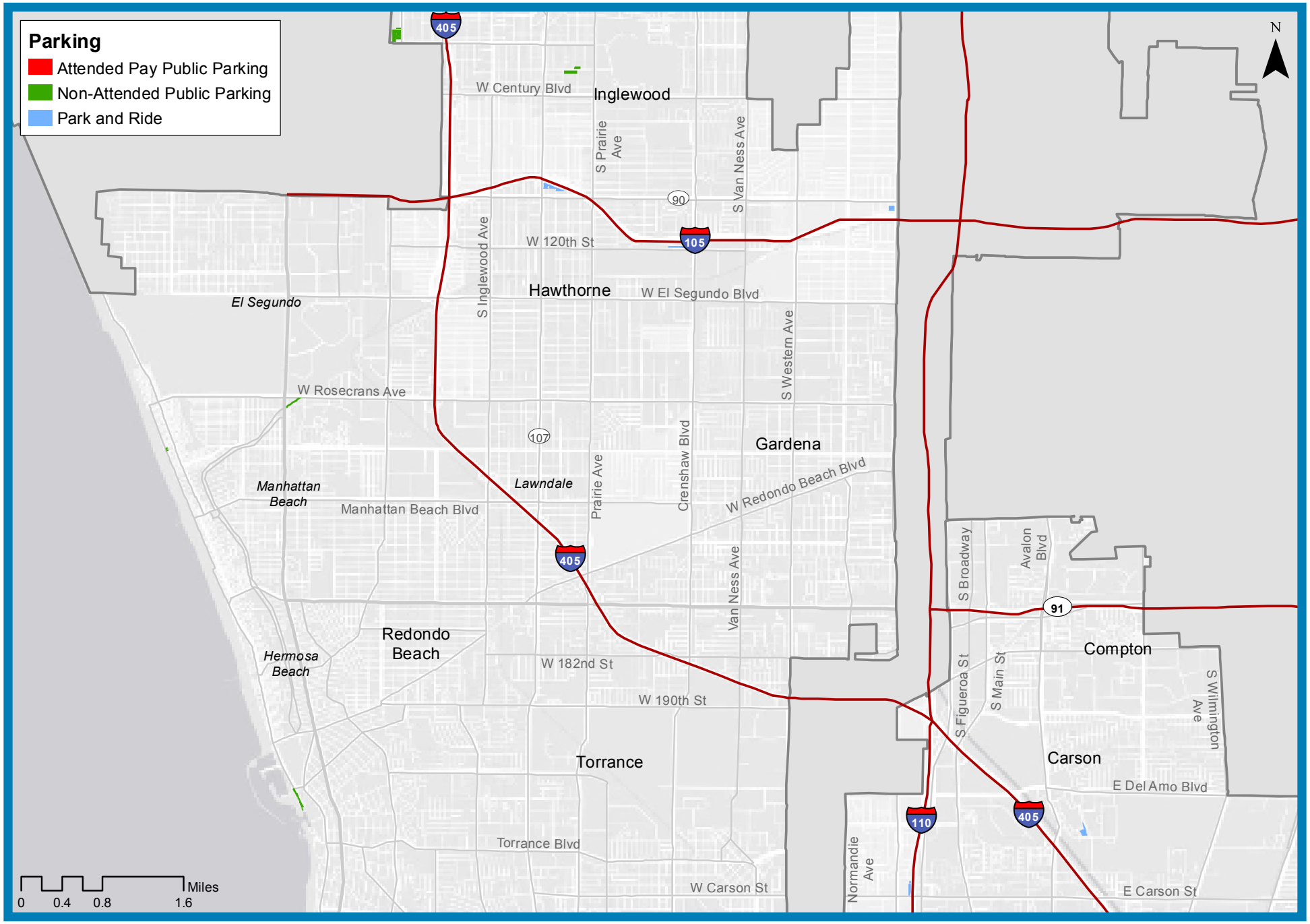
Multi-Unit Residential



Commercial (Retail) Destinations



PEV Mid-Day Destinations and Commercial (Retail) Locations



Stand-alone Parking Facilities