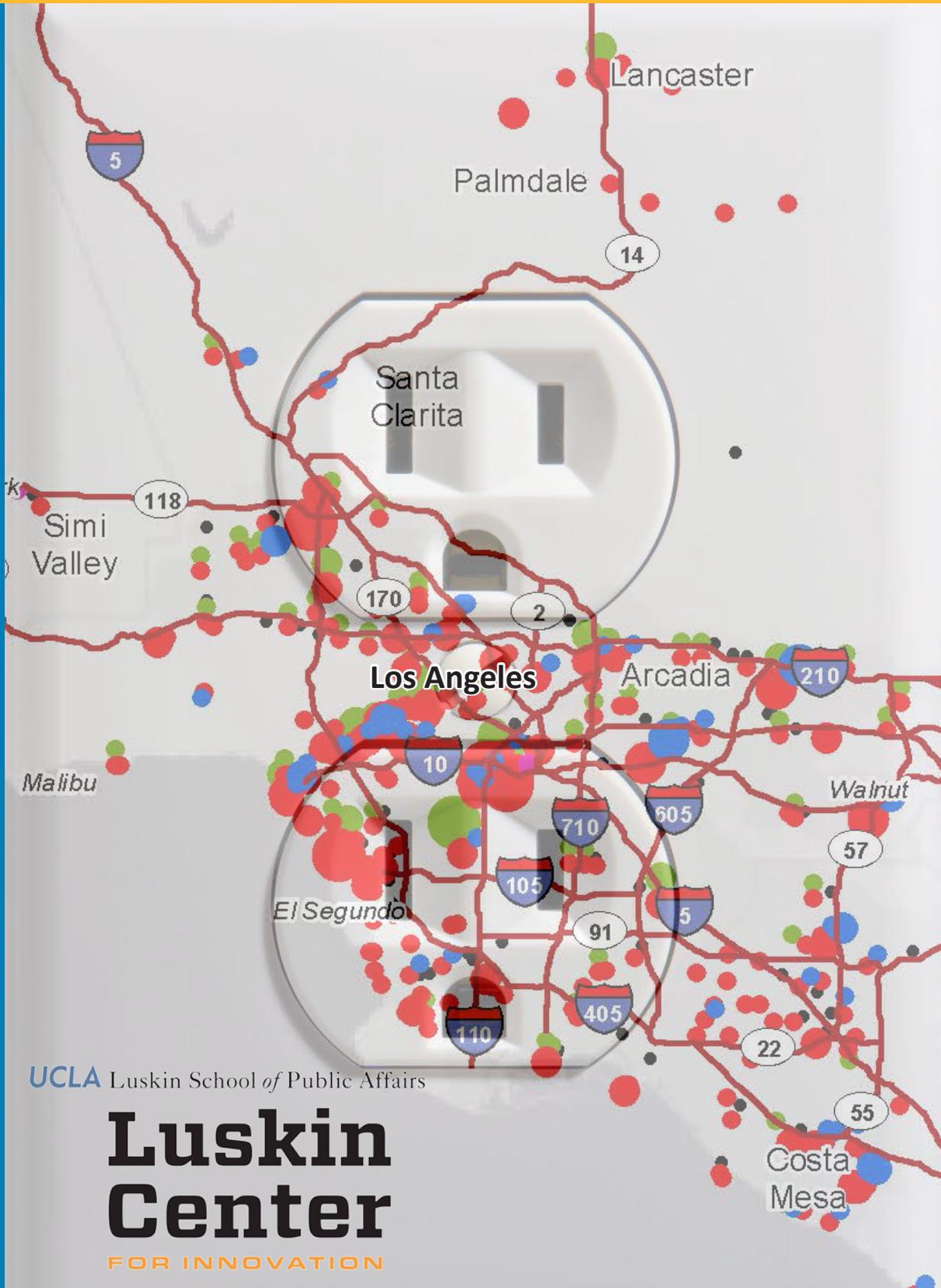


Southern California Plug-in Electric Vehicle Atlas



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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For More Information

Contact J.R. DeShazo, Director, UCLA Luskin Center for Innovation, deshazo@ucla.edu; luskin.ucla.edu/ev

SOUTHERN CALIFORNIA
PLUG-IN ELECTRIC VEHICLE READINESS ATLAS

PRINCIPAL INVESTIGATOR

J.R. DeShazo, Ph.D.

SPATIAL ANALYSIS AND CARTOGRAPHY

Norman Wong

PROJECT MANAGER

Ayala Ben-Yehuda

COVER DESIGN AND LAYOUT

Susan Woodward

CONTRIBUTING RESEARCHERS

Vicky Hsu

Jon Overman

Tamar Sarkisian

Brett Williams, MPhil (cantab), Ph.D.

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 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 County 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	City of Industry Electric Utility Service
Anaheim Public Utilities Department	Moreno Valley Electric Utility
City of Banning Electric Utility	Rancho Cucamonga Municipal Utility
City of Colton Utilities Services	San Diego Gas & Electric (portion within SCAG)

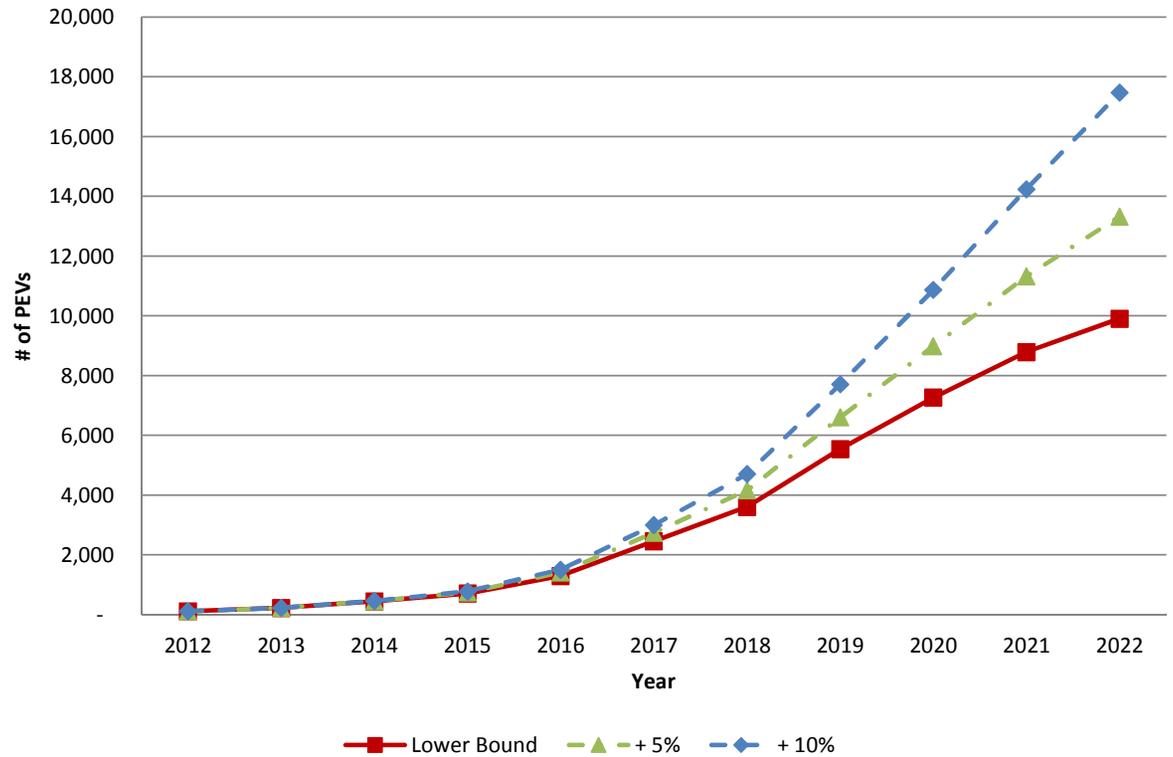
These projections are designed to help regional planners and utilities locate current and future demand for PEV charging and coordinate efforts to meet that demand.

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.

COACHELLA VALLEY ASSOCIATION OF GOVERNMENTS

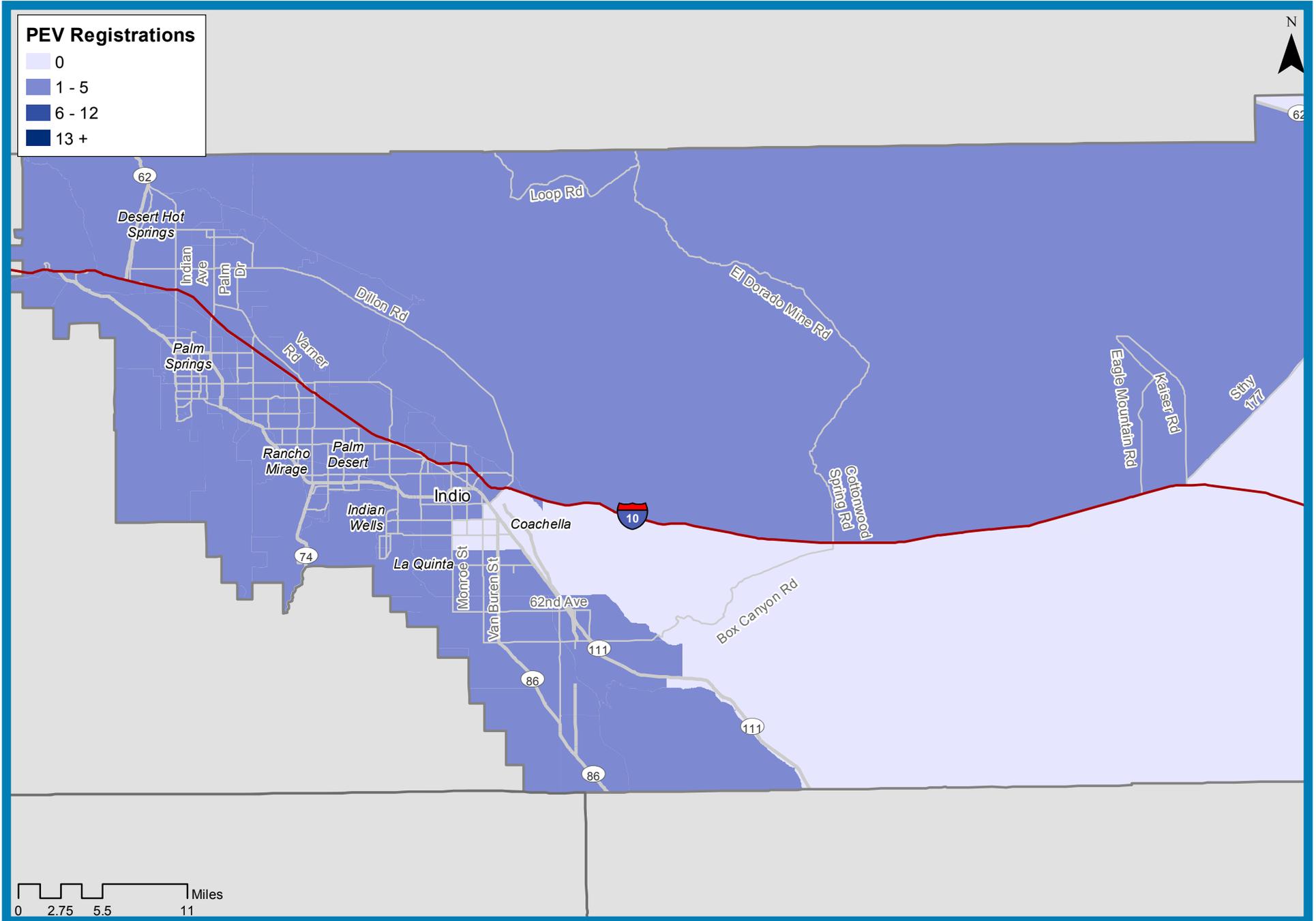
PEV Growth

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

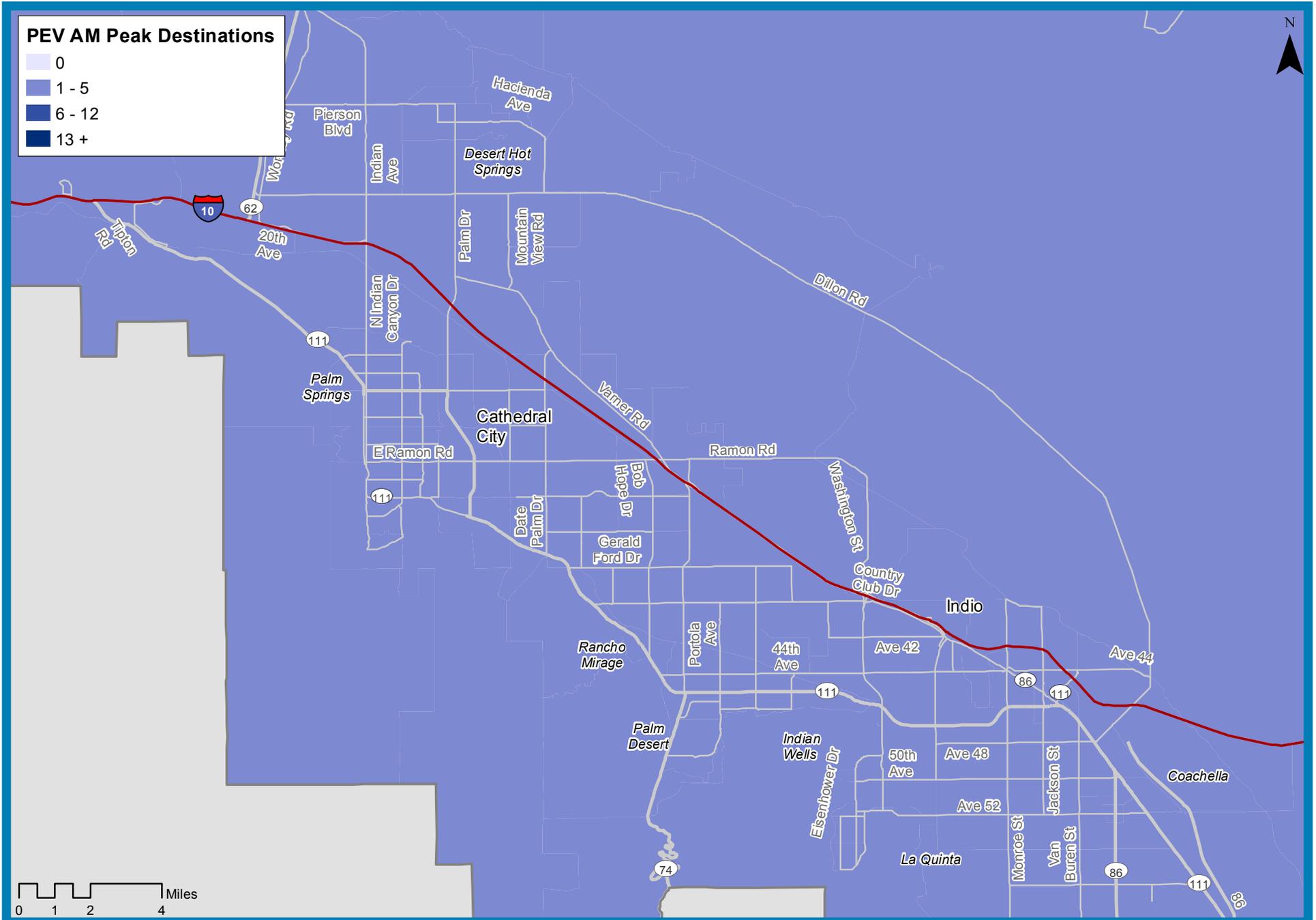


* The +5% and +10% projections begin in 2014, when uncertainty becomes greater.

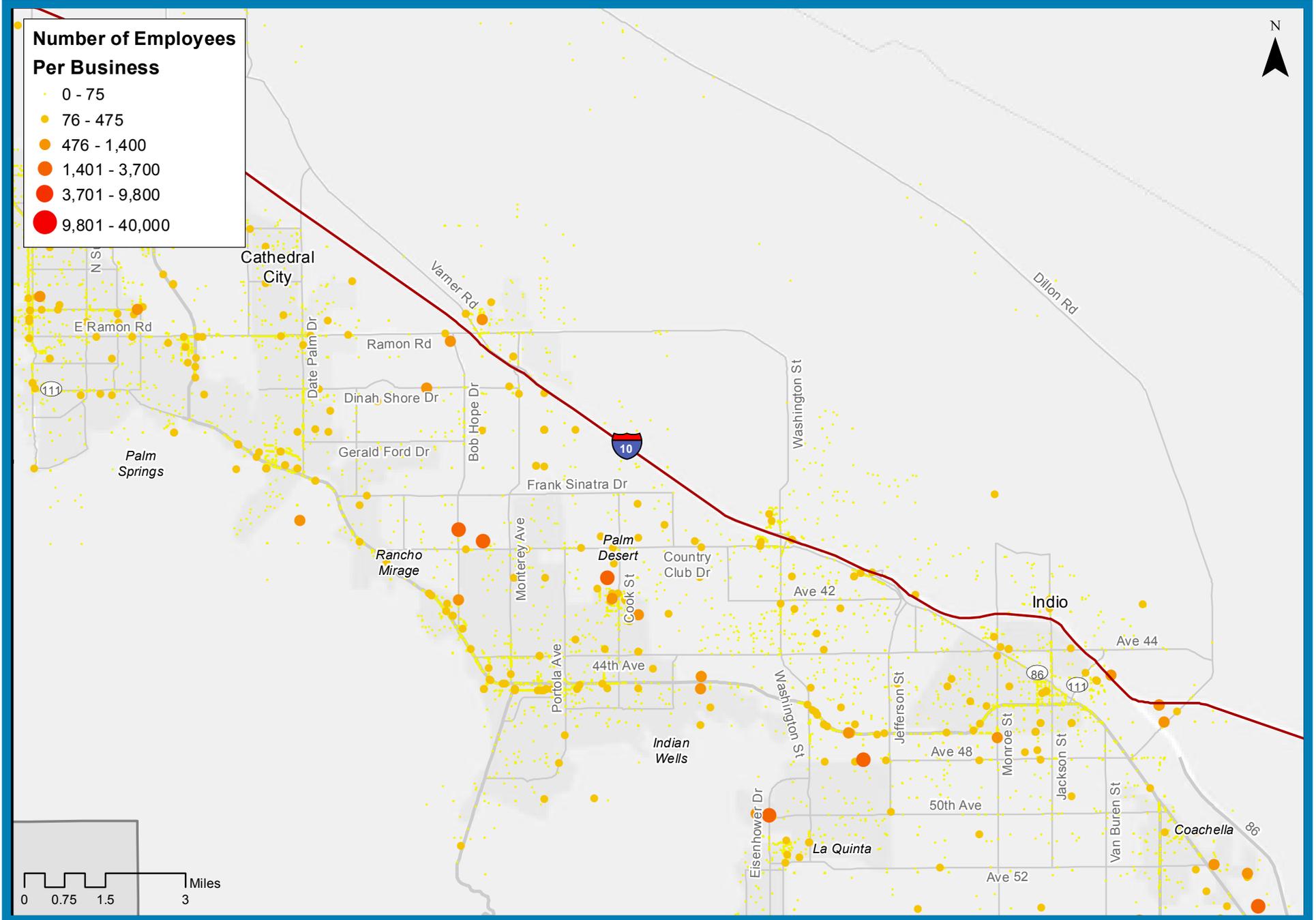
Plug-in Electric Vehicle Registrations



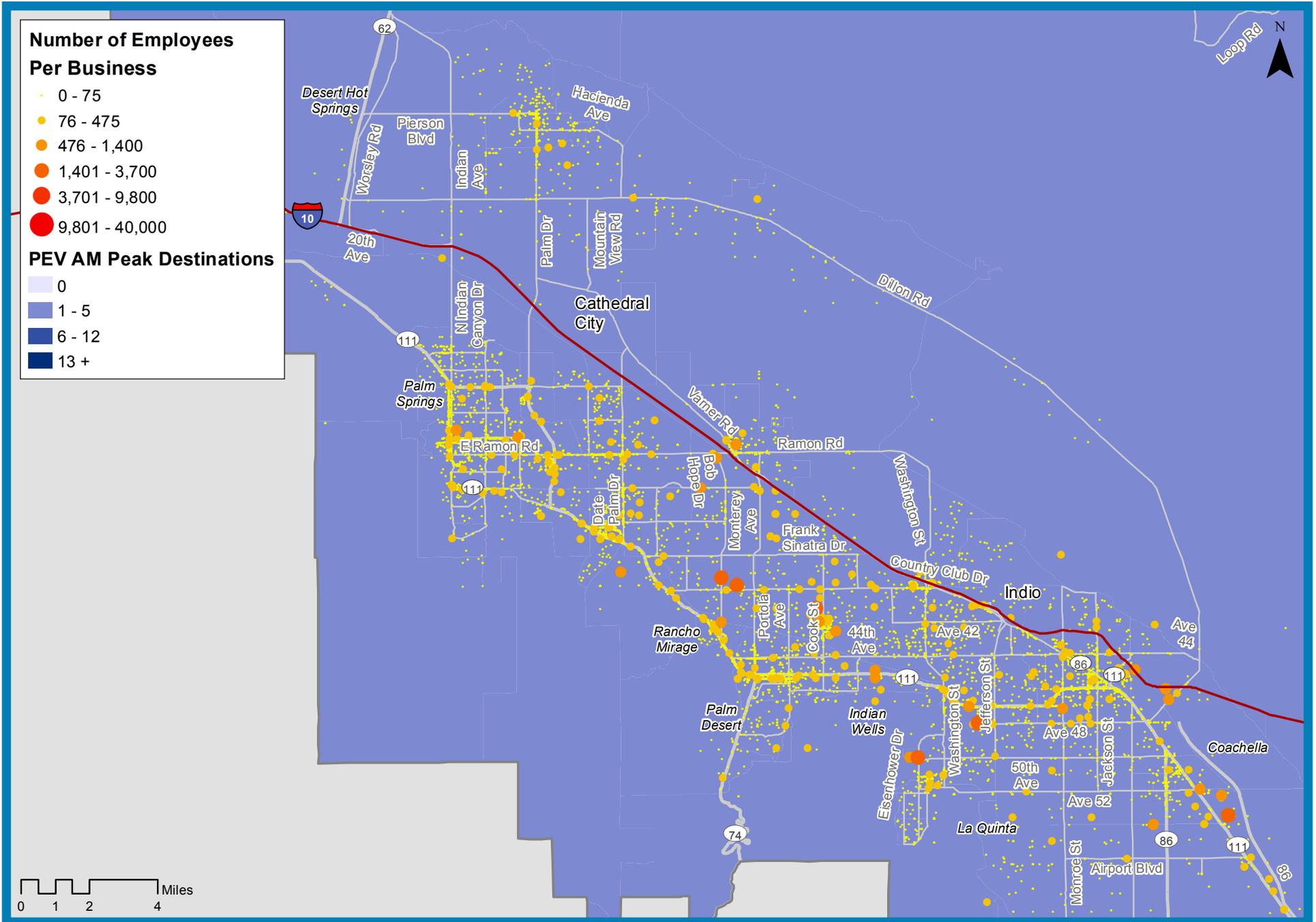
Plug-in Electric Vehicle Morning Peak Destinations



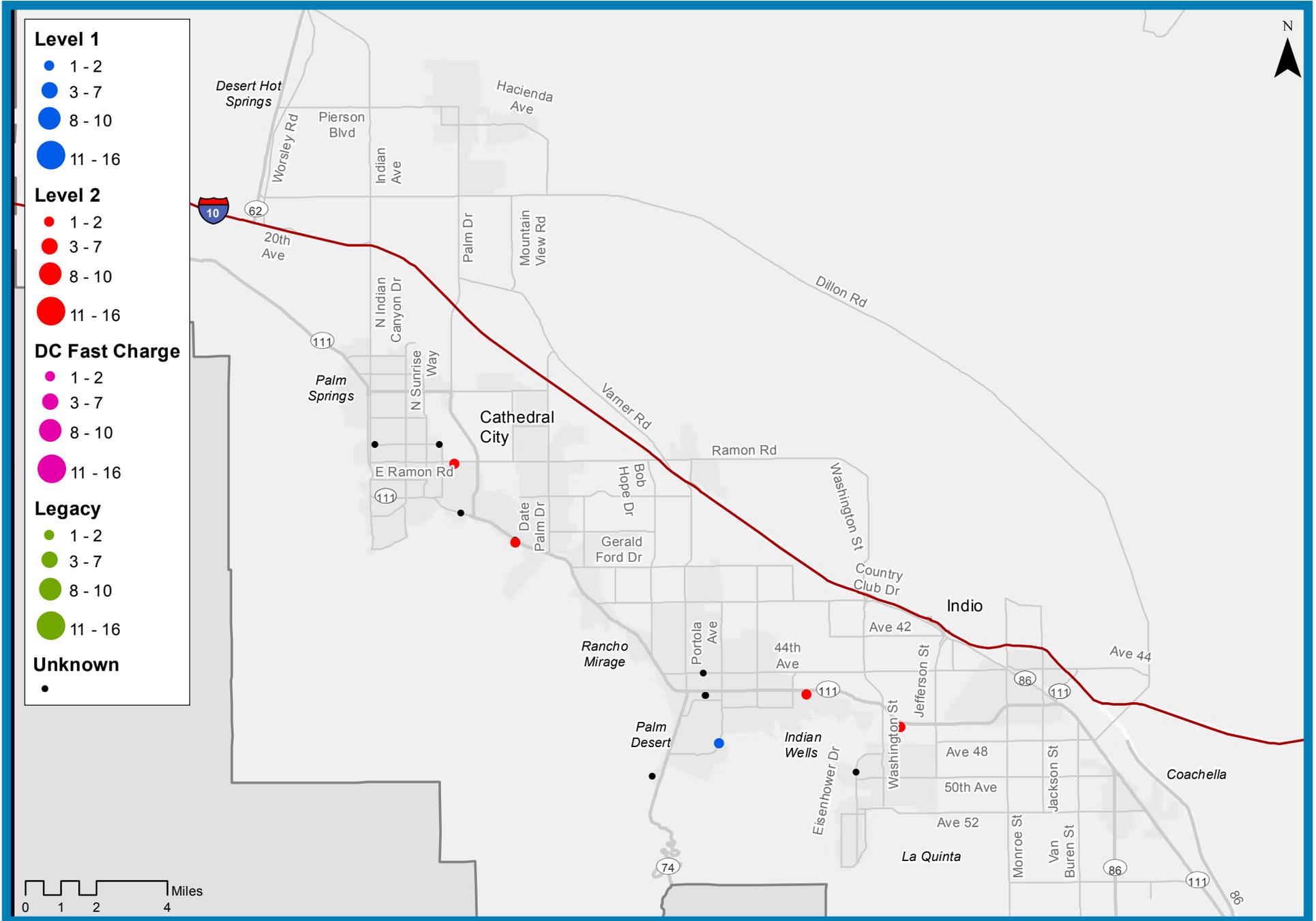
Workplaces by Number of Employees



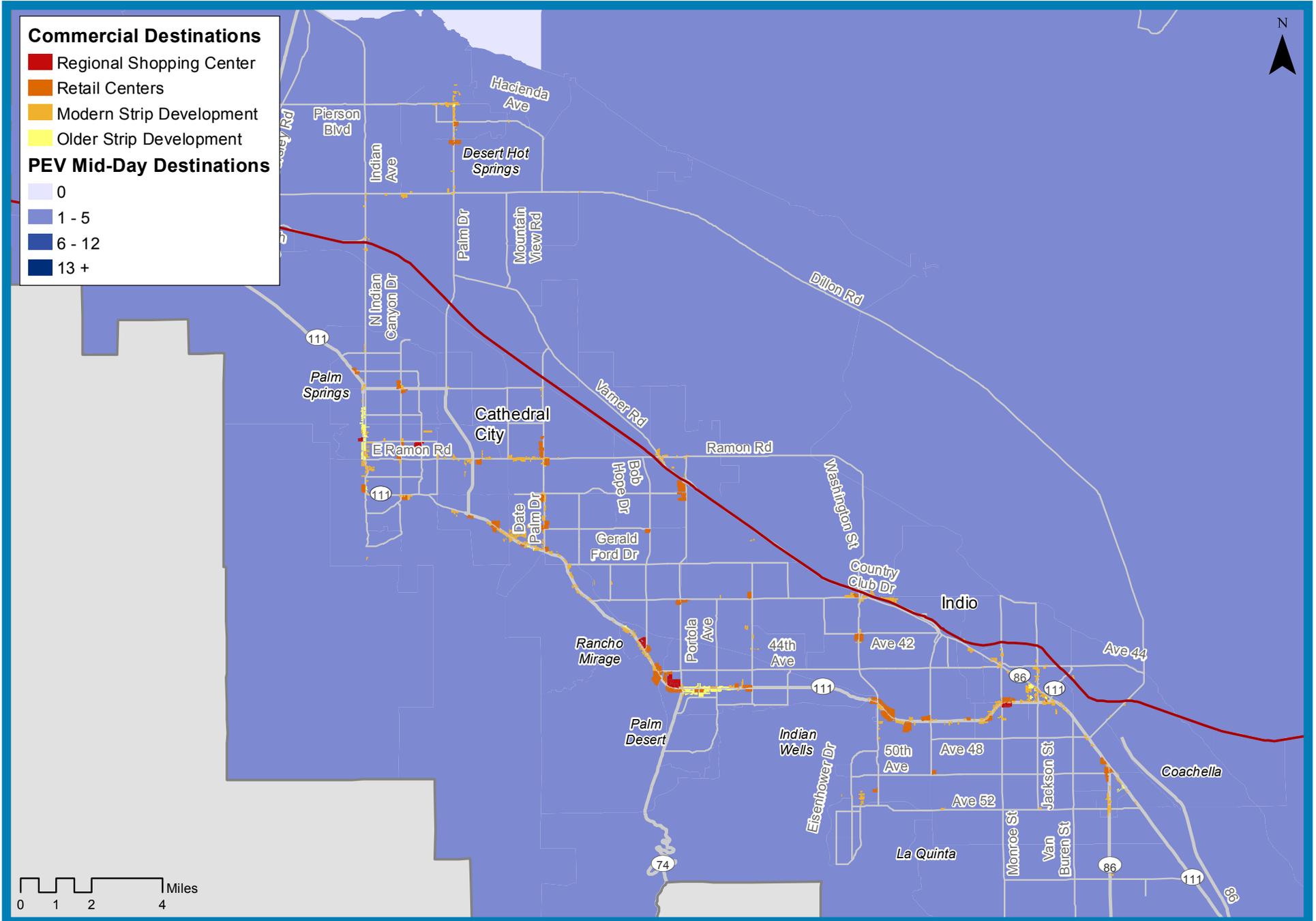
PEV Morning Peak Destinations and Workplaces



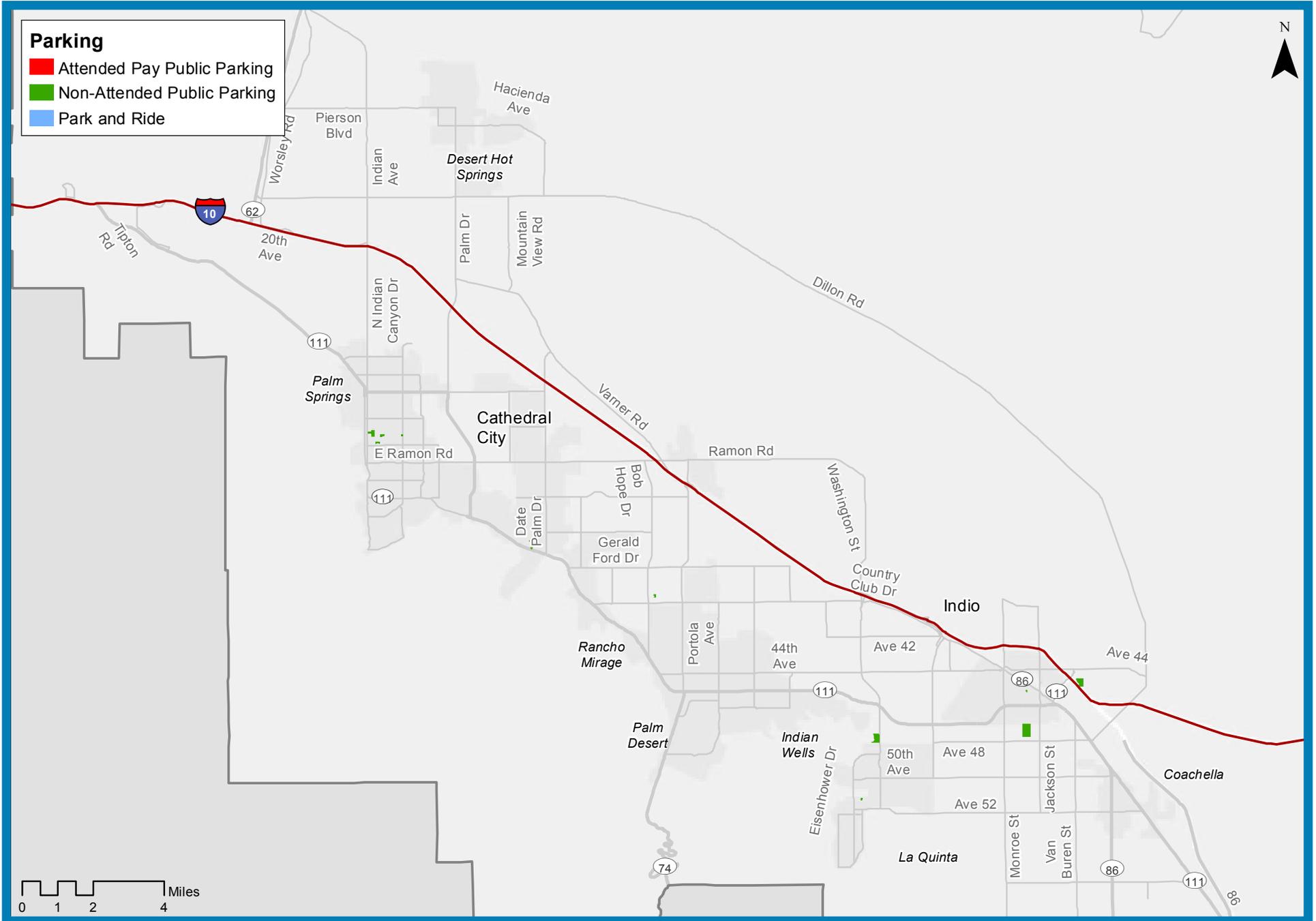
Publicly-Accessible Charging Stations (Summer/Fall 2012)



PEV Mid-Day Destinations and Commercial (Retail) Locations



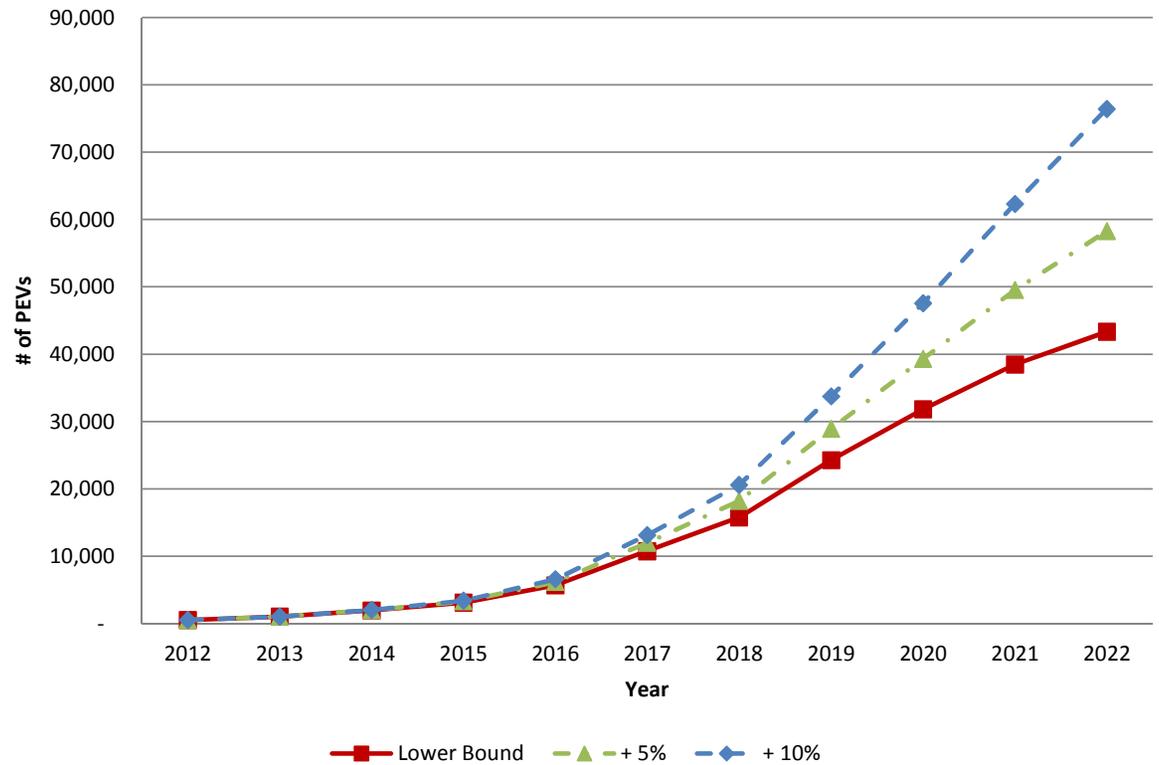
Stand-alone Parking Facilities



GATEWAY CITIES COUNCIL OF GOVERNMENTS

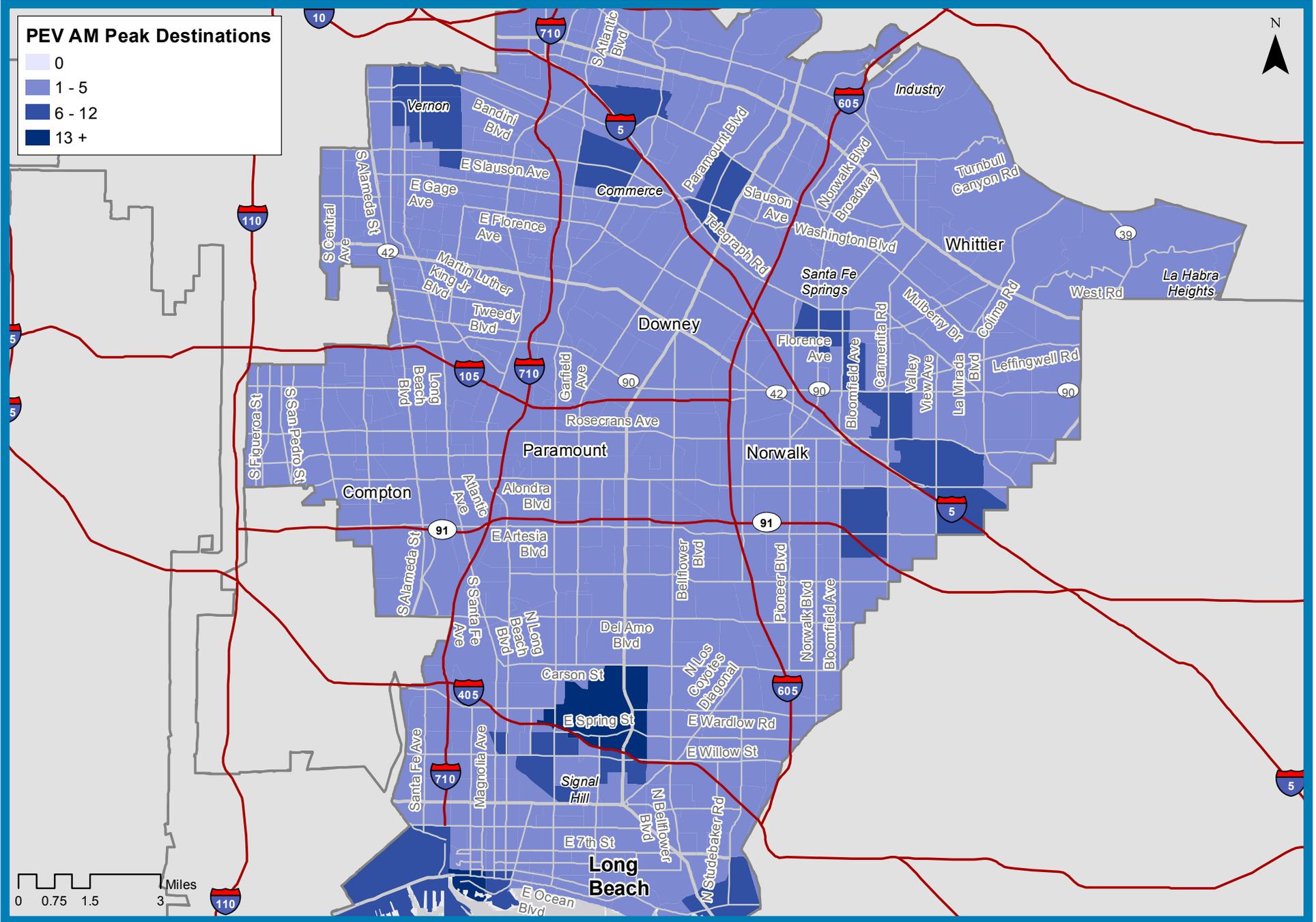
PEV Growth

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

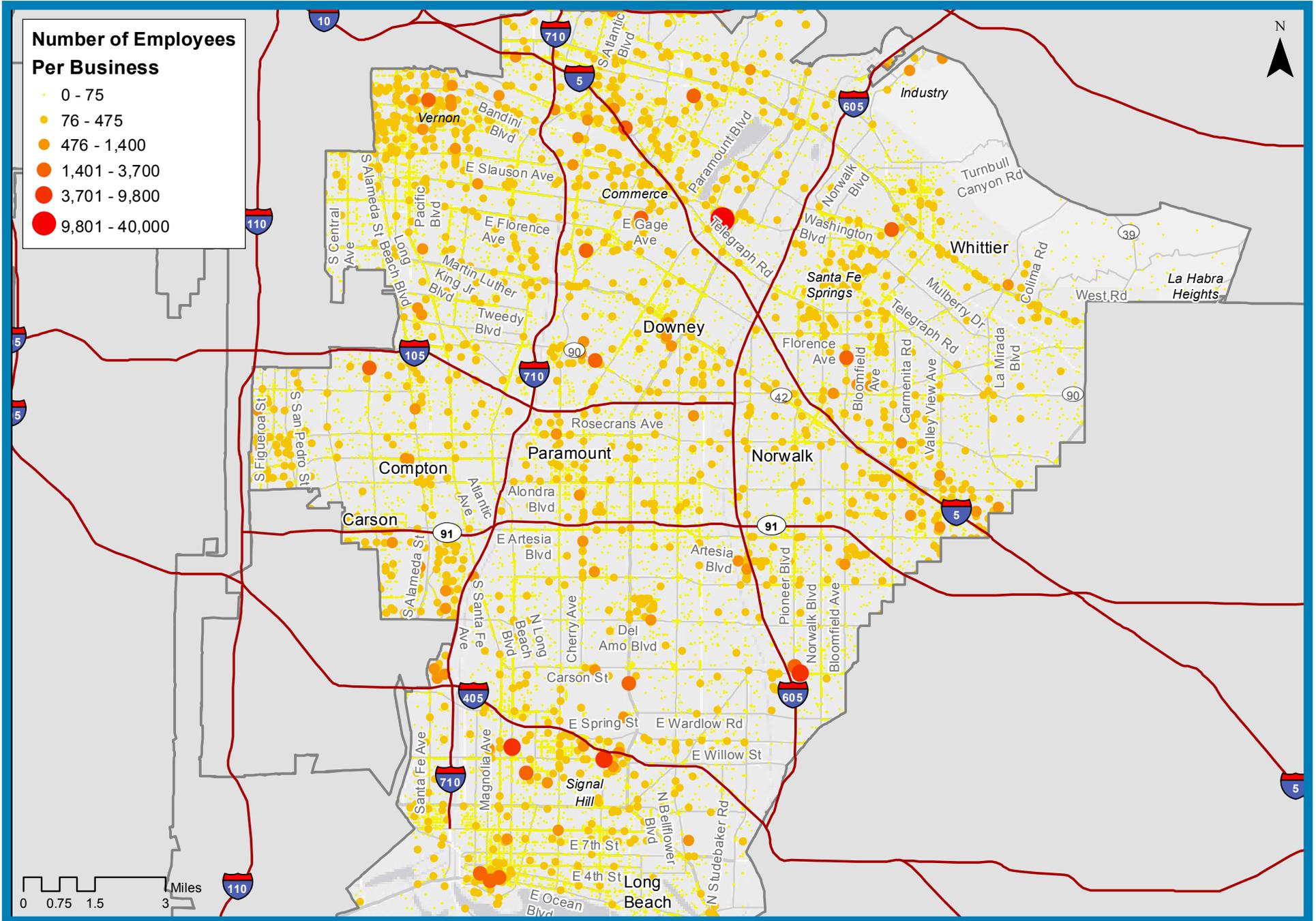


* The +5% and +10% projections begin in 2014, when uncertainty becomes greater.

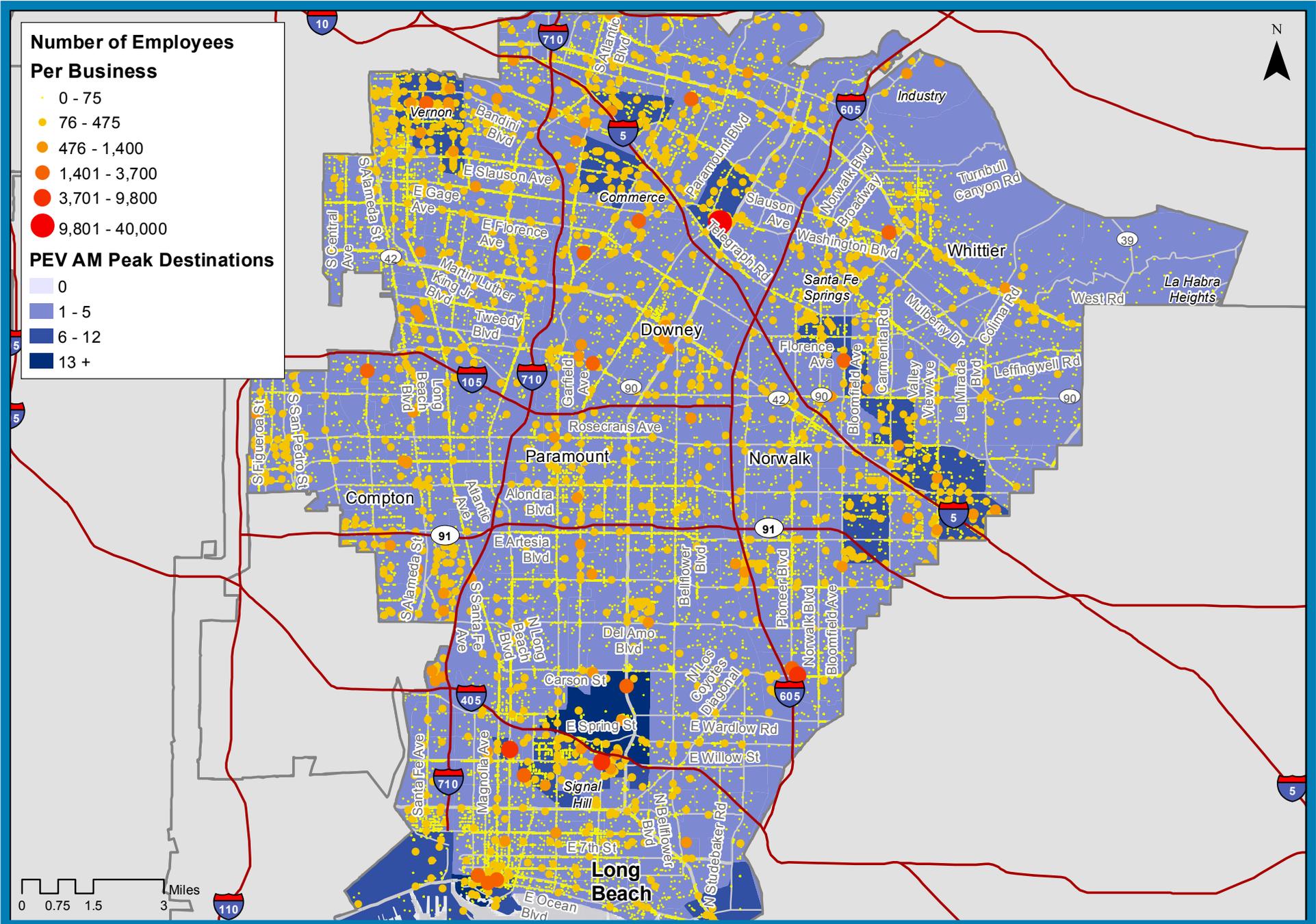
Plug-in Electric Vehicle Morning Peak Destinations



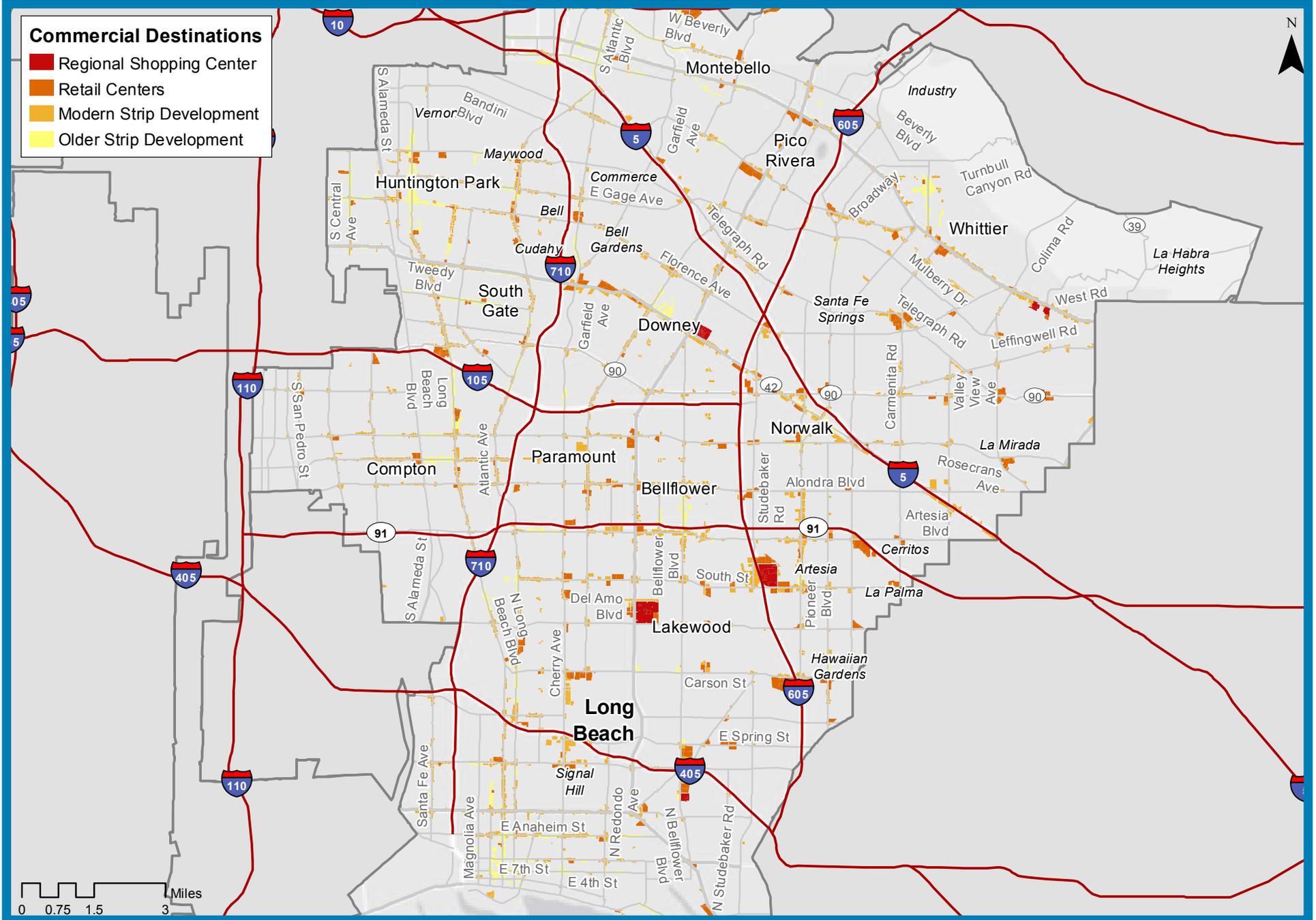
Workplaces by Number of Employees



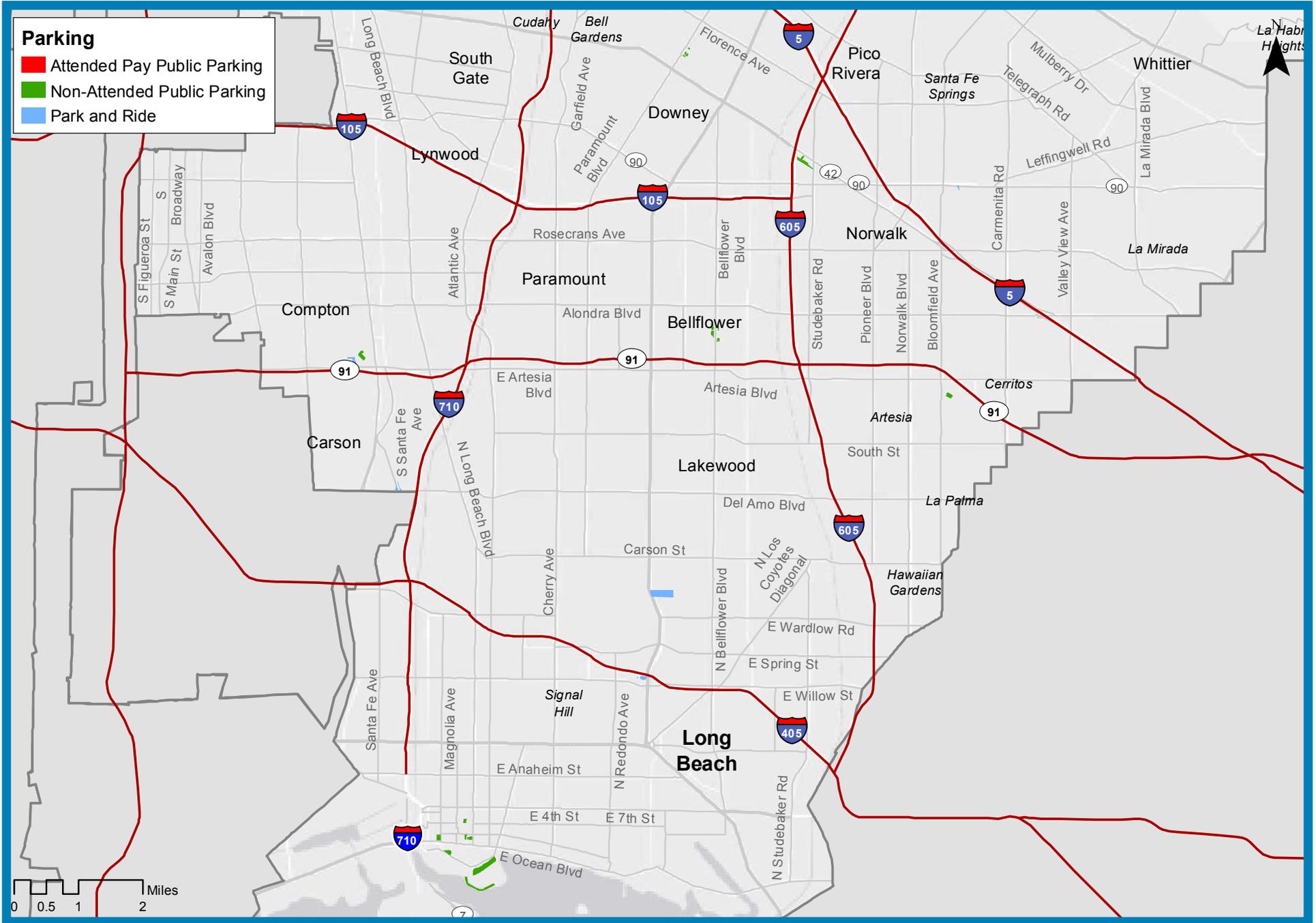
PEV Morning Peak Destinations and Workplaces



Commercial (Retail) Destinations



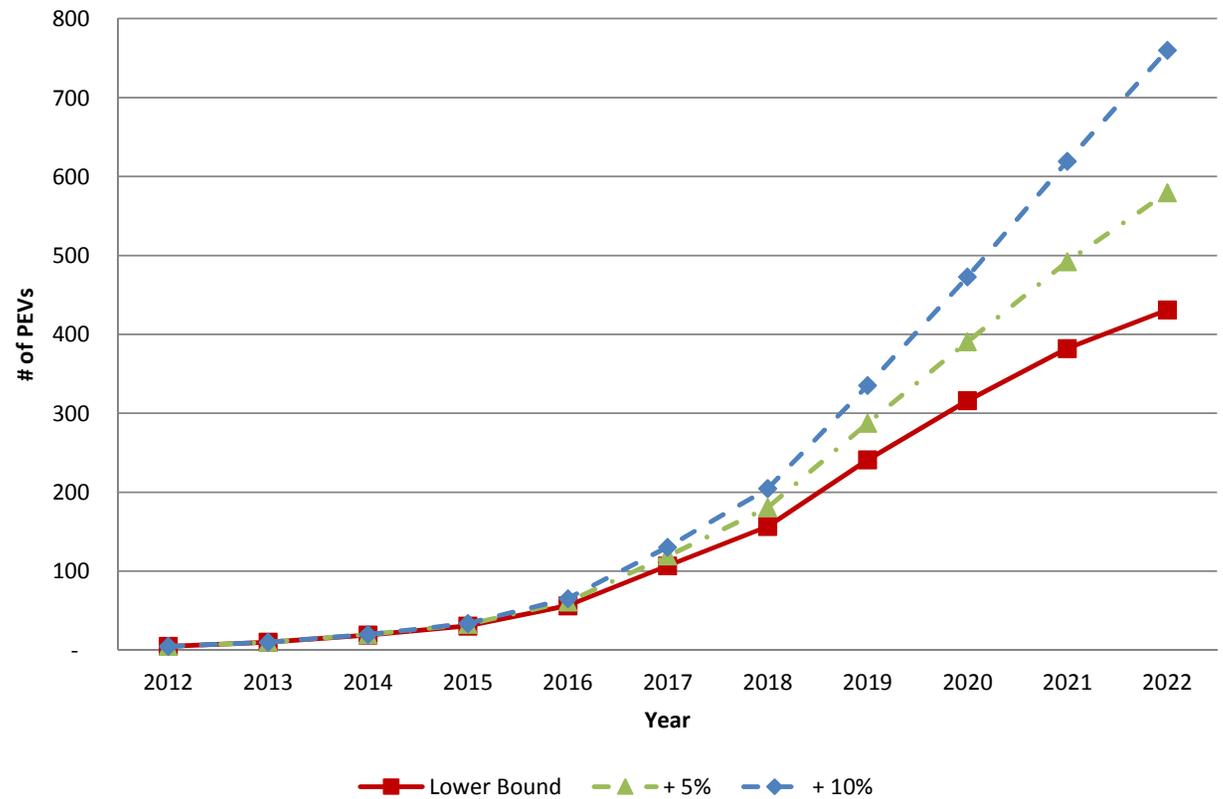
Stand-alone Parking Facilities



IMPERIAL COUNTY TRANSPORTATION COMMISSION

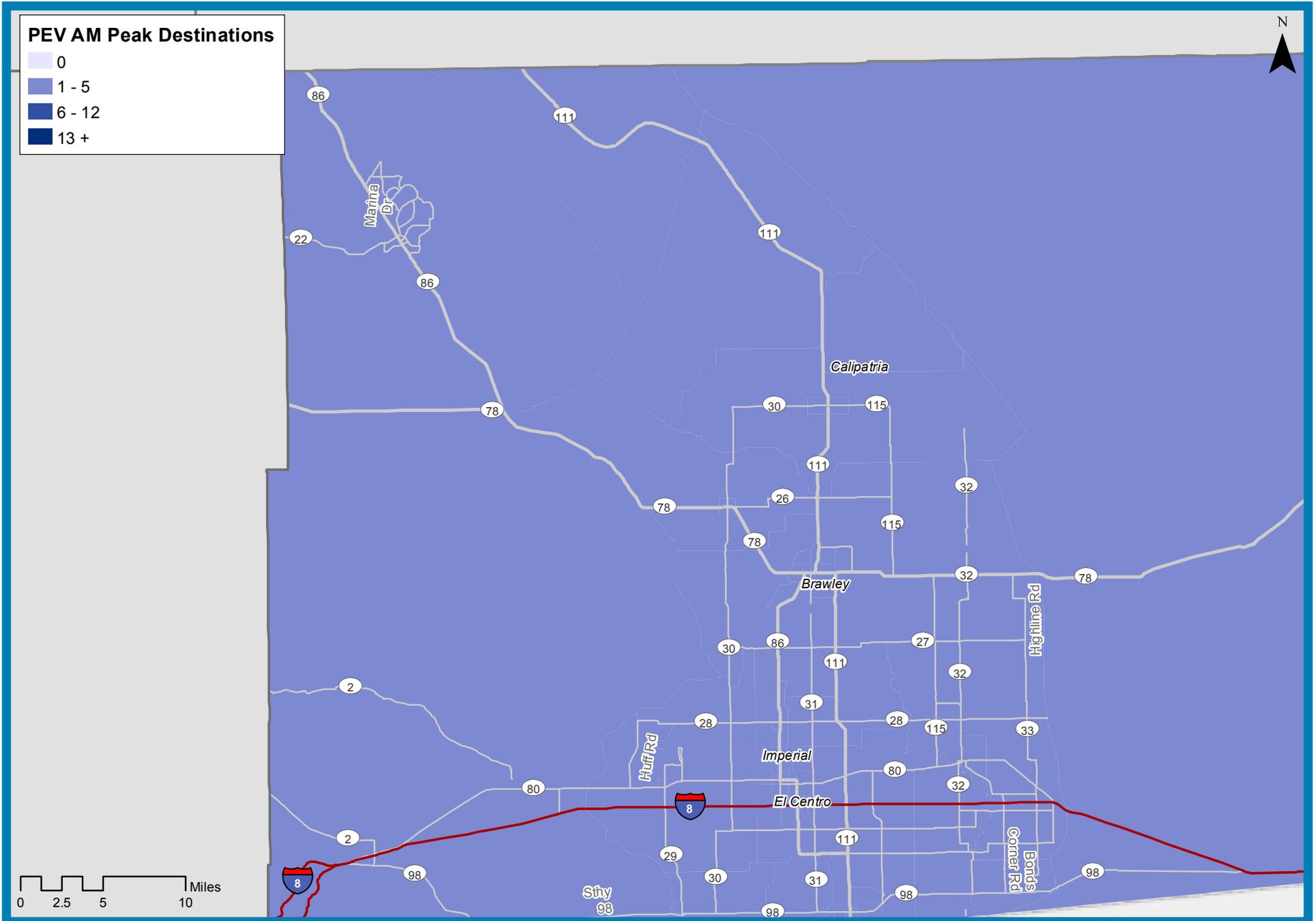
PEV Growth

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

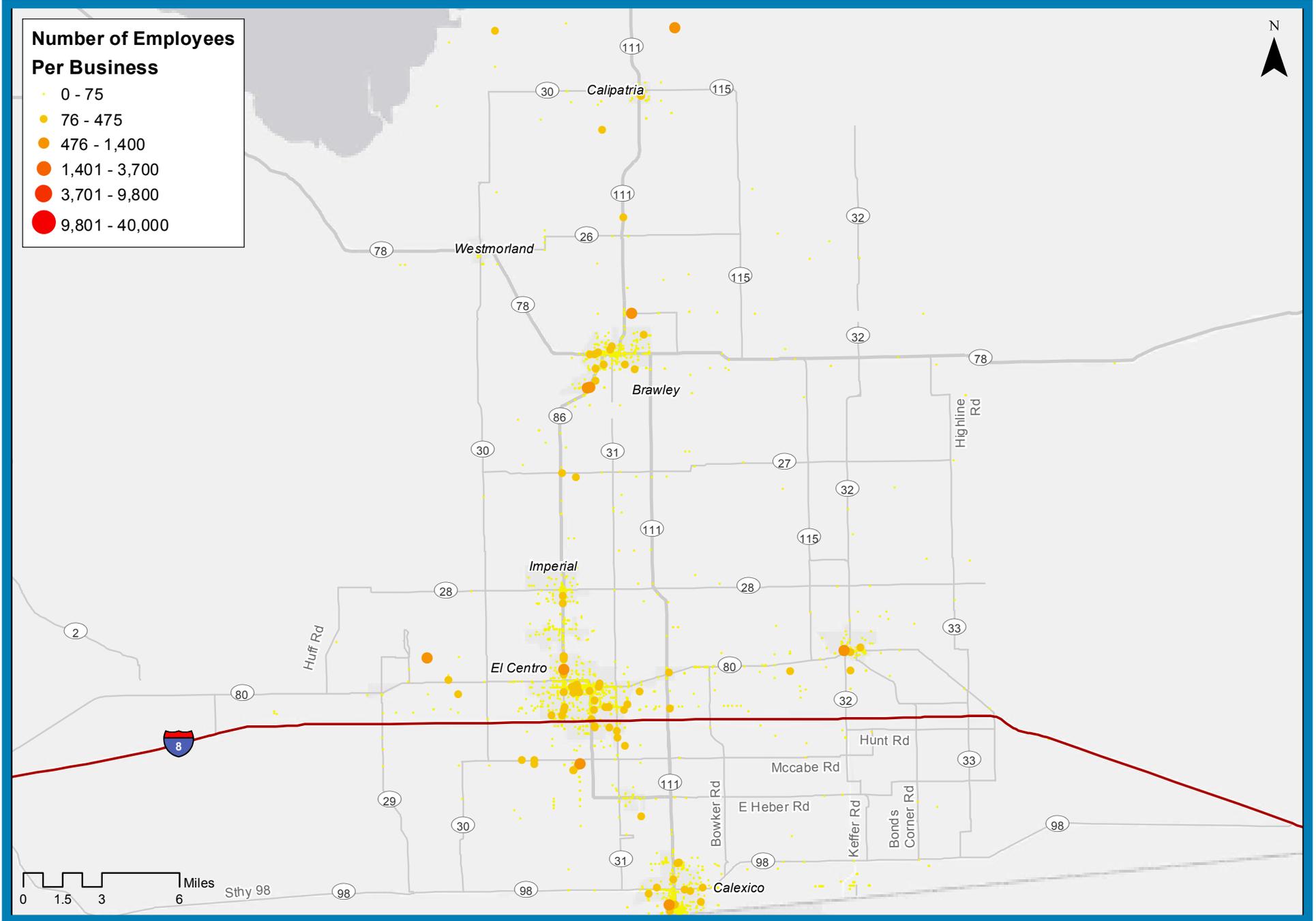


* The +5% and +10% projections begin in 2014, when uncertainty becomes greater.

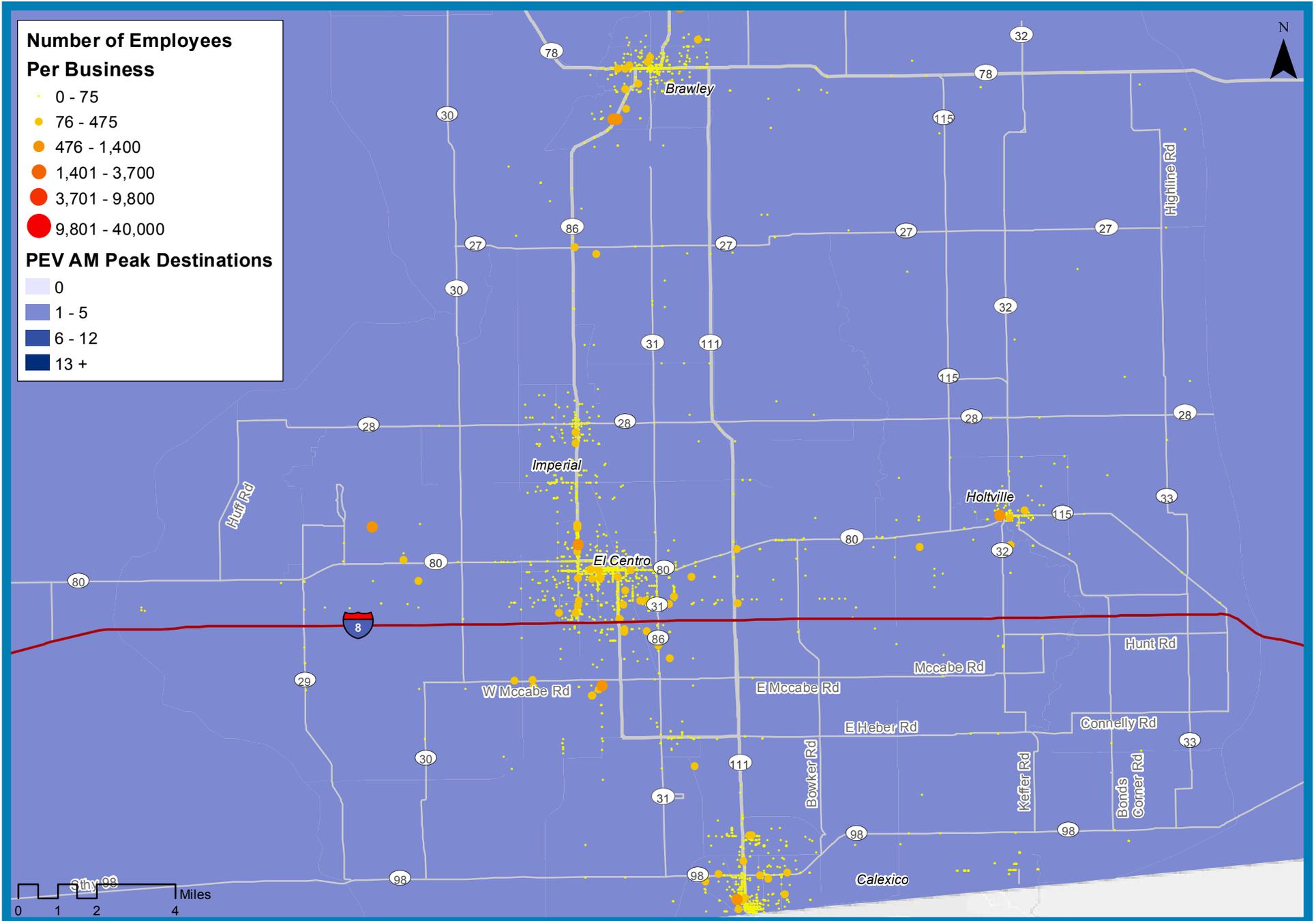
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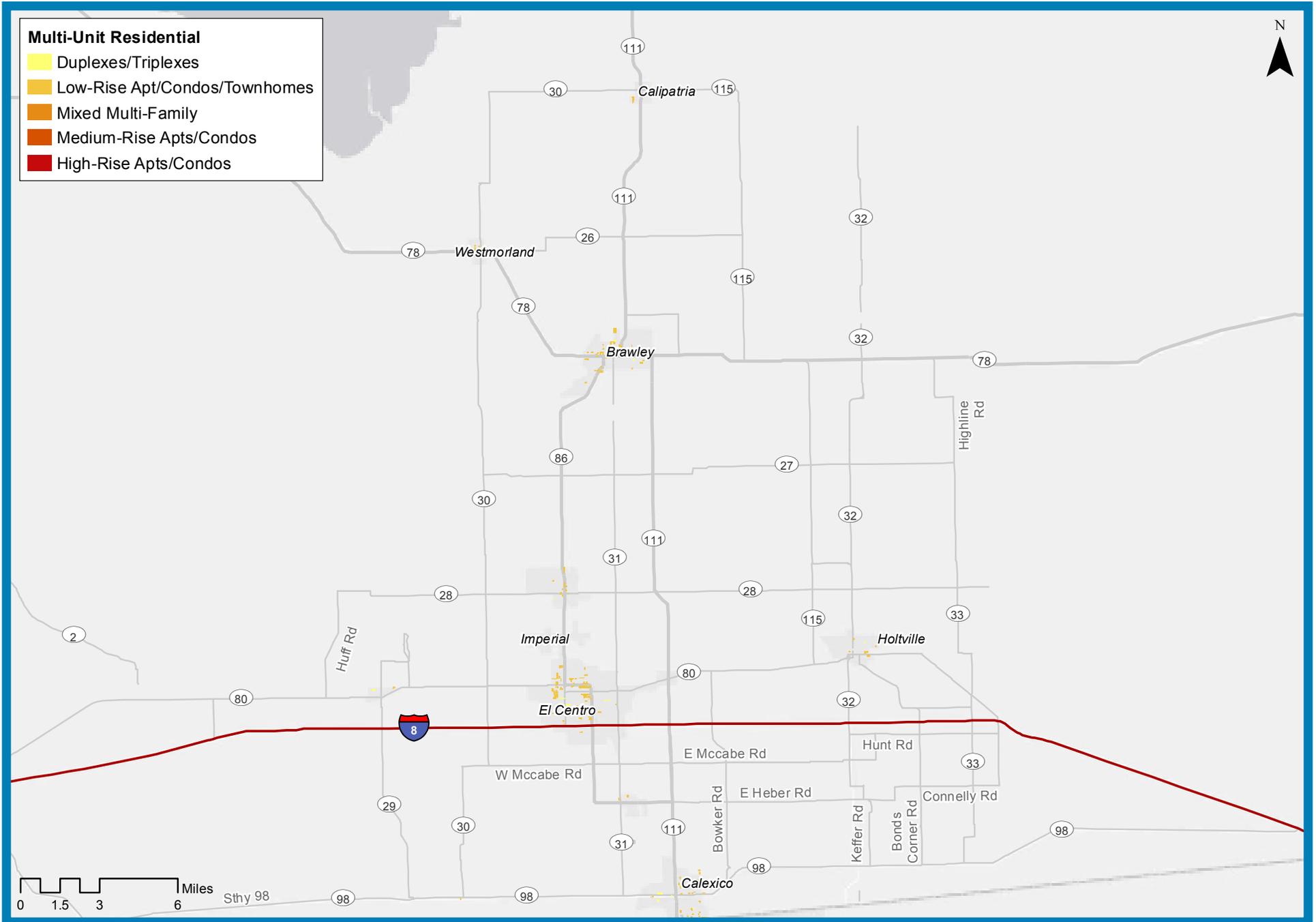
Workplaces by Number of Employees



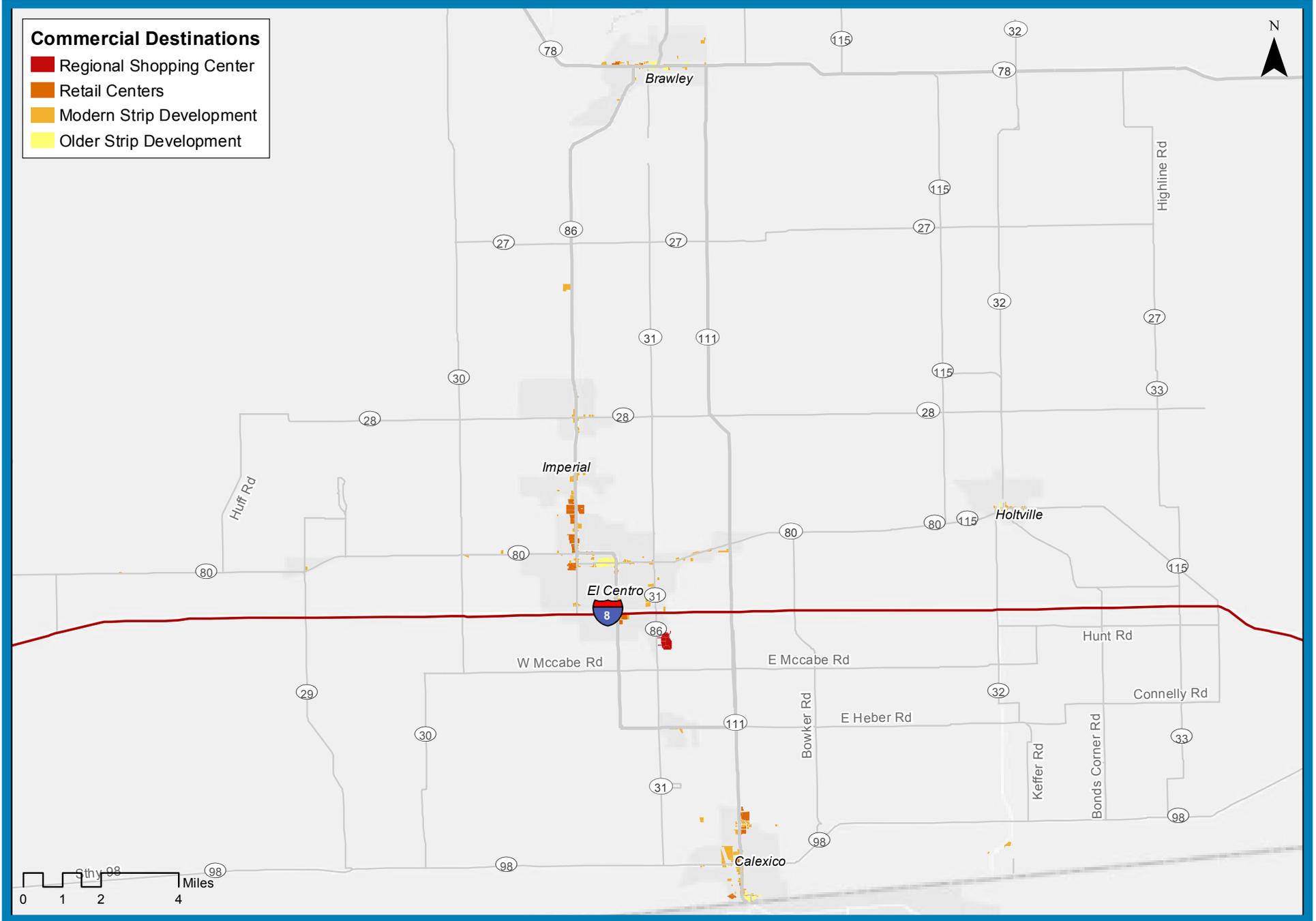
PEV Morning Peak Destinations and Workplaces



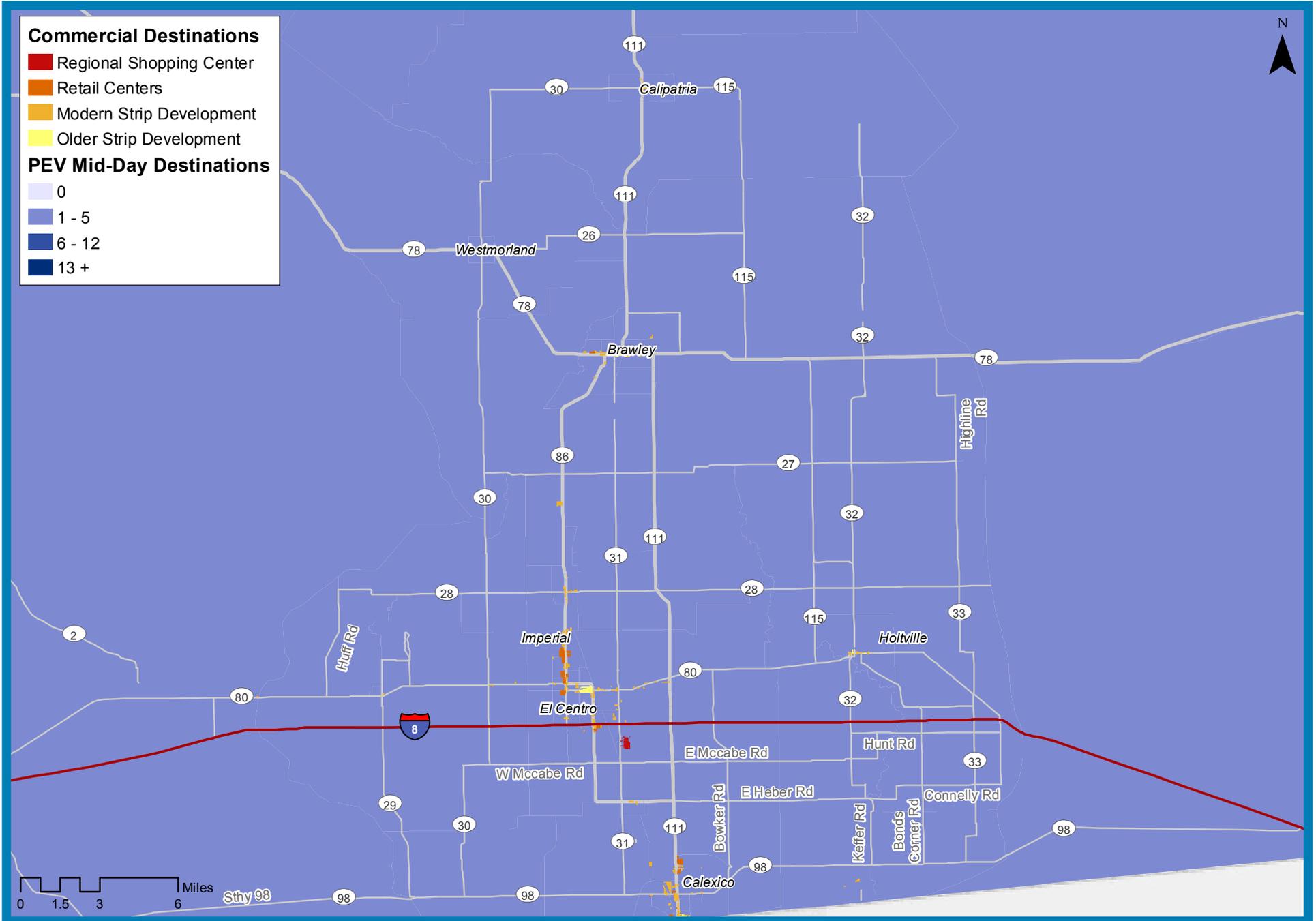
Multi-Unit Residential



Commercial (Retail) Destinations



PEV Mid-Day Destinations and Commercial (Retail) Locations



Stand-alone Parking Facilities

