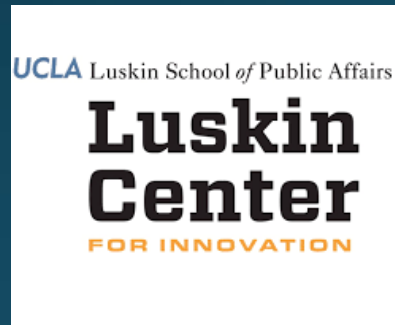


# Assessing the Multi-unit Dwelling Barrier to Plug-in Electric Vehicle Adoption in the South Bay

Alex Turek

July 28, 2016



# Agenda

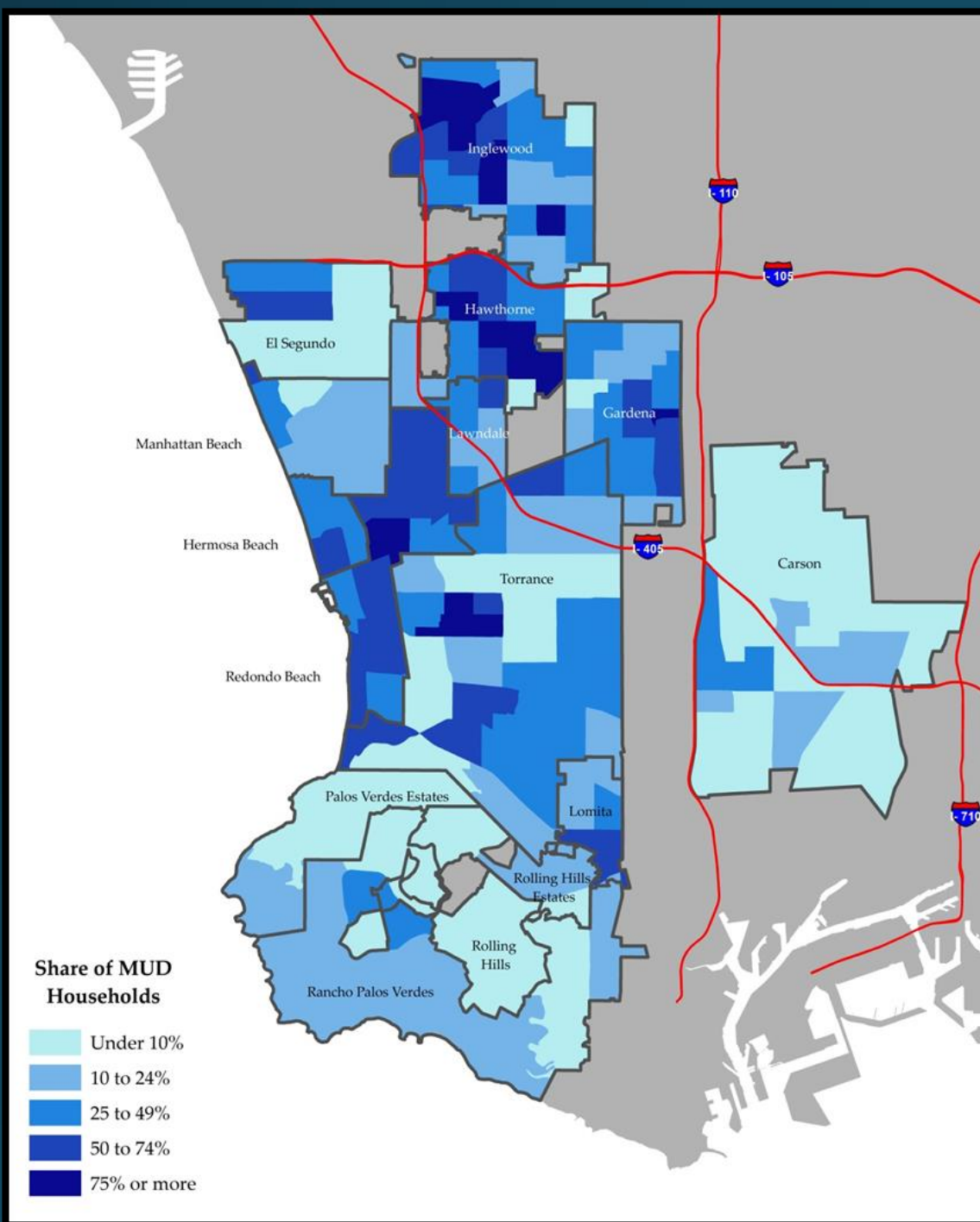
1. Review of research objectives and methodologies
2. Review of multi-unit dwellings in the South Bay
3. Review of PEV demand in the South Bay
4. Review of research findings

# Goal: to identify multi-unit dwellings with high PEV demand and low charging installation costs

## Methodology

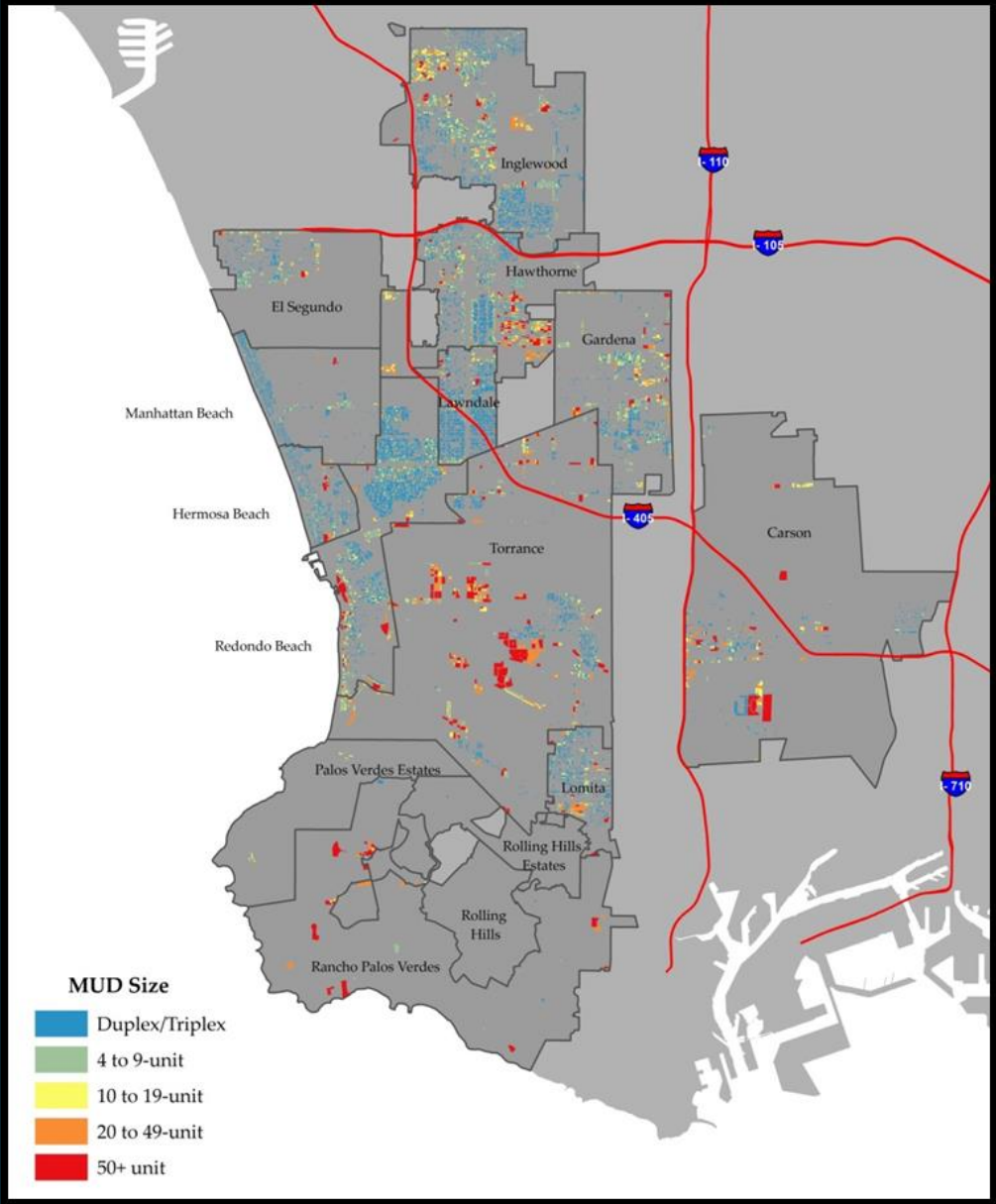
- Review the size, per unit value, vintage, ownership type and parking layout for the South Bay cities' MUD portfolio
- Random sample to determine most frequently observed MUD parking layouts
- Analyze PEV registrations per census tract
- Visited 27 MUD sites with an electrician and received PEV charger installation cost estimates

# MUD Density in the South Bay

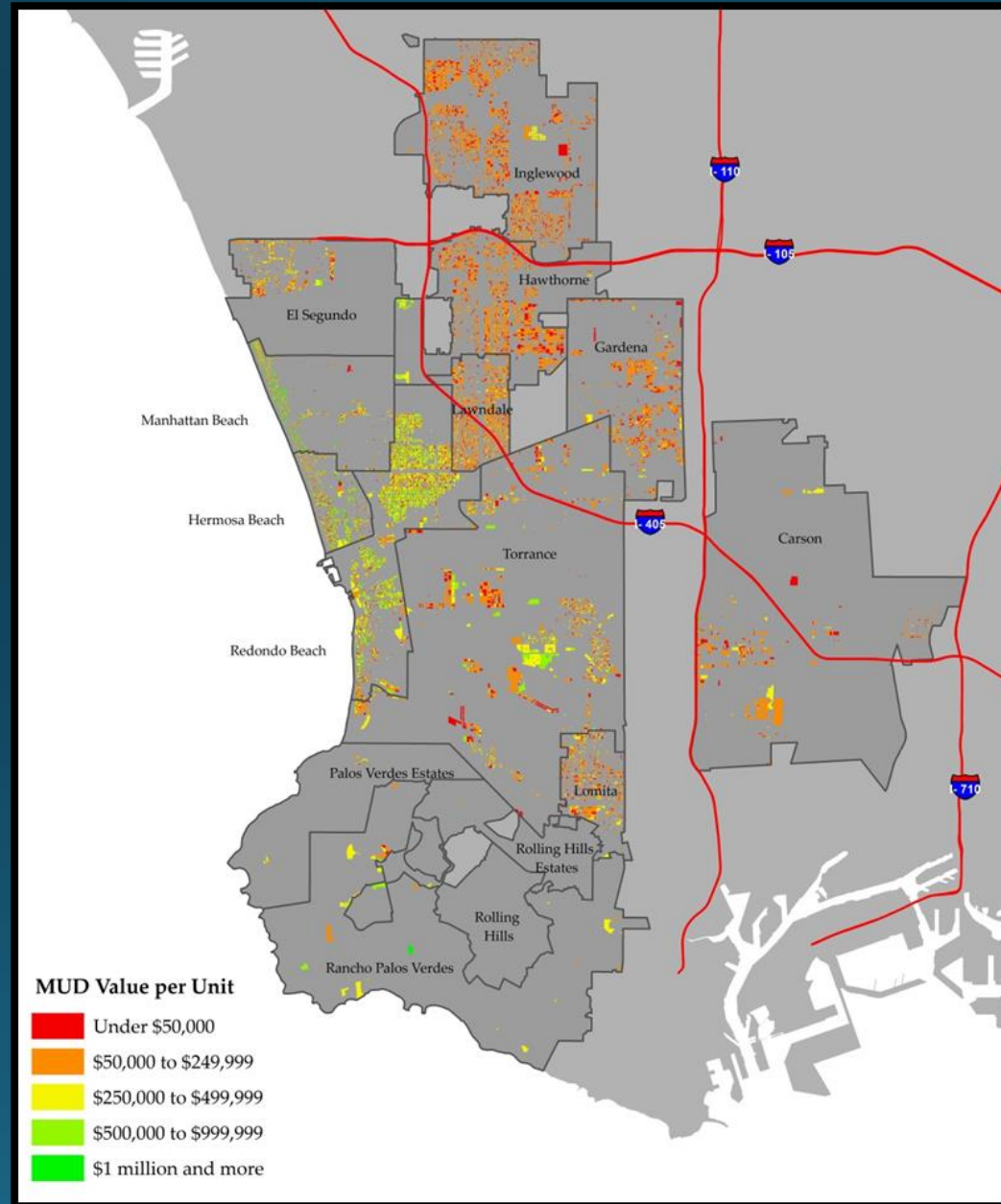


City	MUD Household Count	% MUD
Hermosa Beach	6,476	46%
Manhattan Beach	5,072	22%
Redondo Beach	20,778	57%
Carson	6,136	23%
Gardena	11,017	48%
Hawthorne	23,033	68%
Inglewood	25,618	60%
Lawndale	7,516	53%
Lomita	4,429	47%
Palos Verdes Estates	352	7%
Rachos Palos Verdes	2,831	17%
Rolling Hills	0	0%
Rolling Hills Estates	106	3%
El Segundo	4,518	57%
Torrance	26,250	42%
<b>Total</b>	<b>144,132</b>	<b>46%</b>

# MUD Sizes in the South Bay



# MUD per Unit Value in the South Bay



# MUD Vintage in the South Bay

City	Pre-1970	1970 to 1989	1990 to 1999	2000 and later
Hermosa Beach	3,633	2,209	274	360
Manhattan Beach	3,245	815	601	411
Redondo Beach	8,647	8,966	1,310	1,855
Carson	3,285	1,491	754	606
Gardena	6,923	3,210	608	276
Hawthorne	11,271	10,757	528	477
Inglewood	21,051	3,553	470	544
Lawndale	5,149	1,946	263	158
Lomita	3,311	1,006	47	65
Palos Verdes Estates	226	118	0	8
Rancho Palos Verdes	941	1,852	0	38
Rolling Hills Estates	2	0	44	60
El Segundo	2,760	1,416	172	170
Torrance	17,664	6,220	837	1,529
<b>Total</b>	<b>88,108</b>	<b>43,559</b>	<b>5,908</b>	<b>6,557</b>

# MUD Parking Layouts of the South Bay



## Dingbat with door

- Enclosed individual garage partitioned by walls
- Equipped with private garage door
- Often located directly below driver's housing unit
- At or below grade
- High probability of electrical outlet access



## Dingbat without door

- Open or partitioned parking spots
- Not equipped with private garage door
- Located below housing units
- Medium probability of electrical outlet access



# MUD Parking Layouts of the South Bay



## Detached parking with door

- Enclosed individual garage partitioned by walls
- Equipped with private garage door
- Detached from main MUD structure
- At grade
- Medium to high probability of electrical outlet access



## Detached parking without door

- Open parking structure often partitioned by walls
- Not equipped with private garage door
- Detached from main MUD structure
- At grade
- Low to medium probability of electrical outlet access

# MUD Parking Layouts of the South Bay



## Podium garage

- Enclosed shared garage
- Not equipped with private garage door
- Located below housing units
- At grade
- Medium to high probability of electrical outlet access



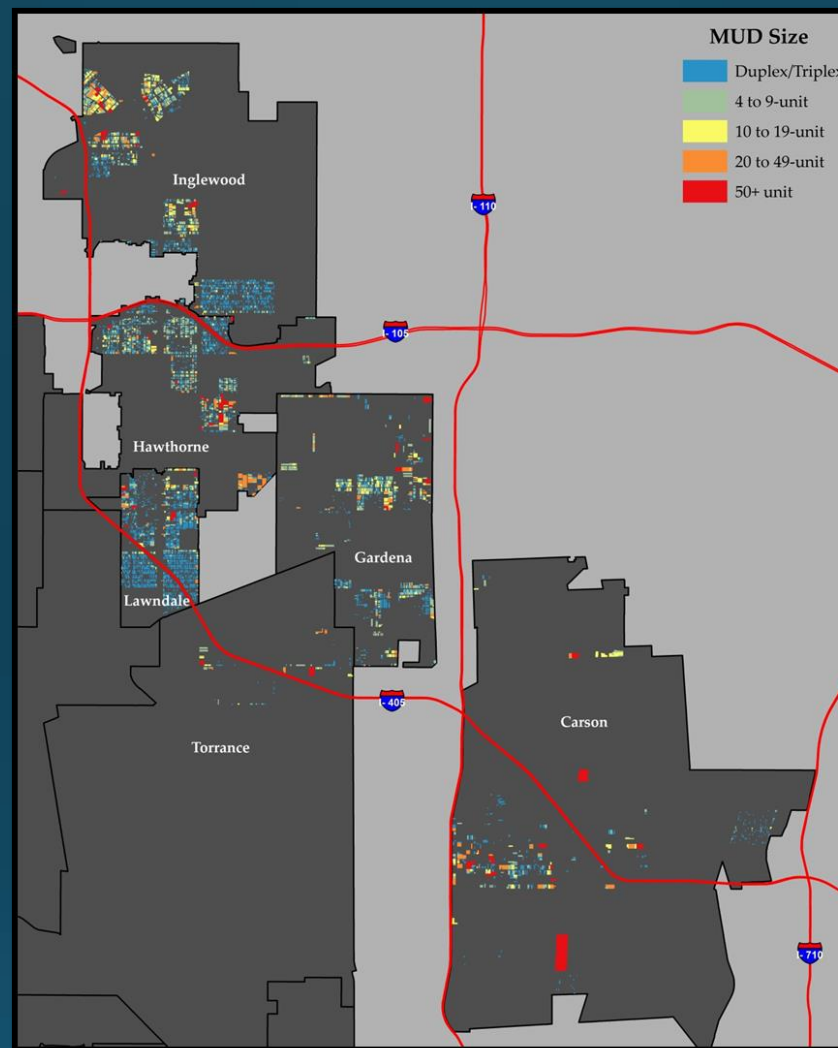
## Subterranean garage

- Enclosed shared garage
- Not equipped with private garage door
- Located below housing units
- Below grade
- Medium to high probability of electrical outlet access

# MUD Parking Layouts of the South Bay

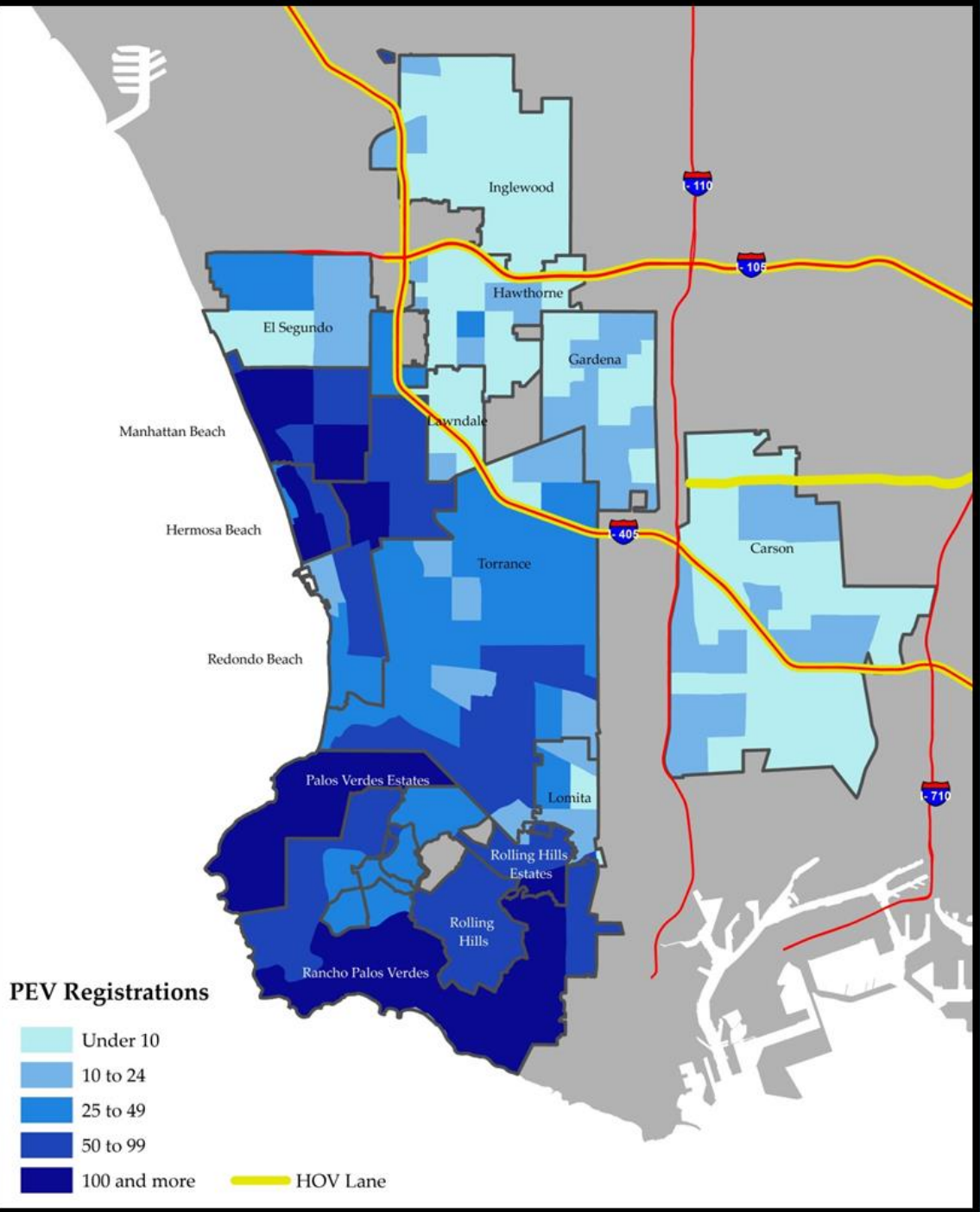
City	Dingbat with door	Dingbat without door	Detached parking with door	Detached parking without door	Podium garage	Sub-teranean garage	Parking lot	Driveway only
Hermosa Beach	4,105	254	415	0	554	492	64	592
Manhattan Beach	3,462	209	231	80	166	250	14	661
Redondo Beach	12,769	813	1,461	488	1,843	1,791	198	1,416
Carson	2,277	574	263	459	1,123	933	275	231
Gardena	4,143	2,503	665	1,118	852	670	468	597
Hawthorne	7,654	4,071	1,359	2,665	2,979	2,289	787	1,230
Inglewood	9,049	3,501	2,200	4,804	1,662	1,282	1,113	2,007
Lawndale	3,393	928	1,065	422	393	305	86	923
Lomita	1,479	658	381	621	397	303	250	338
Palos Verdes Estates	151	0	0	0	104	97	0	0
Rancho Palos Verdes	1,176	22	0	0	904	729	0	0
Rolling Hills Estates	46	0	0	0	31	28	0	0
El Segundo	2,996	393	222	0	358	286	68	195
Torrance	13,579	939	647	0	5,198	4,456	819	612
<b>Total</b>	<b>66,280</b>	<b>14,865</b>	<b>8,909</b>	<b>10,658</b>	<b>16,564</b>	<b>13,912</b>	<b>4,141</b>	<b>8,803</b>

# MUDs in Disadvantaged Communities in the South Bay



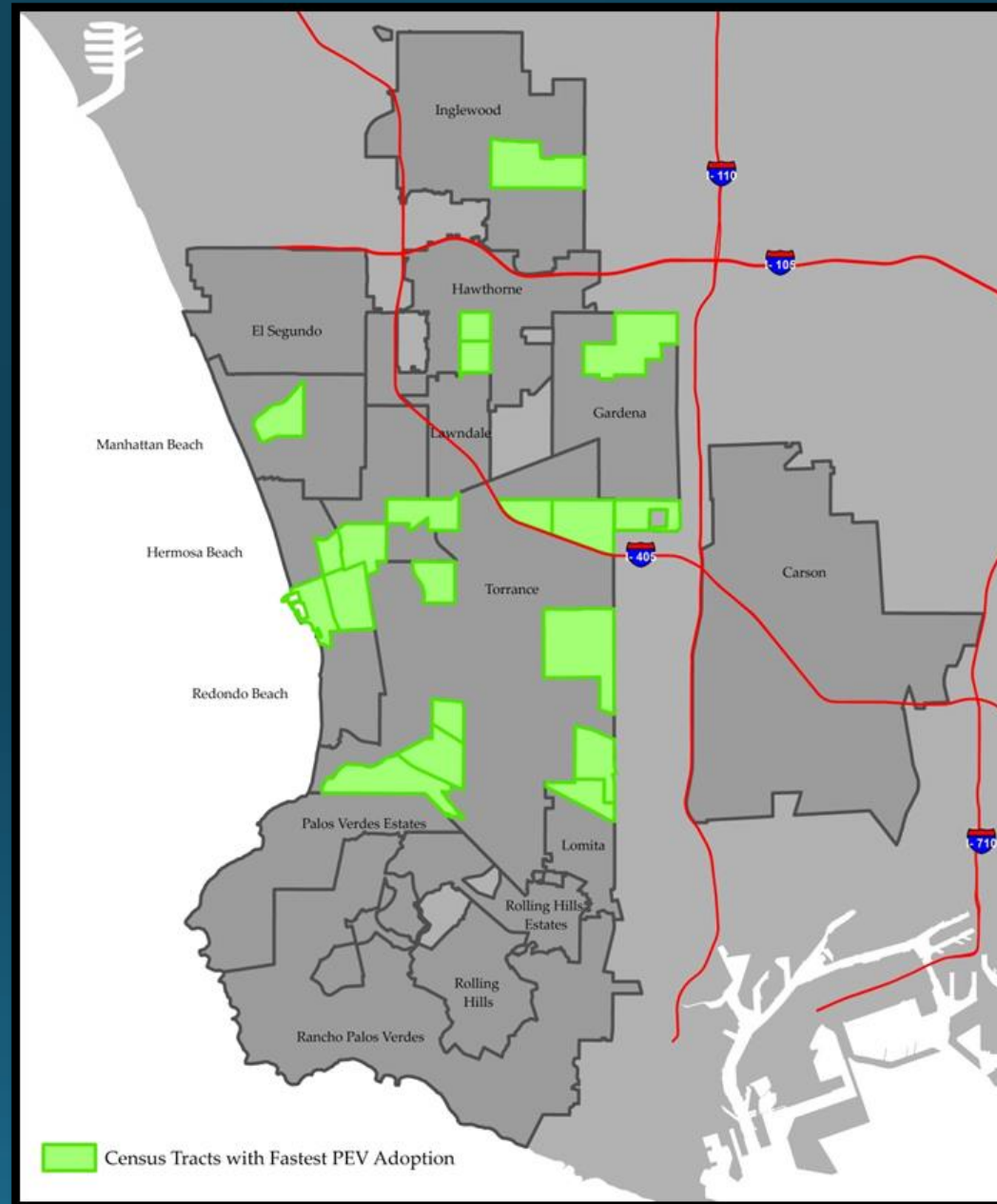
City	Duplex/Triplex	4 to 9-unit	10 to 19-unit	20 to 49-unit	50+ unit	Total
Carson	550	424	94	434	1,125	2,627
Gardena	1,095	2,680	845	860	402	5,882
Hawthorne	1,888	3,180	978	1,668	1,266	8,980
Inglewood	2,343	3,117	2,422	1,320	941	10,143
Lawndale	3,473	881	424	529	166	5,473
Torrance	153	231	25	129	142	680
<b>Total</b>	<b>9,502</b>	<b>10,513</b>	<b>4,788</b>	<b>4,940</b>	<b>4,042</b>	<b>33,785</b>

# PEV Ownership in the South Bay

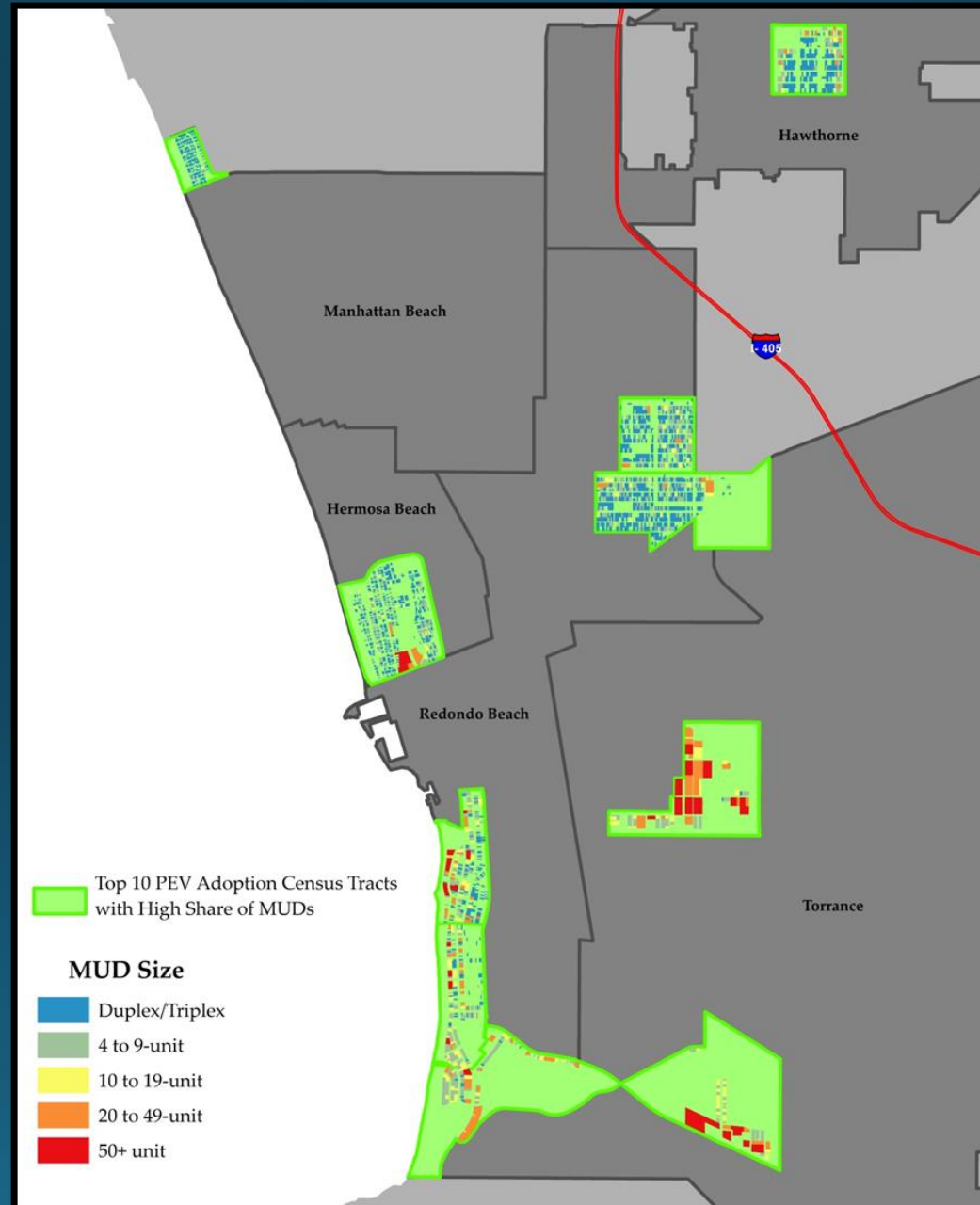


City	PEV Registrations	PEVs per 100 Residents	2015 Growth Rate
Hermosa Beach	420	21.5	42%
Manhattan Beach	1,081	30.8	45%
Redondo Beach	69	1.7	38%
Carson	193	2.1	36%
Gardena	128	2.2	44%
Hawthorne	186	2.2	62%
Inglewood	110	1.0	64%
Lawndale	53	1.6	39%
Lomita	74	3.7	40%
Palos Verdes Estates	388	28.9	40%
Rancho Palos Verdes	877	13.1	45%
Rolling Hills	168	90.3	31%
Rolling Hills Estates	678	84.0	38%
El Segundo	152	9.1	52%
Torrance	1,080	7.4	40%
<b>Total</b>	<b>5,657</b>	<b>7.6</b>	<b>43%</b>

# Census Tracts with Fastest Growing PEV Adoption



# Census Tracts with High PEV Adoption and High MUD Share



# Lessons from MUD Site Visits

- Visited 27 MUD sites throughout the South Bay
  - Level 1 charging
    - 78% of sites visited had access to 110/120-volt outlet
      - Including all dingbats with doors
    - 93% of these were connected to the house panel
  - Level 2 charging
    - 25 of 27 sites estimated to not have sufficient capacity
      - Requiring panel and/or service upgrades



# Lessons from EVSE Installation Cost Estimates

- Received 19 MUD Level 2 installation cost estimates
  - The cost to install EVSE is variable and often high
    - cost estimates ranged from \$1,800 to \$17,800 and averaged \$5,400
  - Cost correlated to distance between panel and parking
  - Detached parking layouts consistently more expensive



# Opportunities to Provide Charging Access to MUDs

- Level 1 charging
  - High probability of access to 110/120-volt outlet
  - Need to review house panel annual peak load to determine sufficient capacity
- Level 2 charging
  - High variable costs lend to sharing across residents
  - Short distances between panel and parking spot

# Policy Tools to Provide Charging Access to MUDs

- Design rebates to reduce the cost of EVSE installation
  - Require multiple PEV drivers per MUD to qualify
  - Free evaluations for Level 1 and Level 2 charging readiness
- Implement PEV-ready new construction codes
  - 2013 California Green Building Standards
  - Los Angeles Green Building Code
- Site public charge programs for MUD residents
- Outreach and education

# Thank you!

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GRID Alternatives

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