



**February 4, 2019**

**To:** Regional Planning and Highways Committee  
**From:** Darrell E. Johnson, Chief Executive Officer  
**Subject:** Regional Traffic Signal Synchronization Program Update

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**Overview**

The Orange County Transportation Authority has been working with local cities, the County of Orange, and the California Department of Transportation in funding and implementing key regional traffic signal synchronization projects. This report provides an update on the Measure M2 Regional Traffic Signal Synchronization Program, including results from recently completed projects.

**Recommendation**

Receive and file as an information item.

**Background**

The Orange County Transportation Authority (OCTA) provides funding and assistance to implement multi-agency signal synchronization as part of the Measure M2 (M2) Regional Traffic Signal Synchronization Program (Project P). Annually, OCTA provides competitive capital grants specifically dedicated to the coordination of traffic signals across jurisdictional boundaries. The goal of Project P is to improve the flow of traffic by developing and implementing regional signal coordination that crosses local agencies' boundaries and maintains coordination through freeway interchanges, where possible.

OCTA and local agencies have implemented signal synchronization for 69 projects that included 2,367 signalized intersections and 613 centerline miles of streets (Attachment A). The projects have improved travel times, reduced delays and congestion, and increased the number of successive green lights drivers see in daily commutes. The results of the program translate into direct cost savings for the motorist, with less fuel consumption, and a reduction of greenhouse gas (GHG) emissions.

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### ***Discussion***

Signal synchronization is a cost-effective way to increase roadway throughput without major new construction. Projects are corridor-based, and new optimized signal timings are developed based on traffic conditions and current travel patterns. These projects optimize traffic signal timings to reduce travel times, stops, delays, and ultimately give users a better driving experience. Key to these efforts is regular dialogue between partner agencies and the California Department of Transportation, resulting in agencies working together towards the multi-jurisdictional goal of the program.

Funding is provided through annual calls for projects (call), with 80 percent of funding from M2 (Project P) and 20 percent from local agencies' matching funds. Supplemental funding is used whenever available, including SB 1 (Chapter 5, Statutes of 2017) Local Partnership Program funds and Congested Corridor grants. A variety of sources have been used in the past to fund signal synchronization projects, including Measure M1, Proposition 1B Traffic Light Signal Synchronization Program, and air quality funds.

Signal projects implement a coordination strategy involving time-based synchronization of the respective agencies' systems, including the necessary upgrades to the traffic signal infrastructure. This includes modifications to prepare for future connected and autonomous vehicle technologies and applications. Existing synchronization on crossing arterials is incorporated when and where applicable. Optimized timings are developed and implemented for identified peak periods, which are typically weekday mornings, midday, and evenings. For weekend operations, the peak is typically mid-morning through early evening. To quantify signal synchronization benefits, "before and after" studies are conducted to evaluate the improvements from these new optimized timing plans.

These studies are conducted during peak traffic periods with specially equipped vehicles that have computer-linked global positioning system devices to collect traffic data. Several runs are made in each direction with the car "floating" in the middle of the traffic platoon of vehicles for each run. These studies showed improvements across all performance measures, including travel time, number of stops, and average safe speed. Additionally, fuel consumption, GHG, and other vehicle emission data is reported (Attachment B). Historically, signal timing efforts nationwide have resulted in travel time and speed improvements, as well as a reduction in stops in the range between five percent and 15 percent. Comparisons of the corridors' before and after studies indicate results in the high end of this range due to the combination of the optimized traffic signal timing plans, cooperation between all participating agencies, and minor signal upgrades to maximize traffic flow.

### Signal Synchronization Projects

OCTA and local agencies have completed 69 signal synchronization projects since 2008. The signal program target of regularly synchronizing 2,000 signalized intersections, as expressed in the M2 voter guide, was met before December 2016. A total of 2,367 signalized intersections and 613 centerline miles of streets have been implemented. The total M2 grant allocation of the completed projects was approximately \$39.5 million. The completed projects are identified on the map in Attachment A. A summary of the results for the 69 completed signal synchronization projects is identified in the table in Attachment B. The early acceleration of Project P allowed the benefits of signal synchronization to be experienced by travelers much earlier than originally promised.

The completed projects have reduced average travel time by 13 percent and the average number of stops by 31 percent. Average speed improved by 15 percent. Consumers will save approximately \$144.5 million (at \$3.90 per gallon in today's dollars) on fuel costs and reduce GHG emissions by approximately 750.1 million pounds over the three-year project cycle. The reduction of GHG emissions is made possible by reducing the number of stops, smoothing the flow of traffic, and reducing the amount of acceleration and deceleration of vehicles. These results are comparable to signal timing efforts nationwide.

Currently, OCTA is funding an additional 34 signal synchronization projects that are in various stages of implementation. The committed funding from OCTA is primarily from the competitive signal program, and the grant allocation of these projects is over \$57.1 million. Once completed, these funded projects will synchronize an additional 1,247 signals and 316 miles of roadway, as summarized in Attachment C.

It is good practice to periodically resynchronize traffic signals to make sure they consider changes in traffic. The signal program allows for streets and highways from completed projects to compete again for funding during the annual call process. Previous investments made as part of earlier projects are incorporated into the refreshed projects. An example of this would be the Pacific Park Drive/Oso Parkway corridor. The signals along this corridor were synchronized in 2009 and updated in 2014. The result is a program that can regularly coordinate intersections as the basis for synchronized operation across Orange County.

### Next Steps

OCTA continues to work with local agencies through various venues, including the Technical Steering Committee, Technical Advisory Committee, and the Traffic Forum to identify corridors that are eligible for funding and would benefit from signal program funding as part of the annual call.

***Summary***

OCTA and local agencies have successfully implemented new cooperative traffic signal synchronization timing on 69 corridors. Another 34 projects are planned or underway. The synchronization of traffic signals along these regional corridors continually results in significant improvements to traffic flow by reducing total travel times, stops per mile, and improving average speeds while decreasing fuel costs, GHG, and overall vehicle emissions.

***Attachments***

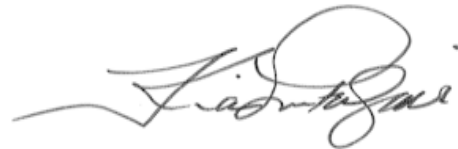
- A. OCTA-Funded Signal Synchronization Projects (2008 – Present)
- B. Summary of Results for Completed Regional Traffic Signal Synchronization Projects
- C. Signal Synchronization Projects Planned or In-Progress

**Prepared by:**



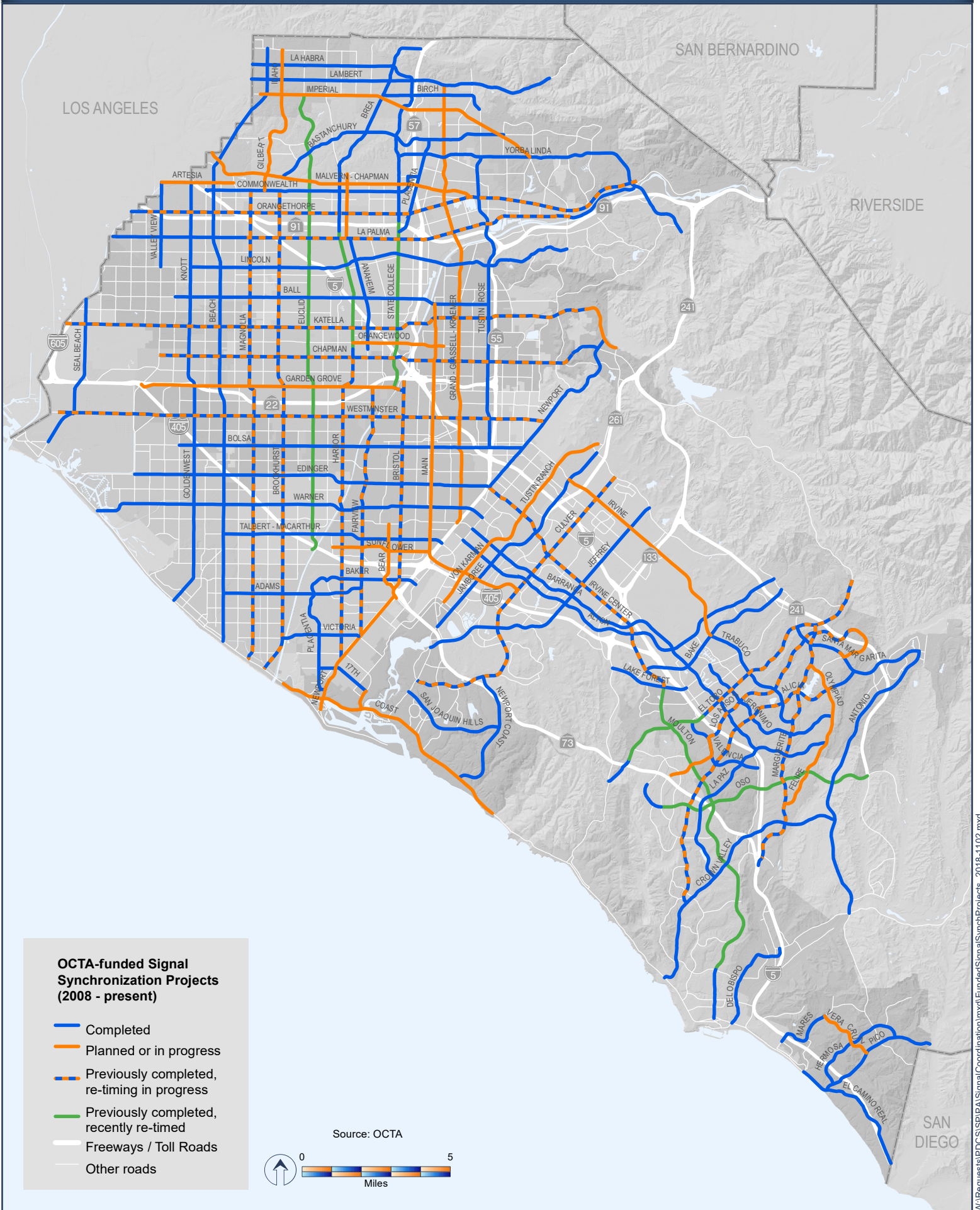
Ron Keith  
Project Manager III  
(714) 560-5990

**Approved by:**



Kia Mortazavi  
Executive Director, Planning  
(714) 560-5741

# OCTA-Funded Signal Synchronization Projects (2008 - Present)



### OCTA-funded Signal Synchronization Projects (2008 - present)

- Completed
- Planned or in progress
- Previously completed, re-timing in progress
- Previously completed, recently re-timed
- Freeways / Toll Roads
- Other roads

Source: OCTA



## Summary of Results for Completed Regional Traffic Signal Synchronization Projects

	Corridor Name	Timing Completed	Lead Agency	Length (Miles)	Signals	M1 / M2 Grant Board Allocation	Project Life Fuel Consumed Savings (gal)	Estimated Project Life Gas Savings (Dollars)^	Estimated Project Life Greenhouse Gas Savings (lbs.)	Travel Time Improvement	Average Speed Improvement	Stops Improvement
1	Euclid Street*	2008	OCTA	15	62	\$450,000	792,726	\$ 3,091,631	16,188,276	20%	24%	43%
2	Pacific Park/Oso Parkway*	2009	OCTA	9	34	\$250,000	935,223	\$ 3,647,370	19,098,249	22%	29%	50%
3	Alicia Parkway	2010	OCTA	11	41	\$945,000	206,667	\$ 806,001	4,220,358	13%	12%	40%
4	Beach Boulevard	2010	OCTA	21	70	\$1,300,000	2,684,544	\$ 10,469,722	54,821,202	14%	21%	28%
5	Chapman Avenue (South)	2010	OCTA	14	52	\$800,000	831,969	\$ 3,244,679	16,989,696	16%	18%	46%
6	Edinger/Irvine Center Drive/Moulton*	2011	OCTA	22.3	109	\$846,000	1,181,976	\$ 4,609,706	24,137,220	11%	14%	34%
7	Harbor Boulevard*	2011	OCTA	16	107	\$520,000	827,208	\$ 3,226,111	16,892,430	11%	12%	23%
8	Orangethorpe Avenue	2011	OCTA	17	47	\$698,000	681,804	\$ 2,659,036	13,923,183	17%	20%	42%
9	State College/Bristol Street*	2011	OCTA	17	97	\$760,000	1,048,650	\$ 4,089,735	21,414,531	15%	18%	28%
10	Westminster Avenue	2011	OCTA	13	48	\$620,000	1,085,484	\$ 4,233,390	22,166,736	14%	17%	35%
11	Brookhurst Street	2012	OCTA	16	56	\$631,764	2,012,875	\$ 7,850,213	41,105,031	19%	18%	31%
12	El Toro Road*	2012	OCTA	11	40	\$478,916	846,879	\$ 3,302,828	17,294,160	19%	24%	32%
13	Katella Avenue	2012	OCTA	17	69	\$673,845	1,137,363	\$ 4,435,716	23,226,165	14%	14%	36%
14	La Palma Avenue	2012	OCTA	18	61	\$803,999	1,610,653	\$ 6,281,546	32,391,229	18%	22%	27%
15	Bastanchury Road	2013	Fullerton	8	27	\$539,936	270,002	\$ 1,053,007	5,513,723	13%	15%	49%
16	Euclid Street*	2013	Fullerton	17	66	\$1,000,000	1,106,675	\$ 4,316,031	22,599,458	15%	17%	39%
17	Tustin/Rose Drive	2013	OCTA	10	43	\$683,200	592,267	\$ 2,309,842	12,094,717	15%	17%	37%
18	Yorba Linda Boulevard	2013	OCTA	12	46	\$521,837	465,049	\$ 1,813,693	9,496,799	12%	10%	21%
19	Culver Drive	2014	Irvine	11	39	\$779,856	929,653	\$ 3,625,648	18,984,998	12%	12%	19%
20	Fairview Road/Street	2014	Costa Mesa	8	31	\$620,001	444,993	\$ 1,735,472	8,087,220	11%	12%	24%
21	Jamboree Road	2014	Irvine	9	27	\$230,608	813,645	\$ 3,173,217	16,615,495	9%	9%	19%
22	Jeffrey Road	2014	Irvine	9	40	\$410,032	489,977	\$ 1,910,910	10,005,845	9%	10%	26%
23	Lincoln Avenue	2014	Anaheim	13	53	\$777,910	401,102	\$ 1,564,300	8,190,935	9%	15%	25%
24	MacArthur Boulevard/Talbert Avenue	2014	OCTA	7	24	\$392,256	134,391	\$ 524,129	2,744,427	7%	8%	13%
25	Magnolia Street	2014	OCTA	16	54	\$400,000	566,394	\$ 2,208,937	11,566,362	10%	12%	26%
26	Pacific Park/Oso Parkway*	2014	OCTA	8	32	\$490,222	490,380	\$ 1,912,481	10,014,071	16%	19%	29%
27	Valley View Street	2014	Buena Park	3	20	\$280,000	783,613	\$ 3,056,089	16,002,194	28%	24%	37%
28	Warner Avenue	2014	OCTA	13	43	\$621,848	460,817	\$ 1,797,186	9,410,366	8%	6%	15%
29	Avenida Pico	2014	San Clemente	4	21	\$416,453	181,023	\$ 705,991	3,696,687	9%	10%	21%
30	Crown Valley Parkway	2014	OCTA	9	30	\$367,200	142,785	\$ 556,861	2,915,820	4%	3%	20%
31	Edinger Avenue*	2014	OCTA	12	38	\$753,800	324,316	\$ 1,264,832	6,622,870	2%	5%	25%
32	El Camino Real	2014	San Clemente	4	19	\$359,998	380,188	\$ 1,482,733	7,763,838	9%	10%	25%
33	First Street/Bolsa Avenue	2014	OCTA	12	49	\$980,000	899,045	\$ 3,506,276	18,359,448	11%	12%	26%
34	Jerónimo Road	2015	OCTA	6	16	\$267,360	386,683	\$ 1,508,063	7,896,471	12%	3%	35%
35	Lake Forest Drive	2014	OCTA	2	10	\$119,679	175,873	\$ 685,904	3,591,510	19%	23%	33%
36	Lambert Avenue	2013	La Habra	10	26	\$520,000	1,173,926	\$ 4,578,312	23,972,807	14%	16%	41%
37	Marguerite Parkway	2014	OCTA	9	31	\$323,056	156,175	\$ 609,084	3,189,264	11%	12%	21%
38	Santa Margarita Parkway	2015	OCTA	5	20	\$311,912	437,265	\$ 1,705,334	8,929,416	15%	18%	41%
39	Del Obispo Street	2014	San Juan Capistrano	4	16	\$138,800	254,554	\$ 992,762	5,198,269	13%	10%	11%
40	Knott Avenue	2015	Buena Park	7	28	\$448,000	491,820	\$ 1,918,098	10,043,483	23%	26%	37%
41	17th Street	2014	Costa Mesa	3	9	\$220,000	31,564	\$ 123,098	644,563	7%	3%	0%
42	Baker/Placentia	2014	Costa Mesa	8	27	\$519,960	138,520	\$ 540,228	2,828,724	14%	16%	34%
43	Victoria Street	2014	Costa Mesa	3	11	\$200,000	32,005	\$ 124,820	653,581	22%	15%	25%
44	Brea Boulevard	2014	Fullerton	4	16	\$320,000	208,598	\$ 813,531	4,259,783	12%	13%	43%
45	Commonwealth Avenue	2014	Fullerton	8	30	\$600,000	205,903	\$ 803,023	4,204,761	11%	12%	36%
46	Lemon Street / Anaheim Boulevard	2014	Fullerton	2	13	\$280,000	136,377	\$ 531,872	2,784,969	16%	21%	40%
47	Placentia Avenue	2014	Fullerton	4	15	\$380,000	146,390	\$ 570,921	2,989,436	18%	22%	48%
48	La Habra Boulevard	2014	La Habra	6	23	\$460,000	397,483	\$ 1,550,184	8,117,025	10%	11%	27%
49	Paseo de Valencia	2014	Laguna Hills	3	12	\$190,742	43,554	\$ 169,859	889,411	8%	5%	34%
50	Newport Coast Drive	2015	Newport Beach	5	15	\$260,000	167,175	\$ 651,984	3,413,896	10%	0%	6%
51	San Joaquin Hills Road	2015	Newport Beach	4	11	\$220,000	149,978	\$ 584,913	3,062,701	11%	12%	32%
52	Avenida Vista Hermosa	2015	San Clemente	3	17	\$305,856	64,846	\$ 252,899	1,324,219	17%	19%	54%
53	Camino De Los Mares	2015	San Clemente	2	13	\$248,208	463,252	\$ 1,806,683	3,153,365	27%	37%	57%
54	Los Alisos Boulevard	2014	OCTA	7	21	\$332,617	7,148	\$ 27,876	145,962	5%	3%	16%
55	Antonio Parkway	2016	OCTA	10	27	\$1,156,920	583,109	\$ 2,274,125	11,907,699	16%	19%	23%
56	Adams Avenue	2016	OCTA	5	17	\$1,042,374	529,737	\$ 2,065,973	10,817,781	12%	14%	27%
57	Trabuco Road	2015	OCTA	5	16	\$266,971	332,011	\$ 1,294,844	6,780,018	15%	18%	32%
58	State College Boulevard*	2016	OCTA	5	35	\$1,041,578	380,749	\$ 1,484,920	7,775,289	10%	11%	16%
59	Newport Avenue/Boulevard (North)	2016	OCTA	7	24	\$946,044	149,162	\$ 581,731	3,046,041	12%	15%	36%
60	Ball Road	2014	OCTA	11	38	\$733,416	392,850	\$ 1,532,115	8,022,411	5%	7%	13%
61	Alton Parkway	2016	Irvine	14	48	\$1,209,397	790,279	\$ 3,082,089	16,138,332	12%	14%	39%
62	Bake Parkway	2016	OCTA	6	19	\$532,603	367,780	\$ 1,434,344	7,510,464	12%	12%	28%
63	Barranca Parkway	2016	Irvine	13	44	\$2,106,434	701,256	\$ 2,734,900	14,320,395	10%	11%	26%
64	Seal Beach/Los Alamitos Boulevard	2016	Seal Beach	3	13	\$586,720	260,610	\$ 1,016,379	5,321,931	10%	11%	31%
65	La Paz Road	2016	OCTA	8	23	\$328,192	500,477	\$ 1,951,861	10,220,270	14%	16%	21%
66	Harbor Boulevard*	2017	Anaheim	4	22	\$731,867	362,716	\$ 1,414,593	7,407,047	8%	9%	15%
67	Birch Street/Rose Drive	2017	Brea	4	14	\$664,230	161,437	\$ 629,603	3,296,709	23%	30%	37%
68	El Toro Road*	2018	Laguna Woods	3	15	\$514,000	286,340	\$ 1,116,724	5,847,356	17%	20%	33%
69	Moulton Parkway	2018	Laguna Woods	11	37	\$645,440	240,928	\$ 939,620	4,920,008	12%	2%	41%
<b>Summary of All Projects</b>				<b>613</b>	<b>2367</b>	<b>\$ 39,575,058</b>	<b>37,068,867</b>	<b>\$ 144,568,588</b>	<b>750,178,606</b>	<b>13%</b>	<b>15%</b>	<b>31%</b>

\* Euclid Street, Pacific Park Drive/Oso Parkway, Edinger Avenue, Harbor Boulevard, State College Boulevard, and El Toro Road are included twice because these projects have been revisited

^ \$3.90 per gallon gasoline price used to estimate savings

Note: Improvements are averaged across both directions over the full corridor

## Acronyms

Gal - Gallons

Lbs - Pounds

M1 - Measure M1

M2 - Measure M2

OCTA - Orange County Transportation Authority

## Signal Synchronization Projects Planned or In-Progress

## AGENCY LEAD

Project	Lead	Corridor Name	Length (miles)	Signals	Number of Agencies	M2 Grant Board Allocation
1	Anaheim	Anaheim Boulevard	3.8	18	2	\$ 787,940
2	Anaheim	La Palma Avenue	11.2	39	1	\$ 2,518,146
3	Anaheim	Orangewood Avenue	3.2	15	3	\$ 683,328
4	Buena Park	Artesia Boulevard	2.4	11	2	\$ 422,142
5	Costa Mesa	Fairview Road	9.0	34	2	\$ 1,695,150
6	Costa Mesa	Sunflower Avenue	3.3	14	1	\$ 617,960
7	Costa Mesa	Bear Street	2.4	14	2	\$ 494,752
8	Fullerton	Malvern Avenue / Chapman Avenue	9.3	40	3	\$ 2,202,304
9	Fullerton	Gilbert Street / Idaho Street	5.3	19	2	\$ 917,280
10	Fullerton	Orangethorpe Avenue	17.3	57	7	\$ 3,577,668
11	Irvine	Culver Drive/Bonita Canyon/Ford	9.3	39	2	\$ 1,139,728
12	Irvine	Irvine Center Drive / Edinger Avenue	9.1	39	2	\$ 1,824,000
13	Irvine	Von Karman Avenue / Tustin Ranch Road	7.9	30	2	\$ 1,439,980
14	Irvine	Irvine Boulevard	7.3	29	1	\$ 378,166
15	La Habra	Imperial Highway / SR-90	10.3	46	5	\$ 2,760,001
16	Mission Viejo	Marguerite Parkway	9.0	30	1	\$ 759,232
17	Mission Viejo	Olympiad Road-Felipe Road	5.8	18	1	\$ 515,656
18	San Clemente	Camino Vera Cruz	1.4	5	1	\$ 192,686
19	Santa Ana	Harbor Boulevard	10.4	46	4	\$ 1,852,080
<b>Total</b>			<b>138</b>	<b>543</b>	<b>44</b>	<b>\$ 24,778,199</b>

## OCTA LEAD AGENCY PROJECTS

Project	Lead	Corridor Name	Length (Miles)	Signals	Number of Agencies	M2 Grant Board Allocation
1	OCTA	Alicia Parkway	10.6	40	4	\$ 1,847,200
2	OCTA	Bristol Street	8.0	45	3	\$ 1,884,620
3	OCTA	Brookhurst Avenue	16.5	59	6	\$ 2,895,884
4	OCTA	Chapman Avenue	14.2	55	3	\$ 2,344,044
5	OCTA	Coast Highway	9.0	27	1	\$ 1,799,210
6	OCTA	El Toro Road	7.2	25	3	\$ 1,112,447
7	OCTA	Garden Grove Boulevard	8.7	34	4	\$ 2,116,670
8	OCTA	Goldenwest Street	7.7	32	2	\$ 380,800
9	OCTA	Katella Avenue	19.6	73	8	\$ 3,924,488
10	OCTA	Kraemer Boulevard / Glassell/Grand	15.0	61	4	\$ 2,433,520
11	OCTA	Los Alisos Boulevard Route	10.9	40	5	\$ 1,777,782
12	OCTA	Magnolia Avenue	16.2	50	7	\$ 2,711,694
13	OCTA	Main Street	11.9	67	3	\$ 3,058,176
14	OCTA	Newport Boulevard - South	7.0	33	2	\$ 1,304,596
15	OCTA	Westminster Avenue / 17th Street	16.3	63	6	\$ 2,820,102
<b>Total</b>			<b>179</b>	<b>704</b>	<b>61</b>	<b>\$ 32,411,233</b>
<b>34</b>			<b>316</b>	<b>1247</b>	<b>105</b>	<b>\$ 57,189,432</b>

## Acronyms

M2 - Measure M2

OCTA - Orange County Transportation Authority

SR-90 - State Route 90

# Regional Traffic Signal Synchronization Program Update



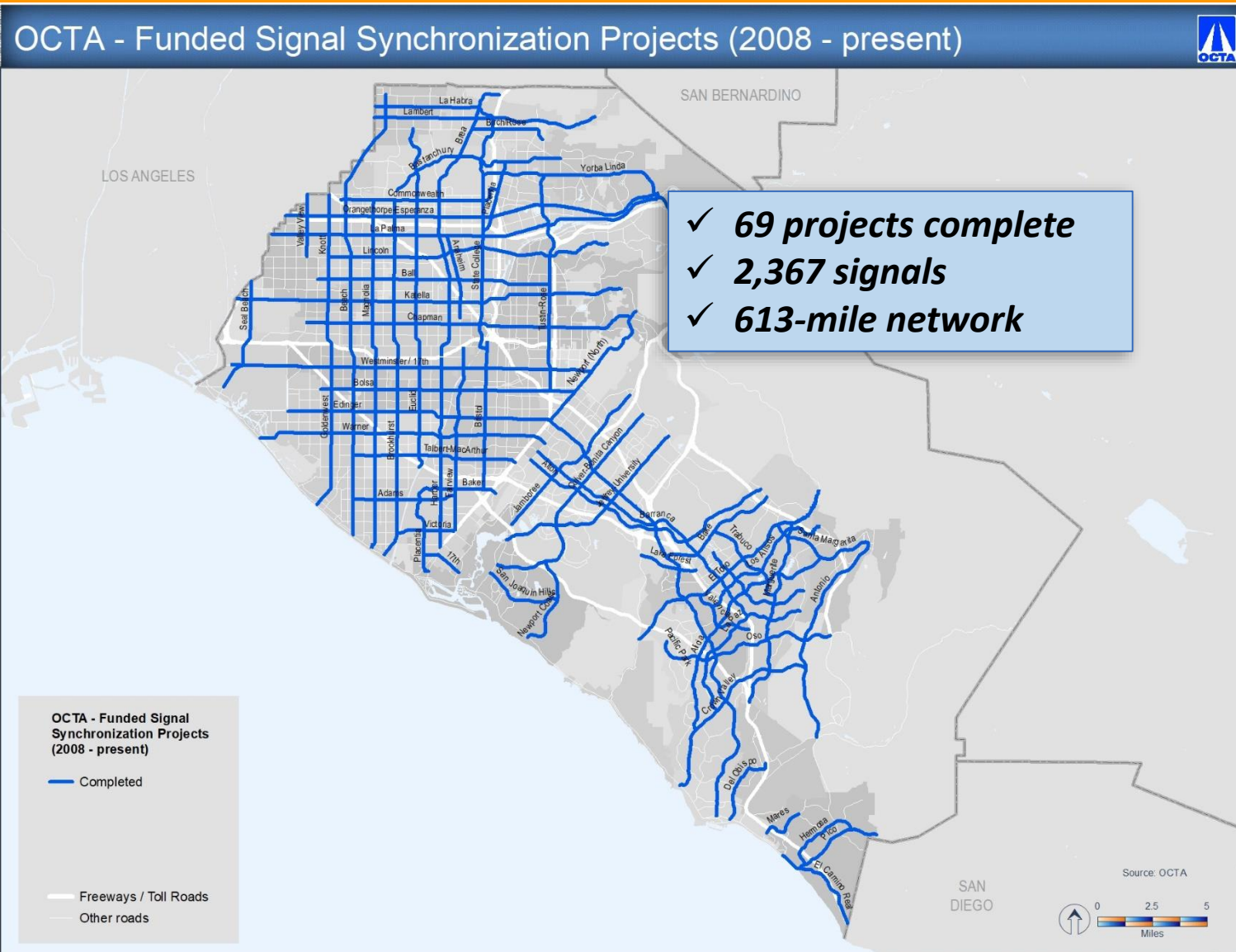
# Program Overview

Goal: Regularly coordinate 2,000 signals on a countywide masterplan to improve traffic flow

Approach:

- Promote multi-jurisdictional projects
- Provide competitive grants to local agencies with local matching funding
- Fund signal timing and hardware costs
- Offer support or lead implementation

# Completed Synchronization Projects

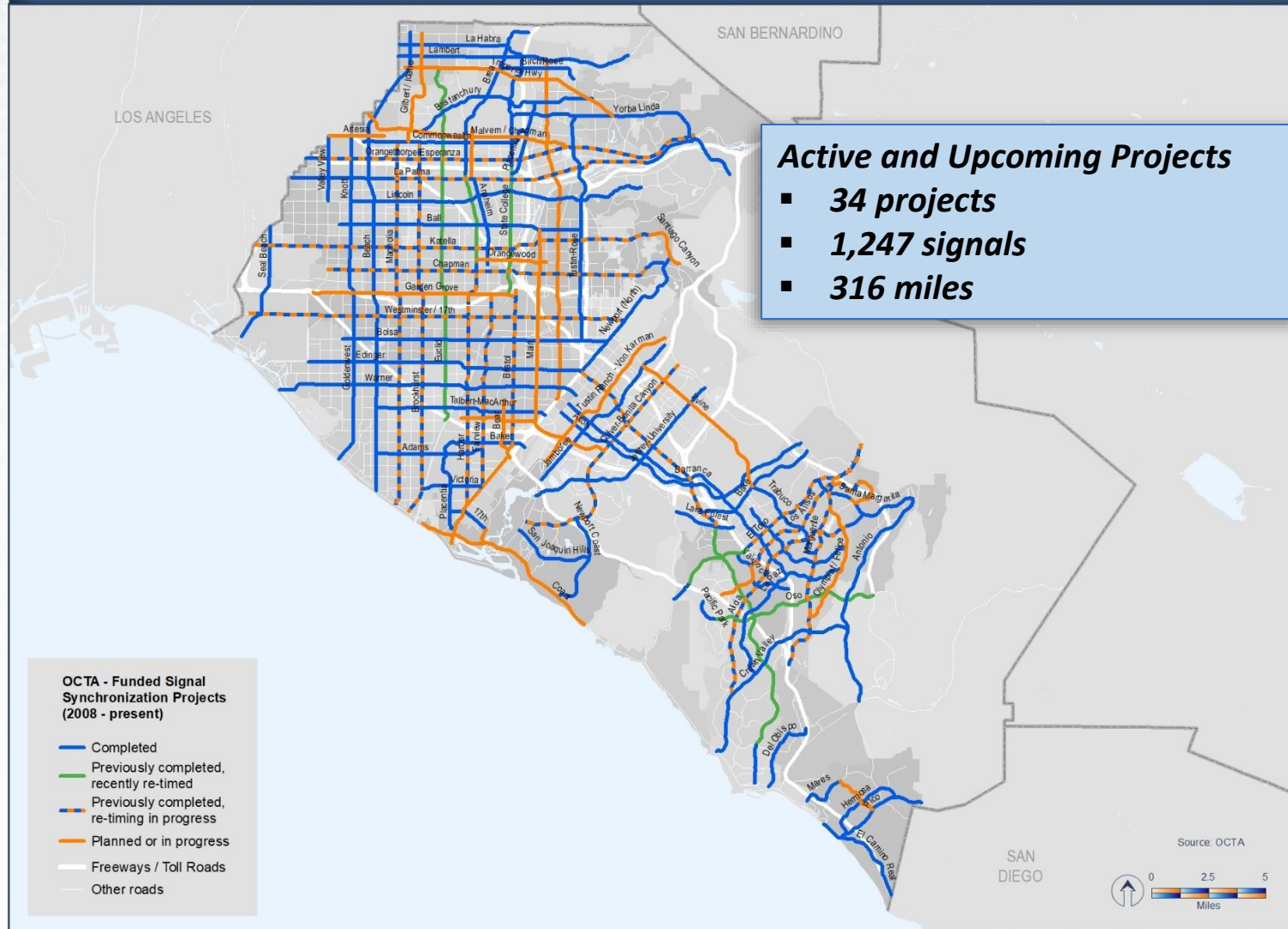


# Results for Completed Projects

- ***Travel time improved an average of 13%***
- ***Speeds improved an average of 15%***
- ***Stops reduced an average of 31%***
- ***Fuel savings \$144 million***
- ***GHG reduction of over 750 million pounds***
  
- ***\$39.5 million investment or less than \$17,000 per intersection***

# Completed, Refreshed, and Planned Projects

## OCTA - Funded Signal Synchronization Projects (2008 - present)



# Next Steps

- 34 signal projects planned or in-progress
  - 1,247 signals across 316 miles
  - \$57 million in investment
- Additional project funding recommendations in spring 2019