



October 5, 2020

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

Overview

The Orange County Transportation Authority has been working with local cities, the County of Orange, and the California Department of Transportation to fund and implement 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 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.

Since 2008, OCTA and local agencies have implemented signal synchronization for 84 projects that included 2,897 signalized intersections and 746 centerline miles of streets (Attachment A). The projects have improved travel times, reduced delays and congestion, and the increased number of successive green light drivers see in their daily commutes. The results of the program translate into direct benefits to motorists in time savings and cost savings in lower fuel consumption and a reduction of greenhouse gas (GHG) emissions.

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 timing to reduce travel times, stops, delays, and ultimately give users an overall 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 multijurisdictional 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 Solutions for Congested Corridors Program 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 synchronization 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 possible. 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" travel time 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 synchronization efforts nationwide have resulted in travel time and speed improvements, as well as a reduction in stops in the range between five 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 84 signal synchronization projects since 2008. The signal program's target of regularly synchronizing 2,000 signalized intersections, as expressed in the M2 voter guide, was met before December 2016. A total of 2,897 signalized intersections and 746 centerline miles of streets have been implemented. The total Board of Directors grant allocations for the completed projects were approximately \$59.95 million. The completed projects are identified on the map in Attachment A. A summary of the results for the 84 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 29 percent. Average speed improved by 14 percent. Consumers will save approximately \$172.1 million (at \$3.90 per gallon in today's dollars) on fuel costs and reduce GHG emissions by approximately 885.9 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 synchronization efforts nationwide.

The following table lists the six signal synchronization projects, where new timing plans were implemented in the last year, along with the corresponding travel time and speed improvements:

Corridor	Limits	Length (Miles)	Travel Time Improvements	Average Speed Improvements
El Toro Road	Bridger Road to Ridgeline Road	7.17	20%	25%
Alicia Parkway	Crown Valley Parkway to Rustic Oak	10.50	12%	13%
Marguerite Parkway	El Toro Parkway to Auto Mall	8.97	8%	9%
Coast Highway	Orange Street to Reef Point Drive	9.01	5%	5%
Westminster Avenue/17 th Street	Apollo Drive to Newport Avenue	16.33	5%	5%
Olympiad Road/ Felipe Road	Marguerite Parkway & Olympiad Road to Marguerite Parkway & Felipe Road	5.82	3%	3%

The travel time collection for all completed projects, including these six corridors, occurred prior to March 2020 or the Governor's stay-at-home executive order. Traffic engineers are continuing to monitor and update the signal timing to respond to changes in traffic patterns and to ensure travelers experience benefits from the completed projects.

OCTA is currently funding an additional 33 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 approximately \$70.8 million. Once completed, these funded projects will synchronize an additional 1,184 signals and 307 miles of roadway.

It is good practice to periodically resynchronize traffic signals to make sure they consider changes in traffic. The signal program allows previously completed streets and highways projects to compete again for funding during the annual call. Previous investments made as part of earlier projects are incorporated into the revisited projects. An example of this would be the Alicia Parkway corridor. The signals along this corridor were synchronized in 2010 and updated in 2019. 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 84 corridors. Another 33 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 safe speeds while decreasing fuel costs, GHG, and overall vehicle emissions.

Attachments

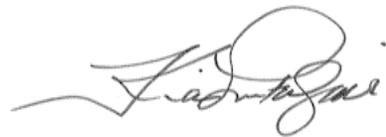
- A. OCTA-Funded Signal Synchronization Projects, (2008 – Present)
- B. Summary of Results for Completed Regional Traffic Signal Synchronization Projects

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