Bus on Shoulder Treatment on Controlled-Access Highways

Overall Effect on California Petroleum Use		Affects Petroleum Demand Through Intermediate Indicators:	
Magnitude	Low	**Primary**	Mode Choice
Certainty	Medium-High	**Secondary**	
Applicable Level of Government	State		
Relevant Laws or Cases Affecting Factor	Vehicle Code §21755 and 21718, and §34500 et seq.		
Time Horizon for Implementation and Maturity	Allowing transit buses to use highway shoulders would lead to immediate system operation efficiency benefits for express buses. Express bus ridership would increase in the mid-to-near term as more commuters are attracted to reliable travel times and reduced delay.		
Relevant Topics	transit, controlled-access highway		
Summary	Allowing transit buses the use of shoulders on controlled-access highways would affect only a small portion of transit route-miles in the state. Its effect on statewide motor vehicle fuel use would be similarly small. However, bus on shoulder treatments may be a viable option to improve the reliability of express and commuter bus transit service.		

Introduction

California's transit agencies operate three basic types of fixed-route bus service. Local buses, which make multiple stops per mile throughout the length of their route, are the most common. Rapid buses make less frequent stops than local buses – no more than twice per mile outside of dense urban centers. Express buses make frequent stops at the ends of a route, but few or no stops in the middle. Commuter bus routes are a special type of express bus route that:

- connects outlying areas with a central city,
- operates with at least five miles between stops,
- typically uses motor coaches instead of transit buses, and
- features peak scheduling and multiple-trip tickets (National Transit Database, 2013).

Because express buses make few or no stops in the middle of a route, these services may be able to use controlled-access highways for a portion of their routes. Commuter bus routes operating on metropolitan controlled-access highways in the peak travel directions and peak travel times may be prone to congestion delays. Prioritizing the mobility of these

By Juan M. Matute and Stephanie M. Pincetl

transit vehicles can produce travel time savings for transit users if buses are able to avoid traffic congestion.

High-occupancy vehicle lanes are one option to prioritize express bus service on controlled-access highways. However, high-occupancy vehicle lanes do not exist on all congested highways, and accessing these far-left lanes can be operational difficult for express buses that occasionally exit the controlled-access highway to serve stops.

Use of the right-hand shoulder is one option to prioritize transit vehicles on routes without high-occupancy vehicle lanes or where use of the far-left lane is impractical for transit operations. However, any plan to use the right-hand shoulder for transit buses must address emergency access and safety concerns. These lanes are often used for breakdowns and first responder access to emergencies during congested traffic. A large speed differential between buses and congested highway traffic could lead to high-risk collision events. Narrow shoulder widths and varied pavement quality also raise safety concerns.

Minnesota's Twin Cities region is home to the nation's longest-running and most successful bus on shoulder network. The bus-only shoulder network has grown to 295 miles since beginning in 1992 (Minnesota Department of Transportation, 2010). To mitigate safety risk, the Minnesota Department of Transportation established guidelines that allow the shoulders to be used only when highway speeds drop below 35 miles per hour and prohibit transit vehicles from exceeding highway traffic speeds by more than 15 miles per hour (Minnesota Department of Transportation, n.d.). Engineers in the Twin Cities developed and deployed a lane-assist system to aid operators in maintaining lane and avoiding obstacles (Cheng et. al., 2004). A subsequent study showed that the system succeeded in enhancing safety in narrow lanes and under crowded roadway conditions (Ward et. al., 2006).

Prioritizing express buses through use of highway shoulders is a highly cost-effective option when compared with the addition of a high-occupancy vehicle lane. The Minnesota Department of Transportation estimates per-mile implementation costs range from $1,500 for restriping to $100,000 if major repairs are needed. This range of per-mile capital costs is so low that savings from operator labor savings may earn the agency a positive return on its capital investment.

Bus on Shoulder Experience in California

In 2005, Caltrans and San Diego's Metropolitan Transit System implemented a trial bus on shoulder program modeled after the Twin Cities' experience. Planners' goals were to keep costs low and increase the reliability of transit services along the corridor (San Diego Association of Governments, 2005). After ten months, transit vehicles operating on the shoulder achieved 99 percent on-time performance; the project had improved travel times and raised levels of customer satisfaction (Leiter, 2006). Similarly, a survey conducted by the San Diego Association of Governments found that the percent of transit riders who agreed with the statement, "traffic congestion is a daily problem for this route" fell from 79 percent before the trial to 46 percent during the trial. The trial program, although successful from the point of view of the Metropolitan Transit System and the San Diego Association of Governments, was terminated after two years with no plans for permanent implementation.

Also in 2005, California Assemblywoman Shirley Horton introduced AB 461, which was originally a bill to formalize the bus-on shoulder demonstration program within California

law. The bill was stripped, amended and later passed without the bus-on shoulder provisions.

Regulation in California

No law grants transit buses permission to use highway shoulders in California. Vehicle Code § 21755 prohibits use of the shoulder to pass on any California street or highway. Vehicle Code § 21718 prohibits transit buses from stopping on freeways unless sidewalks are provided and the bus exits mixed flow traffic for the stop. California law may provide a pathway for future legislation or regulations that supports shoulder use by qualified transit bus drivers. California law does provide for stricter vehicle safety and driver qualification requirements for transit buses than for passenger vehicles. Bus operators in California must obtain a Commercial Class B driver's license with a passenger transportation endorsement. Transit agencies and bus operators must comply with applicable laws and regulations outlined in Vehicle Code 34500 et seq. California policymakers could consider a bus-on-shoulder operations endorsement, either within the existing passenger transportation endorsement or as a separate process. Such a measure would assist in the dissemination of safety guidelines for transit's use of highway shoulders.

Effects on Statewide Petroleum Use

Few Californians currently use express bus services. Even with considerable ridership growth, it's likely that the fuel-use reductions directly attributable to bus on shoulder treatments would be small. The National Transit Database first allowed agencies to differentiate commuter bus service in the 2011 reporting year. The figures below include reported commuter bus service, plus 50% of bus service from Golden Gate Transit, which provides commuter service in the Bay area but did not differentiate this service in reporting.

2011 California commuter bus statistics

	Commuter Bus	All Bus	All Transit Modes
Unlinked Passenger Trips	6,502,417	1,006,578,229	1,379,293,128
Passenger Miles Traveled	95,249,932	3,881,760,559	7,609,800,786
Average Passenger Trip Distance	14.64 miles	3.86 miles	5.52 miles

Commuter service comprised 0.65% of all transit bus trips and 2.45% of all transit bus miles traveled

In 2011, California agencies that reported commuter bus services used diesel (91.2%), compressed natural gas (5.2%), and gasoline (3.4%) (Federal Transit Administration, 2011). The commuter bus vehicles averaged 3.92 miles per gallon-equivalent across these three fuels. All California motor vehicles averaged 18.32 miles per gallon across all fuels (Highway Statistics, 2011). Given the assumptions below, one would expect minimal fuel-use reductions if state policy allowed transit buses to use highway shoulders.

Table of assumptions and results

Assumption/Result	Low	High
Additional passengers attracted to commuter buses due to bus on shoulder treatment	50%	600%
Conversion rate - of new passengers, what percentage represent a foregone vehicle trip?	75%	90%
Vehicle and system operations efficiency benefits for transit buses freed of congestion	5%	15%
Change in commuter bus service to accommodate new passengers	25%	300%
Net change in gasoline and diesel fuel use (in gallons)	-740,000	-11,090,000
Net change in statewide motor vehicle fuel use, percent	-0.004%	-0.063%

However, bus on shoulder implementation could be one of several complementary strategies that, in combination, attract single occupancy vehicle commuters to high-occupancy vehicles and mass transit buses. However, such speculative effects are beyond the scope of this analysis.

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