

Assessing the Impacts and Benefits of Traffic Signal Priority for Buses

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Delays caused by traffic signals and by street traffic congestion increase bus-operating costs and degrade transit service quality. Bus signal priority is an attempt to minimize or eliminate delays to buses at a signalized intersection by temporarily altering the traffic signal phase so that an approaching bus receives a green phase when it arrives. The potential savings in bus travel times can allow buses to maintain its schedule and provide better reliability in travel times. Although signal priority has proven to be an effective tool for reducing delays to buses, this technique is not always beneficial to the overall traffic network.

The objective of the research is to assess the impacts of and the implementation issues associated with the use of bus signal priority in New Jersey and to assess the benefit and costs of signal priority. A simulation study was performed on Broad Street in Newark, New Jersey which was selected because it is a recognized transit corridor, traffic and bus passenger volumes suggested that priority may be warranted, and the necessary data were available. The effects of implementing bus signal priority on the operation of transit and non-transit vehicles along Broad Street were examined with existing and future traffic volumes.

The study found a beneficial impact on both transit and other arterial traffic when transit priority was introduced. There was an expected increase in both bus and auto travel times (relative to the original base) when traffic grows by 10% without any transit priority. However, improvements due to signalization changes equal or exceed those due to transit priority operating with the existing signal timing. As a result of bus travel time reductions, the number of buses servicing the route was determined to be reduced to 9 by slight adjustments to the schedule. The important underlying principle is that for some combinations of these factors ---- notably longer routes, higher bus frequencies, lower bus speeds, and material savings in travel time due to bus priority --- there is a real potential for reducing the number of buses needed to service a route and to reduce operating costs.

Bus signal priority would have the greatest benefits where:

- a significant portion of the bus delay is at signalized intersections;
- bus stops are located at the far-side of the intersection;
- bus volumes are between 10 and 20 buses during the peak hour; all vehicles queuing at signalized intersections discharge in one cycle;
- the level-of-Service for the cross-streets is D or better;
- bunching of buses at bus stop does not occur,
- pedestrian volumes are low to moderate;
- AVL technology exists or is planned.

This research demonstrates that bus signal priority can be effective in New Jersey. The research also demonstrates that bus signal priority may not be appropriate at heavily congested locations or locations serviced by local buses with frequent stops. A successful implementation of signal priority warrants careful consideration of not only the transit impacts, but also the vehicular impacts. Simulation has proved to be a necessary first step in determining the appropriateness of implementing a bus signal priority treatment on an arterial. Although general guidelines can be provided on where signal priority may be effective, each location warrants a separate analysis, similar to the type of analyses performed in this research.



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