Bus Stop Optimization

Overview

While placing bus stops close together reduces the distance that travelers need to walk to get to a bus stop, it also increases the amount of time the bus takes to travel the route and it reduces how reliably a bus reaches each stop on time. There are times when a slightly longer walk to the bus stop may result in a significantly shorter total travel time.

According to a 2016 article in the Journal of Traffic and Transportation Engineering, overall bus reliability is generally affected by dwell time at stops due to the bus stop location, the number of passengers boarding on or off, and the fare payment method. Transit systems across the United States have been exploring ways to rebalance or optimize the distance between bus stops. Many riders and potential riders have said that the total travel time (including their walk to the bus) is a major factor in their decision to ride. During a series of public workshops held by New York City Transit, 63% of Bronx bus riders said they would prefer fewer stops because they had the opinion that bad bus stop spacing slows them down.

Port Authority's Values

Accessible, Efficient, Growth-Oriented

Analysis

Before a transit agency plans a new or updated bus service, it can create guidelines for the following elements based on the goals of the bus route: bus frequency, daily span, stop spacing, levels of population density, and ridership. Port Authority first established its own minimum stop spacing guidelines in 2009 in their Transportation Development Plan but did not begin a system-wide stop optimization project until 2017. In 2019, Port Authority published its own "Bus Stop and Street Design Guidelines" to create a document to help guide future local plans and ordinances. A data-driven plan was developed to accomplish this program on two routes with high ridership and closely spaced stops. According to the plan, areas that have a higher population density (over 5,000 residents and jobs per square mile) should generally have more frequent stops. Areas with a lower population density (fewer than 5,000 persons and jobs per square mile) should have fewer stops. By setting these guidelines upfront, transit agencies can better design their service to appropriately meet customer needs as well as have a ready explanation for decisions on bus stop placements based on metrics.

Many transit riders have said a walk distance of 5 minutes is manageable in urban areas, and distances of up to 8 minutes were found to be manageable in areas with fewer pedestrian amenities. The average adult can walk up to a ¼ mile in 5 minutes. Finding the right balance of stop spacing that allows for a 5-minute walk differs based on the presence and quality of pedestrian infrastructure, the pedestrian environment, local terrain, typical weather, average population age, etc.

Transit agencies in cities such as Baltimore and San Francisco improved bus travel times by 6% by slightly increasing stop spacing to 2.5 stops per mile, thereby reducing the total number of stops the bus makes along a route. Reducing the number of stops also increases travel time reliability by reducing the number of times that a bus might be delayed while navigating to another stop or bus dwell time at the stop. The preference for the trade-off between walking

distance and total travel time may change from area to area. While younger Americans tend to favor shorter travel times, older citizens and persons with disabilities tend to prefer negotiating shorter distances to bus stops.

In addition to these preferences, Allegheny County has many geographical challenges and physical barriers which impact stop spacing. River crossings, steep elevation changes, and man-made obstacles such as railroad tracks limit pedestrian access from certain directions and necessitate stops being closer together. First- and last-mile connections (sidewalks, bike lanes, and rideshare vehicles) vary throughout the county which means stop spacing may also need to vary.

Peer Examples
Maryland's MTA
The Maryland Transit Administration (MTA) created a Bus Stop Design Guide that provides guidance on bus stop placement and bus stop design and amenities, incorporating best practices from across the United States and around the world. A table was created addressing appropriate bus stop spacing dependent on the number of residents and job density within walking distance.

San Francisco's Metro
Metro released a bus stop consolidation plan in 2010 and since then has slowly been consolidating stops along routes. Metro has improved bus travel times by 6% by slightly increasing stop spacing to 2.5 stops per mile, thereby reducing the total number of stops the bus makes along a route. The decrease occurred because of a ridership survey where 61% of respondents said they would be willing to walk longer distances if it meant a shorter travel time.

Level of Effort for Implementation:
Moderate
- o Title VI equity coordination would be needed with organizations such as the

Committee for Accessible Transportation, City County Task Force on Disabilities, and other affected community organizations.

Resources
Journal of Traffic and Transportation Engineering
Maryland Transit Administration
San Francisco Municipal Transportation Agency

NEXTransit