

## TRANSIT STRATEGIES

# FREEWAY TRANSIT/BUS RAPID TRANIST

Most decisions about whether or not to use transit involve time and cost, and most transit services are slower than travel by private vehicle. However, when transit is faster or nearly as fast as travel by private vehicle (for example, many rail services), large numbers of travelers will choose to travel by transit instead of by car. Thus, one of the most effective ways to encourage transit use is to make transit as fast as possible. Freeway bus services are designed to do this and, compared to other transit services, are unique in that they:

1. Operate along freeways, either in regular traffic lanes, in high-occupancy vehicle (HOV) lanes, or along the shoulders.
2. Have stations within the freeway right-of-way that are designed to minimize travel times by eliminating all or most of the local circulation that is required to serve stops or stations outside of the freeway right-of-way.

### CONCEPT FOR BUS RAPID TRANSIT (BRT) OPERATIONS ALONG US 36 BETWEEN BOULDER AND DENVER



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## FREEWAY BUS OPERATIONS

In the 1970s, exclusive bus lanes were developed on freeways in Washington, DC, New Jersey, and California. However, most of these exclusive bus lanes were later converted to HOV lanes, and today, nearly all significant freeway bus services operate in general traffic, HOV lanes, and on shoulders.

## SERVICE IN GENERAL TRAFFIC

With service in general traffic, no special considerations are provided for bus service, and bus service operates in the same manner and at the same speed as all other traffic. Most express bus services operate in general traffic.

## SERVICE IN HOV LANES

Throughout the United States, freeway bus services operate in HOV lanes. One challenge for these services is that most HOV lanes are the leftmost lanes, which requires buses to weave across all lanes of traffic to serve stops that are off the highway. To avoid this situation, transit stations are now being constructed in freeway medians where they can be easily accessed from HOV lanes.

## SHOULDER-RUNNING BUS SERVICE

Twelve states<sup>1</sup> have implemented policies that permit buses to operate on selected freeway shoulders in order to speed service, and more are now considering it. These policies allow buses on selected freeway and arterial shoulders in order to bypass congestion and maintain transit schedules. Bus on shoulder operation is a low-cost way to make freeway transit service faster and more reliable.

Bus on shoulder operations were first implemented in Minnesota more than 20 years ago. The state now has 300 miles of shoulders in use by buses today and cites a number of benefits to bus on shoulder operation, including:

- Shorter and more predictable and reliable transit travel times
- Fewer missed transfer connections
- Increased transit ridership
- Reduced driver overtime
- Decreased operating costs

It should be noted that there are often perceived safety issues with shoulder operations, particularly with respect to the potential for conflict with stalled vehicles or vehicles entering or exiting the highway in front of the path of a shoulder-running bus. However, there has been only one injury-crash that has been attributed to shoulder-running buses in Minnesota since 1992, and no state that has implemented shoulder running policies has ever discontinued them.

## FREEWAY BUS STOPS AND STATIONS

One of the most time-consuming aspects of freeway bus service can be the time it takes to get off the freeway in order to serve local stops and then get back on again. To reduce these delays, many areas have developed stops and stations that are located directly along freeways, with most “retrofitted” into existing freeways. In general, there are three types of freeway stops and stations:

1. Stops located along freeway shoulders
2. Stops located along freeway interchange ramps
3. Stops located in freeway medians

## DENVER TO BOULDER, CO

In the Denver area, the Regional Transportation District (RTD) is upgrading freeway service between Boulder and Denver along US 36, which is the freeway that connects the two cities. The new service includes ramp and in-line stations with pedestrian bridges across the freeway. Most stations also include park and ride lots and connections to local bus services.

<sup>1</sup> California, Delaware, Florida, Georgia, Illinois, Maryland, Minnesota, New Jersey, North Carolina, Ohio, Virginia, and Washington are the 12 states with bus on shoulder policies.

### Best Practice: Buses on Freeway Shoulders Metro Transit, Minneapolis/St. Paul, MN

Bus on freeway shoulder policies were first implemented in Minnesota in 1992, and the state now has 300 miles of bus on shoulder operations. Many of Minnesota’s shoulder-running operations were originally along freeways with 10-foot shoulders, which are barely wider than a bus (approximately 9.5 feet including mirrors). In these areas, buses are only permitted to operate in the right-hand shoulder of highways when main-lane traffic speeds fall below 35 mph and are not permitted to operate more than 15 mph faster than the general traffic lanes. To better facilitate bus operations on highway shoulders, Metro Transit and the Minnesota Department of Transportation are widening highway shoulders throughout the Twin Cities area (to 12 feet where possible).



Bus on shoulder operations make service faster and, perhaps more importantly, provide reliable service. Bus services that used to frequently run late now usually run on schedule.

In Minnesota’s 20-plus year experience with this type of service, bus on shoulder operations have had a better safety record than other types of bus service.

A number of different approaches have been used along US 36. The first, and most extensive, is in Broomfield, with a 1,500 space parking garage, bus stops that are located along exclusive bus slip ramps, and a pedestrian bridge that provides access across the freeway and to the parking garage.

**US 36 FREEWAY BUS STATION WITH EXCLUSIVE SLIP RAMPS: BROOMFIELD, CO**



At other locations, the bus stops have been developed along the interchange ramps. At McCaslin, the bus stops have been developed on the southbound off-ramp and the northbound on-ramp. This configuration requires buses to exit the freeway and to travel through the traffic lights at the ends of the freeway ramps. This operation is slower than the exclusive slip ramps in Broomfield, but still fairly direct.

**US 36 FREEWAY BUS STATION ALONG INTERCHANGE RAMPS: MCCASLIN, CO**



As in Broomfield, this station has a pedestrian bridge that provides access across the freeway and to the park-and-ride lot. Also, RTD is planning to develop bus queue jump lanes along the interchange ramps to reduce intersection delays.

A third example is Church Ranch, where stops are also located along the interchange ramps. The stops are located along the southbound off-ramp and the northbound on-ramp of a diamond interchange, and buses will operate straight through the interchange to re-enter the freeway. However, access across the freeway is via a sidewalk along a

local street under the freeway rather than a pedestrian bridge. This approach is less expensive but, as shown in the image below, significantly increases the walking distance. As at McCaslin, RTD is planning to develop bus queue jump lanes along the interchange ramps to reduce intersection delays.

#### US 36 FREEWAY BUS STATION ALONG INTERCHANGE RAMPS: CHURCH RANCH, CO



## MINNEAPOLIS, MN

As part of the development of BRT service along I-35W between Lakeville and Minneapolis, Metro Transit recently opened a new transit station in the median of I-35W. This station is accessed from exclusive bus slip lanes to the median station. However, unlike most freeway bus stations, the I-35W station is designed only to serve the local area and bus connections and does not provide commuter parking.

#### I-35W MEDIAN STATION: MINNEAPOLIS, MN



This station was constructed within a narrow median and uses center platforms to reduce the station width. However, most buses only have doors on the right side, which is the wrong side for typical center platform operations. To deal with this issue, once within the bus-only area, buses cross over to the left side so that they can board and alight passengers through their right-side doors.

## LOS ANGELES, CA

Los Angeles' MTA provides Silver Line service in the Harbor Transitway along an 11-mile stretch of I-110 in Los Angeles. Harbor Transitway services operate in I-110's HOV lanes, which consist of two lanes in each direction that are physically separated from and located in between the general traffic lanes. There are five transitway stations located in the freeway's median, and buses access the stations via bus-only slip ramps from and to the HOV lanes. Pedestrian access to the stations is from the local streets below the freeway overpass, and in some cases, also via pedestrian bridges.

### I-110 FREEWAY MEDIAN BUS STATION: MANCHESTER ROAD, LOS ANGELES, CA



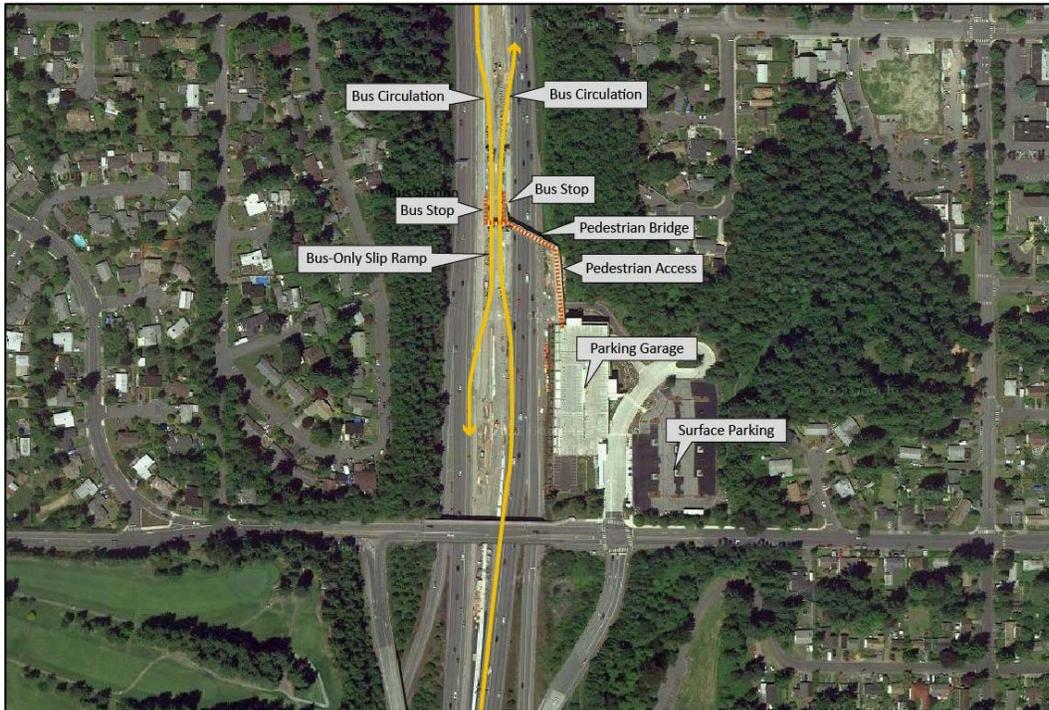
## SEATTLE, WA

Sound Transit, which provides commuter service in the Seattle area, recently opened Mountlake Terrace Freeway Station in the median of I-5. Along this section of I-5, commuter bus service operates in left-hand HOV lanes and accesses the station via exclusive bus slip lanes from and to the HOV lanes. This station also includes 890 parking spaces, most of which are in a garage, and a pedestrian bridge across the eastern side of the freeway to connect all of the elements. The station was built in an area where there was a sufficiently wide median, which (unlike the I-35W station in Minneapolis) had sufficient room for outside platforms.

### FREeway BUS STATION IN MEDIAN: MOUNTLAKE TERRANCE, WA



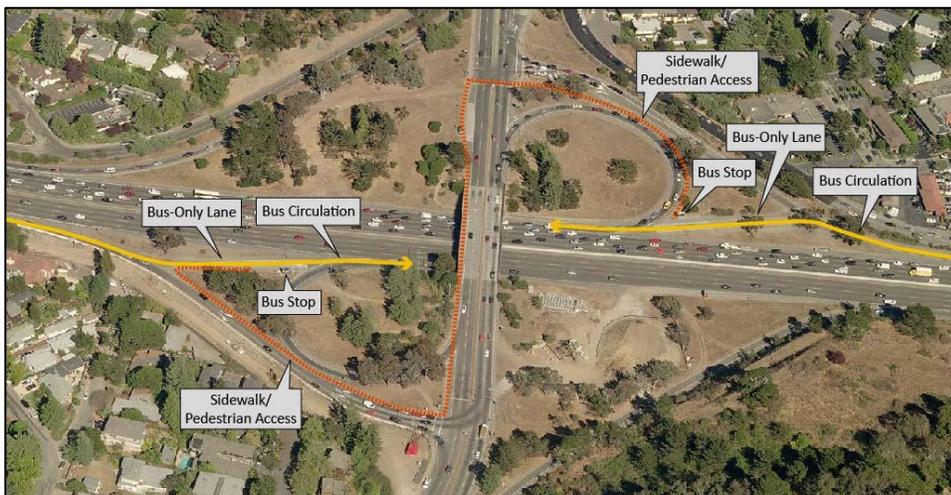
### I-5 FREEWAY BUS STATION IN MEDIAN: MOUNTLAKE TERRANCE, WA



### MARIN COUNTY, CA

North of San Francisco, Golden Gate Transit and Caltrans have developed a number of bus stops on US 101, which is the major freeway to and from San Francisco. These freeway stops were some of the first in the county and were developed within partial cloverleaf interchanges by constructing bus-only connector lanes between off and on ramps. In comparison to the newer freeway bus stations described above, the US 101 stations are very simple, and use sidewalks built between the interchange ramps for access to and from the stops, and sidewalks along the highway overpasses for pedestrian flow from one side of the highway to the other. The walking distances between the opposite stations are relatively long, and, at the Corte Madera stop, passengers frequently cut across the southbound on-ramp to lessen the distance.

### US 101 FREEWAY BUS STATION BETWEEN INTERCHANGE LEGS: CORTE MADERA, CA



#### US 101 FREEWAY BUS STATION BETWEEN INTERCHANGE LEGS: NOVATO, CA



## KEY CONSIDERATIONS

As described above, there are a number of ways to provide freeway transit service. Key considerations include:

- Bus on shoulder service on freeways is a very low-cost way to provide faster and more reliable service along freeways and, in spite of concerns about safety, has proven to be very safe.
- Bus service can be given priority through the use of HOV lanes or shoulder operations. With HOV use, buses typically must be able to access stations from the center of the freeway. With shoulder running service, buses need to access stations or stops located beyond the shoulders of the freeway.
- The most effective station designs serve passengers within the freeway right-of-way. This type of operation is important because it greatly reduces transit travel times (compared to services that must exit the freeway and travel locally to off-freeway stations and stops), and thus makes transit much more attractive.
- Of the different types of freeway stations and stops, those that use exclusive bus ramps and/or pullouts along the freeway are the most attractive because they are the fastest (for example, the US 36 Broomfield Station, Minneapolis' I-35W Station, Seattle's Mountlake Terrace Station, and the Los Angeles and Marin County stations).
- Stations and stops that are located along interchange ramps typically require buses to travel straight through from the off-ramp to the on-ramp). With this type of station, travel times are longer because buses are subject to intersection delays at the ends of the interchange ramps. These delays can be mitigated through the use of bus queue jump lanes. Stations and stops that are located along interchange ramps also typically involve longer walk distances because of the extra right-of-way width at interchanges.
- Most newer freeway bus stations include large park-and-ride facilities, some of which are also major transit centers (for example, the US 36 Broomfield Station and Seattle's Mountlake Terrace Station). However, freeway bus stops can also be developed to serve only local neighborhoods and local transit connections.

## POTENTIAL NASHVILLE AND MIDDLE TENNESSEE OPPORTUNITIES

The Nashville MTA and the Middle Tennessee RTA currently operate a relatively large number of express bus routes along most of the Nashville's radial freeways, but in particular I-24 and I-65 from the south and I-24/I-65 from the

north. Bus on shoulder operations could make these services faster and more reliable, and more competitive with automobile travel.

In addition, most of the express routes provide limited service to a very limited number of places. The development of stations along freeways could provide the ability to serve more locations with fewer routes, which could mean more service to areas that now receive only very limited service. This approach could also allow consolidation of some MTA and RTA express routes in a similar manner.