Appendix G: Regional Transit Design Guidelines and Performance Standards

Transit Market Areas

Demand for transit service varies across the region. This applies to the time of day that transit is used, the number of trips taken, and the purpose of trips taken on transit. While this variation in transit demand is driven by a number of factors, it is primarily due to differences in development density, urban form, and demographics. To account for these differences in the planning and evaluation of transit service, the region is divided into five distinct Transit Market Areas representing different levels of potential transit demand.

Transit Market Areas are a tool used to guide transit planning decisions. They help ensure that the types and levels of transit service provided, in particular fixed-route bus service, match the expected demand in a given area. For example, transit service in a suburban community where the automobile is the most convenient mode for the majority of trips might focus on the work commute, providing express bus service to downtown. Transit service in a dense urban core neighborhood might need to accommodate a broader variety of transit service needs that can be met by providing frequent, all-day service to a variety of destinations.

Transit Market Index

Transit Market Areas are determined using a Transit Market Index which in turn is based on a combination of measures of density, urban form, and automobile availability.

Population and Employment Density

Population and employment density are strong indicators of transit demand. Higher density areas generate more transit demand for the simple reason that they have more people living and working within the fixed area within walking distance of any transit stop. Additionally, people living and working in high density areas are more likely to take transit than those living in low density areas. This is because automobile use is often inconvenient because of congestion and parking costs and because residents typically have less need for a car since there are more destinations within walking distance.

In the Transit Market Index, population and employment densities are calculated separately by dividing the total population and total jobs in a census block group by the developed land area of the block group.

Intersection Density

Block size and urban form are important factors in transit demand. Areas with smaller blocks tend to have more traditional street-grids and provide a more walkable environment for pedestrians. The Transit Market Index measures urban form using intersection density; it is the total number of three-, four-, and five-way intersections in a block group divided by the total developed area. Intersections are weighted by the number of intersecting roads, such that a five-way intersection has more weight than a three-way intersection.

Automobile Availability

For any number of reasons transit is the only means of mobility for many people in the region. Areas with a more people who rely on transit will tend to generate greater demand for transit. The Transit Market Index measures reliance on transit by calculating the availability of automobiles by block group. Automobile availability is calculated by subtracting the total number of automobiles available in a census block group from the total population aged 16 or over. This value then divided by the total developed land area of the block group.

Calculating the Transit Market Index

The four measures included in the Transit Market Index were found to have a strong relationship to existing transit demand in our region. Their respective weights in the Transit Market index formula are determined based on their relative impact on transit demand. The Transit Market Index (TMI) is calculated for each block group as follows:

TMI=0.64*(Population Density)

+ 0.23*(Intersection Density)

+ 0.20*(Employment Density)

+ 0.11*(Automobile Availability)

Block groups are separated into the five Transit Market Areas based on Transit Market Index values. See Table G-1 for the index value ranges for each market area. Block groups with the highest Transit Market Index values are assigned to Market Area I while those with the lowest index value are assigned to Market Area V.

Data Sources

Table G-1 shows the data sources used to calculate the Transit Market Index measures for each block group.

Table G-1: Transit Market Index Data Sources

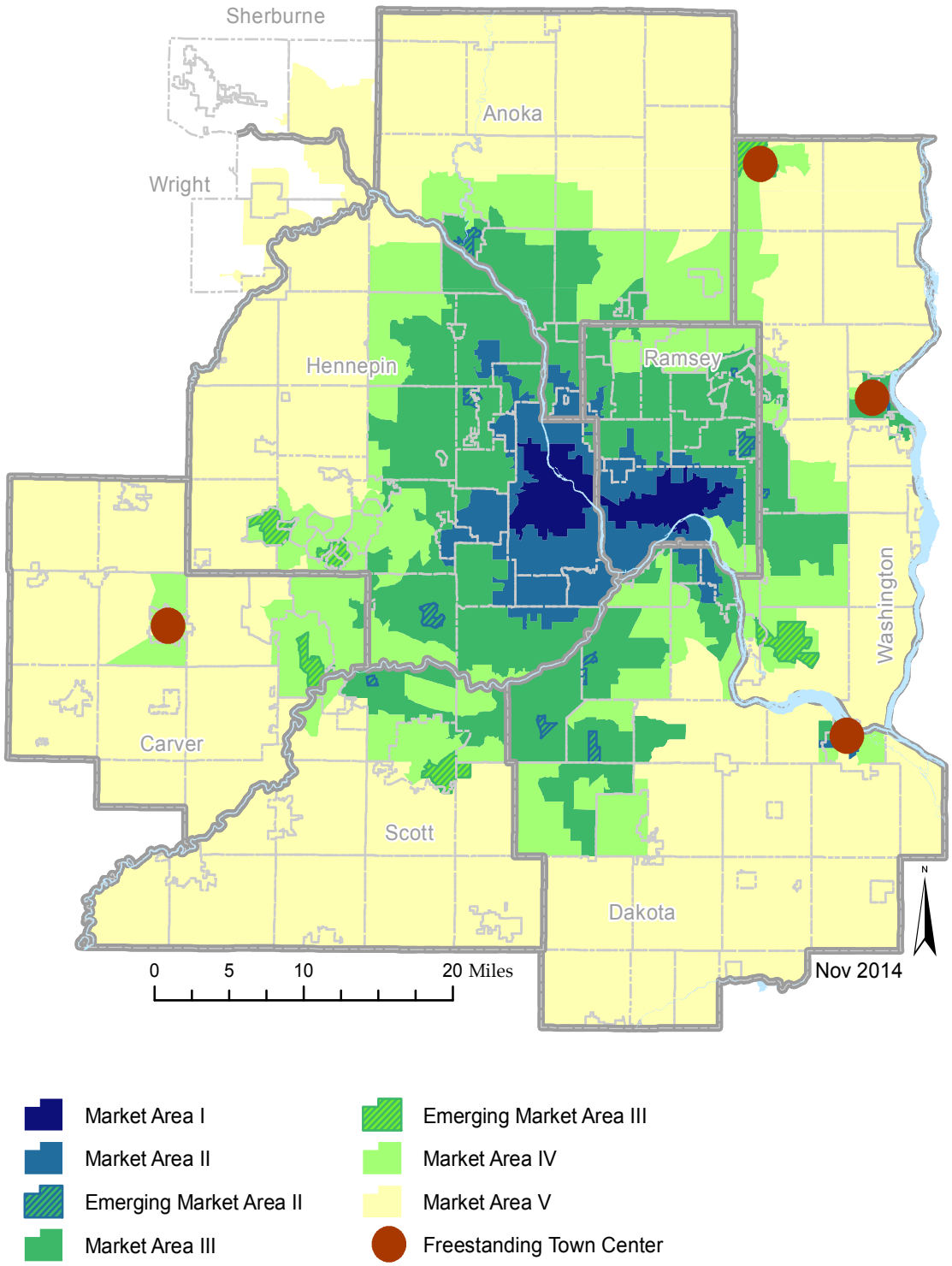
Measure	Data Source
Population	U.S. Census Bureau; Census 2010
Employment	U.S. Census Bureau; Longitudinal-Employer Household Dynamics Program; LODES Data
Automobile Availability	U.S. Census Bureau; American Community Survey, 2012 ACS 5-Year Estimates
Intersection Density	NCompass Technologies; Street Centerline Data
Developed Acres (used to calculate density)	Metropolitan Council; 2010 Generalized Land Use Survey

Adjacency and Connectivity

While the Transit Market Index is calculated at the block-group level, individual block groups do not exist in isolation. Transit demand in any block group is influenced by the characteristics of neighboring block groups. Another way of looking at this is that connected areas of transit demand will have higher overall ridership potential than similar areas that are disconnected. To account for this effect, the Transit Market Area of each block group takes into account the index values of neighboring block groups.

Figure G-1: Transit Market Areas

Transit Market Areas



Transit Market Area Characteristics

Transit Market Area I

Transit Market Area I has the highest density of population, employment, and lowest automobile availability. These are typically Urban Center communities and have a more traditional urban form with a street network laid out in grid form. Market Area I has the potential transit ridership necessary to support the most intensive fixed-route transit service, typically providing higher frequencies, longer hours, and more options available outside of peak periods.

Transit Market Area II

Transit Market Area II has high to moderately high population and employment densities and typically has a traditional street grid comparable to Market Area I. Much of Market Area II is also categorized as an Urban Center and it can support many of the same types of fixed-route transit as Market Area I, although usually at lower frequencies or shorter service spans.

Transit Market Area III

Transit Market Area III has moderate density but tends to have a less traditional street grid that can limit the effectiveness of transit. It is typically Urban with large portions of Suburban and Suburban Edge communities. Transit service in this area is primarily commuter express bus service with some fixed-route local service providing basic coverage. General public dial-a-ride services are available where fixed-route service is not viable.

Transit Market Area IV

Transit Market Area IV has lower concentrations of population and employment and a higher rate of auto ownership. It is primarily composed of Suburban Edge and Emerging Suburban Edge communities. This market can support peak-period express bus services if a sufficient concentration of commuters likely to use transit service is located along a corridor. The low-density development and suburban form of development presents challenges to fixed-route transit. General public dial-a-ride services are appropriate in Market Area IV.

Transit Market Area V

Transit Market Area V has very low population and employment densities and tends to be primarily Rural communities and Agricultural uses. General public dial-a-ride service may be appropriate here, but due to the very low-intensity land uses these areas are not well-suited for fixed-route transit service.

Non-contiguous Market Areas:

Emerging Market Overlay

The Emerging Market Overlay identifies locations within Transit Market Areas III and IV that have a higher potential for transit usage than the rest of the market areas surrounding them. These areas are currently too small or non-contiguous to support a higher level of transit service. Focusing growth in and around these areas to connect to other areas of higher potential transit use will present good opportunities for future transit improvement.

Freestanding Town Centers

Freestanding Town Centers are areas that historically grew independently of Minneapolis and St. Paul and are still separated from the urban and suburban areas of the metro by rural land. Because of their concentrated downtowns laid out in a traditional urban form, these areas have a Transit Market Index value that would indicate Market Area III or higher. However, their relatively small population and land area, as well as their distance from other transit-supportive land uses, limits the potential for local fixed-route transit.

Typical Transit Service Types

Table G-2 shows the typical transit service types and levels that are most appropriate for the different transit market areas. The service types listed here are general descriptions for each market area; specific implementation of transit service will depend on available resources, specific analysis of local transit demand and existing ridership, complementary and competing services, and other factors. Detailed analysis of specific communities and locations may determine that other types and levels of service are more appropriate.

Table G-2: Transit Market Area Transit Demand and Typical Services

Transit Market Area	Transit Market Index Range	Propensity to Use Transit	Typical Transit Service
Market Area I	TMI greater than 256.0	Highest potential for transit ridership	Dense network of local routes with highest levels of service accommodating a wide variety of trip purposes. Limited stop service supplements local routes where appropriate.
Market Area II	TMI between 128.0 and 256.0	Approximately 1/2 ridership potential of Market Area I	Similar network structure to Market Area I with reduced level of service as demand warrants. Limited stop services are appropriate to connect major destinations.
Market Area III	TMI between 64.0 and 128	Approximately 1/2 ridership potential of Market Area II	Primary emphasis is on commuter express bus service. Suburban local routes providing basic coverage. General public dial-a-ride complements fixed route in some cases.
Market Area IV	TMI between 32.0 and 64.0	Approximately 1/2 ridership potential of Market Area III	Peak period express service is appropriate as local demand warrants. General public dial-a-ride services are appropriate.
Market Area V	TMI less than 32.0	Lowest potential for transit ridership	Not well-suited for fixed-route service. Primary emphasis is on general public dial-a-ride services.
Emerging Market Overlay	Varies.	Varies. Typically matches surrounding Market Area.	Varies. Typically matches surrounding Market Area.
Freestanding Town Center	TMI at least 64.0	Varies. Typically matches surrounding Market Area.	Varies. Potential for local community circulator as demand warrants. Some peak period commuter express service may be appropriate

Transitways

Transitways are unique transportation corridors with specific, detailed planning processes that result in appropriate levels of service for specific corridors. The detailed planning work on transitway corridors leads to unique applications of transit service design standards and specific types of service unique to each corridor. See the *Regional Transitway Guidelines* for more information about planning Arterial Bus Rapid Transit (BRT), Highway BRT, Light Rail Transit (LRT) and Commuter Rail

General Public Dial-a-Ride

General public dial-a-ride service is provided by the Metropolitan Council through Transit Link. Transit Link service is open to the general public and operates where regular-route transit service is not available. It is intended to augment the regular-route network and is only available for trips that cannot be accomplished on regular routes alone. Transit Link trips may drop-off passengers at major transfer points to complete their trip on the regular-route network.

ADA Paratransit Services

ADA paratransit service is public transportation for certified riders who are unable to use the regular fixed-route bus due to a disability or health condition. In the Twin Cities region, the Metropolitan Council oversees all ADA paratransit services. Metro Mobility contracts with ADA paratransit service providers, who provide customers with “first-door-through-first-door” transportation.

ADA Eligibility

Eligibility for ADA services is determined using federal guidelines established by the Americans with Disabilities Act (ADA). A person may be eligible for ADA Paratransit Service if any of the following conditions apply:

- The individual is unable to independently navigate the fixed-route transit system because of a health condition or disability (OR)
- The individual is unable to independently board or exit fixed-route vehicles due to a heath condition or disability (OR)
- The individual is unable to propel to or from a bus stop within the fixed-route service area due to a health condition or disability.

ADA Service Span and Coverage

The ADA paratransit service coverage area and hours of service are determined by several factors including Federal and State requirements. Per the Federal requirements, ADA paratransit service must operate within a minimum of 3/4 mile of the local fixed-route network and for the same hours of the day that the fixed-route network operates.

To meet this requirement, Metro Mobility matches the fixed-route hours of service delivery for Weekday, Saturday, and Sunday/Holiday service in each community where fixed-route service is available.

In addition to Federal requirements, the State of Minnesota requires Metro Mobility to provide service to all communities within the transit capital levy district. Metro Mobility is available to eligible residents living in these areas by providing 12 hours of service on Weekdays, and on an as-space-is-available bases on Saturdays and Sundays/Holidays.

Route Types

For the purposes of the Regional Transit Design Guidelines and Performance Standards, routes in the regional transit network are classified based on their mode and role within the overall network. All of the routes classified below are fixed-route service operating along an established path with a published schedule and designated stops.

Core Local Bus

Core Local routes typically serve the denser urban areas of Market Areas I and II, usually providing access to a downtown or major activity center along important commercial corridors. They form the base of the core bus network and are typically some of the most productive routes in the system.

Some Core Local Bus routes are supplemented with a limited stop route designed to serve customers wishing to travel farther distances along the corridor. Limited stop routes make fewer stops and provide faster service than the Core Local routes.

Supporting Local Bus

Supporting Local routes are typically designed to provide crosstown connections within Market Areas I and II. Typically these routes do not serve a downtown but play an important role connecting to Core Local routes and ensuring transit access for those not traveling downtown.

Suburban Local Bus

Suburban Local routes typically operate in Market Areas II and III in a suburban context and are often less productive that Core Local routes. These routes serve an important role in providing a basic-level of transit coverage throughout the region.

Commuter and Express Bus

Commuter and Express Bus routes primarily operate during peak periods to serve commuters to downtown or a major employment center. These routes typically operate non-stop on highways for portions of the route between picking up passengers in residential areas or at park-and-ride facilities and dropping them off at a major destination.

Arterial Bus Rapid Transit

Arterial bus rapid transit (BRT) lines operate in high demand urban arterial corridors with service, facility, and technology improvements that enable faster travel speeds, greater frequency, an improved passenger experience, and better reliability. Design guidelines for arterial BRT can be found in the *Regional Transitway Guidelines*.

Highway Bus Rapid Transit

Highway bus rapid transit (BRT) lines operate in high demand highway corridors with service, facility, and technology improvements providing faster travel speeds, all-day service, greater frequency, an improved passenger experience, and better reliability. Design guidelines for highway BRT can be found in the *Regional Transitway Guidelines*.

Dedicated Bus Rapid Transit

Dedicated bus rapid transit (BRT) lines operate in dedicated right-of-way for the exclusive use of buses in high demand corridors. Service, facility and technology improvements are similar to light rail. It provides faster travel speeds, all-day service, greater frequency, an improved passenger experience, and better reliability. Design guidelines for dedicated BRT have not yet been developed. An update to the *Regional Transitway Guidelines* is identified as a work program item and will consider addressing dedicated BRT.

Light Rail

Light rail operates using electrically-powered passenger rail cars operating on fixed rails in dedicated right-of-way. It provides frequent, all-day service stopping at stations with high levels of customer amenities and waiting facilities. Design guidelines for light rail can be found in the *Regional Transitway Guidelines*.

Commuter Rail

Commuter rail operates using diesel-power locomotives and passenger coaches on traditional railroad track. These trains typically only operate during the morning and evening peak period to serve work commuters. Design guidelines for commuter rail can be found in the *Regional Transitway Guidelines*.

Transit Design Guidelines

Transit Design Guidelines are intended to guide the appropriate allocation of transit resources and ensure regional coordination and consistency. The design guidelines are organized by Transit Market Area and/or Route Type. These guidelines are representative of the general types of transit service that are appropriate to implement, however exceptions often exist based on specific local circumstances and available funding.

Stop Spacing

Stop spacing guidelines must balance between providing greater access to service with faster travel speeds. More stops spaced closer together reduce walk distances to transit but also increase travel times. In general, the average distance people are willing to walk to access transit services is ¼ mile for local bus service and ½ mile for limited stop bus service and transitway service. Table G-3 shows the recommended stop spacing guidelines that seek to balance between access and speed.

Table G-3: Stop Spacing

Route Type	Typical Stop Spacing:
Core Local Bus*	1/8 to 1/4 mile
Supporting Local Bus	1/8 to 1/4 mile
Suburban Local Bus	1/8 to 1/4 mile
Arterial BRT	1/4 to 1/2 mile
Highway BRT	1/2 to 2 miles
Light Rail	1/2 to 1 mile
Commuter Express Bus	Market Specific**
Commuter Rail	5 to 7 miles

* Local routes with limited stop service will have a typical stop spacing of 1/4 to 1/2 mile.

**In downtowns and local pickup areas, stop spacing will follow the standards for local routes. Along limited stop or non-stop portions of the route, stop spacing will be much greater.

An allowable exception to standards may be central business districts and major traffic generators. These guidelines are goals, not a minimum or maximum.

Route Spacing

Route spacing refers to the distance between two parallel routes. Route spacing guidelines seek to balance service coverage with route productivity and transit demand. Routes that are spaced too close together will have overlapping service areas and compete for riders, reducing the productivity of both routes. Routes spaced too far apart will lead to coverage gaps. Generally areas with lower transit demand will have routes spaced farther apart. Table G-4 shows the route spacing guidelines by route type and market area. Commuter Express bus and transitway routes are determined on a case by case basis according to specific transit market conditions. Please see the *Regional Transitway Guidelines* for more details about transitway planning.

Table G-4: Route Spacing

Route Type	Market Area				
	Area I	Area II	Area III	Area IV	Area V
Core Local Bus*	1/2 mile	1 mile	Specific**	NA	NA
Supporting Local Bus	1 mile	1-2 miles	Specific**	NA	NA
Suburban Local Bus	NA	2 miles	Specific**	Specific**	NA

*Local limited stop routes do not follow a route spacing guideline. They will be located in high demand corridors.

** Specific means that route structure will be adapted to the demographics, geography and land use of a specific area.

Span of Service

Span of service refers to the periods of the day that transit is in service. Service span guidelines are typically based on the role a route type plays in the overall transit network. Route types designed to primarily serve commuters generally operate only in peak periods, while route types that serve a broader set of trip purposes generally have a longer span of service. Table G-5 shows the recommended hours of service by route type.

Table G-5: Span of Service

Route Type	Weekday				Weekend	
	Peak	Midday	Evening	Owl	Saturday	Sunday
Core Local Bus*	●	●	●	○	●	●
Supporting Local Bus	●	●	●	○	◑	◑
Suburban Local Bus	●	●	◑	○	○	○
Arterial BRT	●	●	●	○	●	●
Highway BRT	●	●	●	○	●	●
Light Rail	●	●	●	○	●	●
Commuter Express Bus	●	○	○	○	○	○
Commuter Rail	●	○	○	○	○	○

Service Provided ●; Service Typically Provided ◑; Service As Demand Warrants ○

Peak - 6:00am to 9:00am and 3:00pm to 6:30pm; Midday - 9:00am to 3:00pm; Evening - 6:30pm to 1:30am; Owl – 1:30am to 5:00am; Saturday – Saturday Service; Sunday – Sunday/Holiday Service

*Local limited stop routes will operate primarily in the peak period.

Minimum Frequency

Minimum frequency refers to the average number of minutes between transit vehicles on a given route or line traveling in the same direction. Routes serving areas of higher transit demand will tend to have higher frequencies. Table G-6 shows the recommended minimum frequency by route type and market area.

Table G-6: Minimum Frequency

Route Type	Market Area				
	Area I	Area II	Area III	Area IV	Area V
Core Local Bus	15” Peak 30” Offpeak 30” Weekend	30” Peak 60” Offpeak 60” Weekend	60” Peak 60” Offpeak 60” Weekend	NA	NA
Supporting Local Bus	30” Peak 30” Offpeak 30” Weekend			NA	NA
Suburban Local Bus	NA			NA	NA
Arterial BRT	15” Peak 15” Offpeak 15” Weekend			NA	NA
Highway BRT				NA	NA
Light Rail				NA	NA
Commuter Express Bus	30” Peak		3 Trips each peak		NA
Commuter Rail	NA		30” Peak		

Additional service may be added as demand warrants and these guidelines apply primarily to the peak direction.

Accessibility

Accessibility refers to how well the transit network is meeting the travel needs of its users and potential users. People use transit to reach destinations they wish to visit, e.g. work, school, shopping, among many others. Accessibility measures how easily or difficult transit users can reach desired destinations using the transit network. This is related to, but distinct from mobility, which measures the overall distance people are able to travel on the network. By taking into account the destinations that people are able to access via that network, measures of accessibility can provide a more complete measure of the overall usefulness of the network to its users.

The Metropolitan Council views accessibility as an important tool to measure and evaluate the regional transit network and land use patterns. Efforts to develop and implement appropriate measures of accessibility are ongoing.

Passenger Amenities

Regional transit providers offer a range of amenities at bus stops and other passenger facilities to improve the customer experience. Passenger amenities include shelters, shelter lighting or heat, trash receptacles, seating, security cameras, good pedestrian access, bicycle parking and storage, and signage both static and real-time, indicating route, schedule, frequency and other information.

Passenger amenities create a more comfortable, accessible and attractive waiting environment for transit customers. Features such as shelter lighting and good pedestrian access enhance passenger safety. Transit travel may be completed more easily with access to transit service information or secure bike parking. Passenger amenities can also benefit the surrounding

neighborhood by making transit a more attractive travel option for nearby land uses and by contributing to the overall character of the streetscape.

Table G-7 identifies the standard amenities that are included with various facility types. Some amenities are always provided and others are occasionally provided depending on the size, location, or use of the facility.

Table G-8: Passenger Amenities

Facility Type	Shelter	Light	Heater	Trash Receptacle	Stand Alone Bench	Security Cameras	Pedestrian access	Bike parking	Secure bike storage	Customer information	Real-time Customer Information
Transit Centers	●	●	●	●	●	◑	●	◑	◑	●	◑
Park-and-rides	●	●	◑	◑	◑	◑	◑	◑	◑	●	◑
Rail Stations	●	●	●	●	●	●	●	●	◑	●	●
Bus Stop	◑	◑	◑	○	○	○	●	◑	◑	◑	◑

Always Provided ●; Occasionally Provided ◑; Not Provided ○

In some cases transit providers lease park and-rides and some shelters are owned and maintained by other entities. In such cases, providers may not offer all the customer amenities identified above.

In addition to these standard amenities, transit providers occasionally provide - or partner with other organizations to provide - more unique amenities including custom shelters, landscaping, and public art. These amenity options are generally considered where they are integrated into a larger initiative such as a transitway, Transit Center, downtown bus stop, Transit Oriented Development project, or park-and-ride owned and maintained by a regional transit provider. The design of custom shelters, landscaping and public art should address ease of maintenance, repair and replacement.

Bus Stop Shelters

Bus stop shelters provide seating and protection from bad weather for customers and are particularly important to senior citizens, parents with small children, and persons with disabilities. The costs of shelter placement and ongoing maintenance limit the number of bus stops that can include shelters. Metro Transit considers the following factors to prioritize the bus stops where shelters are placed:

- High number of total passenger boardings, typically 40 or more boardings per day at bus stops located in Minneapolis and St. Paul and 25 or more boardings per day at bus stops located in suburban communities. This factor prioritizes shelter placement at bus stops where the most passengers are waiting, relative to the amount of transit service generally available in the community.

- High number of limited mobility boardings, to ensure that people vulnerable to inclement weather are protected.
- Stop location relative to minority and low-income census block groups to ensure regional equity goals are achieved.
- High number of transit transfers, to provide shelter where it is more likely that passengers are including a wait time in their transit trip.

Further, bus stop locations must be capable of supporting transit shelters. Factors such as sidewalk and right-of-way space, topography, land use compatibility and proximity to bus boarding locations are considered. Transit providers may consider locating shelters where ADA improvements are scheduled to maximize capital improvement investments. Requests from the community to place or remove shelters are considered in context of the quantitative analysis used to prioritize shelter locations.

Customer Information

Customer information at passenger facilities, including basic signage, maps, and schedules and real-time information, is an important component of transit service. Transit information can provide customers with basic route information such as a map of the route and the destinations along the route, a schedule, and real-time information about when the next bus will arrive. This type of information increases customer satisfaction and reassures them that they can depend on transit. New technologies play an important role in the deployment of customer information, and the Council will continue to expand a network of customer information systems using proven and cost-efficient technology at key locations, such as transit stations and centers, online and on mobile devices.

Transit Performance Standards

Performance standards are used to evaluate the relative productivity and efficiency of the services provided. To be responsible and dynamic, a transit system must consistently measure and adjust service in unproductive routes and address insufficient service in productive areas. These standards serve as indicators of route performance and call attention to routes that may need to be adjusted. The use of multiple performance standards provides better insight into the operational and financial performance of individual services and allows transit providers to balance the cost and ridership of each route with its role in the regional transit network.

Productivity

Productivity is measured as the number of Passengers per In-Service Hour. It is the total number of passengers carried divided by the in-service time. A high number of passengers per in service hour means a route is serving more people with the resources provided. The passengers per in-service hour standard establishes a minimum threshold of route performance. It is calculated at both the route and trip level. Table G-8 shows the minimum passengers per in-service hour by route type.

Table G-9: Passengers per In-Service Hour

Route Type	Route Average*	Minimum per Trip**
Core Local Bus	≥ 20	≥ 15
Supporting Local Bus	≥ 15	≥ 10
Suburban Local Bus	≥ 10	≥ 5
Arterial BRT	≥ 25	≥ 5
Highway BRT	≥ 25	≥ 5
Light Rail	≥ 70	≥ 50
Commuter Express Bus	Peak ≥ 20; Off-peak ≥ 10	Peak ≥ 15; Off-peak ≥ 5
Commuter Rail	≥ 70	≥ 50
General Public Dial-a-Ride	≥ 2	N/A

*Route average represents the average passengers per in service hour over the entire day. Individual hours may fall below standard.

**Minimum per trip represents the minimum passengers per in service hour for individual trips on a route. Multivehicle trips, such as three-car trains, will be treated as a single trip.

Routes and trips that do not meet these minimum standards should be reviewed for potential changes to increase ridership or reduce service. Very poor performing routes may be considered for elimination.

Cost Effectiveness

The cost effectiveness of a route is measured by the subsidy required to operate the route per passenger. Subsidy is calculated as the difference between the total cost of providing service minus revenue from passenger fares. Since different types of routes are expected to have different levels of performance, each route's subsidy is compared to the average subsidy of its peers. This standard identifies routes that are not operating within the range of peer routes and focuses corrective action for those services. Subsidy thresholds are determined by calculating the non-weighted subsidy per passenger average within each route type. Table G-9 shows the subsidy thresholds and possible corrective action.

Table G-10: Subsidy per Passenger

Threshold Level	Subsidy per Passenger	Monitoring Goal	Possible Action
1	20 to 35 percent over peer route average	For quick review	Minor modifications to route
2	35 to 60 percent over peer route average	For intense review	Major changes to route
3	Greater than 60 percent over peer route average	For significant change	Restructure or eliminate route